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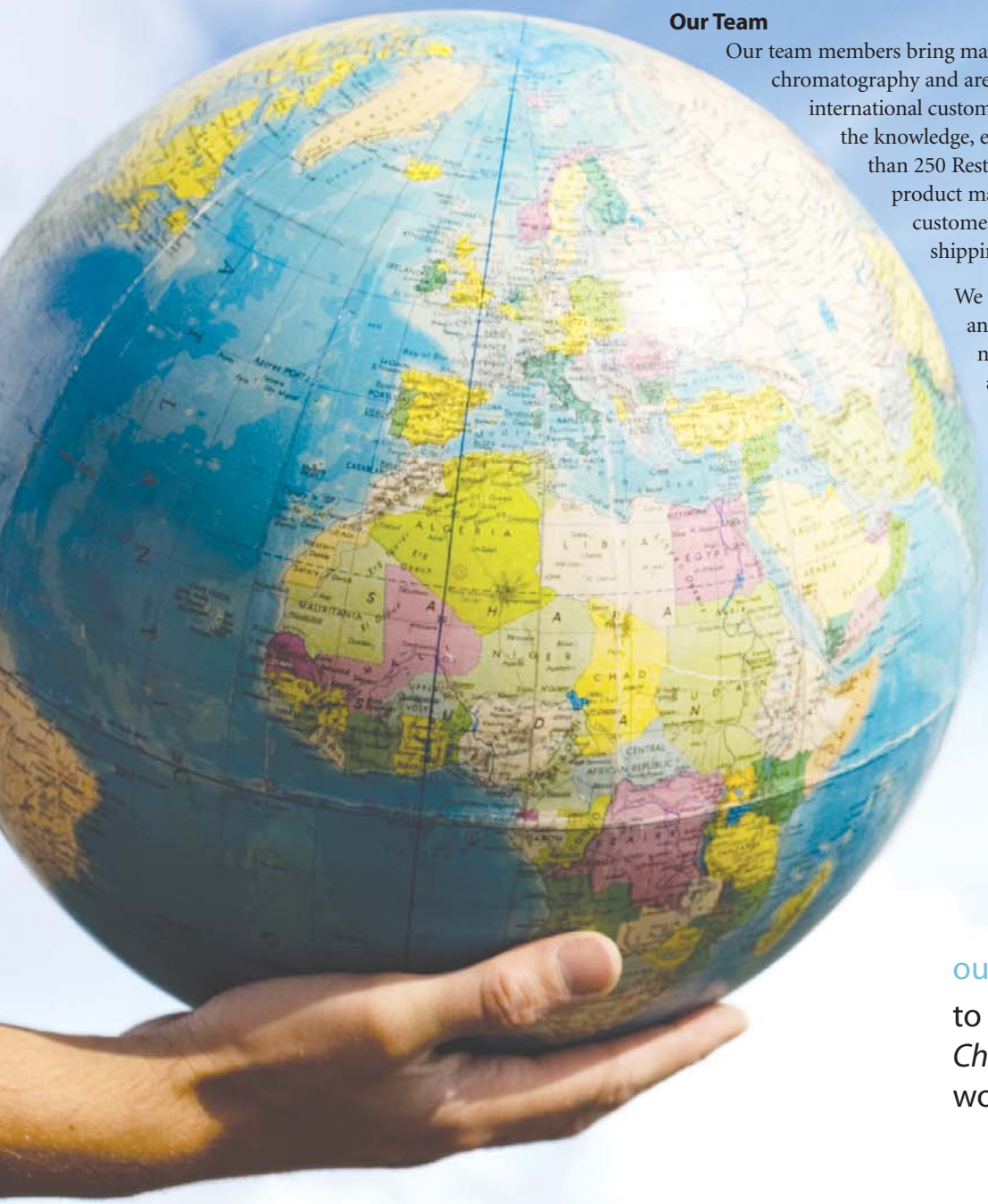
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Christine Vargo
Director of Sales
Phone: 814-353-1300, ext. 2123
Fax: 814-353-1309
e-mail: christine.vargo@restek.com

Restek International Sales Managers and Coordinator



Dave Mannus
European Sales Manager
Phone: +44 (0)2890 814576
Fax: +44 (0)2890 814576
e-mail: restekeurope@aol.com



Eric Steindl
Canada, South America, Latin America, Middle East, & Africa Sales Manager
Phone: 814-353-1300, ext. 2109
Fax: 814-353-9278
e-mail: eric.steindl@restek.com



Eberhardt Kuhn
Asia / Pacific / India Sales Manager
Phone: 814-353-1300, ext. 2159
Fax: 814-353-9278
e-mail: eberhardt.kuhn@restek.com



Karen Kishbach
International Sales Coordinator
Phone: 814-353-1300, ext. 2196
Fax: 814-353-1309
e-mail: karen.kishbach@restek.com

map guide

pages 4 & 5

Dave Mannus
Eric Steindl
Eberhardt Kuhn

for more info

see **pages 4 & 5** to locate your Restek international subsidiary or distributor. Visit www.restek.com for recent updates.

Restek International Subsidiaries



Renzo Brun
France ★
Restek France
Phone: +33 (0)1 60 78 32 10
Fax: +33 (0)1 60 78 70 90
e-mail: restekfr@restekfrance.fr
www.restek.fr



Wolfgang Kutt
Germany ★
Restek GmbH
Phone: +49 (0)6172 2797 0
Fax: +49 (0)6172 2797 77
e-mail: info@restekgmbh.de
www.restekgmbh.de



Dave Mannus
Ireland ★
Restek Ireland
Phone: +44 (0)2890 814576
Fax: +44 (0)2890 814576
e-mail: restekeurope@aol.com



Martin Chignall
United Kingdom ★
Thames Restek UK LTD
Phone: +44 (0)1494 563377
Fax: +44 (0)1494 564990
e-mail: sales@thamesrestek.co.uk
www.thamesrestek.co.uk

Restek International Customer Service Representatives

Restek's customer service representatives provide Plus 1 service to our subsidiaries and distributors to insure that customers throughout the world get the products they order when they need them.



Emily Dillon
Phone: 814-353-1300, ext. 2328
Fax: 814-353-1309 / 1310
e-mail: IntlPlusOne@restek.com



Nicole Simpson
Phone: 814-353-1300, ext. 2391
Fax: 814-353-1309 / 1310
e-mail: IntlPlusOne@restek.com



Ken Poorman
Phone: 814-353-1300, ext. 2378
Fax: 814-353-1309 / 1310
e-mail: IntlPlusOne@restek.com



Velvet Rossman
Phone: 814-353-1300, ext. 2416
Fax: 814-353-1309 / 1310
e-mail: IntlPlusOne@restek.com



Stephanie Sunner
Phone: 814-353-1300, ext. 2189
Fax: 814-353-1309 / 1310
e-mail: IntlPlusOne@restek.com

Restek International Technical Support



Tom Bloom
Phone: 814-353-1300, ext. 2105
Fax: 814-353-1568
e-mail: intltechsupp@restek.com



Tim Herring
Phone: 814-353-1300, ext. 2374
Fax: 814-353-1568
e-mail: intltechsupp@restek.com

Export Compliance



Kristy Myers
Phone: 814-353-1300, ext. 2304
Fax: 814-353-1309 / 1310
e-mail: exportcompliance@restek.com

Intl. GC Specialist



Jaap de Zeeuw
Phone: + 31 118 62 31 51
e-mail: jaap.dezeeuw@restek.com

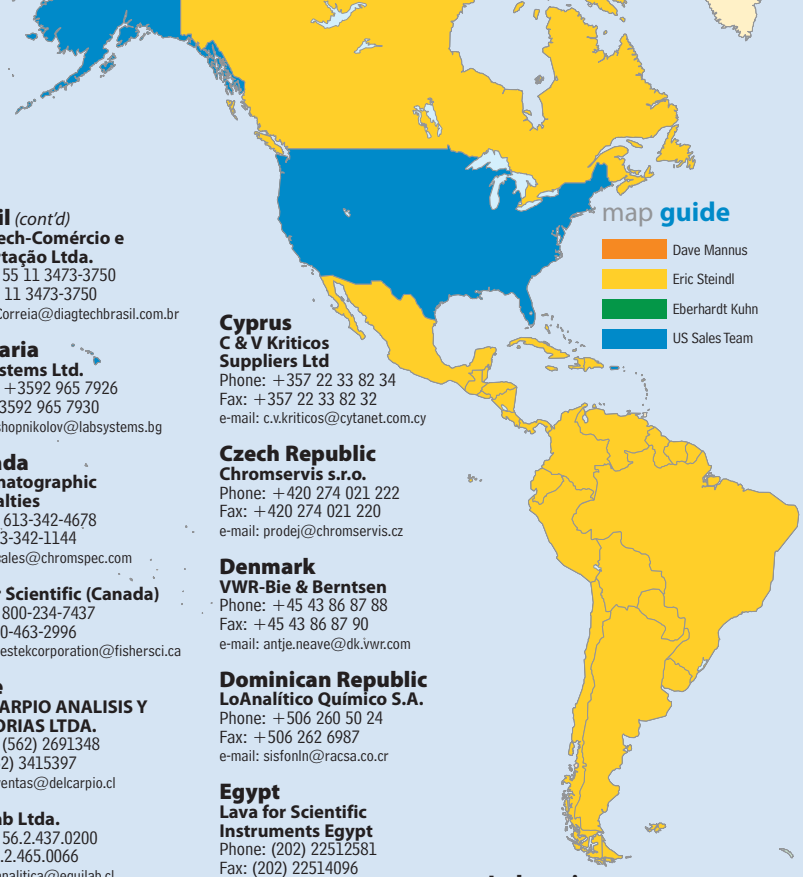
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Becky Wittrig
Phone: 814-353-1300, ext. 2347
Fax: 814-353-1568
e-mail: becky.wittrig@restek.com

Restek Worldwide

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Headquarters

Restek ★
Bellefonte, PA 16823 USA
Toll-free (in U.S.): 800-356-1688
Phone: 814-353-1300
Fax: 814-353-1309
www.restek.com

Subsidiaries

France ★
Restek France
Phone: 33 (0)1 60 78 32 10
Fax: 33 (0)1 60 78 70 90
e-mail: restek@restekfrance.fr

Germany ★
Restek GmbH
Phone: 0049 - (0)6172 2797-0
Fax: 0049 - (0)6172 2797-77
e-mail: info@restekgmbh.de

Ireland ★
Restek Ireland
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Fax: 44-28-90-814576
e-mail: restekeurope@aol.com

United Kingdom ★
Thames Restek UK LTD
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Global Solutions Partners

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Fax: 02 9684 4055

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Fax: 010-85252326

India
Shimadzu Analytical (India) Pvt. LTD.
Phone: 91(22)2920-4741
Fax: 91(22)2920-1678

Japan
Shimadzu Corporation
Phone: +81-75-823-1111

Latin America
Shimadzu Latin America
Phone: 410-381-1227, ext. 1227
Fax: 410-309-6130

Middle East & Africa
Shimadzu Middle East & Africa FZE
Phone: +971-4-883-6668
Fax: +971-4-883-6808

New Zealand
Shimadzu Scientific Instruments (Oceania) PTY LTD.
Phone: 64.9.839.7100
Fax: 64.9.839.710
e-mail: sales@shimadzu.co.nz

Singapore
Shimadzu (Asia Pacific) Pte Ltd
Phone: (65) 91123662
Fax: (65) 67792935
e-mail: adrian@shimadzu.com.sg

South Korea
Dong Il Shimadzu Corp.
Phone: +82-17-763-6622
Fax: +82-2-540-5541
e-mail: wypyo@e-shimadzu.co.kr

U.S.
Shimadzu Scientific Instruments
Phone: 800-477-1227

Distributors

Algeria
HTDS ALGERIA
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Fax: 21 79 02 15
e-mail: info@htds.fr

Argentina
Eidomet SRL
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Fax: 54-11-4334-1737
e-mail: eidomet@eidomet.com.ar

Australia
Chromalytic Technology Pty Ltd
Phone: 61 3 9762 2034
Fax: 61 3 9761 1169
e-mail: jimjeffs@chromtech.net.au

LECO Australia Pty Ltd
Phone: 61 2 9894 5955
Fax: 61 2 9894 5247
e-mail: australia@leco.com

Lomb Scientific (Aust) Pty Ltd
Phone: 61 2 8536 6200
Fax: 61 2 8536 6250
e-mail: sales@lomb.com.au

Austria
CP-Analytica GmbH
Phone: 43 (0)2572/4381
Fax: 43 (0)2572/20791
e-mail: info@cp-analytica.at

Bahrain
LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

Yousuf Mahmood Husain
Phone: +973 276176
Fax: +973 275819
e-mail: reji@ymh.com.bh

Bangladesh
AQ Chowdhury Science & Synergy Pvt. Ltd
Phone: 880-2-9862272
Fax: 880-2-8854428
e-mail: aqcss@siriusbb.com

Belarus
New Analytical Systems Ltd.
Phone: +375-17-226-25-17
Fax: +375-17-226-25-17
e-mail: unichrom@unichrom.com

Belgium
Interscience BVBA
Phone: +32 10 450025
Fax: +32 10 453080
e-mail: info@interscience.be

Belize
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Bolivia
Sistemas Analíticos SRL
Phone: ++591 3 351 6298
Fax: ++591 3 311 9209
e-mail: info@sistemasanaliticos.com.bo

Spektra Ltd
Phone: ++591.2.240.6553
Fax: ++591.2.214.1740
e-mail: spektra@entelnet.bo

Bosnia and Herzegovina
Analitika d.o.o.
Phone: 00387 33 712 060
Fax: 00387 33 712 061
e-mail: analitika_sa@bih.net.ba

Brazil
Cromatec Comercio de Instrumentos Analíticos Ltda.
Phone: 55 11 5670-2510
Fax: 55 11 5670-2530
e-mail: sac@cromatec.com.br

Brazil *(cont'd)*
Diagtech-Comércio e Importação Ltda.
Phone: 55 11 3473-3750
Fax: 55 11 3473-3750
e-mail: Correia@diagtechbrasil.com.br

Bulgaria
Labsystems Ltd.
Phone: +3592 965 7926
Fax: +3592 965 7930
e-mail: shopnikolov@labsystems.bg

Canada
Chromatographic Specialties
Phone: 613-342-4678
Fax: 613-342-1144
e-mail: sales@chromspec.com

Fisher Scientific (Canada)
Phone: 800-234-7437
Fax: 800-463-2996
e-mail: restekcorporation@fishersci.ca

Chile
DEL CARPIO ANALISIS Y ASESORIAS LTDA.
Phone: (562) 2691348
Fax:(562) 3415397
e-mail: ventas@delcarpio.cl

Equilab Ltda.
Phone: 56.2.437.0200
Fax: 56.2.465.0066
e-mail: analitica@equilab.cl

China
Beijing Hesi Scientific & Technology Ltd.
Phone: 86 10 82561086
Fax: 86 10 82561088
e-mail: info@bjhesi.com

Beijing Mingnike Analytical Instrument and Equipment Center
Phone: 010-84726305
Fax: 010-84723212
e-mail: wangqichang@yahoo.com

Dikma Technologies
Phone: 8610-6231-7719
Fax: 8610-6231-7723
e-mail: info@dikma.com.cn

Globetech Systems Ltd.,
a Restek HPLC application partner
Phone: 852-25221114
Fax: 852-25211190
e-mail: lj001@globetechsystems.com

Shimadzu-GL Sciences (Shanghai) Laboratory Supplies Company, Ltd.
Phone: +86-21-6473-2791
Fax: +86-21-6473-4792
e-mail: fujishi@shimadzu.co.jp

Columbia
Impel Ltda.
Phone: 571-290-2862
Fax: 571-290-7290
e-mail: impel@etb.net.co

Innovatek Ltda.
Phone: 57-1 338 0711
Fax: 57-1 327 0936
e-mail: hislenh@innovatek.com.co

Costa Rica
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Croatia
AnAs Analytical Assistance
Phone: 385-1-662-5606
Fax: 385-1-662-5608
e-mail: vladimir.svob@zg.htnet.hr

Cyprus
C & V Kriticos Suppliers Ltd
Phone: +357 22 33 82 34
Fax: +357 22 33 82 32
e-mail: c.v.kriticos@cytanet.com.cy

Czech Republic
Chromservis s.r.o.
Phone: +420 274 021 222
Fax: +420 274 021 220
e-mail: prodej@chromservis.cz

Denmark
VWR-Bie & Berntsen
Phone: +45 43 86 87 88
Fax: +45 43 86 87 90
e-mail: antje.neave@dk.vwr.com

Dominican Republic
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Egypt
Lava for Scientific Instruments Egypt
Phone: (202) 22512581
Fax: (202) 22514096
e-mail: lavaegypt@yahoo.com

Estonia
G.W. Berg OÜ
Phone: 372 6505 658
Fax: 372 6505 653
e-mail: gwb@gwb.ee

Finland
HNU Nordion Ltd. Oy
Phone: 358.9.565.7240
Fax: 358.9.565.72430
e-mail: lea.julin@hnunordion.fi

France ★
see Subsidiaries

Germany ★
see Subsidiaries

Greece
Link Lab Ltd
Phone: 30 210 7564772
Fax: 30 210 7564723
e-mail: sales@linklab.gr

Honduras
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Hong Kong
Guyline (Asia) Ltd.
Phone: 852-2856-0606
Fax: 852-2811-2947
e-mail: guyasia@pacific.net.hk

Hungary
Lab-Comp Kft.
Phone: 36 1 347 6090
Fax: 36 1 280 6358
e-mail: labcomp@lab-comp.hu

India
Labindia Instruments Pvt Ltd
Phone: +91 222 533 5389
Fax: +91 222 533 5940
e-mail: smitat@labindia.com

Toshvin Analytical Pvt Ltd
Phone: 91-22-23015096
Fax: 91-22-23013592
e-mail: mumbai@toshvin.com

Indonesia
Pivot ProChem
Phone: 65-6776-7443
Fax: 65-6776-2652
e-mail: prochem@pacific.net.sg

PT. Tawada Graha
Phone: +6221 – 57941139
Fax: +6221 – 57941140
e-mail: prs@tawada-ndt.com

Ireland ★
(Northern Ireland & Republic of Ireland)
see Subsidiaries **(Restek Ireland)**

Israel
Bargal Analytical Instruments
Phone: +972-3-9796-533
Fax: +972-3-9796-538
e-mail: bargal@bargal.co.il

Italy
Chebios s.r.l.
Phone: + 39 (06) 39080601
Fax: + 39 (06) 39080606
e-mail: chebios@chebios.it

Superchrom S.r.l.
Phone: + 39 02 7610037
Fax: + 39 02 70100100
e-mail: superchrom@iol.it

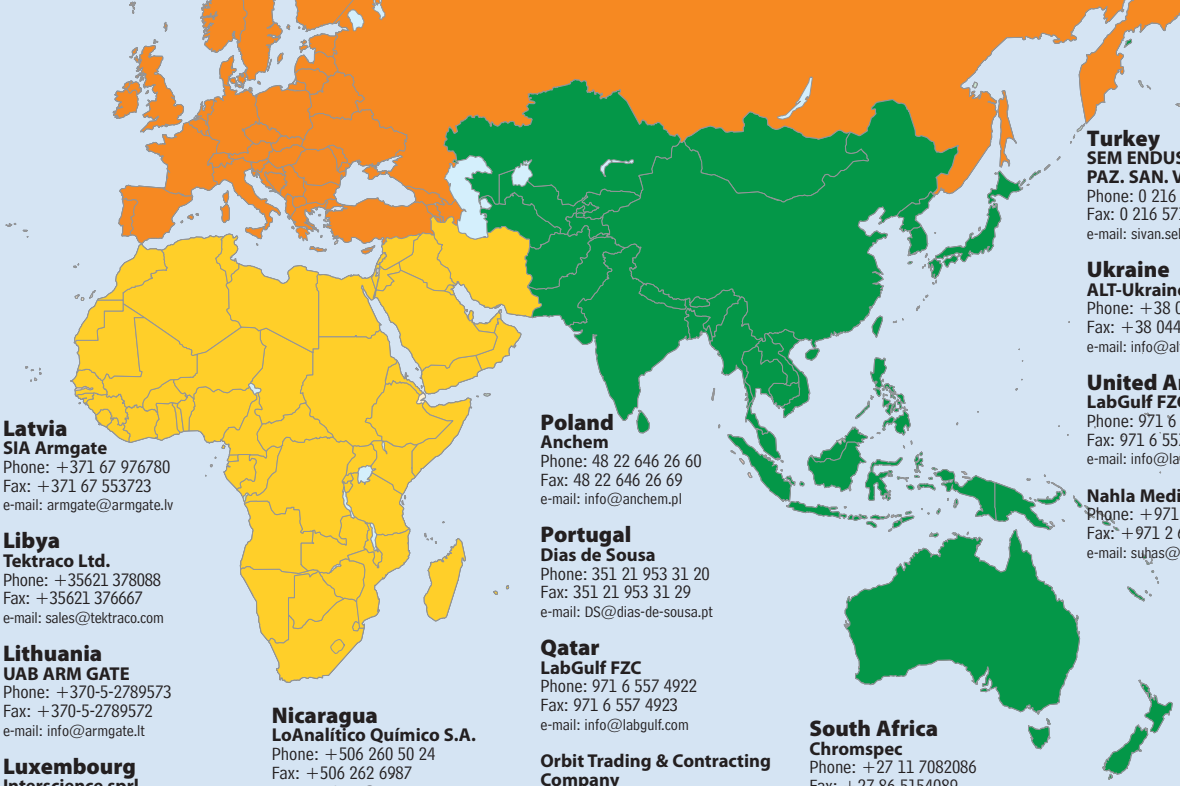
Japan
Shimadzu, GLC Ltd.
Phone: 81 3 5812 3821
Fax: 81 3 5812 3827
e-mail: gsupport@glc.shimadzu.co.jp

Uniflex Co., Ltd.
Phone: 04 7147 3751
Fax: 04 7144 8242
e-mail: info@uniflex.co.jp

Jordan
Vivid Separation & Filtration
Phone: +962 6 5831172
Fax: +962 6 5831173
e-mail: vivid01@wanadoo.jo

Korea
See South Korea

Kuwait
LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com



Latvia
SIA Armgate
Phone: +371 67 976780
Fax: +371 67 553723
e-mail: armgate@armgate.lv

Libya
Tektraco Ltd.
Phone: +35621 378088
Fax: +35621 376667
e-mail: sales@tektraco.com

Lithuania
UAB ARM GATE
Phone: +370-5-2789573
Fax: +370-5-2789572
e-mail: info@armgate.lt

Luxembourg
Interscience sprl
Phone: +32 10 450025
Fax: +32 10 453080
e-mail: info@interscience.be

Macedonia
VARUS
Phone: +389 (0) 23 115122
Fax: +389 (0) 23 137013
e-mail: varus@varus.com.mk

Malaysia
Chemopharm Sdn. Bhd.
Phone: 603.7872.6000
Fax: 603.7874.7958
e-mail: enquiry@chemopharm.com.my

Malta
Tektraco Ltd.
Phone: +35621 378088
Fax: +35621 376667
e-mail: sales@tektraco.com

Mexico
VWR International, S de RL de CV
Phone: 52-55-5005-0100
Fax: 52-55-5005-0126
e-mail: zuleyka_loyola@mx.vwr.com

TECNOLOGIA CRO-MATOGRAFICA , S.A. DE C.V
Phone: +52-55-5615-7487
Fax: +52-55-5598-5917
e-mail: hector.ocampo@tecrom.com

Moldova
Laco Alfatec SRL
Phone: (+373 22) 241507
Fax: (+373 22) 244341
e-mail: egor.efremov@gmail.com

Montenegro
Millitest d.o.o.
Phone: 00381 11 30 48 237
Fax: 00 381 11 3048 239
e-mail: mila.komarcic@millitest.com

Nepal
Associated Enterprises
Phone: + (1) 425 0934
Fax: + (1) 426 1744
e-mail: info@asoent.com

Netherlands
Interscience B.V.
Phone: +31 76 5411800
Fax: +31 76 5420088
e-mail: info@interscience.nl

New Zealand
LECO Australia Pty Ltd
Phone: 61 2 9894 5955
Fax: 61 2 9894 5247
e-mail: australia@leco.com

Nicaragua
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Nigeria
Labstock Nigeria Limited
Phone: 234 1 875 2174
Fax: 234 1 875 2174
e-mail: sales@labstocknigeria.com

Norway
IT Instrument-Teknikk AS
Phone: +47 23194640
Fax: +47 23194641
e-mail: it@instrument-teknikk.no

Oman
LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

Middle East Scientific Equip. Corp. LLC (MESEC)
Phone: + 968-9672 4110
Fax: + 968-2450 4809
e-mail: techuc@omantel.net.om

Pakistan
Analytical Measuring Systems (Pvt) Ltd
Phone: +92-21-5345581
Fax: +92-21-5345582
e-mail: sales@amspvtltd.com

Panama
LoAnalítico Químico S.A.
Phone: +506 260 50 24
Fax: +506 262 6987
e-mail: sisfonln@racsa.co.cr

Paraguay
DEXIN – Grupo Quimico SRL
Phone: (+598 2) 507-6058
Fax: (+598 2) 507-0155
e-mail: ventas@dexin.com.uy

Peru
Electromedica Peruana S.A.
Phone: 51-1-4601317
Fax: 51-1-4601448
e-mail: analitica@empesa.net

Philippines
Brownstone Asia-Tech, Inc.
Phone: 632 532 4310
Fax: 632 531 6518
e-mail: batinc@pldtdsl.net

JEFCOR, Incorporated
Phone: 632 838 8484
Fax: 632-838-8483
e-mail: jefcor@skyinet.net

Poland
Anchem
Phone: 48 22 646 26 60
Fax: 48 22 646 26 69
e-mail: info@anchem.pl

Portugal
Dias de Sousa
Phone: 351 21 953 31 20
Fax: 351 21 953 31 29
e-mail: DS@dias-de-sousa.pt

Qatar
LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

Orbit Trading & Contracting Company
Phone: +974 4351355
Fax: 974 4433541
e-mail: orbittrdg@qatar.net.qa

Romania
S.C. Agilrom Scientific S.R.L.
Phone: 40 21 269 12 88
Fax: 40 21 269 1299
e-mail: office@agilrom.ro

Russian Federation
LAVERNA Group
Phone/Fax: 7.495.482.5678
Phone/Fax: 7.495.482.4054
e-mail: petruk@lab.comcor.ru

Saudi Arabia
K.I. ABDULKADIR & PARTNERS CO. LTD.
Phone: +966 2 640 5906
Fax: +966 2 640 4710
e-mail: vasudevan.arimbra@kiaksa.com

LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

Scotland ★
see Subsidiaries (United Kingdom)

Serbia
Millitest d.o.o.
Phone: 00381 11 30 48 237
Fax: 00 381 11 3048 239
e-mail: mila.komarcic@millitest.com

Singapore
CEMS Marketing PTE Ltd.
Phone: (65)-6786-3559
Fax: (65)-6786-5598
e-mail: cems.marketing@pacific.net.sg

Sintech Scientific (SEA) PTE Ltd.
Phone: (65)-6779-0007
Fax: (65)-6872-2392
e-mail: jonathan@sintechscientific.com

Slovakia
CHROMSERVIS WAFY s.r.o.
Phone: + 421 (0)2 44630377-9
Fax: +421 (0)2 44681183
email: bratislava@chromservis.sk

Slovenia
MIKRO+POLO d.o.o.
Phone: +386(0)2 6143 365
Fax: +386(0)2 6143 320
e-mail: info@mikro-polo.si

South Africa
Chromspec
Phone: +27 11 7082086
Fax: +27 86 5154089
e-mail: chromspec@icon.co.za

South Korea
Young In Frontier Co., Ltd.
Phone: 82-2-2140-3300
Fax: 82-2-2140-3310
e-mail: yift@younginfrontier.com

Spain
Teknokroma S. Coop C. Ltda
Phone: +34 936 748 800
Fax: +34 936 752 405
e-mail: comercial@teknokroma.es

Sri Lanka
LabMasters (Pvt) Ltd.
Phone: 0094-114-924436
Fax: 0094-112-764488
e-mail: labmasters@sltnet.lk

Sweden
Dalco Chromtech AB
Phone: +46-(0)8-5949 6969
Fax: +46-(0)8-5949 6968
email: info@dalcochromtech.se

Switzerland
BGB Analytik AG
Phone: +41 (0) 61 991 00 46
Fax: +41 (0) 61 991 00 25
e-mail: sales@bgb-analytik.com

Taiwan
EHong Instruments co., Ltd
Phone: 886 227 5522 66
Fax: 886 227 0776 93
e-mail: aid@ehong.com.tw

Scientific Hightek Co., Ltd.
Phone: 886-2-2652-2200
Fax: 886-2-2653-0022
e-mail: support@gclc.com.tw

Thailand
C.E. Combination Co., Ltd.
Phone: +66 2 527 7635 - 7
Fax: +66 2 527 7638
e-mail: sales@cecombination.com

C.E. Instruments (Thailand) Co., Ltd.
Tel : 66 2 9658971-3
Fax : 66 2 9658974
e-mail: wisut@cethailand.com

Tunisia
ITTEC LAB / HTDS TUNISIA
Phone: 70 836528 -- 70 836961
Fax: 70 836561 -- 70 836936
e-mail: ittec_lab@gnet.tn

Turkey
SEM ENDUSTRI CIHAZLARI PAZ. SAN. VE DIS TIC. A.S.
Phone: 0 216 571 02 32
Fax: 0 216 571 02 99
e-mail: sivan.seki@semlab.com.tr

Ukraine
ALT-Ukraine Ltd
Phone: +38 044 4927270
Fax: +38 044 4927271
e-mail: info@alt.ua

United Arab Emirates
LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

Nahla Medical Supplies
Phone: +971 2 6764975
Fax: +971 2 6762199
e-mail: suhas@nahlamed.ae

United Kingdom ★
see Subsidiaries

Uruguay
DEXIN – Grupo Quimico SRL
Phone: (+598 2) 507-6058
Fax: (+598 2) 507-0155
e-mail: ventas@dexin.com.uy

Venezuela
Tecno-Center, C.A.
Phone: 58 243 242 3553
Fax: 58 243 241 7674
e-mail: gmoraga@tecnocenterca.net

Vietnam
Stepro Co. Ltd.
Phone: 84 4 8513731
Fax: 84 4 5118391
e-mail: Stepro@fpt.vn

Vina Chemoscience Co., Ltd
Tel: (84-8) 8477 024
Fax: (84-8) 842 3155
E-mail: sales@chemoscience.com.vn

Yemen
Hurab Medical Corporation
Phone: +967 (01) 226 786
Fax: +967 (01) 233 845
e-mail: hurab@y.net.ye

LabGulf FZC
Phone: 971 6 557 4922
Fax: 971 6 557 4923
e-mail: info@labgulf.com

European countries not listed:
Contact Dave Mannus,
European Sales Mgr.
Phone: +44 (0)2890 814576
Fax: +44 (0)2890 814576
e-mail: restekeurope@aol.com

Other countries not listed:
Contact Restek International Customer Service
Phone: 814-353-1300, ext. 2025
Fax: 814-353-1309
e-mail: IntlPlusOne@restek.com

Returns & Warranty

Returns Information/Return Material Authorization (RMA) *(outside the U.S.—contact your local Restek representative)*
If you have a problem with a product, contact Restek's Technical Service Department. Often, we can resolve a problem over the phone, saving you the time and effort of returning an item. Please be prepared to provide the following information:

- Name, company name, address, and phone number
- Product name, catalog number, lot and/or serial number, and quantity
- Purchase order and/or invoice number (including where purchased if other than directly from Restek)
- Detailed description of the problem

If we are unable to resolve the problem, our technical service representative will issue an RMA. Chemical standards must be returned within 10 days from the date the RMA is issued; all other products must be returned within 30 days. If a product is not returned within the time limit, or is returned without an RMA, Restek can refuse to accept it for evaluation or credit.

A completed, signed **Health & Safety Declaration** (www.restek.com/health-safety) must accompany all returns of products that have been used. Please include the completed document with the returned product.

important **note**

If you purchased the product through a distributor, you must obtain return authorization through that distributor.

Problems with your order *(outside the U.S.—contact your local Restek representative)*:

Call **Returns Coordinator** at **(800)356-1688, ext. 2146**, if you have problems such as:

- You've received the wrong part or quantity
- The item you've received is broken or damaged
- Items were omitted from the order

If you are returning a product because of an ordering error by the person placing the order, credit is issued less a 10% restocking fee. There is no fee if Restek was responsible for the error. An ordering error must be brought to our attention within ten (10) days after the product is shipped, and the product must be returned unused and in good condition. We cannot issue credit if the product cannot be returned to stock because it is used or damaged.

Product functioning problems *(outside the U.S.—contact your local Restek representative)*:

Call **Technical Service** at **(800)356-1688, ext. 4**, if you have problems such as:

- You can't get a product to perform properly
- You can't duplicate an application chromatogram in our literature
- Instructions for using a product are unclear

Replacement/Repair Policies *(outside the U.S.—contact your local Restek representative)*
Columns and most consumables normally will be evaluated within seven working days after receipt, unless there are unusual or special circumstances. If you need a replacement immediately, we can send a new product (except for electronic products), but we must invoice you for the item. Credit is issued to your account if the returned product is determined to be defective. If the problem was system-related or was caused by improper use or handling, the item will be returned to you, and the replacement invoice is due. We cannot restock used or damaged items.

Restek will honor the original warranty of resale electronic products. However, if the item is not under warranty, the customer is responsible for all repair costs charged by the vendor.

Contact us:

Contact us for an RMA and return shipping instructions prior to sending the product back:

U.S. Customers

RA Coordinator:
800-356-1688, ext. 2146
Fax: 814-353-1570

Technical Service
800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

International Customers

Contact your local Restek representative.
If you purchased the product through a distributor, you must obtain return authorization through that distributor.

Please note: We cannot accept return products without prior authorization.

U.S. Version - Prices valid thru 12/31/09. Restek reserves the right to change prices without notice.

General Warranty Information

Restek warrants the products it manufactures, except those specifically exempted, to be free from defects in materials and workmanship for ninety (90) days from the date of shipment. This warranty is limited to the original purchaser of the product and is not transferable.

During the warranty period Restek will, at its option, either repair or replace a defective product, or return to purchaser the price of the item. This limited warranty does not extend to any products that have been damaged as a result of accident, misuse, abuse, or service or modification by anyone.

Except as expressly set forth above, no other warranties are expressed or implied including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and Restek expressly disclaims all warranties not stated herein. In the event the product is not free from defect as warranted above, the purchaser's sole remedy shall be as provided above. Under no circumstances will Restek be liable to the purchaser or any user for any damages, including the incidental or consequential damages, expenses, lost profits, lost savings or other damages arising out of the use or inability to use the product.

This warranty shall not be applicable to the extent that any provision of this warranty is prohibited by any federal, state, or municipal law that cannot be preempted.

What's NEW! in 2009

GC Columns

- GCxGC Selectivity Kit, *page 34*
- Rxi®-35Sil MS, *page 44*
- Rxi®-5HT, *page 44*
- Rxi®-17, *page 45*
- Stabilwax® (new manufacturing procedure), *page 57*
- Rtx®-1PONA (new dimensions), *page 68*
- MXT®-1HT Sim Dist (new dimension), *pages 70, 107*
- MXT®-Biodiesel (new dimensions), *pages 72, 107*
- Rtx®-Biodiesel (new dimensions), *page 72*
- Rtx®-1614, *page 83*
- Tubing Scorer for MXT® Columns, *pages 105, 204*

PLOT Columns

- Rt®-Alumina-BOND, *page 98*
- MXT®-Msieve 5A, *page 99*
- Rt®-Q-BOND, *page 100*
- Rt®-S-BOND, *page 100*
- Rt®-U-BOND, *page 100*
- PLOT Column Particle Trap, *page 100*



HPLC Columns

Prep Columns

- Allure® Biphenyl, *page 324*
- Allure® PFP Propyl, *page 324*
- Viva C18, *page 325*
- Viva C8, *page 325*
- Viva C4, *page 325*
- Pinnacle® DB Aqueous C18, *page 325*
- Pinnacle® DB Biphenyl, *page 325*
- Pinnacle® DB PFP Propyl, *page 325*
- Pinnacle® DB IBD, *page 325*

UHPLC Columns

- Pinnacle® DB C8, 1.9µm, *page 298*
- Pinnacle® DB PAH, 1.9µm, *pages 298, 305*
- Pinnacle® DB X3 C18, 1.9µm, *pages 298, 305*
- Pinnacle® DB IBD, 1.9µm, *pages 298, 305*



GC Accessories

- Restek Electronic Leak Detector, *pages 137, 201, 222*
- Application Specific Deactivated Wool, *page 144*
- The Claw & The Claw Holder Kit, *pages 145, 160, 185, 206*
- GC/MS Cleaning Kit, *page 166*
- Vespel®/Graphite Ferrules, Two-Hole (0.4mm & 0.5mm), *pages 197, 211*
- Silicone Column Caps, *page 205*
- MXT™ Low-Dead-Volume Connector Kit for Metal Columns, *page 218*
- MXT™ Low-Dead-Volume "Y" Connector Kit for Metal Columns, *page 218*
- 1/32" Stainless Steel Replacement Ferrules for MXT™ Connectors, *page 218*
- Wall Mounted Cylinder Holders, *page 236*
- Swagelok® Fittings and Kits (Brass & Stainless Steel), *page 237-238*

Supplies for Agilent GCs

- Drilled Cyclo Uniliner®, hole near top, *page 148*
- Hot Swap Capillary Column Nut, *page 151*
- 1/16" Capillary Inlet Adaptor Fitting Kit, *page 157*
- Inlet Adaptor Kit for Dual Column Installation, *pages 162, 197*
- ETP Electron Multipliers for Mass Spectrometry, *page 165*
- Inland 45 Pump Oil, *page 166*
- Capillary Dedicated FID Replacement Jet, High-Temp, 0.018" ID tip, *page 169*

Supplies for Shimadzu GCs:

- Double Gooseneck Splitless Liner, *page 178*
- 2mm Gooseneck Splitless Liner, *page 178*
- Laminar Cup Splitter, *page 178*
- Viton® O-Rings, *page 180*
- Graphite Ferrules, *pages 180, 212*

Supplies for Thermo Scientific GCs:

- Gold-Plated Liner Cap for Split/Splitless Injector, *page 188*
- Siltek® Treated Adaptors for Capillary Columns, *page 189*
- FID Jet, *page 189*
- ETP Electron Multiplier for Mass Spectrometry, *page 191*



Vials & Syringes

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- Certified Autosampler Vial Kits, *page 257*
- 2.0mL Sample Vial Racks, *pages 258, 265*
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HPLC Accessories

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- Waste Overflow Indicator for HPLC Systems, *page 341*
- HPLC PEEK™ Performance Kit, *page 344*



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- Resprep™ SPE Cartridges, Florisil®, *page 356*
- QuEChERS SPE Tubes (expanded offering), *page 359*
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- PEEK™ Washers for ASE® 200 Systems, *page 364*
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- Vacuum Gauge, *page 374*
- Sample Inlets, *page 377*
- Quick-Connect Stem Protector, *page 378*
- Miniature Air Sampling Kits, *page 379*
- Vacuum Bag Sampler, *page 379*
- Small Cylinder Stand, *page 386*
- TPED Compliant Sample Cylinders, *page 390*



Analytical Reference Materials

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- Method 525.2 Herbicide Mix, *page 414*
- Method 535 Internal Standard, *page 417*
- Method 535 Surrogate Standard, *page 417*
- Method 535 Individual Compounds, *page 417*
- EPA 8061A Phthalate Esters Mixture, *page 428*
- EPA 8061A Hexyl 2-Ethylhexyl Phthalate Standard, *page 428*
- EPA 8061A Phthalate Esters Kit, *page 428*
- Pesticide Surrogate Mix, EPA 8080, 8081, *page 429*
- Oxy Set-Up Blend, ASTM D6730-01, *page 471*
- 0.16µg/dL Forensic Ethanol Solution, *page 477*
- Forensic Drug Screen Test Mixture, *page 478*
- Forensic Drug Screen Internal Standard, *page 478*



Applications

Too many to list! Look for the NEW! symbol in the HPLC and GC Applications sections beginning on page 488.

Restek Learning Network



Widely acclaimed Restek seminars reduce guesswork, improve throughput and reliability, and raise confidence in generated data.

Each course delivers a wealth of information in a professional, non-promotional, multimedia format featuring animations and problem-solving exercises that reinforce understanding of important principles. A mixture of introductory, intermediate, and advanced elements makes these presentations suitable for people at all experience levels, from beginners in chromatography to experienced analysts who want to revisit the fundamentals and get an introduction to the newest techniques.

On-Site Seminars!
Choose a topic and we'll come to you. For details visit www.restek.com/seminars

Comprehensive GC

- Provides a sound understanding of gas chromatography fundamentals.
- Presents current best practices and introduces the latest developments in capillary GC.
- Expands your knowledge and improves your ability to select stationary phases/column dimensions, choose injection techniques, optimize detector and analytical conditions, and conduct routine maintenance and troubleshooting.

Major topics include: Introduction to GC, Column Selection, Inlet Systems, Detectors, and Maintenance and Troubleshooting.

Comprehensive LC

- Details fundamentals, best practices, and latest developments in HPLC.
- Gain tools for selecting the correct stationary phase and column format, choosing mobile phases, optimizing a detection system, and conducting routine maintenance and troubleshooting.
- Highlight—a detailed discussion of HPLC method development.

Major topics include: Introduction to LC, Modern LC Systems, Separation Techniques, Column Selection, Method Development in LC, and Maintenance and Troubleshooting.

GC/MS

- Provides a solid introduction to the fundamentals and best practices of this widely used technique.
- Gain practical knowledge of mass spectrometric detectors, GC inlet systems and injection techniques, GC column selection, basic spectral interpretation, and maintenance and troubleshooting of GC/MS systems.

Major topics include: Introduction to GC/MS, MS Detectors, Inlet Systems, Column Selection, Basic Mass Spectral Interpretation, and Maintenance and Troubleshooting.

LC/MS

- Provides a sound basis for selecting and optimizing LC/MS systems used for a wide variety of modern applications.
- Benefit from a detailed discussion of interface and analyzer systems, learn how to properly develop an LC/MS method, and examine a variety of practical case studies.

Major topics include: Introduction to LC/MS, LC/MS Analyzers, LC/MS Interfaces, LC/MS Method Development, Case Studies, and Troubleshooting and Maintenance of LC/MS Systems.

Environmental

- Designed for all analysts—from beginner to veteran—to get exactly the information they need for their work on EPA projects.
- Includes both extractables and purgeables sessions, as well as focused information on pesticides and air monitoring.

Major topics include: Introduction to Environmental Analysis, Semivolatile Organic Analysis, Volatile Organics Analysis, Pesticides and PCB Analysis, and Ambient Air Analysis.

Analysis of Petroleum & Petrochemical Products

- Covers a broad range of topics of interest to petrochemical analysts of all experience levels.
- Sections covering GC principles and hardware operation enhance understanding of laboratory and process GC applications.
- Select petrochemical analyses presented in easy to understand animated format.

Major topics include: Overview of Petroleum Testing, Basic GC Fundamentals and Theory, GC Detector Design and Function, Sample and Switching Valve Basics, Laboratory and Process Analytical Procedures for Petroleum Products.

For more information on upcoming seminars **visit www.restek.com/seminars**

Meet the new company you've known for over 20 years!

SilcoTek™

Driving Innovation

Restek Perfomance Coating Division is now SilcoTek—an independent company!

During the transition to a 100% employee owned company, Restek's Performance Coatings or "RPC" division became an independent company led by Restek's founder Paul Silvis and members of the Performance Coatings team. The new company, called SilcoTek™, will focus on developing new treatment technologies for the passivation, anticoking, automotive, corrosion, and ultra-high vacuum markets. The new organization will remain a key supplier to Restek and Restek will continue to offer Siltek®, Sulfinert®, and Silcosteel® treated products for chromatography markets.

In 1987, Silcosteel® was invented to serve as an alternative means of making fused silica capillary columns. The technology was further refined from 1987 to 2008 with several patents obtained to protect its unique properties. Restek's MXT capillary columns, Siltek® inlet liners, injection ports, and many other chromatography products utilize Silcosteel® Chemical Vapor Deposition (CVD) technology. The first non-chromatography application was in portable bomb sniffers and instruments designed to detect low levels of explosives in airports and public spaces. Since then the technology has found its way into refining and petrochemical plants, industrial fittings and valves, analytical instrument flow paths, aerospace, and the automotive industry.

As Restek grew, it became apparent that this technology had to be separated into its own business to reach its full potential. Restek is a market driven business that focuses on creating products for the chromatography market. SilcoTek™ is a technology



1985 Paul Silvis opened Restek for business in one room of an elementary-school-turned-business incubator.



1987 Restek invents Silcosteel® coating and successfully applies it to instruments for the analytical industry.



1993 Restek develops an approach for treating both the outside and inside of mass spectrometer components.



1998 Restek is awarded the first of several patents for surface treatments.



1999 Silcosteel®-treated air monitoring system components installed in the space shuttle Discovery.



2002 Restek Performance Coatings develops into its own division of Restek, expanding into a state-of-the-art treatment facility.

driven business that focuses on finding new and unique applications for our surface enhancing technologies. Channel conflicts, internal resource conflicts, and customer perceptions that Restek either competed or was only doing CVD coatings as a sideline business hampered the growth of this product line.

Separating SilcoTek™ into a new business will allow the team to focus on innovative treatment solutions for our chromatography customers and will allow us to offer previously unavailable technologies to new markets with material limitations.

The analytical market will remain a key component of SilcoTek's business. If you have custom parts to treat, please contact SilcoTek™ at 814-353-1778 or go online to SilcoTek.com for more information. You will find the same Plus One customer service at SilcoTek™ that Restek is famous for!

Paul Silvis & The SilcoTek™ Team

Contact us at 814-353-1778
www.SilcoTek.com



"SilcoTek's consistent supply of high quality Sulfinert-passivated hardware has been a big factor in the ability of our lab to produce high quality trace analysis data to our international customers. You set the standard for excellence."

Don Pachuta, Ph.D.
President
Airborne Labs International, Inc.

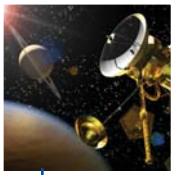
"Restek's Performance Coatings group is a world class team and continually goes above and beyond to help make their customers life easier all while supplying a product that is A+++ quality."

Brad Rightnour
Owner
Rightnour Machining Company



2003 Silcosteel®-AC and Silcosteel®-CR developed.

2004 *R&D* magazine recognizes Silcosteel®-UHV as one of the100 most technologically significant products of the year.



2004 Silcosteel®-treated components enter orbit on the Cassini-Huygens Mission to Saturn.



2006 Silcosteel® high-performance automotive coatings awarded 2 "Best New Product" awards at SEMA 2006.

2009 SilcoTek is formed. The world's largest provider of silicon CVD treatment services.

SilcoTek Treatments

SilcoTek can treat a wide variety of materials and substrates

METALS

- Stainless steel (all grades)
- High carbon steel
- Titanium
- Nickel alloys
- Inconel®
- Hastelloy®
- Frit material
- Metal fiber/matting
- Electropolished and rough surfaces

GLASS

- Ceramics
- Borosilicate glass
- Silica
- Glass/ceramic media
- Diatomaceous earth

CARBON

green™ TECHNOLOGY™

www.SilcoTek.com/green

SilcoNert™

The SilcoNert™ families of inert treatments are used for sampling active compounds and where adsorptive effects or moisture can impact sample integrity. SilcoNert™ is the first and last word in assuring the highest level of sample integrity. The SilcoNert™ family includes:

SilcoNert™ 1000 (Silcosteel®): A general purpose passivation layer for ferrous and non-ferrous metals, glass, and ceramics.

SilcoNert™ 2000 (Siltek®/Sulfinert®): The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel. A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds & mercury. Greatly reduce moisture contamination and improve system performance with SilcoNert™ 2000.

SilcoKlean™

Carbon buildup due to coking can reduce sample flow and ruin a sampling system. Extend the life of sampling systems by reducing carbon buildup while improving your sample system performance with SilcoKlean™.

SilcoKlean™1000 (Silcosteel®-AC): Dramatically reduces carbon buildup on stainless steel components.

Silcolloy™

The Silcolloy™ is a great way to reduce corrosion while extending the life of your analytical system. Save money, improve analytical system performance and avoid the use of costly high performance alloys with Silcolloy™.

Silcolloy™ 1000 (Silcosteel®-CR): A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

SilcoGuard™

SilcoGuard™ is designed to minimize outgassing in ultra-high-vacuum (UHV) systems. SilcoGuard™ increases productivity, reduces operating costs and reduces contaminants in UHV systems.

SilcoGuard™1000 (Silcosteel®-UHV): Greatly reduces outgassing from components in ultra-high-vacuum systems.

"The coatings have been working perfectly! They have opened up the possibilities of making intricate metal pieces chemically inert to allow us to transport electronically excited gases. In the past, we were limited to using brittle quartz tubes and fittings; now we can use all Silcosteel coated stainless steel parts."

Tim Ombrello
Princeton University

SilcoTek™ Driving Innovation

Industries Served SilcoTek™ has provided solutions to:

- **Laboratories**
  save thousands in needless retests caused by high surface activity through the use of SilcoNert™ treated analytical flow paths.
- **Refiners**
  save millions yearly by detecting plant upsets sooner with SilcoTek™ treated sampling systems.
- **Natural gas producers**
  are able to precisely assess feed stock quality with SilcoNert™ sample cylinders.
- **Semiconductor manufacturers**
  eliminate yield-robbing contamination with Silcolloy™ treated process systems.
- **Chemical and petrochemical plants**
  save down time and maintenance costs by reducing corrosion in process systems treated with Silcolloy™.
- **Research & semiconductor operations**
  improve throughput by speeding pump-down rates in vacuum processes, using SilcoGuard™ treatment.
- **NASA**
  has improved analytical instrument durability and sensitivity by treating analytical pathways with SilcoNert™ coating.
- **Power plants**
  nationwide are able to cost effectively detect mandated mercury emissions, using SilcoNert™ treated systems.
- **Chemical process plants**
  improve inertness and corrosion resistance saving thousands.
- **Environmental**
  continuous emissions monitor response is improved by orders of magnitude with SilcoNert™.
- **Alternative energy providers**
  improve corrosion resistance and low level sulfur response.
- **Aerospace**
  suppliers have reduced coking in jet engines with SilcoKlean™

To learn how SilcoTek™ can meet your process or materials challenge, contact our technical service group at 814-353-1778, or visit us on the web at www.SilcoTek.com.

Treated Products for Chromatography

SilcoTek™ surface treatments have found many applications worldwide, from analytical laboratories to refineries to semiconductor operations. Makers of scientific instruments have benefited from SilcoTek™ treatments since the mid 1990s, allowing detection of compounds at the parts-per-trillion level. The chromatographer will realize these benefits when treating sample pathways, from injector to detector. Restek offers a full line of coated accessories for the chromatography market. Available from Restek for immediate delivery, some treated chromatographic products include:

- MXT® columns (pages 104-111)
- Inlet liners (see the Instrument Supplies section, beginning on page 134)
- Inlet seals (pages 152-153)
- FID jets (see the Instrument Supplies section, beginning on page 134)
- Injection ports (pages 154-156)
- Tubing and fittings (pages 238-245)
- SilcoCan® air monitoring canisters (pages 370-371)
- Sample cylinders and valves (page 390)
- Sample loops (page 391)

SilcoTek™ also offers treatments on a custom basis.
Specialized items in your laboratory can benefit by having an inert surface.

How to send parts to SilcoTek™ for treatment.

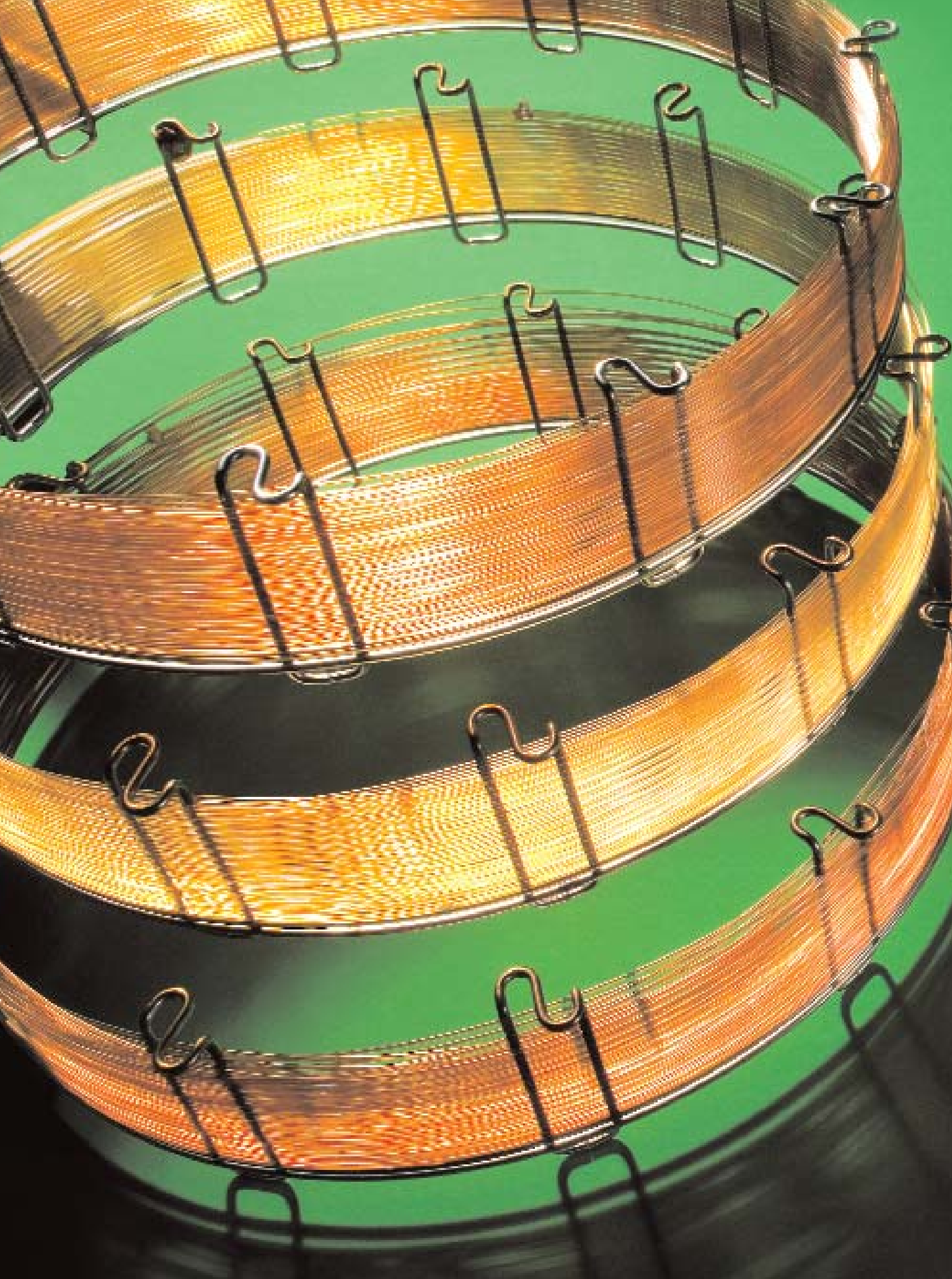
Step 1: **Get a quote!**
We make it easy with quote options to fit your needs.Visit our website www.SilcoTek.com and complete our quote request.

E-mail your quote request to
support@SilcoTek.com
Fax your quote request to 814-353-1697
Call us! 814-353-1778

We'll get a quote out to you within 24 hours!

Step 2: **Send in your parts for custom treatment to SilcoTek™**
Follow the mailing instructions included with your quote. Box up your parts and send them to us at 112 Benner Circle, Bellefonte, PA 16823. Your order will be processed in 10 working days or less.

Our treatments maximize the performance of your analytical instrument—giving you accurate analytical results the first time, every time! Saving you thousands in improved yields, better test cycle times and improved system reliability.



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Can't find the column that you're looking for?

Check out our website at **www.restek.com**.



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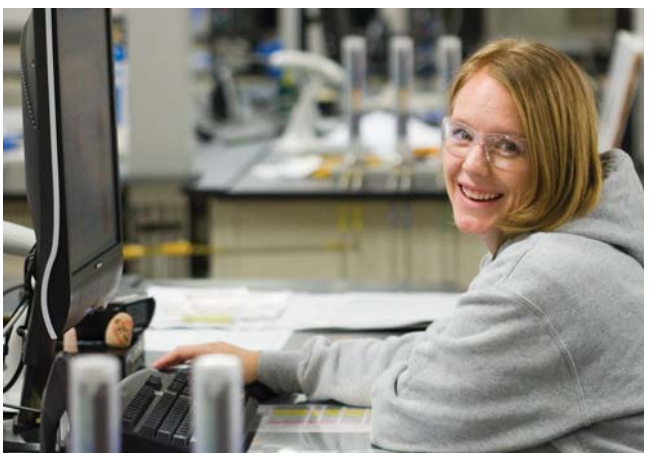
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CAPILLARY COLUMNS

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Top: Henry Knepp and Tim Wilson, Manufacturing Technicians
Bottom: Trisha Houser, Quality Assurance

What's **NEW?** look for this circle

Selecting a GC Column

Several simple principles can be used to simplify the selection process and find the correct column for the analytical task at hand. When selecting the proper capillary column, the chromatographer is faced with choices that require informed decisions when optimizing analysis speed, retention or capacity, and resolution. These three analysis goals are affected by several factors or variables that are contained in the resolution equation:

$$R = \frac{1}{4}\sqrt{\frac{L}{H}} \times \frac{k}{k+1} \times \frac{\alpha-1}{\alpha}$$

Efficiency Retention Selectivity

R=resolution
L=column length
H=HETP
k=capacity factor
α=selectivity

The resolution equation is divided roughly into three sections consisting of variables affecting selectivity, efficiency, and capacity or retention. Looking at how each section of the resolution equation influences the analytical separation will make column selection less difficult.



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Restek's Research & Development Group
pictured: Steve Allison, Lisa Pantzar, Jarl Snider, Mike Wittrig, Donald Rhoads, Valerie Strohm, Doug Smith, Jack Cochran

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Selectivity, α

The selectivity of the capillary column is directly related to how the analyte molecule interacts with the stationary phase being considered. If the analyte strongly interacts with the stationary phase, it can be said that strong "intermolecular" forces exist. These intermolecular forces of attraction of the analyte for the stationary phase are a function of the structure of both the analyte molecule and the stationary phase. If these two structures are similar, then these attractive forces for one another are strong. If they are weak, then analyte to stationary phase attraction is weak, and retention is less. Therefore, when selecting a stationary phase, knowledge of the structure of the analytes of interest and the stationary phase is crucial. Table II provides the chemical structure of Restek's most common stationary phases.

An example of selectivity can be shown using benzene and butanol (both have nearly the same boiling point) eluting through the 20% diphenyl/80% dimethyl polysiloxane stationary phase (Rtx®-20). The benzene molecule will dissolve into the stationary phase more readily than the butanol based on the concept that "likes dissolve likes". Benzene solvates more readily with the stationary phase results in more interactions with the stationary phase as it elutes through the column. Therefore, the elution order of these two compounds on the Rtx®-20 stationary phase will be butanol first and benzene second.

As methyl groups are replaced by different functionalities such as phenyl or cyanopropyl pendant groups, the selectivity of the column shifts towards compounds that will have a better solubility in the stationary phase. For example the Rtx®-200 stationary phase provides high selectivity for analytes containing lone pair electrons, such as halogens, nitrogen, or carbonyl groups. Polyethylene glycol columns, such as the Stabilwax® and Rtx®-Wax columns are highly selective towards polar compounds such as alcohols. Again using the example above, the butanol more readily solvates into the polyethylene glycol stationary phase; therefore, the butanol will have more interaction with the phase and elute after benzene.

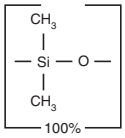
Table I lists the Kovats retention indices for the stationary phases in Table II. Assigning a retention index to each probe listed provides a basis for comparing several stationary phases and their relative retention to one another for a set of molecular probes. For example, when Kovats indices are identical on two column phases, then the resulting separations will be identical. If, however, a Kovats value of one probe varies significantly from the value on another phase for the same probe, then the resulting compound elution order will differ. Thus, the Kovats indices are useful for comparing selectivity of different types of compounds among different phases.

Table I Retention indices for Restek phases

Phase	Benzene	Butanol	Pentanone	Nitropropane
Rtx-1	651	651	667	705
Rtx-5/Rtx-5MS	667	667	689	743
Rtx-20	711	704	740	820
Rtx-1301/Rtx-624	689	729	739	816
Rtx-35	746	733	773	867
Rtx-200	738	758	884	980
Rtx-50	778	769	813	921
Rtx-1701	721	778	784	881
Rtx-65TG	794	779	825	938
Rtx-225	847	937	958	958
Stabilwax	963	1158	998	1230

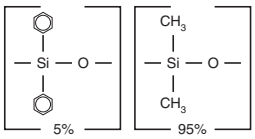
Table II Structures, polarities, properties, and uses for Restek capillary column phases, in order of increasing polarity

Rxi®-1ms, Rtx®-1
100% dimethyl polysiloxane



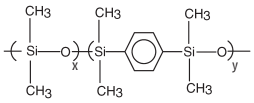
Polarity: nonpolar
Uses: solvents, petroleum products, pharmaceutical samples, waxes
[G1]

Rxi®-5ms, Rtx®-5, Rtx®-5MS
5% diphenyl
95% dimethyl polysiloxane



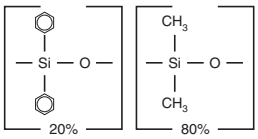
Polarity: slightly polar
Uses: flavors, environmental, aromatic hydrocarbons
[G27]

Rxi®-5Sil MS, Rtx®-5Sil MS
proprietary



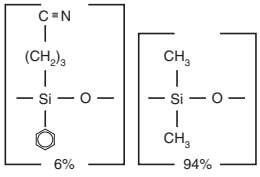
Polarity: slightly polar
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

Rtx®-20
20% diphenyl
80% dimethyl polysiloxane



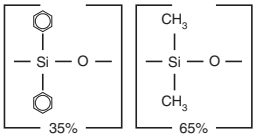
Polarity: slightly polar
Uses: volatile compounds, alcohols
[G32]

Rtx®-1301, Rtx®-624, Rtx®-G43
6% cyanopropylphenyl
94% dimethyl polysiloxane



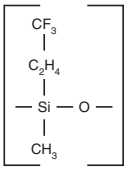
Polarity: slightly polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products
[G43]

Rtx®-35
35% diphenyl
65% dimethyl polysiloxane



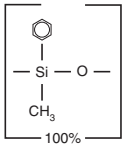
Polarity: intermediately polar
Uses: pesticides, Aroclor PCBs, amines, nitrogen-containing herbicides
[G42]

Rtx®-200
trifluoropropylmethyl polysiloxane



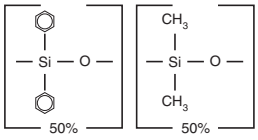
Polarity: selective for lone pair electrons
Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols
[G6]

Rtx®-50
100% methylphenyl polysiloxane



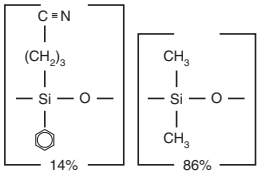
Polarity: intermediately polar
Uses: FAMEs, carbohydrates
[G3]

Rxi®-17
50% diphenyl
50% dimethyl polysiloxane



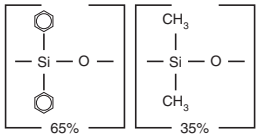
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols
[G3]

Rtx®-1701
14% cyanopropylphenyl
86% dimethyl polysiloxane



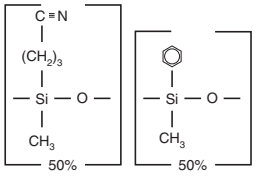
Polarity: intermediately polar
Uses: pesticides, Aroclor PCBs, alcohols, oxygenates
[G46]

Rtx®-65TG
65% diphenyl
35% dimethyl polysiloxane



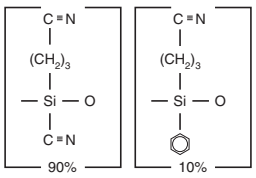
Polarity: intermediately polar
Uses: triglycerides, rosin acids, free fatty acids

Rtx®-225
50% cyanopropylmethyl
50% phenylmethyl polysiloxane



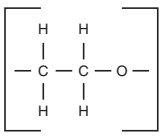
Polarity: polar
Uses: FAMEs, carbohydrates
[G7]

Rt®-2330
90% biscyanopropyl
10% cyanopropylphenyl polysiloxane



Polarity: polar
Uses: cis/trans FAMEs, dioxin isomers, rosin acids
[G48]

Stabilwax®, Rtx®-Wax
Carbowax® PEG



Polarity: polar
Uses: FAMEs, flavors, acids, amines, solvents, xylene isomers
[G16]

ordering **note**

Designations in [brackets] are USP codes. We recommend this phase when your application calls for this code.





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Retention, k

The capacity of the column relates to how much material a column can chromatograph without adversely affecting peak shape. If the amount of a compound (mass) exceeds the capacity of a wall coated open tubular column (WCOT), the peak will front, i.e., the column will exhibit peak symmetry of less than 1, a characteristic "shark fin" shaped peak. The goal is to select a column with sufficient capacity such that peak shape will not suffer.

There are two primary column-related dimensions that affect capacity, assuming the proper column phase was selected: column internal diameter (ID) and phase film thickness (μ).

When selecting column ID, consideration should include the type of injection, the detector being used, and the concentration of sample (amount on-column). The injection technique is an important consideration because the ID of the column may need to be selected based on whether a split, splitless, cool on-column injection, or other sample transfer to the column is being used. The second consideration is how much flow the detector can optimally work under. For example, some MS detectors can only handle column flow up to 1.5mL/min.; therefore, a 0.53mm ID column, which requires higher flows for proper chromatography, is not an option for this detector. The third consideration is sample capacity. If the concentration of the sample exceeds the column capacity, loss of resolution, poor reproducibility, and peak distortion will result. Table III shows several typical column characteristics.

Film thickness (μ) has a direct effect on the retention and elution temperature for each sample component. Extremely volatile compounds should be analyzed on thick-film columns to increase the time the compounds spend in the stationary phase, allowing them to separate. High molecular weight compounds must be analyzed on thinner film columns. This reduces the length of time the analytes stay in the column, and minimizes bleed at required higher elution temperatures. Film thickness also affects the amount of material that can be injected onto the column without overloading. A thicker film column can be used for higher concentration samples.

Table III Typical column characteristics

	Column ID				
Characteristic	**0.10mm**	**0.18mm**	**0.25mm**	**0.32mm**	**0.53mm**
Helium Flow (@ 20cm/sec.)	0.05mL/min.	0.3mL/min.	0.7mL/min.	1.2mL/min.	2.6mL/min.
Hydrogen Flow (@ 40cm/sec.)	0.09mL/min.	0.6mL/min.	1.4mL/min.	2.4mL/min.	5.2mL/min.
Sample Capacity (max load per component)	<10ng	<50ng	50–100ng	400–500ng	1000–2000ng
Theoretical Plates/Meter	8000	3700	2700	2100	1300

Efficiency, N

Column efficiency (N) is the column length divided by the height equivalent to a theoretical plate (HETP). The effective theoretical plates are affected by how well the phase has been coated onto the column walls and is measured by how narrow the peaks are when they are eluted at the end of the column. Therefore, the higher the column efficiency (N), the better resolution power the column will have.

Capillary columns are made in various lengths, typically in standard lengths of 10, 15, 30, 60, and 105 meters. Longer columns provide more resolving power, but increase analysis time. Doubling the column length increases resolution by approximately 41% (note: the column length is under the square root function). However, under isothermal conditions, it will double analysis time. In temperature-programmed analyses, retention times are more dependent on temperature than column length, with a marginal increase (approx. 10-20%) in analysis time upon doubling the column length.

What Are the Operating Temperatures for My Column?

All Restek columns have published minimum and maximum operating temperatures that establish the working range for the stationary phase. Note that these ranges vary with the thickness of the coating.

Rtx®-VMS (fused silica)

ID	df (µm)	temp. limits
0.25mm	1.40	-40 to 240/260°C
0.32mm	1.80	-40 to 240/260°C
0.45mm	2.55	-40 to 240/260°C
0.53mm	3.00	-40 to 240/260°C

The minimum operating temperature defines the lowest usable temperature before the stationary phase solidifies. Operating the column below the minimum temperature will not harm the phase, but poor peak shape and other chromatography problems may occur.

Many phases list 2 maximum operating temperatures. The first temperature is the maximum isothermal operating temperature. This is the temperature to which the columns are guaranteed to meet the minimum bleed specification (i.e., lowest bleed level). The second temperature is the maximum temperature-programmed operating temperature, the temperature to which the column can be heated for short periods of time (i.e., during a temperature-programmed analysis). If only one temperature is listed, it is both the isothermal and the maximum temperature.

Selection of Capillary Column Summary

Selecting a capillary column for an analysis can be done by utilizing the resources available. This includes the following steps:

1) Choose the proper phase for the compounds being chromatographed

a. Review the application section of this catalog or www.restek.com for similar compound list.
b. Call Restek's experienced technical support team (800-356-1688, ext. 4) or e-mail us at:
   i. support@restek.com (in the USA)
   ii. intltechsupp@restek.com (international)
   iii. or contact your Restek representative.

2) Select column ID, film thickness, and length

a. Base consideration on:
   i. Injection technique (split, splitless, cool on-column, etc.)
   ii. Detector type (is low flow required?)
   iii. Amount of analyte being injected onto column (sample capacity)

3) Set optimum parameters for your analysis

a. Optimize column flow (mL/min.)
b. Choose appropriate carrier gas (hydrogen, helium, or nitrogen)
c. Optimize oven temperature program



Column Cross-Reference

Columns by Phase

Restek	Phase Composition	USP Nomenclature*	Agilent	Varian	SGE	Phenomenex	Macherey-Nagel	Supelco	Alltech	Quadrex
Rtx-1 (p. 47)	100% dimethyl polysiloxane	G1, G2, G38	HP-1 / DB-1	CP Sil 5 CB	BP-1	ZB-1	Optima-1	SPB-1	AT-1	007-1
Rxi-1ms (p. 40)	100% dimethyl polysiloxane (low bleed)		HP-1/ HP-1ms DB-1/ DB-1ms Ultra-1	VF-1ms / CP-Sil 5 CB Low Bleed/MS		ZB-1ms	Optima-1/ Optima-1ms	SPB-1, Equity-1	AT-1	007-1
Rtx-5 (p. 48, 76)	5% diphenyl 95% dimethyl polysiloxane	G27, G36	HP-5/ DB-5	CP-Sil 8 / CP Sil 8 CB	BP-5	ZB-5	Optima-5	SPB-5	AT-5	007-2
Rxi-5HT (p. 44)	5% phenyl 95% dimethyl polysiloxane		DB-5HT	VF-5HT		ZB-5HT				
Rxi-5ms (p. 41)	5% diphenyl 95% dimethyl polysiloxane (low bleed)	G27, G36	HP-5/ HP-5ms DB-5, Ultra-2					SPB-5, Equity-5	AT-5ms	007-2
Rxi-5Sil MS (p. 42, 78, 88)	5% phenyl arylene 95% dimethyl polysiloxane		DB-5ms	VF-5ms / CP-Sil 8 CB Low Bleed/MS	BPX-5	ZB-5ms	Optima-5ms	SLB-5		
Rxi-XLB (p. 44, 85)	Arylene/methyl modified polysiloxane		DB-XLB	VF-XMS		MR1				
Rtx-20 (p. 49)	20% diphenyl 80% dimethyl polysiloxane	G28, G32						SPB-20	AT-20	007-7
Rtx-35 (p. 49)	35% diphenyl 65% dimethyl polysiloxane	G42	HP-35, DB-35	VF-35ms	BPX-35, BPX-608	ZB-35		SPB-35, SPB-608	AT-35	007-11
Rxi-35Sil MS (p. 44)	35% phenyl arylene polysiloxane		DB-35ms			MR2				
Rtx-50 (p. 50)	100% phenyl methyl polysiloxane (50% phenyl)	G3	HP-50		AT-50		Optima-17	SPB-50	AT-50	007-17
Rxi-17 (p. 45)	50% diphenyl 50% dimethyl polysiloxane		HP-17, DB-17	CP-Sil 24 CB / VF-17ms		ZB-50				
Rtx-65 (p. 50)	65% diphenyl 35% dimethyl polysiloxane	G17								400-65HT, 007-65HT
Rtx-1301 (p. 53, 74) Rtx-624 (p. 74)	6% cyanopropyl phenyl 94%dimethyl polysiloxane	G43	HP-1301, HP-624, DB-1301, DB-624	CP-1301, VF-1301ms, VF-624ms	BP-624	ZB-624	Optima-1301, Optima-624	SPB-1301	AT-624	007-1301
Rtx-1701 (p. 54)	14% cyanopropyl phenyl 86%dimethyl polysiloxane	G46	HP-1701, PAS-1701, DB-1701	CP Sil 19 CB, VF-1701ms	BP-10	ZB-1701, ZB-1701P	Optima-1701	SPB-1701	AT-1701	007-1701
Rtx-200 (p. 52)	trifluoropropyl methyl polysiloxane	G6	DB-210, DB-200	VF-200ms			Optima-210		AT-210	007-210
Rtx-200ms (p. 52)	trifluoropropyl methyl polysiloxane (low bleed)			VF-200ms						
Rtx-225 (p. 53)	50% cyanopropyl 50% phenylmethyl polysiloxane	G7, G19	HP-225, DB-225	CP Sil 43 CB	BP-225		Optima-225		AT-225	007-225
Rtx-440 (p. 51)	modified polysiloxane (unique phase)		unique **column**							
Rt-2330 (p. 55)	90% biscyanopropyl 10% cyanopropyl phenyl polysiloxane	G48			BPX-70			SP-2330, SP-2331, SP-2380	AT-Silar	
Rt-2560 (p. 55)	bicyanopropyl polysiloxane		HP-88	CP Sil 88				SP-2560		
Rtx-Wax (p. 56)	polyethylene glycol	G14, G15, G16, G20, G39	HP-Wax, DB-Wax	CP Wax 52 CB	BP-20	ZB-Wax	Optima Wax		AT-Wax	
Stabilwax (p. 57, 75)	polyethylene glycol	G14, G15, G16, G20, G39	Innowax	CP Wax 52 CB				Supelcowax-10		
Restek	**Phase Composition**	**USP Nomenclature**	**Agilent**	**Varian**	**SGE**	**Phenomenex**	**Macherey-Nagel**	**Supelco**	**Alltech**	**Quadrex**
Rt-Alumina BOND (p. 98)	Na_2SO_4 deactivation		GS-Alumina, HP PLOT S	CP-AL2O3 / Na2SO4				Alumina-PLOT	AT-Alumina	
Rt-Msieve 5A (p. 99)			GS-Msieve, HP PLOT Molsieve	CP-Molsieve 5A				Molsieve 5A	AT-Molsieve	PLT-5A
Rt-Q-BOND (p. 100)	100% divinylbenzene			CP-PoraPLOT Q, CP-PoraBond Q				Supel-Q-PLOT	AT-Q	
Rt-QS-BOND (p. 100)	porous divinyl benzene homopolymer		GS-Q							
Rt-S-BOND (p. 100)	divinylbenzene 4-vinylpyridine			CP-PoraPLOT S				Supel-G45		
Rt-U-BOND (p. 100)	divinylbenzene ethylene glycol/dimethylacrylate		HP-PLOT U	CP-PoraPLOT U, CP-PoraBond U				Supel-N PLOT		

*See page 129 for our USP Liquid Phase and Solid Support Cross-Reference.

Columns by Application

Restek	Applications	Agilent	Supelco	Macherey-Nagel	SGE	Varian	Phenomenex
Specially deactivated phases							
Rtx-5Amine (p. 59)	Amines					CP-Sil 8 CB	
Rtx-35Amine (p. 60)	Amines	unique column					
Stabilwax-DB (p. 61)	Amines	CAM	Carbowax Amine			CP WAX 51	
Stabilwax-DA (p. 62)	Free acids	HP-FFAP, DB-FFAP	Nukol	Permabond FFAP, Optima FFAP	BP-21	CP WAX 58 CB	
Chiral Columns							
Rt-βDEXm (p. 63)	Chiral						
Rt-βDEXsm (p. 63)	Chiral						
Rt-βDEXse (p. 63)	Chiral						
Rt-βDEXsp (p. 63)	Chiral						
Rt-βDEXsa (p. 63)	Chiral						
Rt-βDEXcst (p. 63)	Chiral						
Rt-γDEXsa (p. 63)	Chiral						
Foods, Flavors, & Fragrances							
Rt-2560 (p. 64)	*cis/trans* FAMEs	HP-88	SPB-2560				
FAMEWAX (p. 65)	Marine oils		Omegawax				
Rt-CW20M F&F (p. 66)	Flavors & fragrance	HP-20m, CarboWax 20			BP-20M	007-CW	
Rtx-1 F&F (p. 66)	Flavors & fragrance						
Rtx-65 TG (p. 67)	Triglycerides	unique column					
Petrochemical							
Rtx-1PONA (p. 68)	Detailed hydrocarbon analysis	HP-PONA, DB-Petro	Petrocol DH		BP1-PONA	CP Sil PONA CB	
Rtx-2887 (p. 69)	Hydrocarbons - ASTM 2887	DB-2887	Petrocol 2887, Petrocol EX2887				
MXT-2887 (p. 69,106)	Hydrocarbons - ASTM 2887						
D3606 (p. 118)	Ethanol - ASTM 3606	unique column					
Rt-TCEP (p. 71)			TCEP			CP-TCEP	
MXT-1 Sim Dist (p. 70,107)	Simulated distillation	DBHT-SMD				CP-SIMDIST	
MXT-500 Sim Dist (p. 70,107)	Simulated distillation	unique column					
Rtx-Biodiesel TG (p. 72) MXT-Biodiesel TG (p. 72,107)	Triglycerides in biodiesel	unique column					
Clinical/Forensic - Blood Alcohol Testing							
Rtx-BAC1 (p. 73)	Blood alcohol testing	DB-ALC1					
Rtx-BAC2 (p. 73)	Blood alcohol testing	DB-ALC2					
Pharmaceutical							
Rtx-G27 w/IntegraGuard (p. 77)	Organic volatile impurities (OVI) - USP 467						
Rtx-G43 w/IntegraGuard (p. 77)	Organic volatile impurities (OVI) - USP 467		OVI-G43				
Rtx-1301 (p. 53, 74) Rtx-624 (p. 74, 93) (G43)	Organic volatile impurities (OVI) - USP 467	HP-1301, HP-624, DB-1301, DB-624	SPB-1301		BP-624	CP-1301, VF-1301ms, VF-624	ZB-624
Rtx-5 (p. 48, 76) (G27)	Organic volatile impurities (OVI) - USP 467	HP-5/ DB-5	SPB-5, Equity-5	Optima-1301, Optima-624	BP-5	CP-Sil 8, CP Sil 8 CB	ZB-5
Stabilwax (p. 57, 75) (G16)	Organic volatile impurities (OVI) - USP 467	Innowax	Supelcowax-10		BP-624	CP Wax 52 CB	
Environmental							
Rxi-5Sil MS (p. 42, 78, 88)	Semivolatiles - EPA Methods 8270, 625, 525	DB-5ms	SLB-5	Optima-5ms		VF-5ms	
Rtx-VMS (p. 90)	Volatiles - EPA Methods 8260, 624, 524	unique column					
Rtx-624 (p. 74, 93)	Volatiles - EPA Method 624	HP-624, DB-624	SPB-1301	Optima-624		VF-1301ms	ZB-624
Rtx-502.2 (p. 92)	Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602	DB-502.2	VOCOL				
Rtx-VRX (p. 91)	Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602	DB-VRX					
Rtx-CLPesticides (p. 80)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	unique column					
Rtx-CLPesticides2 (p. 80)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	unique column					
Stx-CLPesticides (p. 82)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	unique column					
Stx-CLPesticides2 (p. 82)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	unique column					
Rtx-1614 (p. 83)	Brominated flame retardants	unique column					
Rtx-PCB (p. 84)	Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners	unique column					
Rxi-XLB (p. 44, 85)	Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners	DB-XLB				VF-XMS	
Rtx-OPPesticides (p. 79)	Organophosphorus pesticides - EPA Method 8141	unique column					
Rtx-OPPesticides2 (p. 79)	Organophosphorus pesticides - EPA Method 8141	unique column					
Rtx-Dioxin2 (p. 87)	Dioxin & Furans - EPA Methods	unique column					
Rtx-Dioxin (p. 86)	Dioxin & Furans - EPA Methods	unique column					
Rt-PAH (p. 89)	Polycyclic aromatic hydrocarbons	unique column					
Rtx-TNT & Rtx-TNT2 (p. 93)	Explosives - EPA Method 8095	unique column					

GC Column Installation Checklist

The Restek Innovations and Technical Services specialists have found this to be a reliable sequence for avoiding problems when installing a capillary GC column.



Trisha Houser, Quality Assurance

Instrument Preparation & Column Installation

1. Cool all heated zones.
2. Visually inspect indicating oxygen and moisture traps. Replace saturated traps.
3. Examine the inlet and the detector. Clean or replace all dirty or corroded parts.
4. Replace the inlet liner and septum, and the injector seals (O-rings, inlet seals, ferrules, etc.).
5. Mount the column in the oven with a support that protects it from scratches. Center the column in the oven. This ensures uniform heat exposure generating consistent retention times.
   - Restek has two types of cages for fused silica columns, an 11-pin cage and the original cage that uses high temperature string to hold the column in place. **If you have the cage with high temperature string, do not remove the string that holds the column in the cage!**
6. Uncoil the ends to make sure the ends are long enough to reach the injector and detector. Cut 10cm from each end of the column.
   - To cut a fused silica column, use the smooth edge of a ceramic scoring wafer (cat.# 20116).
7. While pointing the inlet end of the column downward (to prevent shards from falling into the column), slide the nut and appropriate size ferrule onto the inlet end of the column. Cut an additional 2cm from the end of the column to remove any material scraped from the ferrule onto the edge of the column.
8. Install the column the appropriate distance in the injector, as indicated in your instrument manual.
9. Set the carrier gas to the flow rate or inlet pressure recommended for the column or to your method flow rate/pressure. Confirm presence of column flow by immersing the column outlet in a vial of solvent.
10. Flush the column at ambient temperature with carrier gas: at least 5 minutes for a 25-30m column and 10 minutes for a 50-60m column.
11. Set the injector temperatures. Do not exceed the column's maximum operating temperature (listed on the column tag). Check inlet for leaks.
12. Install the column into the detector as described in the instrument manual. Set the detector gases and temperatures to proper settings.
13. Check the detection connections for leaks, using a thermal conductivity leak detector (cat.# 22839).
14. Verify the carrier gas flow is at the rate you intend to use for your analysis. Set the split vent, septum purge, and any other applicable gas rates as appropriate.
15. Inject an unretained compound, to verify the column is installed correctly and to determine the dead volume time for checking column flow. A symmetric peak indicates the column is installed correctly. Adjust the carrier gas flow as necessary.
16. Condition the column 20°C above the final analysis temperature of your method. Do not exceed the column's maximum operating temperature. For most applications, 1 hour of conditioning is sufficient. For sensitive detectors or low level analysis, longer conditioning times or conditioning the column at the maximum temperature may be beneficial. Extended time at high temperatures will not adversely affect column performance as long as precautions are taken to make sure the carrier gas is clean and is filtered for oxygen and water.
17. To check for instrument performance, analyze a column test mix for a new method, or a known standard to confirm proper column and system performance.
18. Your GC system is now ready to be calibrated and acquire samples.



Scott Grossman, Applications Chemist
Checking for leaks, using a thermal conductivity leak detector (step 13).

Note 1: For some types of sensitive detection systems, like MS, PID and PDD, it is recommended to condition the column as listed in Step 16 without making the connection to the detector. In this case, plug off the detector during conditioning. After conditioning, continue with Step 12.

Note 2: Also when you intend to condition thick-film coated columns (film thickness $> 1\mu m$) at temperatures near the maximum operation temperature, it is recommended to do the initial 1-2 hrs conditioning without a connection to the detector and repeat procedure above, starting at Step 12.

Standby Conditions

Short-Term: leave the column in the GC with the carrier gas flow on at an oven temperature of 100-150°C.

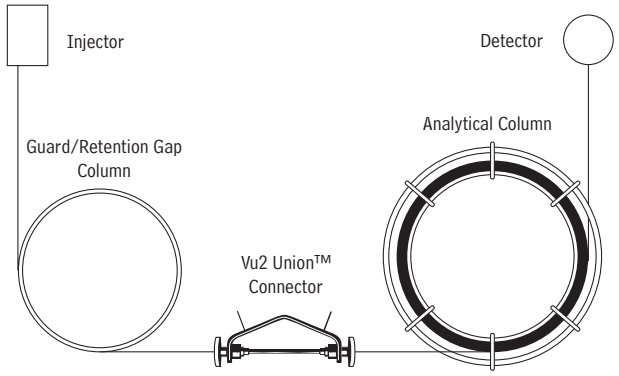
Long-Term: remove the column from the GC and seal the ends by gently and carefully pushing each end into the curved edge of a septum. Store the column in the original box away from strong lighting.

If you have any questions or problems installing a Restek column, visit **www.restek.com/gcinstall** or call Technical Service at 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative.

Guard Columns and Retention Gaps

Guard columns and retention gaps are widely used in gas chromatography. The concept of the guard column is to trap nonvolatile material at the head of the column, not allowing the material to reach the analytical column. The concept of the retention gap is to help focus the compounds transferred from the inlet to a small band at the head of the analytical column in order to reduce chromatographic peak broadening. Both concepts (trapping nonvolatile material and refocusing the target analytes) may take place when a piece of deactivated tubing is connected to an analytical column as in Figure 1.

Figure 1 A guard/retention gap column connected to an analytical column



Analyte Focusing

There are two injection techniques where the retention gap is used to help focus target analytes at the beginning of the analytical column, cool on-column injection and splitless injection.

For cool on-column injection, the purpose of a retention gap is to help focus the sample components when introducing a liquid sample directly into the retention gap. The cool on-column injection is performed by inserting the syringe needle into the retention gap (this can be accomplished with a 0.53mm ID retention gap and a 26s gauge syringe) and transferring the liquid sample directly into the retention gap. The injection is made with the injector and column oven set below the boiling point of the solvent. As the solvent is evaporated, the volatile target analytes migrate in the solvent towards the analytical column, and the heavier analytes will be distributed over the retention gap. As the oven temperature increases, the target analytes vaporize and move unretained down the retention gap column until the compounds reach the liquid stationary phase of the analytical column. At this juncture, the target analytes are trapped/focused by the liquid phase and form a narrow injection band.

The retention gap may also be useful in hot vaporization injections when the transfer of the compounds from the inlet to the column does not form a focused band. Typical applications include water injections or injections using small ID columns, where split or tailing peaks would indicate an unfocused band. In these applications, the target analytes are trapped in a nonuniform or longitudinally diffuse band at the head of the retention gap (Figure 2a, next page). As the oven temperature is increased, the solvent and target compounds are vaporized and move unretained through the retention gap (Figure 2b, next page). When the target compounds come in contact with the stationary phase, they are refocused in a narrow band (Figure 2c, next page), improving the chromatography.

please **note**

For superior inertness, try our Siltek® guard columns!

See **page 31** for details.

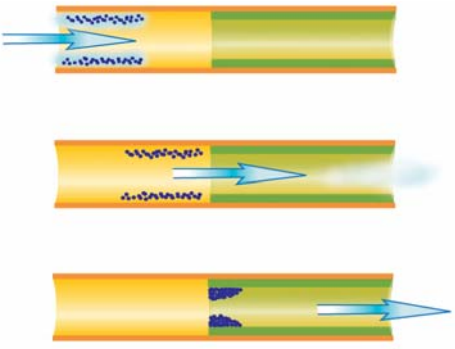
Having trouble making a leak-free connection?
Try our "built in" Integra-Guard™ columns!

See **page 33** for details.

did you **know**?

We test our guard columns/ transfer lines with the Grob test mix to ensure high inertness.

Figure 2 Retention gaps are used to focus components in a tight band at the beginning of the analytical column



a) Sample introduction: a liquid film of solvent and sample is deposited in the first length of capillary.

b) As oven temperature increases, the solvent evaporates and the target compounds elute unretained through the retention gap until they contact the analytical column.

c) When target compounds come in contact with the stationary phase, they are refocused on the analytical column, resulting in a narrow initial band width.

it's a **fact**

To eliminate connections, use our unique Integra-Guard™ Column. See **page 33**.

Protecting the Analytical Column

The concept of a guard column is to protect the analytical column from becoming contaminated with nonvolatile compounds. The guard column is used to retain nonvolatile material, usually in the first 10-20cm, not allowing this material to elute onto the liquid phase of the analytical column. As the oven temperature increases, the more volatile target compounds vaporize, elute down the guard column, and refocus at the head of the analytical column without interference from the nonvolatile material left behind.

Contamination can cause active sites as well as change the conditions of the focusing zone of the analytical column. Both conditions will adversely affect the chromatography. Another advantage of the guard column is when a section is removed for maintenance the resolution of closely eluting compounds will not be affected because the guard column is not a contributor to the resolving power of the analytical column. This allows for a longer lifetime of the analytical column, and replacing only the guard column when it becomes too short.

In summary, the retention gap and guard column are essentially the same products, but are used for different purposes. The deactivated tubing helps focus target analytes at the head of the analytical column for on-column and splitless injections, and also prevents nonvolatile material from contaminating the head of the analytical column.

What type of guard column should be used?

When using a guard column, it is important to match the polarity of the solvent and the polarity of the surface deactivation. Rxi® Guard tubing is good for a wide variety of applications and allows most common solvents (methylene chloride, hexane, isooctane, toluene) to easily wet and create a uniform film on the tubing surface. If more polar solvents such as methanol or water are used, a polar-deactivated guard column is recommended to allow the solvent to wet the tubing surface. Polar-deactivated guard columns are not resistant to harsh "water vaporization" that occurs when water in the liquid state is injected into the tubing and rapidly vaporizes (such as in steam cleaning). Hydroguard™ deactivation is an alternative for direct aqueous injections. However, a Hydroguard™-deactivated guard column will not allow polar solvents to wet the tubing surface, and may cause beading of the solvent if the oven temperature is 20°C below the solvent boiling point.

Siltek® deactivation creates a highly inert surface for very active compounds such as chlorinated and organophosphorus pesticides. Base-deactivated guard columns reduce adsorption and tailing for amines and other basic compounds.

How is a guard column connected to the analytical column?

To connect the guard column to the analytical column, Vu2-Union™, Press-Tight®, and other connectors are available. MXT™ unions, typically used for connecting metal columns together, are now available for fused silica columns. See pages 215 to 219 for information about these connectors.

Connectors for Fused Silica Columns



Vu2 Union™ Connector



Press-Tight® Connector



MXT™ Union Connector Kit for Fused Silica

Rxi® Guard/Retention Gap Columns (Fused Silica)

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360°C.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	10-Meter/6-pk.
0.25mm	0.37 ± 0.04mm	10029	10029-600	10059	10059-600
0.32mm	0.45 ± 0.04mm	10039	10039-600	10064	10064-600
0.53mm	0.69 ± 0.05mm	10054	10054-600	10073	10073-600

Intermediate-Polarity Deactivated Guard/Retention Gap Columns/Transfer Lines (Fused Silica)

Diameters greater than 0.10mm are tested with the Grob test mix, to ensure high inertness.

- Useful for a wide range of applications.
- Use with most common solvents.
- Maximum temperature: 325°C

Nominal ID	Nominal OD	1-Meter	5-Meter	5-Meter/6-pk.
0.025mm*	0.363 ± 0.012mm	10097		
0.05mm*	0.363 ± 0.012mm	10098	10040	10040-600
0.075mm*	0.363 ± 0.012mm	10099		
0.10mm*	0.363 ± 0.012mm	10100	10041	
0.15mm	0.363 ± 0.012mm	10101	10042	
0.18mm	0.37 ± 0.04mm	10102	10046	
0.25mm	0.37 ± 0.04mm		10043	10043-600
0.28mm	0.37 ± 0.04mm		10003	10003-600
0.32mm	0.45 ± 0.04mm		10044	10044-600
0.45mm	0.69 ± 0.04mm		10005	10005-600
0.53mm	0.69 ± 0.05mm		10045	10045-600

Nominal ID	Nominal OD	10-Meter	10-Meter/6-pk.	30-Meter**	60-Meter**†
0.25mm	0.37 ± 0.04mm	10049	10049-600	10012	10013
0.32mm	0.45 ± 0.04mm	10048	10048-600	10022	10023
0.53mm	0.69 ± 0.05mm	10047		10032	10033

Siltek®-Deactivated Guard/Retention Gap Columns/Transfer Lines (Fused Silica)

Tested with the Grob test mix, to ensure high inertness.

- Revolutionary deactivation process for superior inertness.
- Analyze active samples accurately; ideal for chlorinated pesticide analysis (reduces endrin breakdown to less than 1%).
- Maximum temperature: 380°C.

Nominal ID	Nominal OD	5-Meter	10-Meter
0.25mm	0.37 ± 0.04mm	10026	10036
0.32mm	0.45 ± 0.04mm	10027	10037

Polar-Deactivated Guard/Retention Gap Columns (Fused Silica)

Tested with the Grob test mix, to ensure high inertness.

- Polyethylene glycol deactivation layer provides optimum wettability for polar compounds.
- Minimize peak splitting when using polar solvents such as methanol or water.
- Compatible with Stabilwax®, Rtx®-225, and Rt®-2330 capillary columns.
- Maximum temperature: 280°C.

Nominal ID	Nominal OD	5-Meter	10-Meter	30-Meter**	60-Meter**†
0.25mm	0.37 ± 0.04mm	10065	10068	10014	10015
0.32mm	0.45 ± 0.04mm	10066	10069	10024	10025
0.53mm	0.69 ± 0.05mm	10067	10070	10034	10035

*Not tested with the Grob test mix because of a large pressure drop.
**30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60m guard columns into shorter lengths. Using full length may cause peak distortion.

it's a **fact**

To eliminate connections, use an Integra-Guard™ Column. See **page 33**.

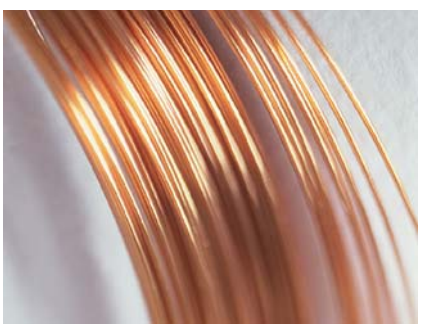
also **available**

MXT® Guard/Retention Gap Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 104** for our Intermediate-Polarity Deactivated MXT® Guard/ Retention Gap Columns/ Transfer Lines.

it's a **fact**

Use guard columns to:

- Reduce effects of dirty samples on column performance.
- Reduce downtime and maintenance.



did you **know**?

Siltek®-deactived guard columns minimize breakdown and improve recovery of analytes!

Guard/Retention Gap Columns



Base-Deactivated Guard/Retention Gap Columns (Fused Silica)

- Tested with a basic amine test mix.
- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, and Stabilwax®-DB capillary columns.
- Batch test chromatogram included.
- Maximum temperature: 315°C.

Chemists using guard columns in analyses of basic compounds frequently observe peak tailing and low recovery. This happens because conventionally deactivated tubing surfaces can be adsorptive to basic compounds. Restek offers base-deactivated guard columns for completely inert sample pathways.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.
0.25mm	0.37 ± 0.04mm	10000	10000-600
0.32mm	0.45 ± 0.04mm	10001	10001-600
0.53mm	0.69 ± 0.05mm	10002	10002-600

did you **know**?

We test our guard columns/ transfer lines with the Grob test mix to ensure high inertness.

Hydroguard™ Water-Resistant Guard/Retention Gap Columns/Transfer Lines (Fused Silica)

- Extend analytical column lifetime by preventing degradation by harsh "steam-cleaning" water injections.
- Maximum temperature: 325°C.

When transfer lines from purge & trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds such as alcohols and diols.

Restek chemists have addressed this concern and found a solution—the Hydroguard™ deactivation process. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard™ deactivation layer effectively prevents water vapor from reaching the fused silica surface beneath. Use Hydroguard™ tubing for connecting GCs to:

- Purge & trap systems.
- Headspace analyzers.
- Air analysis equipment and concentrator units.

also **available**

MXT® Guard Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 104** for our Hydroguard™ MXT® Guard Tubing/Transfer Lines.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	30-Meter**	60-Meter**†
0.05mm*	0.363 ± 0.012mm	10075				
0.10mm*	0.363 ± 0.012mm	10076				
0.15mm	0.363 ± 0.012mm	10077				
0.18mm	0.37 ± 0.04mm	10078				
0.25mm	0.37 ± 0.04mm	10079	10079-600	10082	10085	10088
0.32mm	0.45 ± 0.04mm	10080	10080-600	10083	10086	10089
0.53mm	0.69 ± 0.05mm	10081	10081-600	10084	10087	10090

best **choice**

Siltek® treated tubing (cat.# 22505, **page 244**) is recommended for purge and trap transfer lines.

*Not tested with the Grob test mix because of a large pressure drop.
**30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60m guard columns into shorter lengths. Using full length may cause peak distortion.

Innovative Integra-Guard™ Columns

For analysts who find it inconvenient to make a leak-free connection between the guard column and the analytical column, we offer Integra-Guard™ columns. These innovative columns incorporate both guard column and analytical column in a continuous length of tubing, eliminating the connection and all connection-associated problems! The guard column section is marked separately from the analytical column, using high-temperature string.

A wide variety of our Integra-Guard™ capillary columns are listed below. The Integra-Guard™ column is so economical that we challenge you to compare our price against that of a conventional connection, even if you assemble it yourself. If you are currently using a guard column, or are considering using one, call today and ask about Integra-Guard™ columns.

restek **innovation**!

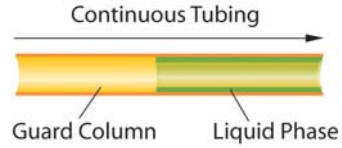
Integra-Guard™ Columns: guard columns WITHOUT connections—protecting your analytical column has never been this easy!

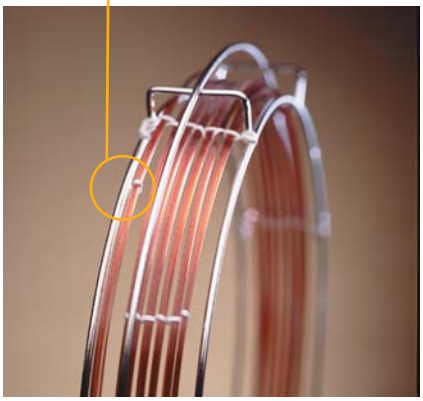
similar **products**

DuraGuard, EZ-Guard, Guardian

Description	qty.	cat.#	price
Rtx-1			
30m, 0.25mm ID, 0.25µm Rtx-1 w/5m Integra-Guard Column	ea.	10123-124	
30m, 0.53mm ID, 1.00µm Rtx-1 w/5m Integra-Guard Column	ea.	10155-126	
30m, 0.53mm ID, 5.00µm Rtx-1 w/5m Integra-Guard Column	ea.	10179-126	
Rtx-5			
30m, 0.25mm ID, 0.25µm Rtx-5 w/5m Integra-Guard Column	ea.	10223-124	
30m, 0.25mm ID, 0.25µm Rtx-5 w/10m Integra-Guard Column	ea.	10223-127	
30m, 0.25mm ID, 1.00µm Rtx-5 w/5m Integra-Guard Column	ea.	10253-124	
30m, 0.32mm ID, 0.25µm Rtx-5 w/5m Integra-Guard Column	ea.	10224-125	
30m, 0.32mm ID, 1.00µm Rtx-5 w/5m Integra-Guard Column	ea.	10254-125	
30m, 0.53mm ID, 5.00µm Rtx-5 w/5m Integra-Guard Column (Rtx-G27)	ea.	10279-126	
60m, 0.32mm ID, 0.25µm Rtx-5 w/5m Integra-Guard Column	ea.	10227-125	
Rtx-5MS			
15m, 0.25mm ID, 0.25µm Rtx-5MS w/5m Integra-Guard Column	ea.	12620-124	
15m, 0.25mm ID, 0.50µm Rtx-5MS w/10m Integra-Guard Column	ea.	12635-127	
30m, 0.25mm ID, 0.10µm Rtx-5MS w/5m Integra-Guard Column	ea.	12608-124	
30m, 0.25mm ID, 0.25µm Rtx-5MS w/5m Integra-Guard Column	ea.	12623-124	
30m, 0.25mm ID, 0.25µm Rtx-5MS w/10m Integra-Guard Column	ea.	12623-127	
30m, 0.25mm ID, 0.50µm Rtx-5MS w/5m Integra-Guard Column	ea.	12638-124	
30m, 0.25mm ID, 0.50µm Rtx-5MS w/10m Integra-Guard Column	ea.	12638-127	
30m, 0.32mm ID, 0.25µm Rtx-5MS w/5m Integra-Guard Column	ea.	12624-125	
30m, 0.32mm ID, 1.00µm Rtx-5MS w/5m Integra-Guard Column	ea.	12654-125	
Rxi-5Sil MS			
15m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13620-127	enquire
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13623-124	
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13623-127	
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13638-124	
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13638-127	
30m, 0.32mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13639-125	enquire
Rtx-624			
30m, 0.25mm ID, 1.40µm Rtx-624 w/5m Integra-Guard Column	ea.	10968-124	
30m, 0.32mm ID, 1.80µm Rtx-624 w/5m Integra-Guard Column	ea.	10970-125	
30m, 0.53mm ID, 3.00µm Rtx-624 w/5m Integra-Guard Column	ea.	10971-126	
Rtx-1301			
30m, 0.53mm ID, 3.00µm Rtx-1301 w/5m Integra-Guard Column (Rtx-G43)	ea.	16085-126	
Rtx-1701			
30m, 0.25mm ID, 0.25µm Rtx-1701 w/5m Integra-Guard Column	ea.	12023-124	
Stabilwax			
30m, 0.25mm ID, 0.25µm Stabilwax w/5m Integra-Guard Column	ea.	10623-124	
30m, 0.32mm ID, 1.00µm Stabilwax w/5m Integra-Guard Column	ea.	10654-125	
30m, 0.53mm ID, 1.00µm Stabilwax w/5m Integra-Guard Column	ea.	10655-126	
Rtx-BAC1 & Rtx-BAC2			
30-Meter, 0.32mm ID, 1.80µm Rtx-BAC1 w/5m Integra-Guard	ea.	18003-125	
30-Meter, 0.32mm ID, 1.20µm Rtx-BAC2 w/5m Integra-Guard	ea.	18002-125	
30-Meter, 0.53mm ID, 3.00µm Rtx-BAC1 w/5m Integra-Guard	ea.	18001-126	
30-Meter, 0.53mm ID, 2.00µm Rtx-BAC2 w/5m Integra-Guard	ea.	18000-126	

Integra-Guard™ built-in guard column





Phases currently available as Integra-Guard™ columns

Rtx®-1
Rtx®-5
Rtx®-5MS
Rxi®-5Sil MS
Rtx®-1301
Rtx®-624
Rtx®-1701
Rtx®-Volatiles
Rtx®-20
Rtx®-35
Rtx®-BAC 1 & 2
Stabilwax®

Integra-Guard™ columns are available for all phases listed, for columns with 0.25, 0.32 or 0.53mm ID.
If you don't see what you need here, contact us.

Fast GC/Comprehensive GC Columns

Fast GC Using 0.10mm and 0.18mm ID Capillary Columns and Comprehensive GC

- Significantly reduces analysis time without sacrificing resolution.
- Highest column efficiencies, great for GC/MS.
- Excellent for comprehensive GC (GCxGC) as second dimension column.

Narrow bore (0.10mm ID) columns are attractive alternatives to conventional-diameter capillary columns because they provide faster analysis times and higher resolving power. As column ID decreases, column efficiency (plates/meter) greatly increases. For instance, a 0.18mm ID column (5,150 plates/meter) is much more efficient than a 0.25mm ID column (2,500 plates/meter). Therefore, resolution can be achieved with a shorter column, which decreases the analysis time. When switching from a 0.25mm ID column to a 0.10mm ID column (8,500 plates/meter), the improvement in column efficiency is even more dramatic.

Typically, 0.18mm ID columns are used for fast GC analysis, and methods are easily converted. The 0.10mm ID columns require more research to switch methods to the smaller ID due to higher back pressures and lower column capacity.

The outer diameter of the 0.10mm and 0.18mm ID tubing is the same as 0.25mm ID tubing, which makes connections less complicated.

Rxi®-1ms Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	13301	
0.18mm	0.18	-60 to 330/350°C		13302

Rxi®-5ms Columns (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	13401	
0.18mm	0.18	-60 to 330/350°C		13402
	0.30	-60 to 330/350°C		13409
	0.36	-60 to 330/350°C		13411

Rxi®-5Sil MS Columns (fused silica)

(Crossbond®, selectivity similar to 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	43601	
0.18mm	0.18	-60 to 330/350°C		43602
	0.36	-60 to 330/350°C		43604

Rxi®-17 Columns (fused silica)

(Crossbond® 50% diphenyl/50% dimethyl polysiloxane)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	40 to 280/320°C	13501	
0.18mm	0.18	40 to 280/320°C		13502

tech tip

Operating considerations for 0.10mm ID columns

The small degree of extra care involved in using 0.10mm ID columns will be more than repaid by faster analyses and higher column efficiencies. 0.10mm ID columns require higher operating pressures (>40psig), which can result in more ferrule leaks, septum leaks, and sample flashback through leaking syringe plungers. Connections must be monitored and leak-checked more often. Operating a 0.10mm ID column below optimum pressure will cause poor resolution and other poor performance. Sample capacity also is reduced, relative to wider-bore columns. Take care to not overload the column, and make sure you inject quickly when using split injection.

Stabilwax® Columns (fused silica)

(Crossbond® Carbowax® polyethylene glycol)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	40 to 250°C	42601	
0.18mm	0.18	40 to 250°C		40602

Rt®-LC50 Columns (fused silica)

ID	df (µm)	temp. limits	10-Meter
0.10mm	0.10	100°C to 270°C	19736
0.18mm	0.10	100°C to 270°C	19735

Rtx®-CLPesticides (fused silica)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 310/330°C	43101	
0.18mm	0.18	-60 to 310/330°C	42101	42102

Rtx®-CLPesticides2 (fused silica)

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 310/330°C	43301	43302
0.18mm	0.14	-60 to 310/330°C	42301	42302

GCxGC Selectivity Kit A

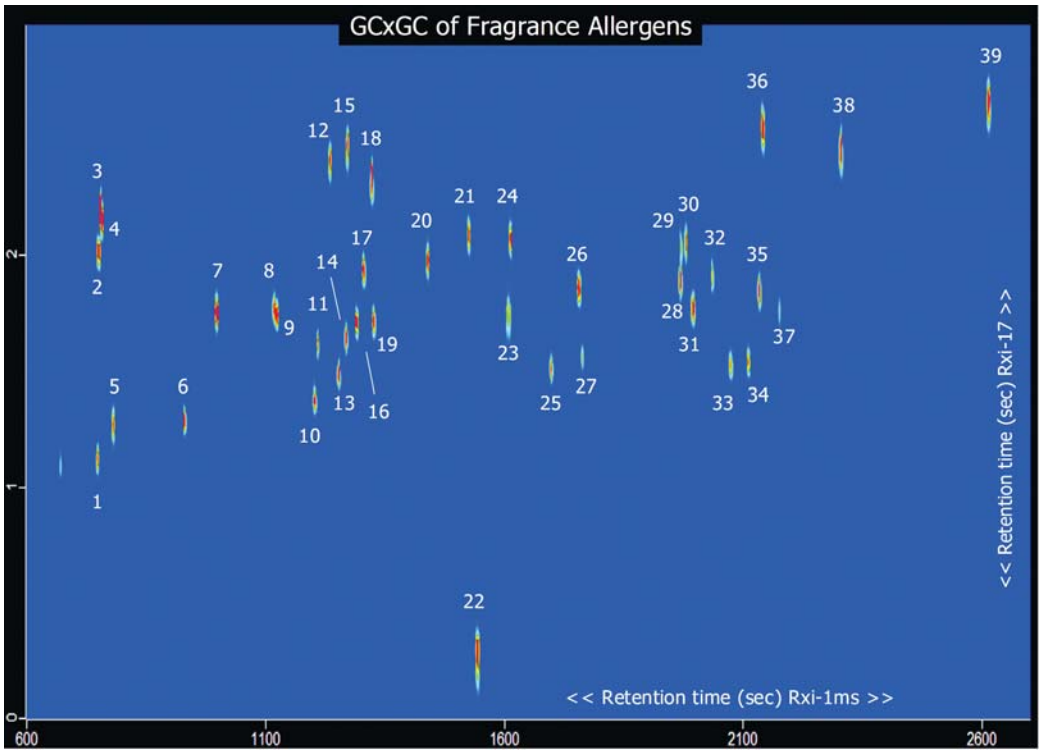
The selectivity kit contains four columns of different selectivity for method development. Includes one each of the following:

NEW!

- Rxi®-17, 1.1m (±3cm), 0.10mm ID, 0.10µm, 50% diphenyl dimethylpolysiloxane
- Rtx®-CLPesticides, 1.1m (±3cm), 0.10mm ID, 0.10µm, trifluoropropyl containing polymer
- Stabilwax®, 1.1m (±3cm), 0.10mm ID, 0.10µm, polar polyethylene glycol
- Rt®-LC350, 1.1m (±3cm), 0.15mm ID, 0.10µm, liquid crystalline phase selective for aromatic compounds

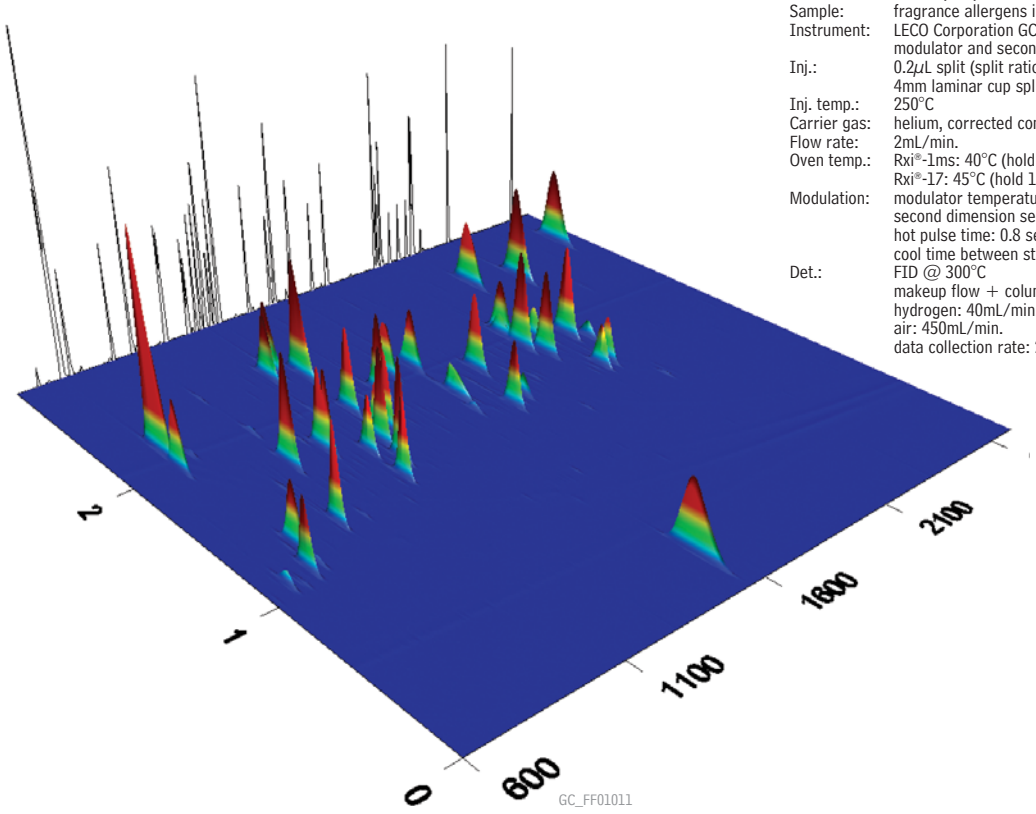
Description	qty.	cat.#	price
GCxGC Selectivity Kit A	kit	15105	
Columns can also be purchased individually.			
Rxi-17, 1.1m (±3cm), 0.10mm ID, 0.10µm	ea.	15104	
Rtx-CLPesticides, 1.1m (±3cm), 0.10mm ID, 0.10µm	ea.	15103	
Stabilwax, 1.1m (±3cm), 0.10mm ID, 0.10µm	ea.	15102	
Rt-LC350, 1.1m (±3cm), 0.15mm ID, 0.10µm	ea.	15101	

Fragrance Allergens on Rxi®-1ms & Rxi®-17 (GC x GC)



GC_FF01010

1. limonene
2. 1-fluoronaphthalene
3. benzyl alcohol
4. phenyl acetaldehyde
5. eucalyptol
6. linalool
7. camphor
8. methyl-2-octynoate
9. estragole
10. citronellol
11. citral 1
12. *trans*-cinnamaldehyde
13. geraniol
14. citral 2
15. anise alcohol
16. hydroxycitronellol
17. safrole
18. cinnamyl alcohol
19. methyl-2-nonynoate
20. eugenol
21. methyl eugenol
22. coumarin
23. hydroxycitronellol contaminant
24. isoeugenol
25. α-isomethyl ionone 1
26. lilial
27. α-isomethyl ionone 2
28. amyl cinnamal
29. lyral 1
30. lyral 2
31. amylcinnamyl alcohol 1
32. amylcinnamyl alcohol 2
33. farnesol 1
34. farnesol 2
35. hexyl cinnamal 1
36. benzyl benzoate
37. hexyl cinnamal 2
38. benzyl salicylate
39. benzyl cinnamate

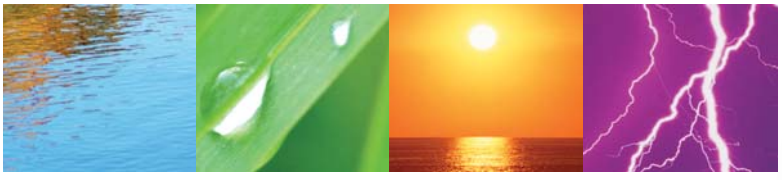


GC_FF01011

Columns:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323) Rxi®-17, 1m, 0.10mm ID, 0.10µm (10m, cat.# 13501)
Sample:	fragrance allergens in MTBE
Instrument:	LECO Corporation GCxGC/FID with quad-jet, dual-stage modulator and secondary oven
Inj.:	0.2µL split (split ratio 1:200), 4mm laminar cup splitter (cat.# 20801)
Inj. temp.:	250°C
Carrier gas:	helium, corrected constant flow via pressure ramps
Flow rate:	2mL/min.
Oven temp.:	Rxi®-1ms: 40°C (hold 1 min.) to 240°C @ 4°C/min. Rxi®-17: 45°C (hold 1 min.) to 245°C @ 4°C/min.
Modulation:	modulator temperature offset: 20°C second dimension separation time: 3 sec. hot pulse time: 0.8 sec. cool time between stages: 0.7 sec.
Det.:	FID @ 300°C makeup flow + column flow: 50mL/min. hydrogen: 40mL/min. air: 450mL/min. data collection rate: 200 Hz

High-Perfomance Rxi® Columns

Exceptionally Inert Capillary Columns



Unsurpassed inertness

An Rxi® column's inertness allows analysis of active compounds at levels not attainable with other manufacturers' columns. Basic and acidic compounds can be analyzed on the same column, often under the same conditions.

Ultra-low bleed

Save time and money through faster baseline stabilization.
With the lowest column bleed in the industry, Rxi® columns improve detection for trace level GC/MS analysis. Ultra-low bleed also reduces conditioning time after instrument maintenance.

Guaranteed reproducibility

Consistency is everything. With Rxi® column technology, we guarantee it: every new column will perform exactly as the column it replaces.

Unmatched performance

Every Rxi® column is held to stringent performance specifications for coating efficiency, selectivity, film thickness, inertness, and bleed. This guarantees you the most reliable columns available anywhere.



Restek's Exceptionally Inert Rxi® Capillary GC Columns

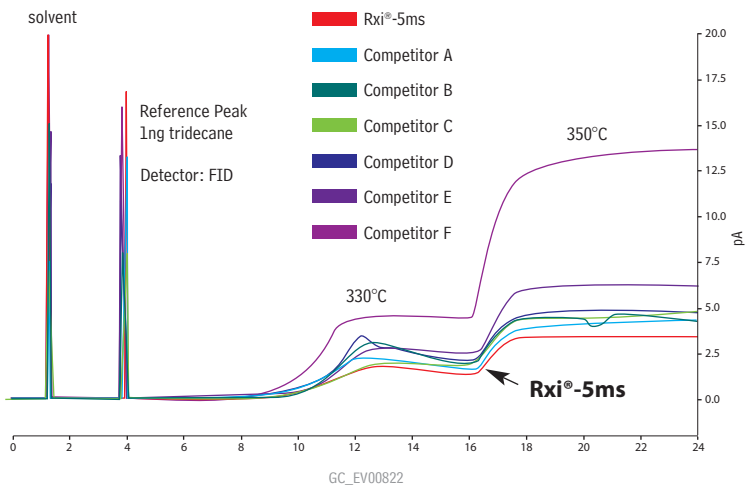
As GC detectors become more sensitive, accurately quantifying low concentrations of target compounds becomes much more challenging. We developed the Rxi® column line specifically to improve low-level quantification. Our goal was to develop a superior column that had the highest inertness, lowest bleed, and greatest reproducibility of any column available.

The exceptionally low bleed levels of Rxi® columns improve low-level analysis by reducing detector noise. This improves signal-to-noise ratios for low-level compounds leading to more accurate and reproducible results. A highly inert column improves results for active compounds by preventing adsorption of target analytes in the system. The inertness of Rxi® columns allows analysis of acidic and basic compounds on the same column—often under the same conditions—without the peak tailing, that can skew results for low-level analytes.

Finally, consistent column performance is critical to low-level analysis. In developing the Rxi® columns we wanted to guarantee reproducibility, so customers would always receive a column that worked as well as their previous column. To guarantee column-to-column reproducibility we redesigned the entire manufacturing process and used strict quality specifications. Every Rxi®column is individually tested for coating efficiency, selectivity, film thickness, inertness, and bleed level. As a result, Rxi® columns offer the most consistent retention times and highest level of inertness on the market. The data presented here demonstrate the unmatched performance of the Rxi® columns; we guarantee these columns, engineered to improve low-level analyses, are the most reliable columns available.

Figure 1 Rxi®-5ms columns have the lowest bleed among all major column brands.

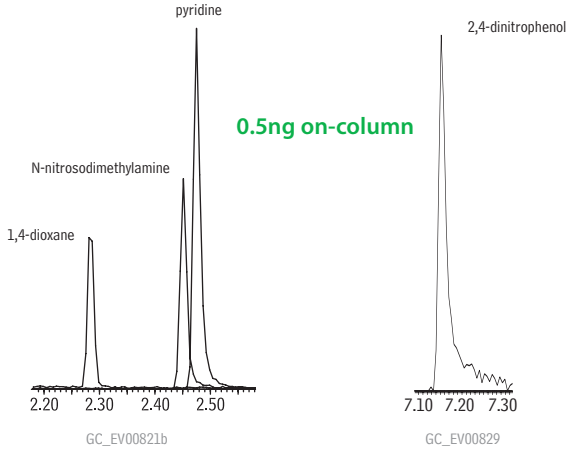
Comparison of 30m x 0.25mm ID, 0.25µm columns at 330°C through 350°C; hydrogen carrier gas; flame ionization detection.



Low Bleed

Our bleed test is performed using a flame ionization detector with a compound marker to ensure the accuracy of the comparison. Column bleed was evaluated at 330°C and also at 350°C. As shown in Figure 1, the Rxi®-5ms column exhibits the lowest bleed of any column at both 330°C and 350°C. Note that at 350°C the variation in the bleed levels of the columns tested increases significantly. This increase is due to the difference in how the stationary phases are cross-linked by different manufacturers. As shown, the Rxi® technology used for Restek columns results in a very stable stationary phase that does not degrade, or bleed, compared to other columns on the market.

Figure 2 Peak symmetry for pyridine or 2,4-dinitrophenol is excellent from an Rxi®-5ms column, even with 0.5ng on-column!

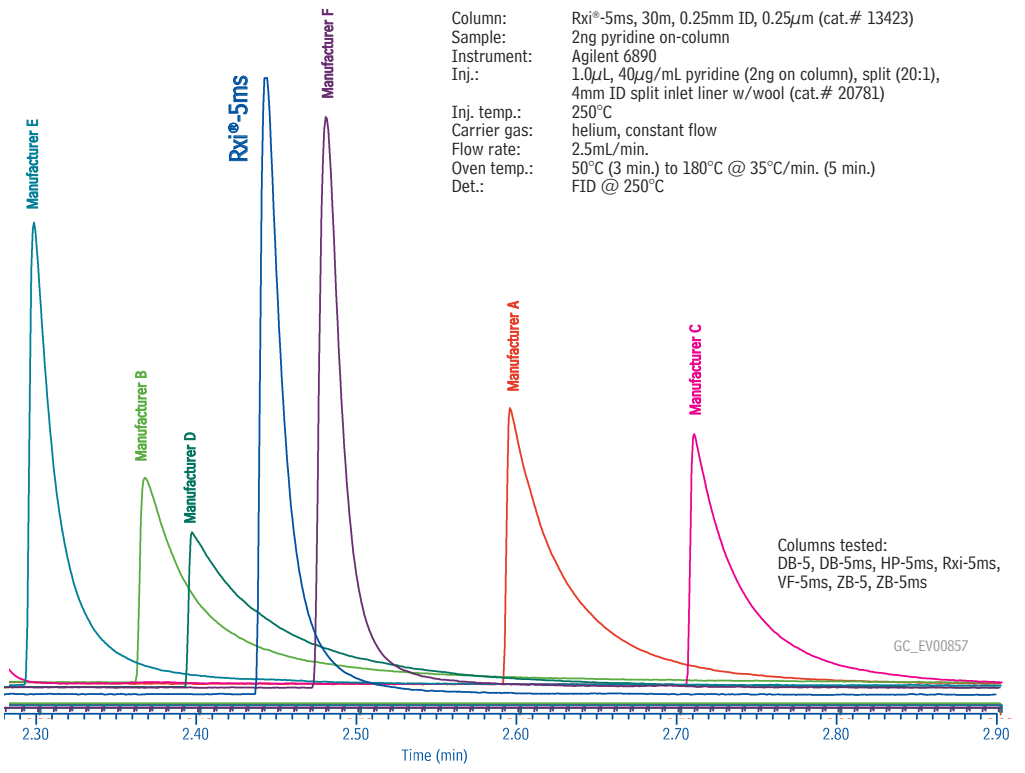


Highly Inert

We used pyridine (a basic compound) and 2,4-dinitrophenol (an acidic compound) to evaluate the activity level of our Rxi® columns. In this test, if the column was too acidic the pyridine peak would tail, whereas if the column was too basic the 2,4-dinitrophenol peak would tail and exhibit a low response factor. The excellent peak symmetry shown in Figure 2 demonstrates the neutrality of the Rxi®-5ms column for both acidic and basic compounds. Additionally, while many other commercially available columns are not able to detect 2,4-dinitrophenol at 0.5ng on-column, the Rxi®-5ms column produces a response factor of 0.14.

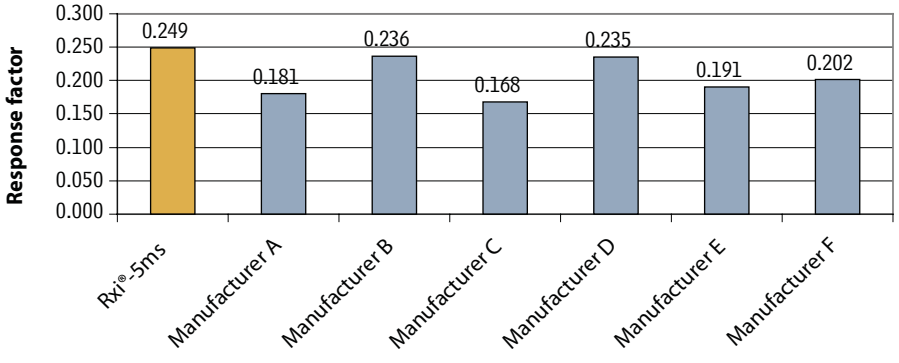
To further compare the inertness of the Rxi®-5ms column toward basic compounds to other columns on the market, 2ng of pyridine was used as a test probe. As shown in Figure 3, the tailing of pyridine is a very sensitive marker for inertness, and the excellent peak symmetry on the Rxi®-5ms column demonstrates its inertness for basic compounds.

Figure 3 An Rxi®-5ms column provides the most symmetric peak for the basic compound pyridine.



Another comparison of column inertness to acidic compounds was made with 2ng of 2,4-dinitrophenol. Figure 4 compares the mean response factors obtained on several columns and demonstrates that the Rxi®-5ms column is the most sensitive and gives the highest response factor for 2,4-dinitrophenol. In summary, Rxi®-5ms is the most inert column available for both basic and acidic compounds.

Figure 4 The Rxi®-5ms column gives the highest response factor for the acidic compound 2,4-dinitrophenol.



Column-to-Column Reproducibility

Column-to-column reproducibility is critical to obtaining consistent, reliable results for low-level analytes. We re-engineered our column manufacturing process to guarantee column-to-column reproducibility. The data in Figure 5 compare column performance from three separate production lots that were manufactured independently over a three-month period. The inertness and retention time of the probes match exactly across all three column batches. This means the responses and peak characteristics of active compounds will not vary from column-to-column, or lot-to-lot.

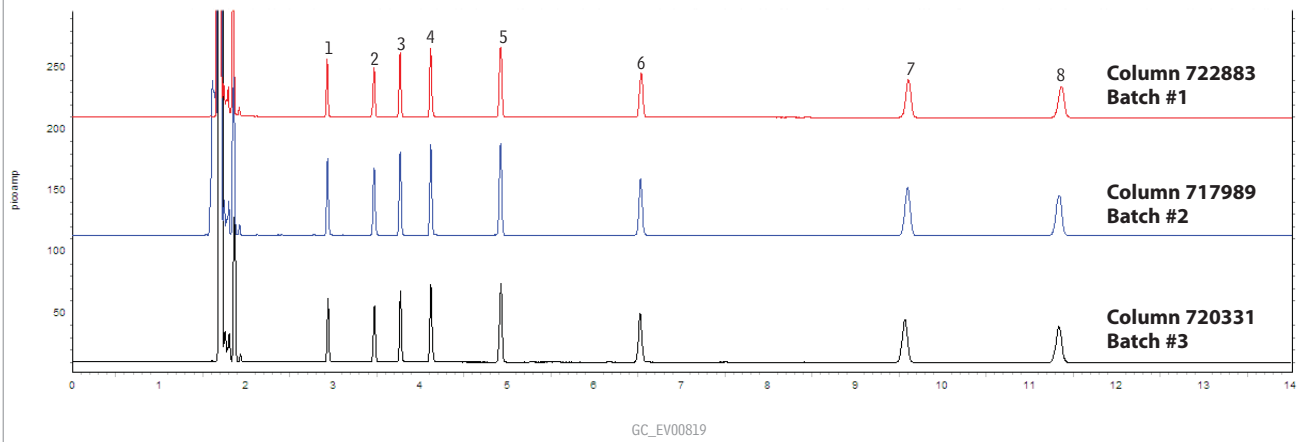
Summary

Rxi® columns offer unmatched performance in the three areas most critical to the accurate analysis of low-level analytes: bleed, inertness and reproducibility. Whether you are pursuing lower detection limits or simply looking for greater column-to-column consistency, Rxi® columns will outperform any column in the industry. Try these columns for yourself. We are sure you will be 100% satisfied, guaranteed.



Restek's Research & Development Group
pictured: Roy Lautamo, Bill Bromps, Ryan Smith, Shawn Reese

Figure 5 Rxi® column technology assures reliable column-to-column performance.



Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	500µg/mL Isothermal Column Test Mix in toluene
Inj.:	1.0µL, split injection (split ratio 1:100), 4mm single gooseneck inlet liner with wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow
Linear velocity:	38cm/sec. @ 135°C
Oven temp.:	135°C
Det.:	FID @ 330°C

1. 1,6-hexanediol
2. 4-chlorophenol
3. methyl nonanoate
4. 1-decylamine
5. tridecane
6. 1-undecanol
7. acenaphthylene
8. pentadecane

Guard Columns, Rxi®-1ms

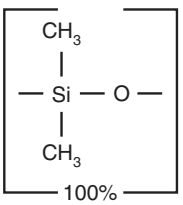
Rxi® Guard/Retention Gap Columns

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360°C.

Fused Silica

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	10-Meter/6-pk.
0.25mm	0.37 ± 0.04mm	10029	10029-600	10059	10059-600
0.32mm	0.45 ± 0.04mm	10039	10039-600	10064	10064-600
0.53mm	0.69 ± 0.05mm	10054	10054-600	10073	10073-600

Rxi®-1ms Structure



Rxi®-1ms (nonpolar phase, Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for drugs of abuse, essential oils, hydrocarbons, pesticides, PCB congeners or (e.g.) Aroclor mixes, sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Ultra-low bleed—improved signal-to-noise ratio, for better sensitivity and mass spectral integrity.
- Temperature range: -60°C to 330/350°C (bleed tested temperature/maximum operating temperature).
- Equivalent to USP G2 phase.

Rxi®-1ms Columns (fused silica)

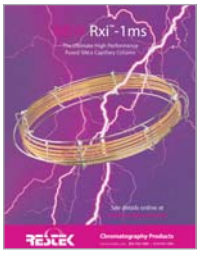
(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-60 to 330/350°C	13320	13323	13326
	0.50	-60 to 330/350°C	13335	13338	13341
	1.00	-60 to 330/350°C	13350	13353	13356
0.32mm	0.25	-60 to 330/350°C	13321	13324	13327
	0.50	-60 to 330/350°C	13336	13339	13342
	1.00	-60 to 330/350°C	13351	13354	13357
	4.00	-60 to 330/350°C		13396	
0.53mm	0.50	-60 to 330/350°C	13337	13340	
	1.00	-60 to 330/350°C	13352	13355	
	1.50	-60 to 330/350°C	13367	13370	13373

ID	df (µm)	temp. limits	10-Meter	12-Meter	20-Meter	25-Meter	50-Meter
0.10mm	0.10	-60 to 330/350°C	13301				
0.18mm	0.18	-60 to 330/350°C			13302		
0.20mm	0.33	-60 to 330/350°C		13397		13398	13399

similar **phases**

DB-1, DB-1ms, HP-1, HP-1ms, Ultra-1, SPB-1, Equity-1, VF-1ms, CP-Sil 5 CB Low Bleed/MS



free literature

Rxi®-1ms: The Ultimate High Performance Fused Silica Capillary Column

Download your free copy from **www.restek.com**.

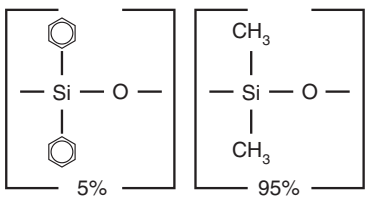
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Searching for a chromatogram?
www.restek.com

Rxi®-5ms (low polarity phase, Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- General purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners or (e.g.) Aroclor mixes, solvent impurities.
- Most inert column on the market.
- Ultra-low bleed—improved signal-to-noise ratio, for better sensitivity and mass spectral integrity.
- Temperature range: -60°C to 330/350°C (bleed tested temperature/maximum operating temperature).
- Equivalent to USP G27 phase.

Rxi®-5ms Structure



Rxi®-5ms Columns (fused silica)

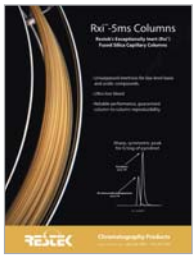
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-60 to 330/350°C	13420	13423	13426
	0.40	-60 to 330/350°C		13481	
	0.50	-60 to 330/350°C	13435	13438	13441
	1.00	-60 to 330/350°C	13450	13453	13456
0.32mm	0.25	-60 to 330/350°C	13421	13424	13427
	0.50	-60 to 330/350°C	13436	13439	13442
	1.00	-60 to 330/350°C	13451	13454	13457
0.53mm	0.25	-60 to 330/350°C	13422	13425	
	0.50	-60 to 330/350°C	13437	13440	
	1.00	-60 to 330/350°C	13452	13455	
	1.50	-60 to 330/350°C	13467	13470	

ID	df (µm)	temp. limits	10-Meter	12-Meter	20-Meter	25-Meter	50-Meter
0.10mm	0.10	-60 to 330/350°C	13401				
0.18mm	0.18	-60 to 330/350°C			13402		
	0.30	-60 to 330/350°C			13409		
	0.36	-60 to 330/350°C			13411		
0.20mm	0.33	-60 to 330/350°C		13497		13498	13499

similar phases

DB-5, HP-5, HP-5ms, Ultra-2, SPB-5, Equity-5, CP-Sil 8



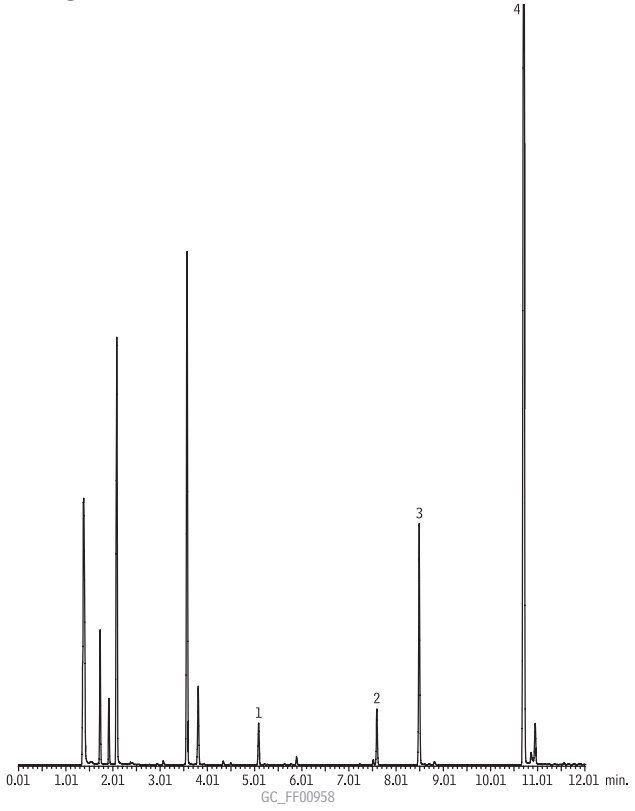
free literature

Rxi®-5ms Columns

Download your free copy from **www.restek.com**.

Flyer
lit. cat.# 580046A

Fresh garlic on an Rxi®-5ms column.



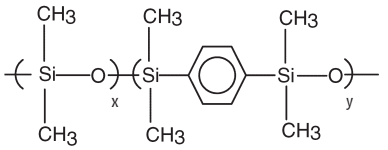
1. allyl methylsulfide
2. 3,3'-thiobis-1-propene
3. allyl mercaptan
4. diallyl disulphide

Column:	Rxi®-5ms, 30m, 0.25mm ID, 1.0µm (cat.# 13453) with a 5m, 0.32mm ID IP deactivated guard column (cat.# 10044)
Sample:	fresh garlic
Inj.:	split (10:1)
Inj. temp.:	220°C
Flow rate:	1.5mL/min.
Oven temp.:	35°C (hold 1 min.) to 220°C @ 15°C/min. to 300°C @ 45°C/min.
Det:	MS
Scan range:	35-350amu
Ionization:	EI
Mode:	scan

Headspace Conditions

Instrument:	PerkinElmer TurboMatrix 40 Trap Headspace Sampler
Column pressure:	15psi (103kPa)
Inj. pressure:	30psi (207kPa)
Thermostat time:	15 min.
Vial pressurize time:	1 min.
Withdraw time:	0.2 min.
Injection time:	0.02 min.
Oven temp.:	80°C
Needle temp.:	90°C
Transfer temp.:	110°C

Rxi®-5Sil MS Structure



Rxi®-5Sil MS (low polarity Crossbond® silarylene phase; selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

- Engineered to be a low bleed GC/MS column.
- Excellent inertness for active compounds.
- General purpose columns—ideal for GC/MS analysis of polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60°C to 350°C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC/MS applications requiring high sensitivity, including use in ion trap systems.

similar **phases**

DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS

Rxi®-5Sil MS Columns (fused silica)

(Crossbond®, selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-60 to 330/350°C	13605	13608	
	0.25	-60 to 330/350°C	13620	13623	13626
	0.50	-60 to 330/350°C	13635	13638	
	1.00	-60 to 325/350°C	13650	13653	13697
0.32mm	0.25	-60 to 330/350°C	13621	13624	
	0.50	-60 to 330/350°C		13639	
	1.00	-60 to 325/350°C		13654	
0.53mm	1.50	-60 to 310/330°C		13670	

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	43601	
0.18mm	0.18	-60 to 330/350°C		43602
	0.36	-60 to 330/350°C		43604



free literature

Rxi®-5Sil MS: Exceptionally Inert Columns for GC/MS and Trace Level Analyses

Download your free copy from **www.restek.com**.

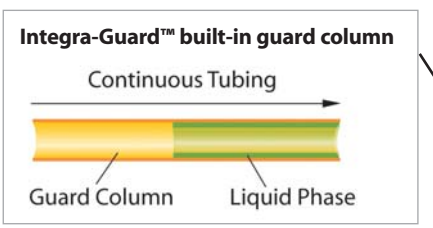
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lit. cat.# GNFL1061

Rxi®-5Sil MS with Integra-Guard™

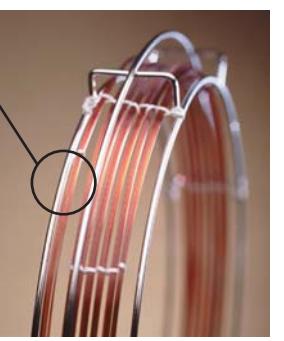
Get the protection without the connection!

- Extend column lifetime.
- Eliminate leaks with a built-in retention gap.
- Inertness verified by isothermal testing.

Description	qty.	cat.#	price
15m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13620-127	enquire
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13623-124	
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13623-127	
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13638-124	
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13638-127	
30m, 0.32mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13639-125	enquire



Phases currently available as Integra-Guard™ columns

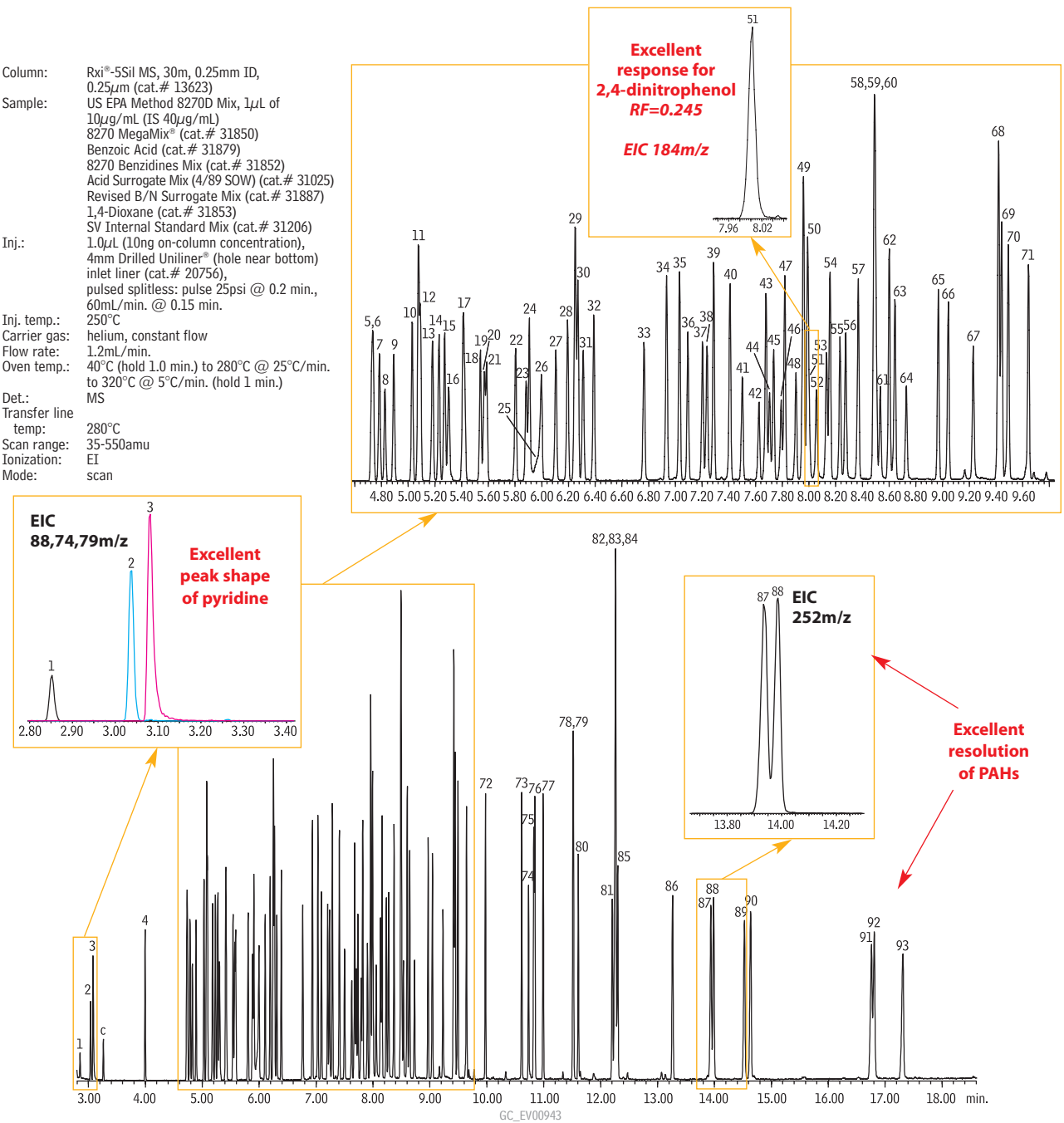


Rtx®-1
Rtx®-5
Rtx®-5MS
Rxi®-5Sil MS
Rtx®-1301
Rtx®-624
Rtx®-1701
Rtx®-Volatiles
Rtx®-20
Rtx®-35
Rtx®-BAC 1 & 2
Stabilwax®

Integra-Guard™ columns are available for all phases listed, for columns with 0.25, 0.32 or 0.53mm ID and lengths to 75 meters.

Semivolatile organics for US EPA Method 8270 on an Rxi®-5Sil MS column.

Column:	Rxi®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 13623)
Sample:	US EPA Method 8270D Mix, 1µL of 10µg/mL (IS 40µg/mL) 8270 MegaMix® (cat.# 31850) Benzoic Acid (cat.# 31879) 8270 Benzidines Mix (cat.# 31852) Acid Surrogate Mix (4/89 SOW) (cat.# 31025) Revised B/N Surrogate Mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL (10ng on-column concentration), 4mm Drilled Uniliner® (hole near bottom) inlet liner (cat.# 20756), pulsed splitless: pulse 25psi @ 0.2 min., 60mL/min. @ 0.15 min.
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	40°C (hold 1.0 min.) to 280°C @ 25°C/min. to 320°C @ 5°C/min. (hold 1 min.)
Det.:	MS
Transfer line temp:	280°C
Scan range:	35-550amu
Ionization:	EI
Mode:	scan



1. 1,4-dioxane
2. *n*-nitrosodimethylamine
3. pyridine
c. toluene
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 1,2-dichlorobenzene
15. 2-methylphenol
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/3-methylphenol
18. *n*-nitroso-di-*n*-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2-nitrophenol
24. 2,4-dimethylphenol
25. benzoic acid
26. bis(2-chloroethoxy)methane
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. acenaphthene
51. 2,4-dinitrophenol
52. 4-nitrophenol
53. 2,4-dinitrotoluene
54. dibenzofuran
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. 4-chlorophenyl phenyl ether
59. fluorene
60. 4-nitroanaline
61. 4,6-dinitro-2-methylphenol
62. *n*-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-*n*-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. pyrene
77. *p*-terphenyl-d14 (SS)
78. 3,3'-dimethylbenzidine
79. butyl benzyl phthalate
80. bis(2-ethylhexyl) adipate
81. 3,3'-dichlorobenzidine
82. benzo(a)anthracene
83. bis(2-ethylhexyl) phthalate
84. chrysene-d12 (IS)
85. chrysene
86. di-*n*-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene

c = contaminant

Rxi®-XLB (low polarity proprietary phase)

- General purpose columns exhibiting extremely low bleed. Ideal for many GC/MS applications, including pesticides, PCB congeners or (e.g.) Aroclor mixes, PAHs.
- Unique selectivity.
- Temperature range: 30°C to 360°C.

similar phases

DB-XLB, VF-Xms

Improvements in polymer synthesis and tubing deactivation enable us to make inert, stable Rxi®-XLB columns especially well-suited for analyzing active, high molecular weight compounds with sensitive GC/MS systems, including ion trap detectors. Excellent efficiency, coupled with inertness, low bleed, and high thermal stability, make Rxi®-XLB columns ideal for analyzing semivolatile compounds in drinking water (e.g., US EPA Method 525).

tech tip

In combination with an Rxi®-XLB column, simple adjustments to the injection conditions can greatly improve sensitivity for active and high molecular weight Method 525.2 target compounds.

- By eliminating contact between the sample and the hot metal surfaces in the injection port, a Drilled Uniliner® inlet liner prevents analytes from degrading in the injection port.
- A pulsed injection (30psi/0.4 min.) reduces the time the analytes spend in the injection port, and helps to minimize breakdown.

Rxi®-XLB Columns (fused silica)

(low polarity proprietary phase)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	30 to 340/360°C	13705	13708	
	0.25	30 to 340/360°C	13720	13723	13726
	0.50	30 to 340/360°C		13738	
	1.00	30 to 340/360°C	13750	13753	
0.32mm	0.10	30 to 340/360°C		13709	
	0.25	30 to 340/360°C	13721	13724	13727
	0.50	30 to 340/360°C		13739	
	1.00	30 to 340/360°C		13754	
0.53mm	0.50	30 to 340/360°C		13740	
	1.50	30 to 320/340°C	13767	13770	

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	30 to 340/360°C	43701	
0.18mm	0.18	30 to 340/360°C		43702

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

NEW!

Rxi®-35Sil MS (midpolarity phase; equivalent to 35% phenyl methylpolysiloxane)

- Excellent inertness for active compounds.
- Very low bleed phase for GC/MS analysis.
- Extended temperature range: 50°C to 340/360°C.

similar phases

DB-35ms, MR2

Rxi®-35Sil MS Columns (fused silica)

(midpolarity phase; equivalent to 35% phenyl methylpolysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	50 to 340/360°C	13823
0.32mm	0.25	50 to 340/360°C	13824
0.53mm	0.50	50 to 320/340°C	13840

NEW!

Lowest bleed, most inert high-temperature column available!

Rxi®-5HT (nonpolar phase; 5% diphenyl/95% dimethylpolysiloxane)

- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high temperature applications.
- Temperature range: -60 to 400°C*.

similar phases

DB-5HT, VF-5HT, ZB-5HT

Rxi®-5HT Columns (fused silica)

(nonpolar phase; 5% diphenyl/95% dimethylpolysiloxane)

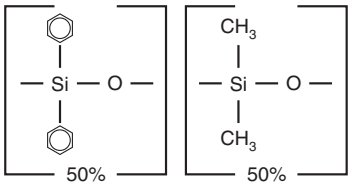
ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	-60 to 380/400°C	13905	13908
	0.25	-60 to 380/400°C		13923
0.32mm	0.10	-60 to 380/400°C	13906	13909
	0.25	-60 to 380/400°C		13924
0.53mm	0.15	-60 to 380/400°C		13910

*Column is capable of going to 430°C, but column lifetime will be reduced.

Rxi®-17 (midpolarity phase; Crossbond® 50% diphenyl/50% dimethyl polysiloxane)

- General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Temperature range: 0°C to 320°C.

Rxi®-17 Structure



Rxi®-17 Columns (fused silica)

(Crossbond® 50% diphenyl/50% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	40 to 280/320°C	13520	13523
	0.50	40 to 280/320°C	13535	13538
	1.00	40 to 280/320°C	13550	13553
0.32mm	0.25	40 to 280/320°C	13521	13524
	0.50	40 to 280/320°C	13536	13539
	1.00	40 to 280/320°C	13551	13554
0.53mm	0.25	40 to 280/320°C	13522	13525
	0.50	40 to 280/320°C	13537	13540
	0.83	40 to 280/320°C		13569
	1.00	40 to 280/320°C	13552	13555
	1.50	40 to 280/320°C	13567	13570

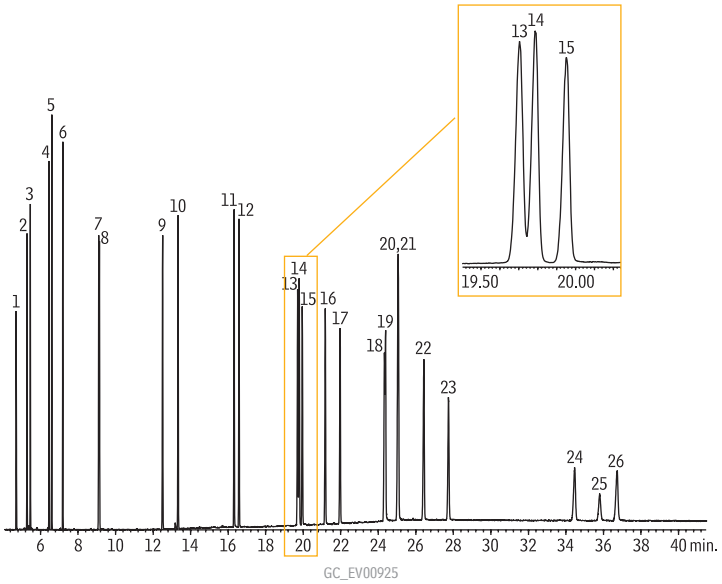
ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	40 to 280/320°C	13501	
0.18mm	0.18	40 to 280/320°C		13502

NEW!

similar phases

DB-17, DB-608, VF-17ms, CP-Sil 24 CB

Polycyclic aromatic hydrocarbons on an Rxi®-17 column.



Completely resolve benzo(j)fluoranthene.

Peak List	Ret. Time (min.)
1. naphthalene	4.70
2. 1-methylnaphthalene	5.28
3. 2-methylnapthalene	5.46
4. acenaphthylene	6.45
5. acenaphthene	6.60
6. fluorene	7.18
7. phenanthrene	9.10
8. anthracene	9.14
9. fluoranthene	12.50
10. pyrene	13.33
11. benzo(a)anthracene	16.32
12. chrysene	16.58
13. benzo(b)fluoranthene	19.70
14. benzo(k)fluoranthene	19.78
15. benzo(j)fluoranthene	19.95
16. benzo(a)pyrene	21.17
17. 3-methylcholanthrene	21.97
18. dibenzo(a,h)acridine	24.33
19. dibenzo(a,j)acridine	24.39
20. indeno(1,2,3-cd)pyrene	25.04
21. dibenzo(a,h)anthracene	25.07
22. benzo(ghi)perylene	26.43
23. 7H-dibenzo(c,g)carbazole	27.75
24. dibenzo(a,e)pyrene	34.46
25. dibenzo(a,i)pyrene	35.80
26. dibenzo(a,h)pyrene	36.73

Column:	Rxi®-17, 30m, 0.25mm ID, 0.25µm (cat.# 13523)
Sample:	PAH mix, 20µg/mL each component: EPA Method 610 Mix (cat.# 31011), PAH Supplement Mix (cat.# 31857) 1-methylnaphthalene (cat.# 31283), 2-methylnaphthalene (cat.# 31285)
Inj.:	1.0µL pulsed splitless injection (20ng each component on column), 4mm Drilled Uniliner® inlet liner with hole near top (cat.# 21055); pulse: 20psi @ 0.3 min., 40mL/min. @ 0.2 min.
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	90°C (hold 1.0 min.) to 215°C @ 25°C/min. (hold 0.5 min.) to 235°C @ 4°C/min., to 280°C @ 15°C/min., to 320°C @ 4°C/min. (hold 20 min.)
Det.:	Agilent 5973 GC/MS
Scan range:	50-550amu
Solvent delay:	4.0 min.
Tune:	DFTPP
Ionization:	EI

General Purpose Columns





Chemically bonded capillary columns

- Allow for direct solvent injection onto column.
- Columns can be solvent rinsed.

Comprehensive GC column selection

- Available in many dimensions, including variations in length, internal diameter, and film thickness.
- Internal diameters include 0.10mm and 0.18mm for faster analysis time and greater resolution.

Broad range of stationary phases

- Columns based on polysiloxane backbone; functional groups added to the polymers to vary selectivity.
- Polyethylene glycol (PEG) phases.

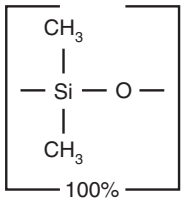


Rtx®-1 (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for solvent impurities, PCB congeners or (e.g.) Aroclor mixes, simulated distillation, drugs of abuse, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, oxygenates.
- Temperature range: -60°C to 350°C.
- Equivalent to USP G1, G2, G38 phases.

Rtx®-1 columns exhibit long lifetime and very low bleed at high operating temperatures. A proprietary synthesis process eliminates residual catalysts that could cause degradation and increase bleed.

Rtx®-1 Structure



Rtx®-1 Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 330/350°C	10105	10108	10111	
	0.25	-60 to 330/350°C	10120	10123	10126	10129
	0.50	-60 to 330/350°C	10135	10138	10141	10144
	1.00	-60 to 320/340°C	10150	10153	10156	10159
0.32mm	0.10	-60 to 330/350°C	10106	10109	10112	
	0.25	-60 to 330/350°C	10121	10124	10127	10130
	0.50	-60 to 330/350°C	10136	10139	10142	
	1.00	-60 to 320/340°C	10151	10154	10157	10160
	1.50	-60 to 310/330°C	10166	10169	10172	10175
	3.00	-60 to 280/300°C	10181	10184	10187	10190
	4.00	-60 to 280/300°C		10198		
	5.00	-60 to 260/280°C	10176	10178	10180	
0.45mm	2.55	-60 to 270/290°C				
0.53mm	0.10	-60 to 320/340°C	10107	10110		
	0.25	-60 to 320/340°C	10122	10125	10128	
	0.50	-60 to 310/330°C	10137	10140	10143	
	1.00	-60 to 310/330°C	10152	10155	10158	
	1.50	-60 to 310/330°C	10167	10170	10173	
	3.00	-60 to 270/290°C	10182	10185	10188	10189
	5.00	-60 to 270/290°C	10177	10179	10183	10194
	7.00	-60 to 240/260°C	10191	10192	10193	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.10mm	0.10	-60 to 330/350°C	41101	41102	
	0.40	-60 to 320/340°C	41103	41104	
0.18mm	0.20	-60 to 330/350°C	40101	40102	40103
	0.40	-60 to 320/340°C	40110	40111	40112

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Rtx®-1 with Integra-Guard™ Column

Get the protection without the connection!

- Extend column lifetime.
- Eliminate leaks with a built-in retention gap.
- Inertness verified by isothermal testing.

Description	qty.	cat.#	price
30m, 0.25mm ID, 0.25µm Rtx-1 w/5m Integra-Guard Column	ea.	10123-124	
30m, 0.53mm ID, 1.00µm Rtx-1 w/5m Integra-Guard Column	ea.	10155-126	
30m, 0.53mm ID, 5.00µm Rtx-1 w/5m Integra-Guard Column	ea.	10179-126	

similar phases

DB-1, DB-1MS, HP-1, HP-1MS, Ultra-1, SPB-1, Equity-1, MDN-1, VF-1ms, CP-Sil 5 CB

also available

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing.
See **page 105** for our MXT®-1 columns.

it's a fact

For exceptional inertness, ultra-low bleed, and unsurpassed performance, choose Rxi®-1ms columns!
See **pages 36-40**.

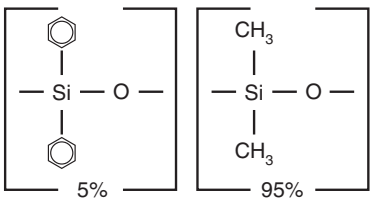
crossbond® technology

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.



Catch the Buzz
Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Rtx®-5/Rtx®-5MS Structure

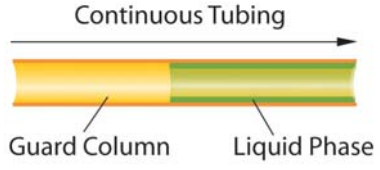


similar **phases**

DB-5, HP-5, HP-5MS, Ultra-2, SPB-5, Equity-5, MDN-5, CP-Sil 8 CB

NOTE: DB-5MS is a silarylene based polymer, similar to Rxi-5Sil MS.

Integra-Guard™ built-in guard column



Get the protection without the connection!
For Rtx®-5 and Rtx®-5MS columns with built-in Integra-Guard™ guard columns, see **page 33**.

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 106** for our MXT®-5 columns.

Rtx®-5 Amine Columns
See **page 59**.

it's a **fact**

For exceptional inertness, ultra-low bleed, and unsurpassed performance, choose Rxi®-5ms columns! See **pages 36-39, 41**.

Rtx®-5/Rtx®-5 MS (low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners or (e.g.) Aroclor mixes, essential oils, semivolatiles.
- Temperature range: -60°C to 350°C.
- Equivalent to USP G27 and G36 phases.

The 5% diphenyl/95% dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

Rtx®-5 Columns (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 330/350°C	10205	10208	10211	10214
	0.25	-60 to 330/350°C	10220	10223	10226	10229
	0.50	-60 to 330/350°C	10235	10238	10241	10244
	1.00	-60 to 320/340°C	10250	10253	10256	10259
0.32mm	0.10	-60 to 330/350°C	10206	10209	10212	10215
	0.25	-60 to 330/350°C	10221	10224	10227	10230
	0.50	-60 to 330/350°C	10236	10239	10242	10245
	1.00	-60 to 330/350°C	10251	10254	10257	10260
	1.50	-60 to 310/330°C	10266	10269	10272	10275
	3.00	-60 to 280/300°C	10281	10284	10287	10290
0.53mm	0.10	-60 to 320/340°C	10207	10210	10213	
	0.25	-60 to 320/340°C	10222	10225	10228	
	0.50	-60 to 310/330°C	10237	10240	10243	
	1.00	-60 to 310/330°C	10252	10255	10258	
	1.50	-60 to 310/330°C	10267	10270	10273	
	3.00	-60 to 270/290°C	10282	10285	10288	
	5.00	-60 to 270/290°C	10277	10279	10283	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.10mm	0.10	-60 to 330/350°C	41201	41202	
	0.40	-60 to 320/340°C	41203	41204	
0.18mm	0.20	-60 to 325/340°C	40201	40202	40203
	0.40	-60 to 315/330°C	40210	40211	40212

30-meter	6-pack cat.#	6-pack price
0.25mm ID, 0.25µm	10223-600	
0.25mm ID, 0.50µm	10238-600	
0.32mm ID, 1.00µm	10254-600	
0.53mm ID, 1.50µm	10270-600	

Six columns for the price of five!
Other phases and configurations available on request.

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Rtx®-5MS—Low-bleed GC/MS Columns (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

Column specifically tested for low bleed performance.

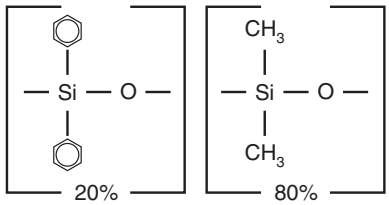
ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-60 to 330/350°C	12605	12608	12611
	0.25	-60 to 330/350°C	12620	12623	12626
	0.50	-60 to 330/350°C	12635	12638	12641
	1.00	-60 to 325/350°C	12650	12653	
0.32mm	0.10	-60 to 330/350°C	12606	12609	12612
	0.25	-60 to 330/350°C	12621	12624	12627
	0.50	-60 to 330/350°C	12636	12639	12642
	1.00	-60 to 325/350°C	12651	12654	
0.53mm	0.50	-60 to 320/340°C	12637	12640	
	1.00	-60 to 320/340°C	12652	12655	
	1.50	-60 to 310/330°C	12667	12670	

Rtx®-20 (low to midpolarity phase; Crossbond® 20% diphenyl/80% dimethyl polysiloxane)

- General purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Temperature range: -20°C to 320°C.
- Equivalent to USP G28, G32 phases.

Rtx®-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight mono-modal distribution and extremely low bleed.

Rtx®-20 Structure



Rtx®-20 Columns (fused silica)

(Crossbond® 20% diphenyl/80% dimethyl polysiloxane)

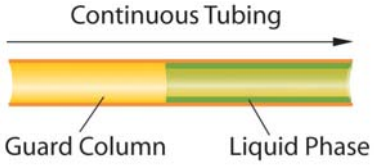
ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	-20 to 300/320°C	10320	10323
	0.50	-20 to 290/310°C	10335	10338
	1.00	-20 to 280/300°C	10350	10353
0.32mm	0.25	-20 to 300/320°C	10321	10324
	0.50	-20 to 290/310°C	10336	10339
	1.00	-20 to 280/300°C	10351	10354
0.53mm	0.25	-20 to 260/280°C	10322	10325
	1.00	-20 to 260/280°C	10352	10355

similar phase

SPB-20

Integra-Guard™ built-in guard column

Get the protection without the connection!
For Rtx®-20 and Rtx®-35 columns with built-in Integra-Guard™ guard columns, see **page 33**.

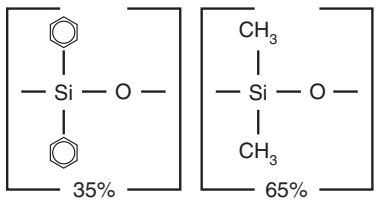


Rtx®-35 (midpolarity phase; Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

- General purpose columns for organochlorine pesticides, PCB congeners or (e.g.) Aroclor mixes, herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Temperature range: 40°C to 320°C.
- Equivalent to USP G42 phase.

An Rtx®-35 column is a popular confirmation column for pesticides and herbicides, in conjunction with an Rtx®-5 or Rtx®-1701 column. The higher phenyl content causes useful elution order and retention time changes.

Rtx®-35 Structure



Rtx®-35 Columns (fused silica)

(Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	40 to 320°C	10420	10423
	0.50	40 to 310°C	10435	10438
	1.00	40 to 290°C	10450	10453
0.32mm	0.25	40 to 320°C	10421	10424
	0.50	40 to 310°C	10436	10439
	1.00	40 to 290°C	10451	10454
0.53mm	0.25	40 to 260/280°C	10422	10425
	0.50	40 to 300°C	10437	10440
	1.00	40 to 290°C	10452	10455
	1.50	40 to 280°C	10467	10470
	3.00	40 to 240/260°C	10482	10485

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.18mm	0.20	40 to 300/320°C	40401	40402
	0.40	40 to 290/310°C	40410	40411

similar phases

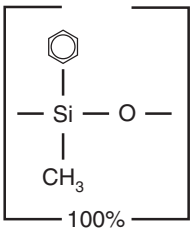
DB-35, HP-35, SPB-35, SPB-608

also available

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 108** for our MXT®-20 columns and **page 108** for our MXT®-35 columns.

Rtx®-35 Amine Columns
See **page 60.**

Rtx®-50 Structure



similar **phases**

HP-50, SPB-50, SP-2250

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing.
See **page 108** for our MXT®-50 columns.

Rtx®-50 (midpolarity phase; Crossbond® 100% methylphenyl polysiloxane)

- General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Temperature range: 40°C to 320°C.
- Equivalent to USP G3 phase.

The high thermal stability of Rtx®-50 columns makes possible dual-column analysis with common phases such as Rtx®-1MS or Rtx®-5MS. Between analyses, high temperatures can be used to drive less volatile contaminants off of the column.

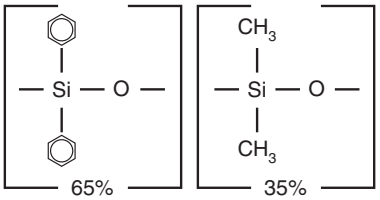
Rtx®-50 Columns (fused silica)

(Crossbond® 100% methylphenyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	40 to 300/320°C	10520	10523
	0.50	40 to 290/310°C	10535	10538
	1.00	40 to 280/300°C	10550	10553
0.32mm	0.25	40 to 300/320°C	10521	10524
	0.50	40 to 290/310°C	10536	10539
	1.00	40 to 280/300°C	10551	10554
0.53mm	0.25	40 to 280/300°C	10522	
	0.50	40 to 270/290°C	10537	10540
	0.83	40 to 270/290°C		10569
	1.00	40 to 260/280°C	10552	10555
	1.50	40 to 250/270°C	10567	10570

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.18mm	0.20	40 to 310/330°C	40501	40502
	0.40	40 to 300/320°C	40510	40511

Rtx®-65 Structure



similar **phases**

TAP-CB, 400-65HT, 007-65HT

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing.
See **page 109** for our MXT®-65 columns.

Rtx®-65 (mid to high polarity phase; Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

- General purpose columns for phenols, fatty acids.
- Temperature range: 50°C to 300°C.
- Equivalent to USP G17 phase.

The Rtx®-65 phase contains the highest phenyl content of any bonded stationary phase available, to improve separation of aromatic compounds through increased phase-analyte interaction. A unique polarity makes these columns ideal for a variety of analyses, from phenols to FAMEs. As a confirmation column for EPA Method 604 phenols, an Rtx®-65 column produces a different elution order, compared to the primary Rtx®-5 column. Rtx®-65 columns elute FAMEs according to equivalent chain length, similar to bonded Carbowax® columns, but the Rtx®-65 phase does not suffer the thermal stability limitations of other polar stationary phases.

Rtx®-65 Columns (fused silica)

(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	50 to 300°C	17023
	0.50	50 to 280/300°C	17038
	1.00	50 to 260/280°C	17053
0.32mm	0.25	50 to 300°C	17024
	0.50	50 to 280/300°C	17039
	1.00	50 to 260°C	17054
0.53mm	0.25	50 to 290/300°C	17025
	0.50	50 to 270/290°C	17040
	1.00	50 to 250/270°C	17055

also **available**

Rtx®-65TG Columns
See **page 67.**

crossbond® **technology**

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

restek **innovation**!

Rtx®-440 (intermediate polarity proprietary Crossbond® phase)

- General purpose columns for pesticides, PAHs, or other semivolatiles. Ideal for low/trace level analyses.
- Low bleed, high-resolution columns with unique selectivity.
- Temperature range: 20°C to 340°C.

Rtx®-440 Columns (fused silica)

(intermediate polarity proprietary Crossbond® phase)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	20°C to 320/340°C	12923
	0.50	20°C to 320/340°C	12938
0.32mm	0.25	20°C to 320/340°C	12924
	0.50	20°C to 320/340°C	12939
0.53mm	0.50	20°C to 320/340°C	12940
	1.00	20°C to 320/340°C	12955

ID	df (µm)	temp. limits	20-Meter	40-Meter
0.18mm	0.18	20°C to 320/340°C	42902	42903

Organochlorine Pesticides (US EPA Method 8081A) on an Rtx®-440 column.

Column: Rtx®-440 30m, 0.25mm ID, 0.50µm (cat.# 12939)

Sample: Organochlorine Pesticides Mix AB #2 (cat.# 32292),
8-80µg/mL each component in ethyl acetate
Chlorobenzilate (cat.# 32211) 1,000µg/mL in methanol
Diallate (*cis* & *trans*) (custom) 1,000µg/mL in hexane
Hexachlorobenzene (cat.# 32231) 1,000µg/mL in acetone
Hexachlorocyclopentadiene (cat.# 32232) 1,000µg/mL in methanol
Isodrin (custom) 1,000µg/mL in hexane
Kepone (custom) 1,000µg/mL in hexane
Mirex (custom) 1,000µg/mL in hexane
2,4'-DDD (cat.# 32098) 1,000µg/mL in methanol
2,4'-DDE (cat.# 32099) 1,000µg/mL in methanol
2,4'-DDT (cat.#32200) 1,000µg/mL in methanol
TCMX (cat.# 32027) 200µg/mL in acetone
DCB (cat.# 32029) 200µg/mL in acetone

Inj.: 1.0µL splitless (hold 0.75 min.), 2mm Siltek® treated single gooseneck inlet liner (cat.# 20961-214.1)

Inj. temp.: 275°C

Carrier gas: hydrogen, constant pressure

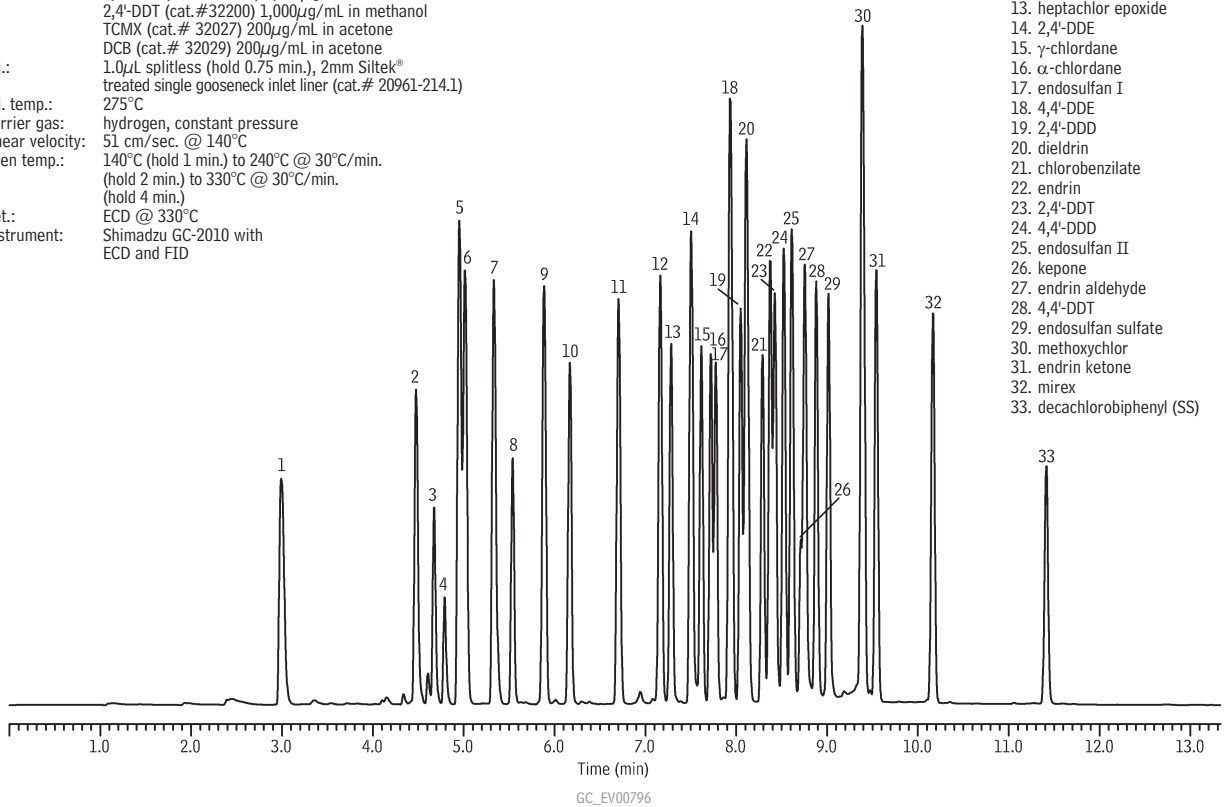
Linear velocity: 51 cm/sec. @ 140°C

Oven temp.: 140°C (hold 1 min.) to 240°C @ 30°C/min.
(hold 2 min.) to 330°C @ 30°C/min.
(hold 4 min.)

Det.: ECD @ 330°C

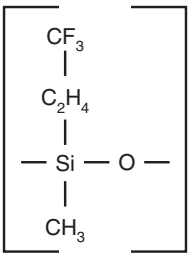
Instrument: Shimadzu GC-2010 with ECD and FID

1. hexachlorocyclopentadiene
2. 2,4,5,6-tetrachloro-m-xylene (SS)
3. *cis*-diallate
4. *trans*-diallate
5. α-BHC
6. hexachlorobenzene
7. γ-BHC
8. β-BHC
9. δ-BHC
10. heptachlor
11. aldrin
12. isodrin
13. heptachlor epoxide
14. 2,4'-DDE
15. γ-chlordane
16. α-chlordane
17. endosulfan I
18. 4,4'-DDE
19. 2,4'-DDD
20. dieldrin
21. chlorobenzilate
22. endrin
23. 2,4'-DDT
24. 4,4'-DDD
25. endosulfan II
26. kepone
27. endrin aldehyde
28. 4,4'-DDT
29. endosulfan sulfate
30. methoxychlor
31. endrin ketone
32. mirex
33. decachlorobiphenyl (SS)



Rtx®-200, Rtx®-200MS

Rtx®-200 Structure



similar **phases**

DB-200, DB-210

Rtx®-200 (midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, glycols. Excellent confirmation column, with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20°C to 340°C.
- Equivalent to USP G6 phase.

Rtx®-200 columns have accomplished many difficult separations not possible on any other bonded stationary phase. Many analysts consider these the best, most inert mid-polarity columns available. The trifluoropropyl stationary phase has a unique selectivity that changes elution orders and resolves compounds that phenyl, cyano, or Carbowax® phases can not. The Rtx®-200 column offers exceptional thermal stability, low bleed, and superior inertness—even for active compounds such as phenols, and with sensitive detectors such as ECDs, NPDs, and MSDs.

Rtx®-200 Columns (fused silica)
(Crossbond® trifluoropropylmethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.25	-20 to 320/340°C	15020	15023	15026	15029
	0.50	-20 to 310/330°C	15035	15038	15041	15044
	1.00	-20 to 290/310°C	15050	15053	15056	15059
0.32mm	0.25	-20 to 320/340°C	15021	15024	15027	15030
	0.50	-20 to 310/330°C	15036	15039	15042	15045
	1.00	-20 to 290/310°C	15051	15054	15057	15060
	1.50	-20 to 280/300°C	15066	15069	15072	15075
0.53mm	0.25	-20 to 310/330°C	15022	15025	15028	
	0.50	-20 to 300/320°C	15037	15040	15043	
	1.00	-20 to 290/310°C	15052	15055	15058	
	1.50	-20 to 280/300°C	15067	15070	15073	
	3.00	-20 to 260/280°C	15082	15085	15088	15091

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	-20 to 310/330°C	45001	45002	45003
	0.40	-20 to 310/330°C	45010	45011	45012

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing.
See **page 110** for our MXT®-200 columns.

Rtx®-200MS—Low-bleed GC/MS Columns (fused silica)
(Crossbond® trifluoropropylmethyl polysiloxane)
Column specifically tested for low bleed performance.

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.10	-20 to 320/340°C	15608
	0.25	-20 to 320/340°C	15623
	0.50	-20 to 310/330°C	15638
	1.00	-20 to 290/310°C	15653
0.32mm	0.10	-20 to 320/340°C	15609
	0.25	-20 to 320/340°C	15624
	0.50	-20 to 310/330°C	15639
	1.00	-20 to 290/310°C	15654

Rtx®-1301 (low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/ 94% dimethyl polysiloxane)

- General purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G43 phase.

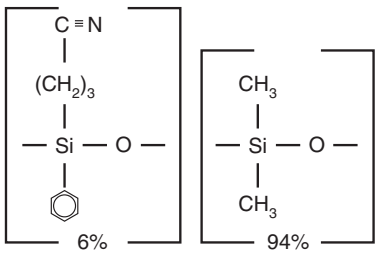
Many analysts feel the Rtx®-1301 column has the best cyanosilicone bonded stationary phase available, with no other column manufacturer providing lower bleed, longer lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed—even with sensitive detectors such as ECDs and MSDs.

Rtx®-1301 (G43) Columns (fused silica)

(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	0.25	-20 to 280°C	16020	16023	16026		
	0.50	-20 to 270°C	16035	16038	16041		
	1.00	-20 to 260°C	16050	16053	16056		
	1.40	-20 to 240°C			16016		
0.32mm	0.25	-20 to 280°C	16021	16024	16027		
	0.50	-20 to 270°C	16036	16039	16042		
	1.00	-20 to 260°C	16051	16054	16057		
	1.50	-20 to 250°C	16066	16069	16072		
	1.80	-20 to 240°C		16092	16093		
0.53mm	0.25	-20 to 280°C	16022	16025	16028		
	0.50	-20 to 270°C	16037	16040	16043		
	1.00	-20 to 260°C	16052	16055	16058		
	1.50	-20 to 250°C	16067	16070	16073		
	3.00	-20 to 240°C	16082	16085	16088	16076	16091

Rtx®-1301 Structure

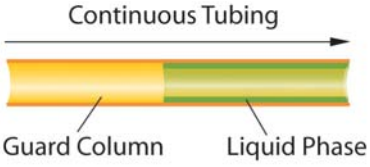


similar phases

DB-1301, DB-624, HP-1301, HP-624, SPB-1301, SPB-624, VF-1301, VF-624ms, CP-1301, CP-Select 624 CB

See Rtx-624, pages 74 and 93.

Integra-Guard™ built-in guard column



Get the protection without the connection!
For Rtx®-1301 columns with built-in Integra-Guard™ guard columns, see **page 33**.

Rtx®-225 (polar phase; Crossbond® 50% cyanopropylmethyl/ 50% phenylmethyl polysiloxane)

- General purpose columns for FAMEs, carbohydrates, sterols, flavor compounds.
- Temperature range: 40°C to 240°C.
- Equivalent to USP G7, G19 phases.

The cyanopropyl-containing Rtx®-225 phase is slightly less polar than bonded polyethylene glycol (PEG) phases, but it can be used for many of the same applications.

Improvements to the Rtx®-225 polymer have increased thermal stability, reduced bleed, and improved inertness. The Rtx®-225 column provides a 20°C thermal stability advantage over other "225" columns because of our unique polymer synthesis technology and proprietary siloxane deactivation. In most similar columns, the Carbowax® deactivation layer is not fully compatible with the cyanopropyl siloxane polymer, which can cause adsorption, tailing of active compounds, and lower efficiency.

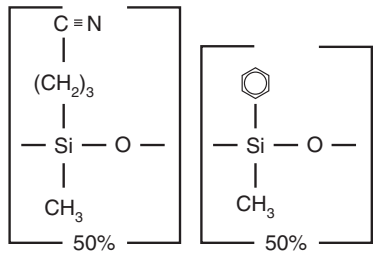
Rtx®-225 Columns (fused silica)

(Crossbond® 50% cyanopropylmethyl/50% phenylmethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 220/240°C	14005	14008	
	0.25	40 to 220/240°C	14020	14023	14026
	0.50	40 to 220/240°C	14035	14038	14041
0.32mm	0.10	40 to 220/240°C	14006	14009	
	0.25	40 to 220/240°C	14021	14024	14027
	0.50	40 to 220/240°C	14036	14039	14042
	1.00	40 to 200/220°C	14051	14054	14057
0.53mm	0.10	40 to 200/220°C	14007	14010	
	0.25	40 to 200/220°C	14022	14025	
	0.50	40 to 200/220°C	14037	14040	14043
	1.00	40 to 200/220°C	14052	14055	14058

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

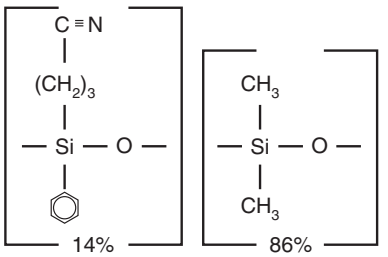
Rtx®-225 Structure



similar phases

DB-225, HP-225, SPB-225

Rtx®-1701 Structure



Rtx®-1701 (midpolarity phase; Crossbond® 14% cyanopropylphenyl/ 86% dimethyl polysiloxane)

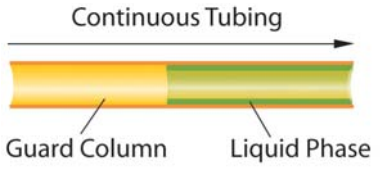
- General purpose columns for alcohols, oxygenates, PCB congeners or (e.g.) Aroclor mixes, pesticides.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G46 phase.

Rtx®-1701 is one of the more popular stationary phases used in capillary GC. The mix of cyano and phenyl functional groups increases the polarity and offers a different elution order relative to less polar Rtx®-1 or Rtx®-5 columns. An Rtx®-1701 column is ideal for confirmation analysis, in combination with an Rtx®-35 or Rtx®-5 column. The polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed, even with sensitive detectors such as ECDs and MSDs.

similar **phases**

DB-1701, HP-1701, SPB-1701, VF-1701, CP-Sil 19 CB

Integra-Guard™ built-in guard column



Get the protection without the connection!
For Rtx®-1701 columns with built-in Integra-Guard™ guard columns, see **page 33**.

Rtx®-1701 Columns (fused silica)

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-20 to 280°C			12011
	0.25	-20 to 280°C	12020	12023	12026
	0.50	-20 to 270/280°C	12035	12038	12041
	1.00	-20 to 260/280°C	12050	12053	12056
0.32mm	0.10	-20 to 280°C		12009	
	0.25	-20 to 280°C	12021	12024	12027
	0.50	-20 to 270/280°C	12036	12039	12042
	1.00	-20 to 260/280°C	12051	12054	12057
	1.50	-20 to 240/260°C	12066	12069	12072
0.53mm	0.10	-20 to 270/280°C	12007		
	0.25	-20 to 270/280°C	12022	12025	12028
	0.50	-20 to 260/270°C	12037	12040	12043
	1.00	-20 to 250/270°C	12052	12055	12058
	1.50	-20 to 240/260°C	12067	12070	12073
	3.00	-20 to 230/250°C	12082	12085	12088

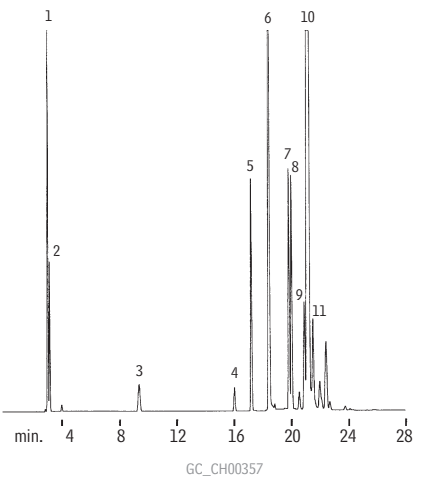
ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-20 to 280°C	42201	42202
0.18mm	0.20	-20 to 280°C	42001	42002
	0.40	-20 to 270/280°C	42010	42011

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 110** for our MXT®-1701 columns.

Styrene impurities on an Rtx®-1701 column.



1. 1,3-butadiene
2. butene
3. acrylonitrile
4. diethylhydroxylamine
5. toluene
6. vinylcyclohexene
7. ethylbenzene
8. *m*-xylene
9. *o*-xylene
10. styrene
11. cumene

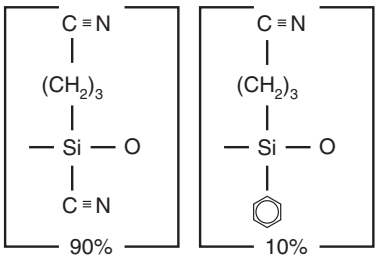
Column:	Rtx®-1701, 30m, 0.53mm ID, 3.0µm (cat.# 12085)
Inj.:	0.5mL split injection of a 95% pure styrene
Oven temp.:	40°C (hold 10 min.) to 150°C @ 12°C/min. (hold 15 min.)
Inj./det. temp.:	150°C
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 40°C
FID sensitivity:	16 x 10^{-11} AFS
Split vent:	40cc/min.

Permission to publish this chromatogram granted by Copolymer Rubber and Chemical Corp.

Rt®-2330 (highly polar phase; 90% biscyanopropyl/10% phenylcyanopropyl polysiloxane—not bonded)

- General purpose columns for *cis*/*trans* FAMEs, dioxin isomers.
- Temperature range: 0°C to 275°C.
- Equivalent to USP G8 and G48 phase.

Rt®-2330 Structure



Rt®-2330 is one of the most polar capillary column stationary phases. Cyano groups on both sides of the polymer backbone give the phase a strong dipole moment and high selectivity for *cis*/*trans* compounds or compounds with conjugated double bonds. Highly polar columns typically exhibit poor column efficiencies, high bleed, and short column lifetimes when thermally cycled. To overcome some of these problems, we developed a surface treatment that is more compatible with the Rt®-2330 phase. In addition, our improved polymer produces columns with improved column efficiency and lower bleed.

Because the Rt®-2330 stationary phase is not bonded, it should not be solvent rinsed.

Rt®-2330 Columns (fused silica)
(90% biscyanopropyl/10% phenylcyanopropyl polysiloxane)

ID	df (µm)	temp. limits*	30-Meter	60-Meter	105-Meter
0.25mm	0.10	0 to 260/275°C	10708	10711	10714
	0.20	0 to 260/275°C	10723	10726	10729
0.32mm	0.20	0 to 260/275°C	10724	10727	10730
0.53mm	0.10	0 to 260/275°C	10710	10713	
	0.20	0 to 260/275°C	10725	10728	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.10	0 to 260/275°C	40701	40702	40703

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

similar phases

DB-23, HP-23, SP-2330, SP-2380

Doing Dioxin Analysis?
Rtx®-Dioxin and Rtx®-Dioxin2 columns provide better resolution and higher maximum temperatures than conventional columns. See **pages 86 and 87**.

Rt®-2560 (highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis*/*trans* FAMEs.
- Stable to 250°C.

Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

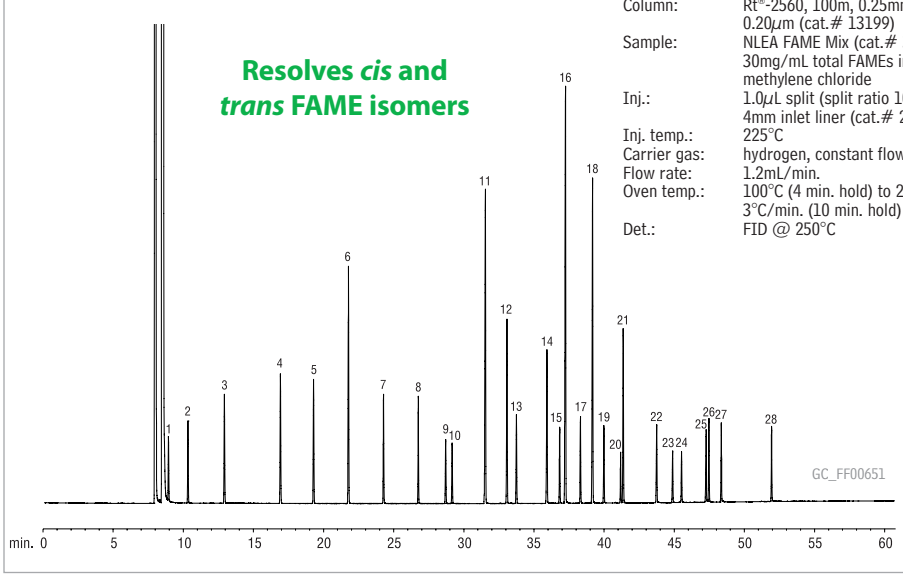
Rt®-2560 Column (fused silica)
(biscyanopropyl polysiloxane)

ID	df (µm)	temp. limits	100-Meter
0.25mm	0.20	20 to 250°C	13199

similar phases

SPB-2560, HP-88, Silar 10C, CP-Sil 88 FAME, CP-Sil 88

NLEA FAMEs resolved on an Rt®-2560 column.



Column:	Rt®-2560, 100m, 0.25mm ID, 0.20µm (cat.# 13199)
Sample:	NLEA FAME Mix (cat.# 35078), 30mg/mL total FAMEs in methylene chloride
Inj.:	1.0µL split (split ratio 100:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	225°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (4 min. hold) to 240°C @ 3°C/min. (10 min. hold)
Det.:	FID @ 250°C

1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

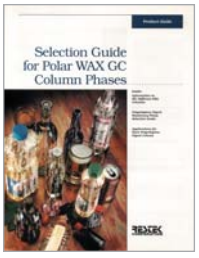
a **plus 1** story

"For many years, I have searched the market place for a bonded polar GC phase that delivered the chemical inertness, long-term phase stability and practical robustness necessary to meet my operational requirements. Only after an extensive nine month in-house testing programme, can I say that I have finally found that phase in Rtx®-Wax."

Steve Rowlands, Quest International (Kent UK)

similar **phases**

DB-WAX, HP-Wax



free literature

Selection Guide for Polar Wax GC Column Phases

Download your free copy from **www.restek.com**.

Technical Guide
lit. cat.# 59890

Rtx®-Wax (polar phase; Crossbond® Carbowax® polyethylene glycol)

- General purpose columns for FAMEs, solvents, BTEX aromatics, flavor compounds, alcohols.
- Temperature range: 20°C to 250°C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

Rtx®-Wax columns are the most inert and efficient PEG columns currently available. The extended operating temperature range allows analysis of compounds having a wide volatility range, and ensures low bleed at temperatures as high as 250°C. Selectivity is comparable to other Carbowax® columns, for compounds of intermediate to high polarity. Selectivity data available on request.

Rtx®-Wax Columns (fused silica)

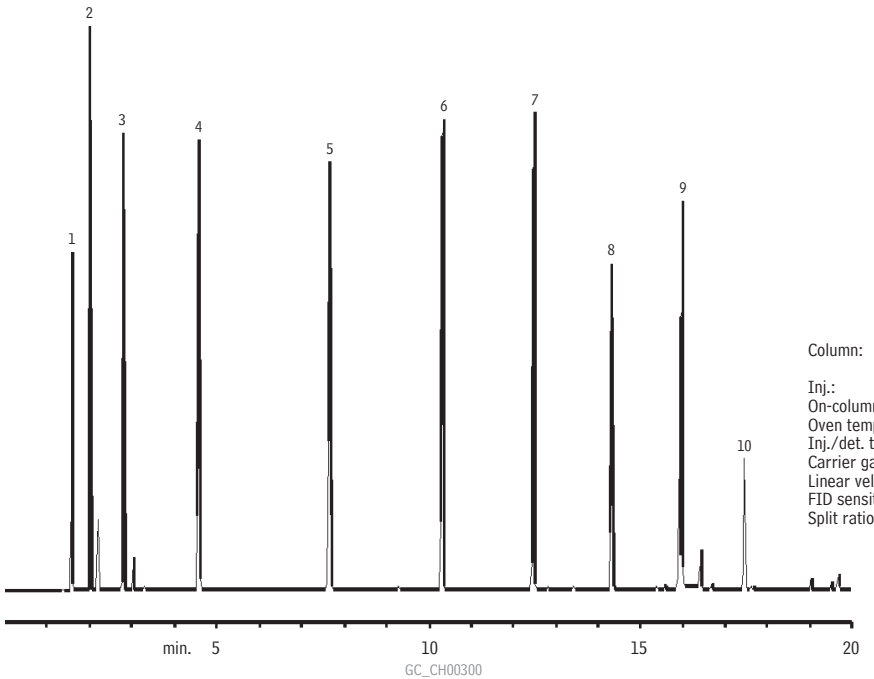
(Crossbond® Carbowax® polyethylene glycol)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	20 to 250°C	12420	12423	12426
	0.50	20 to 250°C	12435	12438	12441
0.32mm	0.25	20 to 250°C	12421	12424	12427
	0.50	20 to 250°C	12436	12439	12442
	1.00	20 to 240/250°C	12451	12454	12457
0.53mm	0.25	20 to 250°C	12422	12425	
	0.50	20 to 250°C	12437	12440	12443
	1.00	20 to 240/250°C	12452	12455	12458

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	20 to 250°C	41601	41602
	0.20	20 to 240/250°C	41603	41604

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Sharp, well-resolved peaks for aldehydes, using an Rtx®-Wax column.



1. ethanal
2. propanal
3. butenal
4. pentanal
5. hexanal
6. heptanal
7. octanal
8. nonanal
9. decanal
10. undecanal

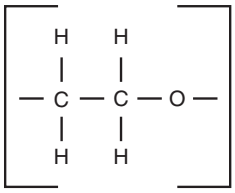
Column:	Rtx®-Wax, 30m, 0.25mm ID, 0.50µm (cat.# 12438)
Inj.:	split injection of C2-C11 aldehydes mixture
On-column conc.:	250ng
Oven temp.:	40°C (hold 5 min.) to 200°C @ 10°C/min.
Inj./det. temp.:	200°C
Carrier gas:	hydrogen
Linear velocity:	35cm/sec. set @ 40°C
FID sensitivity:	82 x 10^{11} AFS
Split ratio:	100:1

Stabilwax® (polar phase; Crossbond® Carbowax® polyethylene glycol)

- General purpose columns for FAMEs, flavor compounds, essential oils, solvents, xylene isomers, and US EPA Method 603 (acrolein/acrylonitrile).
- Resistant to oxidative damage.
- Temperature range: 40°C to 260°C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Our polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. The bonding mechanisms produce a column that can be rejuvenated by solvent washing. Compared to silicone stationary phases, PEG phases are more resistant to damage from strongly acidic or basic volatile compounds.

Stabilwax® Structure



NEW! manufacturing procedure

Better column-to-column reproducibility

Stabilwax® Columns (fused silica)

(Crossbond® Carbowax® polyethylene glycol)

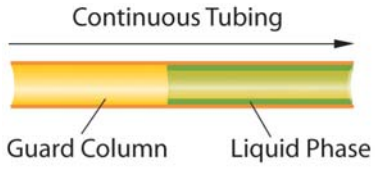
ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 250/260°C	10605	10608	10611
	0.25	40 to 250/260°C	10620	10623	10626
	0.50	40 to 250/260°C	10635	10638	10641
0.32mm	0.25	40 to 250/260°C	10621	10624	10627
	0.50	40 to 250/260°C	10636	10639	10642
	1.00	40 to 240/260°C	10651	10654	10657
0.53mm	0.25	40 to 250/260°C	10622	10625	10628
	0.50	40 to 250/260°C	10637	10640	10643
	1.00	40 to 240/260°C	10652	10655	10658
	1.50	40 to 230/240°C	10666	10669	10672
	2.00	40 to 220/230°C	10667	10670	

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	40 to 250/260°C	42601	
0.18mm	0.18	40 to 250/260°C		40602

similar phases

DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10, CP-Wax 52 CB

Integra-Guard™ built-in guard column

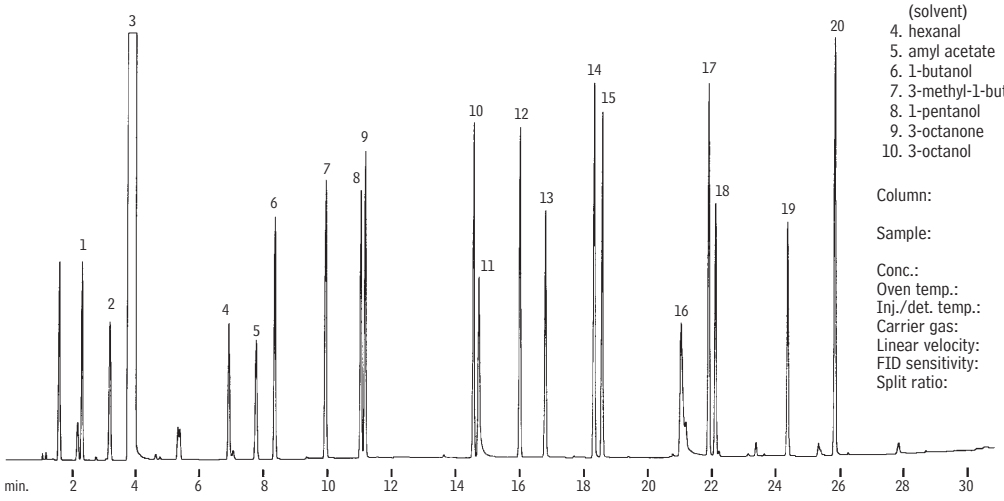


Get the protection without the connection!
For Stabilwax® columns with built-in Integra-Guard™ guard columns, see **page 33**.

also available

MXT® Columns
Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing.
See **page 110** for our MXT®-WAX columns.

Synthetic mushroom aroma on a Stabilwax® column.



GC_FF00143

1. acetone
2. ethyl acetate
3. methylene chloride (solvent)
4. hexanal
5. amyl acetate
6. 1-butanol
7. 3-methyl-1-butanol
8. 1-pentanol
9. 3-octanone
10. 3-octanol
11. nonanal
12. 1-octen-3-ol
13. furfural
14. benzaldehyde
15. octyl alcohol
16. phenylacetaldehyde
17. α-terpineol
18. 2,4-nonadienal
19. 2,4-decadienal
20. benzyl alcohol

Column:	Stabilwax®, 30m, 0.32mm ID, 1.0µm (cat.# 10654)
Sample:	1.0µL split injection of a synthetic mushroom aroma
Conc.:	10ng per component
Oven temp.:	40°C to 220°C @ 6°C/min.
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	100:1

Application-Specific Columns



Application-specific columns

- Designed for specific classes of compounds and methods.
- Includes specially deactivated columns.

Many chromatography markets and applications represented

- Foods, Flavors, & Fragrances.
- Petrochemical.
- Clinical/Forensic.
- Pharmaceutical.
- Environmental.

Unique stationary phases and applications

- Designed to help solve chromatographic challenges.



Basic Compounds Analysis

Rtx®-5 Amine (low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

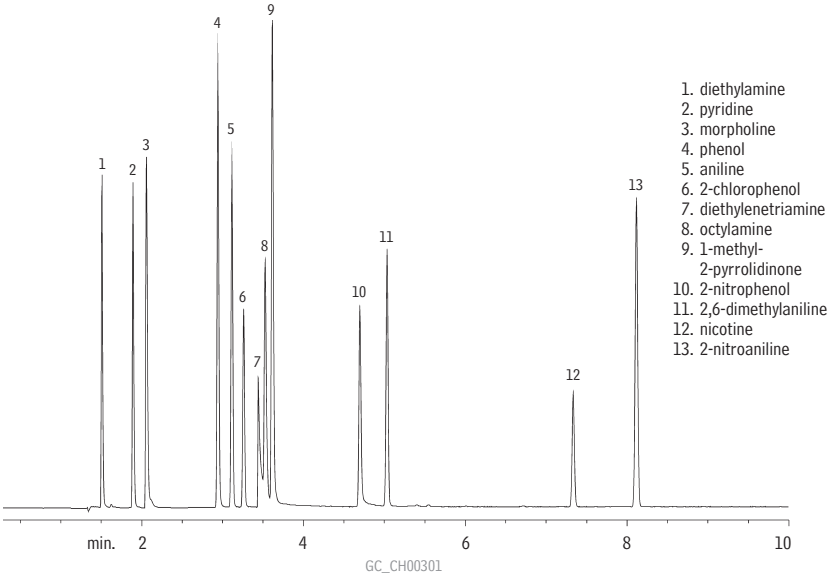
- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 315°C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-5 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-5 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds, adsorptive compounds with oxygen groups susceptible to hydrogen bonding, or even weakly acidic compounds such as phenols. Every Rtx®-5 Amine column is tested to ensure that it exceeds the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

Rtx®-5 Amine Columns (fused silica)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	-60 to 300/315°C	12320	12323
	0.50	-60 to 300/315°C	12335	12338
	1.00	-60 to 300/315°C	12350	12353
0.32mm	1.00	-60 to 300/315°C	12351	12354
	1.50	-60 to 290/305°C	12366	12369
0.53mm	1.00	-60 to 290/305°C	12352	12355
	3.00	-60 to 280/295°C	12382	12385

Excellent peak shapes for amines & phenols on an Rtx®-5 Amine column.



1. diethylamine
2. pyridine
3. morpholine
4. phenol
5. aniline
6. 2-chlorophenol
7. diethylenetriamine
8. octylamine
9. 1-methyl-2-pyrrolidinone
10. 2-nitrophenol
11. 2,6-dimethylaniline
12. nicotine
13. 2-nitroaniline

Column:	Rtx®-5 Amine, 30m, 0.32mm ID, 1.0µm (cat.# 12354)
Sample:	1.0µL split injection of amines and phenols in water
On-column conc.:	22ng
Oven temp.:	120°C to 220°C @ 10°C/min.
Inj./det. temp.:	305°C
Carrier gas:	hydrogen
Linear velocity:	38cm/sec. set @ 120°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split ratio:	25:1

restek innovation!

similar phase

PTA-5

also available

See **page 60** for Rtx®-35 Amine columns.

please note

We recommend using base-deactivated fused silica guard columns **(page 32)** and base-deactivated liners (www.restek.com) with Rtx®-5 Amine columns.

Table of Contents for **Applications**
see **page 489**

restek
innovation!

Basic Compounds Analysis

Rtx®-35 Amine (midpolarity phase; Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 220°C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-35 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-35 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds, adsorptive compounds with oxygen groups susceptible to hydrogen bonding. Every Rtx®-35 Amine column is tested to ensure that it meets the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

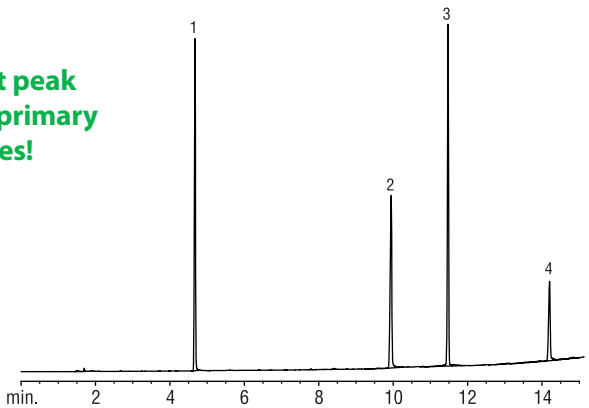
Rtx®-35 Amine Columns (fused silica)

(Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.50	0 to 220°C	11335	11338
	1.00	0 to 220°C	11350	11353
0.32mm	1.00	0 to 220°C	11351	11354
	1.50	0 to 220°C	11366	11369
0.53mm	1.00	0 to 220°C	11352	11355
	3.00	0 to 220°C	11382	11385

Sharp ethanolamine peaks, low bleed: Rtx®-35 Amine column.

Excellent peak shape for primary amines!



GC_CH00585

1. monoethanolamine
2. diethanolamine
3. triethyleneglycol monomethylether
4. triethanolamine

Column:	Rtx®-35 Amine, 30m, 0.32mm ID, 1.0µm (cat.# 11354)
Sample:	500µg/mL ethanolamine standard in water
Inj.:	1.0µL split (split ratio 10:1), cup splitter inlet liner (cat.# 20709)
Inj. temp.:	300°C
Carrier gas:	helium, constant pressure
Linear velocity:	40cm/sec. @ 50°C
Oven temp.:	50°C (hold 0.50 min.) to 280°C @15°C/min.
Det.:	FID @ 300°C

Basic Compounds Analysis

Stabilwax®-DB (polar phase; Crossbond® base-deactivated Carbowax® polyethylene glycol)

- Application-specific columns for underivatized amines and other basic compounds, including alkylamines, diamines, triamines, nitrogen-containing heterocyclics. No need for column priming.
- Temperature range: 40°C to 220°C.

Stabilwax®-DB columns reduce adsorption and improve responses for many basic compounds, without analyte derivatization or column priming. For different selectivity of basic compounds, or higher oven temperatures, use an Rtx®-5 Amine column.

Stabilwax®-DB is a bonded stationary phase, but avoid rinsing these columns with water or alcohols.

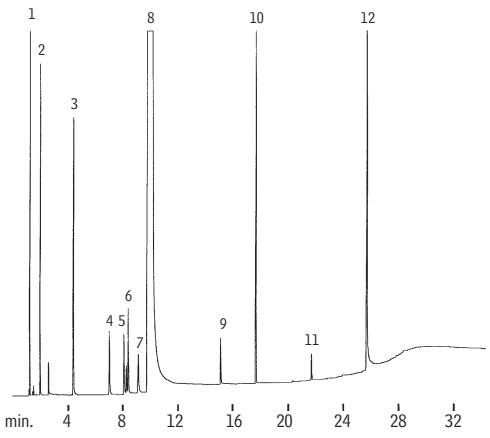
Stabilwax®-DB Columns (fused silica)
(Crossbond® Carbowax® polyethylene glycol for amines and basic compounds)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.25	40 to 210/220°C	10820	10823	
	0.50	40 to 210/220°C		10838	
0.32mm	0.25	40 to 210/220°C	10821	10824	
	0.50	40 to 210/220°C		10839	
	1.00	40 to 210/220°C	10851	10854	10857
0.53mm	0.50	40 to 210/220°C		10840	
	1.00	40 to 210/220°C	10852	10855	10858
	1.50	40 to 210/220°C		10869	

similar **phases**

DB-CAM, Carbowax® Amine, CP Wax 51 for amines

Hexamethylenediamine (HMD) on a Stabilwax®-DB column.



GC_CH00302

Excellent resolution and peak shape for impurities in HMD!

1. cyclohexane
2. hexamethyleneimine
3. 1,4-diaminobutane
4. pentamethylenediamine
5. 1,2-diaminocyclohexane
6. 1,5-diamino-2-methylpentane
7. aminomethylcyclopentylamine
8. hexamethylenediamine
9. 6-aminocapronitrile
10. *n*-valeramide
11. adiponitrile
12. bis-hexamethylenetriamine

Column:	Stabilwax®-DB, 30m, 0.32mm ID, 0.25µm (cat.# 10824)
Sample:	0.4µL direct injection of a neat hexamethylenediamine (HMD) sample
On-column conc.:	10 to 1,000ng/component
Oven temp.:	95°C (hold 6 min.) to 235°C @ 7°C/min. (hold 4 min.)
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	2 x 10-11 AFS

Acidic Compounds Analysis

Stabilwax®-DA (polar phase; Crossbond® acid-deactivated Carbowax® polyethylene glycol)

- Application-specific columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Temperature range: 40°C to 250°C.
- Equivalent to USP G25, G35 phases.

Stabilwax®-DA bonded polyethylene glycol has an acidic functionality incorporated into the polymer structure. This permits analysis of acidic compounds without derivatization, significantly reduces adsorption of acids, and increases sample capacity for volatile free acids. Stabilwax®-DA columns last longer and give better peak shapes for high molecular weight acids. Some inorganic acids also chromatograph well on a Stabilwax®-DA column; the limitation is the volatility of the acidic compound.

similar **phases**

DB-FFAP, HP-FFAP, NUKOL, OV-351, CP-Wax 58 CB, FFAP

crossbond® **technology**

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

Stabilwax®-DA Columns (fused silica)

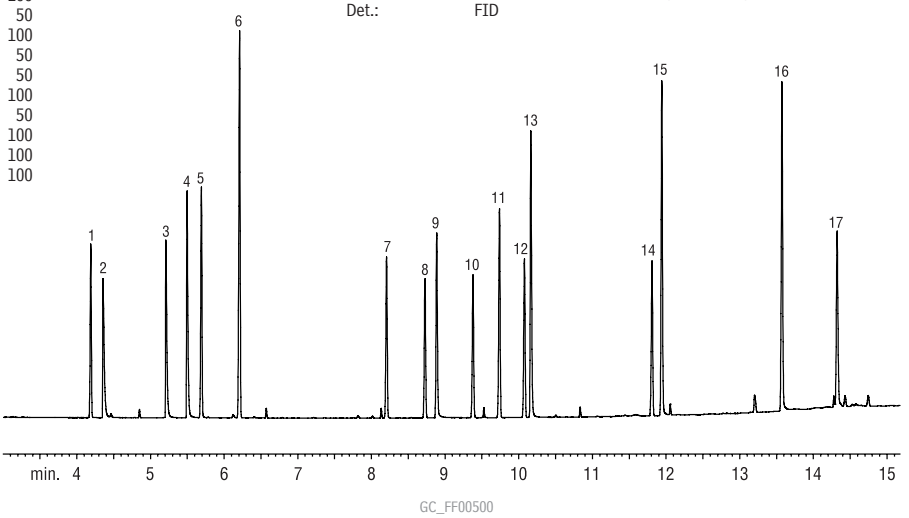
(Crossbond® Carbowax® polyethylene glycol for acidic compounds)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 250°C	11005	11008	11011
	0.25	40 to 250°C	11020	11023	11026
	0.50	40 to 250°C	11035	11038	11041
0.32mm	0.10	40 to 250°C	11006	11009	11012
	0.25	40 to 250°C	11021	11024	11027
	0.50	40 to 250°C	11036	11039	11042
	1.00	40 to 240/250°C	11051	11054	11057
0.53mm	0.10	40 to 250°C	11007	11010	11013
	0.25	40 to 250°C	11022	11025	11028
	0.50	40 to 250°C	11037	11040	11043
	1.00	40 to 240/250°C	11052	11055	11058
	1.50	40 to 230/240°C	11062	11065	11068

Underivatized alcoholic beverage acids and methyl esters on a Stabilwax®-DA column.

Peak List	Conc. (ppm)
1. ethyl octanoate	100
2. acetic acid	100
3. propionic acid	100
4. isobutyric acid	100
5. 3-decanol	50
6. ethyl decanoate	50
7. ethyl laurate	50
8. *cis*-lactone	100
9. 2-phenylethanol	50
10. *trans*-lactone	100
11. methyl myristate	50
12. ethyl myristate	50
13. octanoic acid	100
14. ethyl palmitate	50
15. decanoic acid	100
16. dodecanoic acid	100
17. vanillin	100

Column: Stabilwax®-DA, 30m, 0.18mm ID, 0.18µm (cat.# 550752)
Inj.: 1µL splitless (hold 0.5 min.) at conc. shown in peak list, in ethyl acetate, 4mm ID splitless liner w/wool (cat.# 20814-202.1)
Inj. temp.: 240°C
Carrier gas: hydrogen
Make-up gas: nitrogen
Linear velocity: 28psi @ 240°C
Oven temp.: 70°C to 240°C at 12°C/min. (hold 3 min.)
Det.: FID



GC_FF00500

Enantiomers Analysis

Cyclodextrin Columns for Analyzing Many Chiral Compounds

By adding β or γ cyclodextrin to our bonded Rtx®-1701 stationary phase, we greatly enhance overall utility and column lifetime for our chiral columns, compared to columns that have pure cyclodextrin stationary phases. Separations of more than one hundred chiral compounds have been achieved using our unique DEX columns, and our columns continue to demonstrate stability after hundreds of temperature program cycles. Refer to the applications section of this catalog for examples, or call our Technical Service chemists or your Restek representative for assistance in matching a column to your chiral analysis.

Rt®-βDEXm Columns (fused silica)

(permethylated beta cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13100
0.32mm	0.25	40 to 230°C	13101

Uses: General purpose chiral phase with many published applications.

Rt®-βDEXsm Columns (fused silica)

(2,3-di-O-methyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13105
0.32mm	0.25	40 to 230°C	13104

Uses: Excellent column for most chiral compounds in essential oils.

Rt®-βDEXse Columns (fused silica)

(2,3-di-O-ethyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13107
0.32mm	0.25	40 to 230°C	13106

Uses: Similar in performance to Rt-βDEXsm but provides better resolution for limonene, linalool, linalyl acetate, ethyl-2-methylbutyrate, 2,3-butane diol, and styrene oxides.

Rt®-βDEXsp Columns (fused silica)

(2,3-di-O-propyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13111
0.32mm	0.25	40 to 230°C	13110

Uses: Often useful in dual-column configurations, with the Rt-βDEXsm column, for complex enantiomeric separations.

Rt®-βDEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13109
0.32mm	0.25	40 to 230°C	13108

Uses: Unique selectivity for esters, lactones, and other fruit flavor components.

Rt®-βDEXcst Columns (fused silica)

(Proprietary cyclodextrin material doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13103
0.32mm	0.25	40 to 230°C	13102

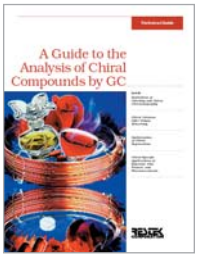
Uses: Proprietary stationary phase, developed specifically for the fragrance industry. Also used for pharmaceutical applications.

Rt®-γDEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl gamma cyclodextrin doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	40 to 230°C	13113
0.32mm	0.25	40 to 230°C	13112

Uses: Larger organic molecules. Also useful for flavor compounds in fruit juices.



free literature

A Guide to the Analysis of Chiral Compounds by GC

Download your free copy from **www.restek.com**.

Technical Guide
lit. cat.# 59889

please **note**

Application-specific chiral column kits are available! See **www.restek.com**.

tech tip

Chiral selectivity improves significantly by realizing lower elution temperatures. This can be achieved by:

- Faster linear velocities (80cm/sec.) with hydrogen carrier gas.
- Slower temperature ramp rates (1–2°C/min.).
- Appropriate minimum operating temperature (40 or 60°C).
- On-column concentrations of 50ng or less.



free literature

Grape Flavor Analysis, Using an Rt®-γDEXsa GC Column

Applications Note
lit. cat.# 59553



GC Analysis of Chiral Flavor Compounds in Apple Juices, Using Rt®-βDEXsm and Rt®-βDEXse Columns

Applications Note
lit. cat.# 59546

Download your free copies from **www.restek.com**.

cis/trans FAMEs

Rt®-2560 (highly polar phase; biscyanopropyl polysiloxane—not bonded)
- Application-specific column for *cis/trans* FAMEs.
- Stable to 250°C.

Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

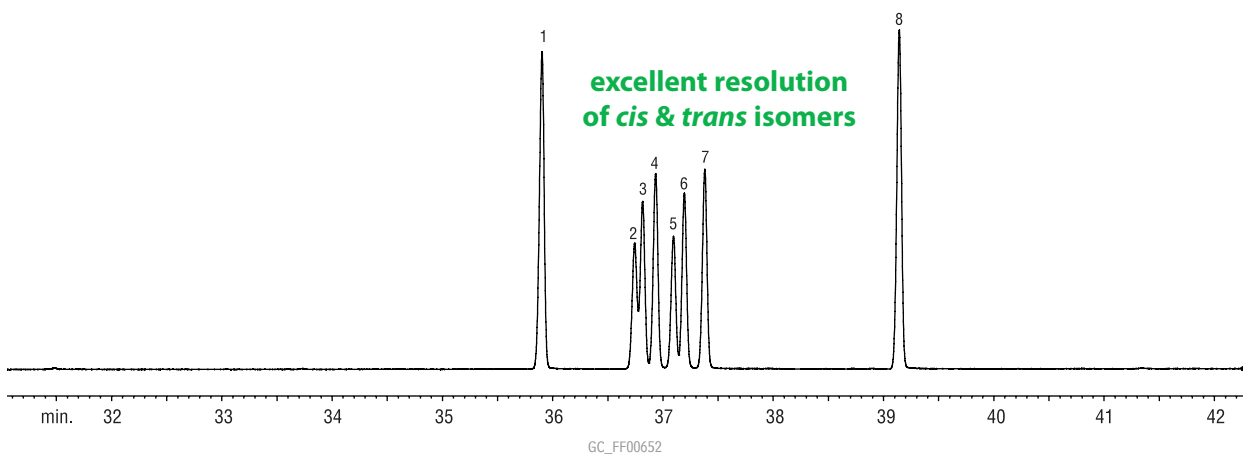
similar **phases**

SPB-2560, HP-88, Silar 10C, CP-Sil 88 FAME, CP-Sil 88

Rt®-2560 Column (fused silica)
(biscyanopropyl polysiloxane)

ID	df (µm)	temp. limits	100-Meter
0.25mm	0.20	20 to 250°C	13199

FAMEs (*cis/trans* isomers) on an Rt®-2560 column.



GC_FF00652

Column:	Rt®-2560, 100m, 0.25mm ID, 0.2µm (cat.# 13199)
Sample:	*cis/trans* FAME Mix (cat.# 35079), 10mg/mL total FAMEs in methylene chloride
Inj.:	1.0µL split (split ratio 20:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	225°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (4 min. hold) to 240°C @ 3°C/min. (10 min. hold)
Det.:	FID @ 250°C

Compound	% in Mix
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselaidate (*trans*-6)	8.0
3. C18:1 methyl elaidate (*trans*-9)	10.0
4. C18:1 methyl transvaccenate (*trans*-11)	12.0
5. C18:1 methyl petroselinate (*cis*-6)	8.0
6. C18:1 methyl oleate (*cis*-9)	10.0
7. C18:1 methyl vaccenate (*cis*-11)	12.0
8. C18:2 methyl linoleate (*cis*-9,12)	20.0



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Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Polyunsaturated FAME Analysis

FAMEWAX (polar phase; Crossbond® polyethylene glycol)
- Application-specific columns for FAMEs, specially tested with a FAME mixture.
- Temperature range: 20°C to 250°C.

The elution order of polyunsaturated FAMEs on FAMEWAX columns is comparable to that on other Carbowax® columns, but baseline resolution is achieved in significantly less time.

FAMEWAX Columns (fused silica)

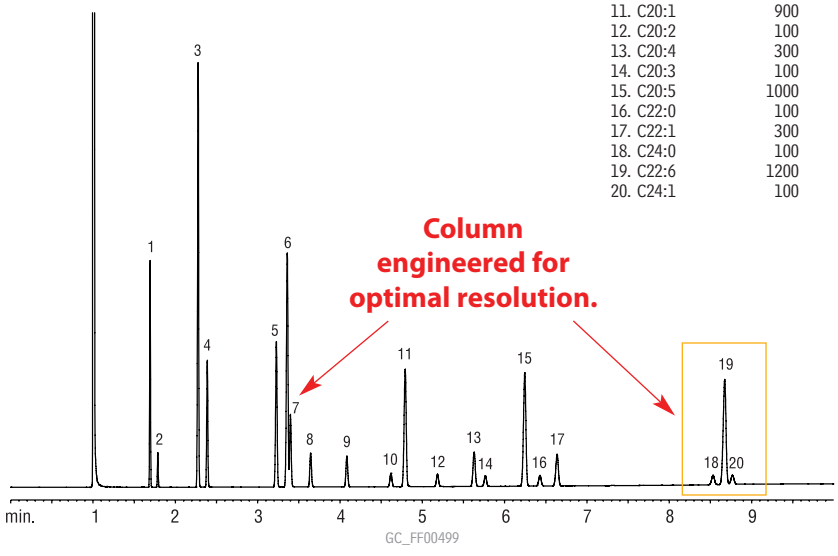
(Crossbond® polyethylene glycol)

ID	df (µm)	temp. limits	30-Meter
0.25mm	0.25	20 to 250°C	12497
0.32mm	0.25	20 to 250°C	12498
0.53mm	0.50	20 to 250°C	12499

FAMEs (marine oil standard) on a FAMEWAX column.

Column: FAMEWAX, 30m, 0.32mm ID, 0.25µm (cat.# 12498)
Inj.: 1µL
Conc.: 10,000µg/mL in isooctane (total FAMES; see breakdown in peak list)
Oven temp.: 195–240°C at 5°C/min., 1 min. hold
Inj./det. temp.: 250°C/275°C
Carrier gas: hydrogen
Flow rate: 3mL/min. (constant flow)
Split ratio: 100:1

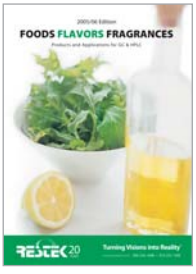
Peak List	Conc. (µg/mL)
1. C14:0	600
2. C14:1	100
3. C16:0	1600
4. C16:1	500
5. C18:0	800
6. C18:1 (oleate)	1300
7. C18:1 (vaccenate)	400
8. C18:2	200
9. C18:3	200
10. C20:0	100
11. C20:1	900
12. C20:2	100
13. C20:4	300
14. C20:3	100
15. C20:5	1000
16. C22:0	100
17. C22:1	300
18. C24:0	100
19. C22:6	1200
20. C24:1	100



similar phase

Omegawax

free literature



Foods, Flavors, and Fragrances
Includes important analysis tips and chromatograms for analysis of fats and oils, carbohydrates, vitamins, amino acids, organic acids, preservatives, flavors and fragrances, essential oils, and chiral separations. Retention time indices and complete product listings for all relevant GC and HPLC products also are included.

Minicatalog
lit. cat.# 59260A



Monitoring Volatile Compounds in Food Contact Packaging, Using Purge and Trap GC/MS and an Rtx®-5MS Capillary Column

Applications Note
lit. cat.# 59348

Download your free copies from **www.restek.com**.

Flavor & Fragrance Compounds Analysis

Perfect confirmation column for F&F analysis!

similar **phases**

HP-20M, Carbowax® 20M

Rt®-CW20M F&F (polar phase; Carbowax® polyethylene glycol—not bonded)

- Application-specific columns for flavor and fragrance compounds, specially tested.
- True nonbonded Carbowax® 20M polarity.
- Temperature range: 60°C to 220°C.

Rt®-CW20M F&F Columns (fused silica)

(Carbowax® polyethylene glycol)

ID	df (µm)	temp. limits	30-Meter	50-Meter
0.25mm	0.25	60 to 220°C	12523	
0.32mm	0.33	60 to 220°C		12539

Rtx®-1 F&F (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- Application-specific columns for flavor and fragrance compounds.
- Stable to 350°C.

Retention index libraries in the flavor and fragrance industry have been compiled from years of data and thousands of compounds. Any slight variation in column selectivity could render the column useless. Rtx®-1 F&F columns are tailored to match the selectivity required in the industry, while offering excellent thermal stability. Our stringent quality testing ensures column-to-column reproducibility and extended column lifetimes over conventional 100% dimethyl polysiloxane columns.

similar **phase**

HP-1

Rtx®-1 F&F Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter	50-Meter
0.25mm	0.25	-60 to 330/350°C	18023	
	0.50	-60 to 330/350°C	18038	
	1.00	-60 to 320/340°C	18053	
0.32mm	0.25	-60 to 330/350°C	18024	
	0.50	-60 to 330/350°C	18039	18010
	1.00	-60 to 320°C	18054	



"Our Innovations chemists come from industry and regularly collaborate with government and industry leaders in order to continually develop new methods and optimize market-specific applications. When you work with Restek, you work with experienced chromatographers who practice in your field."

Restek's Innovations Group
pictured: Silivia Martinez, Kristi Sellers, Julie Kowalski, Chris English, Barry Burger, Amanda Rigdon, Jason Thomas, Scott Grossman, Michelle Misselwitz (not pictured: Ty Kahler, Rick Morehead)

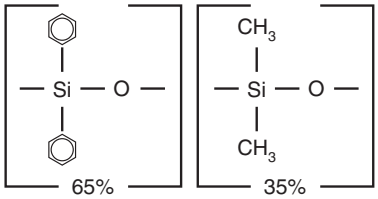
Triglycerides in Foods Analysis

Rtx®-65TG (high polarity phase; Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370°C.

The Rtx®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370°C thermal stability, an Rtx®-65TG column should not be used for analyses of polar compounds.

Rtx®-65TG Structure



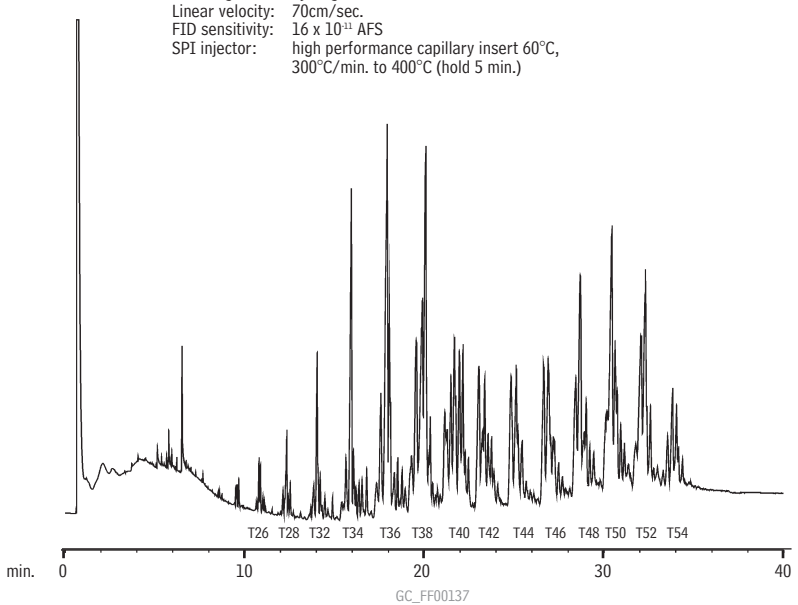
Rtx®-65TG Columns (fused silica)

(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	40 to 370°C	17005	17008
0.32mm	0.10	40 to 370°C	17006	17009
0.53mm	0.10	40 to 370°C	17007	17010

Sharp resolution of butter triglycerides on an Rtx®-65TG column.

Column: Rtx®-65TG, 30m, 0.25mm ID, 0.10µm (cat.# 17008)
Sample: 0.2µL cold on-column injection of 1% butterfat in isooctane
Oven temp.: 80°C (hold 1 min.) to 240°C @ 30°C/min. to 360°C @ 4°C/min. (hold 5 min.)
Det. temp.: 380°C
Carrier gas: hydrogen
Linear velocity: 70cm/sec.
FID sensitivity: 16 x 10^{11} AFS
SPI injector: high performance capillary insert 60°C, 300°C/min. to 400°C (hold 5 min.)



save money!

Get six columns for the price of five. **Call 800-356-1688, ext. 4**, or your Restek representative for details!

crossbond® technology

reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

please note

Triglycerides are often injected via on-column injection. Use 0.53mm retention gaps and appropriate connectors.

- Vu2 Union® (see page 215)
- MXT™-Union Connector Kits for Fused Silica (see page 218)



Detailed Hydrocarbon Analysis (DHA)

NEW! Rtx®-1PONA column now available in 50 and 150 meter lengths.

similar **phases**

Petrocol DH, DB-Petro, HP-PONA

please **note**

To achieve critical resolutions, a 5-meter tuning column is connected to the analytical column and adjusted to the needed length through a series of trial analyses.

Rtx®-1PONA (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- Application-specific columns meet ASTM and CGSB requirements for detailed hydrocarbon analysis.
- Stable to 340°C.

The Rtx®-1PONA polymer was designed to offer the exact polarity necessary to resolve hydrocarbons in the specific order requested by petrochemical companies. In order to meet the demanding resolution and retention criteria of the American Society for Testing and Materials (ASTM) and the Canadian General Standards Board (CGSB), Restek has developed unique quality control tests and specifications for the Rtx®-1PONA column. The measured values for retention (k), efficiency (n), and stationary phase selectivity (RI) are controlled so that each column exceeds the requirements of the ASTM and CGSB methods.

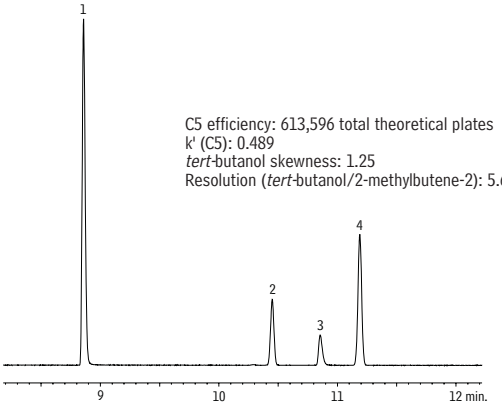
Rtx®-1PONA Column (fused silica)
(Crossbond® 100% dimethyl polysiloxane—optimized for hydrocarbon analysis)

ID	df (µm)	temp. limits	50-Meter	100-Meter	150-Meter
0.25mm	0.50	-60 to 300/340°C	10186	10195	10197

Rtx®-5PONA Tuning Column (fused silica)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	5-Meter
0.25mm	1.0	-60 to 325°C	10196

Sharp, symmetric peak for ethanol (gasoline oxygenate), using an Rtx®-1PONA column.**



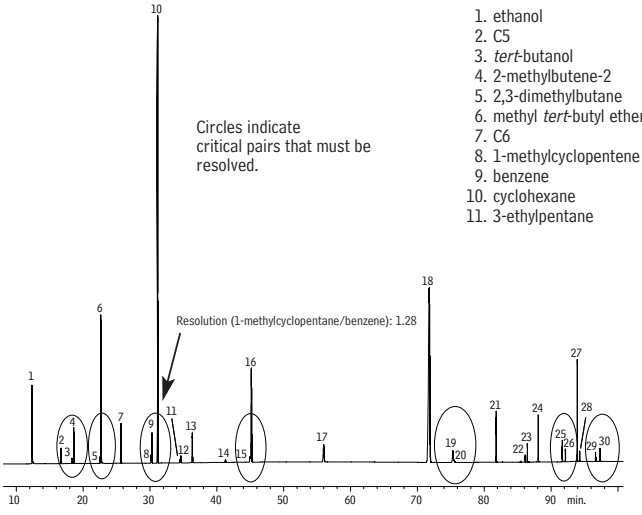
C5 efficiency: 613,596 total theoretical plates
k' (C5): 0.489
tert-butanol skewness: 1.25
Resolution (*tert*-butanol/2-methylbutene-2): 5.60

1. ethanol
2. C5
3. *tert*-butanol
4. 2-methylbutene-2

Rtx®-1PONA column produces symmetrical alcohol peaks!

**P=paraffins; O=olefins; N=naphthenes; A=aromatics.
In alternate terminology: paraffins & isoparaffins = alkanes; naphthenes = cyclic alkanes; olefins = alkenes.

Critical pairs of gasoline components resolved per ASTM specifications, using an Rtx®-1PONA column.



GC_PC00743

1. ethanol
2. C5
3. *tert*-butanol
4. 2-methylbutene-2
5. 2,3-dimethylbutane
6. methyl *tert*-butyl ether (MTBE)
7. C6
8. 1-methylcyclopentene
9. benzene
10. cyclohexane
11. 3-ethylpentane
12. 1-*tert*-2-dimethylcyclopentane
13. C7
14. 2,2,3-trimethylpentane
15. 2,3,3-trimethylpentane
16. toluene
17. C8
18. ethylbenzene
19. *p*-xylene
20. 2,3-dimethylheptane
21. C9
22. 5-methylnonane
23. 1,2-methylethylbenzene
24. C10
25. C11 (undecane)
26. 1,2,3,5-tetramethylbenzene
27. naphthalene
28. C12 (dodecane)
29. 1-methylnaphthalene
30. C13 (tridecane)

Column:	Rtx®-1PONA, 100m, 0.25mm ID, 0.5µm (cat.# 10195) plus Rtx®-5PONA tuning column, 2.62m, 0.25mm ID, 1.0µm, connected via Press-Tight® connector (cat.# 20446)
Sample:	custom detailed hydrocarbon analysis (DHA) mix, neat
Inj.:	0.01µL, split (split ratio 150:1), 4mm cup inlet liner (cat.# 20709)
Inj. temp.:	200°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. (2.3mL/min.)
Oven temp.:	5°C (hold 15 min.) to 50°C @ 5°C/min. (hold 50 min.) to 200°C @ 8°C/min. (hold 10 min.)
Det.:	FID @ 250°C

Simulated Distillation (C5-C44) Analysis

Rtx®-2887 (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)
- Application-specific column for simulated distillation.
- Stable to 360°C.

The Rtx®-2887 column's stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements currently specified in ASTM method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times.

also available

Rtx®-1 SimDist 2887—a packed column for process instrumentation. See **page 116**.

similar phases

DB-2887, Petrocol EX2887

Rtx®-2887 Column (fused silica)

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

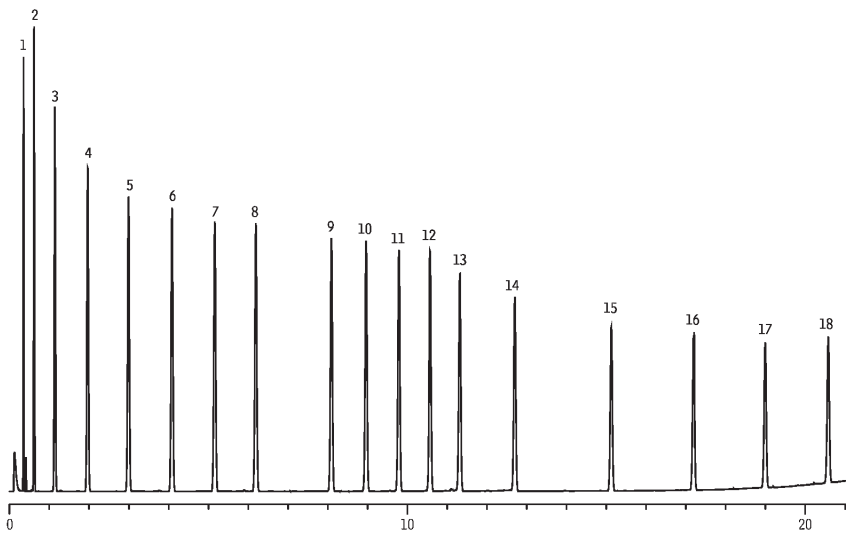
ID	df (µm)	temp. limits	10-Meter
0.53mm	2.65	-60 to 360°C	10199

MXT®-2887 Column (Siltek® treated stainless steel)

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (µm)	temp. limits	10-Meter
0.53mm	2.65	-60 to 400°C	70199

Negligible baseline rise for C5 to C44 hydrocarbons on an Rtx®-2887 column.



GC_PC00750

1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

Column:	Rtx®-2887, 10m, 0.53mm ID, 2.65µm (cat.# 10199)
Sample:	1µL direct injection of 0.01-0.1 wt. % C5 to C44 hydrocarbon standard in carbon disulfide
Inj. temp.:	360°C
Det. temp:	360°C
Carrier gas:	helium (constant flow)
Linear velocity:	15mL/min. (112cm/sec.)
Oven temp.:	35°C to 360°C @ 15°C/min. (hold 5 min.)

Simulated Distillation (C44-C100) Analysis

MXT®-1HT Sim Dist/MXT®-1 Sim Dist/MXT®-500 Sim Dist (nonpolar phases)

- Application-specific columns in unbreakable Siltek® treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation (e.g., ASTM Method D2887 Extended).
- MXT®-1HT Sim Dist and MXT®-1 Sim Dist phases offer true methyl silicone polarity; MXT®-500 Sim Dist phase is a carborane siloxane polymer.
- Stable to 430°C.

Manufactured from Siltek® treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available. As outlined in ASTM Method D6352, high temperature simulated distillation requires a column that can withstand temperatures to 430°C. MXT®-1HT Sim Dist and MXT®-500 Sim Dist columns exhibit excellent peak shape and low bleed, even at 430°C! The unique MXT®-1HT Sim Dist methyl silicone polymer gives the correct retention time/boiling point curve. The MXT®-500 Sim Dist carborane siloxane polymer offers a slight shift in the calculated boiling range distribution for petroleum samples containing aromatic hydrocarbons.

NEW! MXT®-1HT Sim Dist column now available in 0.20µm film thickness.

similar **phases**

DB-1HT, CP-HT-Simdist CB

MXT®-1HT Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	5-Meter
0.53mm	0.10	-60 to 430°C	70100
	0.20	-60 to 400/430°C	70103

MXT®-1 Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70101

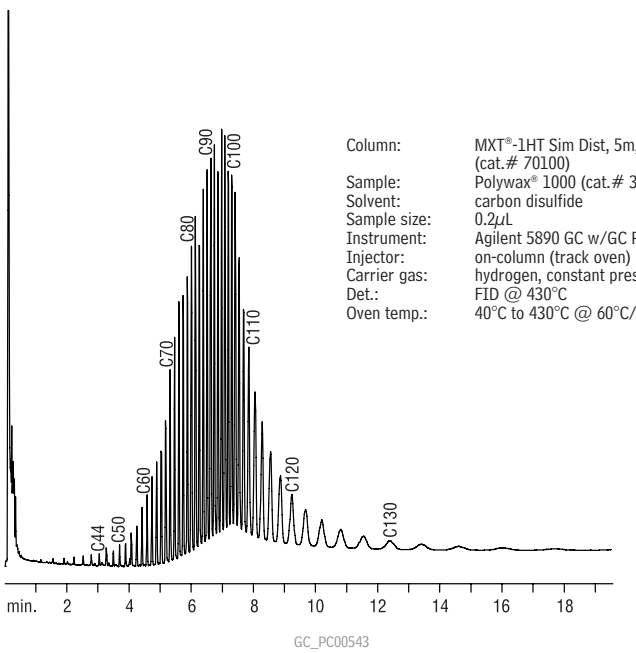
MXT®-500 Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70104

Polywax® Calibration Materials

Description	qty.	cat.#	price
Polywax 655 calibration material	1g	36225	
Polywax 1000 calibration material	1g	36227	

C44-C130 hydrocarbons on an MXT®-1HT Sim Dist column.



Column: MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.10µm (cat.# 70100)
Sample: Polywax® 1000 (cat.# 36227)
Solvent: carbon disulfide
Sample size: 0.2µL
Instrument: Agilent 5890 GC w/GC Racer
Injector: on-column (track oven)
Carrier gas: hydrogen, constant pressure (1.0psi)
Det.: FID @ 430°C
Oven temp.: 40°C to 430°C @ 60°C/min. (hold 30 min.)

Aromatics & Oxygenates in Gasoline Analysis

Rt®-TCEP (highly polar phase; 1,2,3-tris[2-cyanoethoxy]propane—not bonded)

- General purpose columns, ideal for aromatics and oxygenates in gasoline.
- Temperature range: 0°C to 135°C.

Most gasolines contain aliphatic hydrocarbons up to *n*-dodecane (C12). To improve identification of the aromatics and oxygenates, it is desirable to elute benzene after C11 and toluene after C12. The extremely polar Rt®-TCEP stationary phase provides a retention index for benzene greater than 1100 and permits the separation of alcohols and aromatics from the aliphatic constituents in gasoline.

Rt®-TCEP columns have the same high polarity as TCEP packed columns (precolumns in ASTM Method D4815 for the analysis of petroleum oxygenates), with the efficiency of a capillary column. The result is a column that can separate a wide variety of compounds with an elution pattern unattainable using other high polarity siloxanes.

The Rt®-TCEP column incorporates a nonbonded stationary phase coated on a surface specialized for enhanced polymer stability and extended column lifetime. Solvent rinsing should be avoided. Conditioning is necessary only if the column is to be used at temperatures near the maximum operating temperature.

Rt®-TCEP Columns (fused silica)

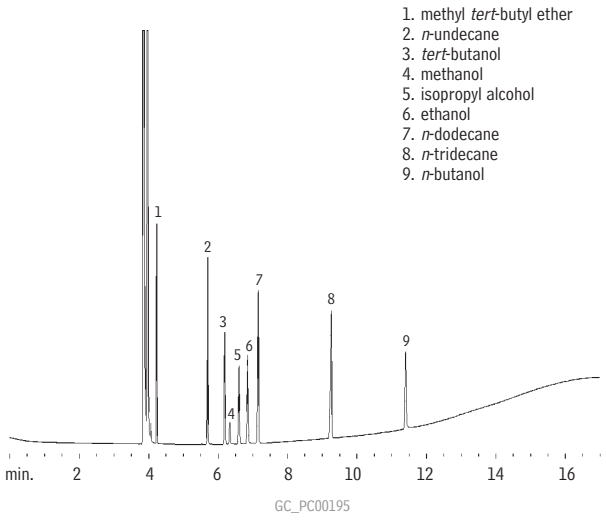
(1,2,3-tris[2-cyanoethoxy]propane)

ID	df (µm)	temp. limits	30-Meter	60-Meter
0.25mm	0.40	0 to 135°C	10998	10999

similar **phases**

SPB-TCEP, CP-TCEP

Petroleum oxygenates on an Rt®-TCEP column.



Column:	Rt®-TCEP, 60m, 0.25mm ID, 0.4µm (cat.# 10999)
Inj.:	1.0µL split injection, components @ 500ppm.
Oven temp.:	60°C (hold 5 min.) to 100°C @ 5°C/min. (hold 10 min.)
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 80°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split flow:	46mL/min.

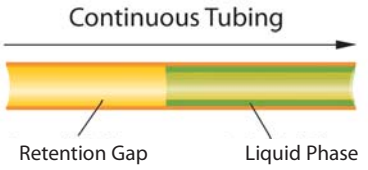
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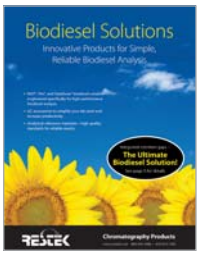
Biodiesel Fuels Analysis

NEW! Rtx®-Biodiesel TG and MXT®-Biodiesel TG columns now available in more dimensions.

Integra-Gap™ technology

- Built-in retention gap
- Eliminates connector





free literature

Biodiesel Solutions: Innovative Products for Simple, Reliable Biodiesel Analysis

Download your free copy from **www.restek.com**.

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Rtx®-Biodiesel TG

- Linearity for all reference compounds exceeds method requirements.
- Alumaseal™ connector provides leak-free connection; guard column extends column life.
- Low column bleed at high temperatures.
- For glycerine and glyceride analysis, according to ASTM D6584 and EN 14105 methods.

Rtx®-Biodiesel TG Columns (fused silica)

Description	temp. limits	cat.#	price
10m, 0.32mm ID, 0.10	to 330/380°C	10292	
10m, 0.32mm ID, 0.10 w/2m x 0.53mm retention gap**	to 330/380°C	10291	
15m, 0.32mm ID, 0.10	to 330/380°C	10294	
15m, 0.32mm ID, 0.10 w/2m x 0.53mm retention gap**	to 330/380°C	10293	

MXT®-Biodiesel TG

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430°C for reliable, consistent performance.
- Integra-Gap™ built-in retention gap on 0.53mm ID column eliminates column coupling completely.

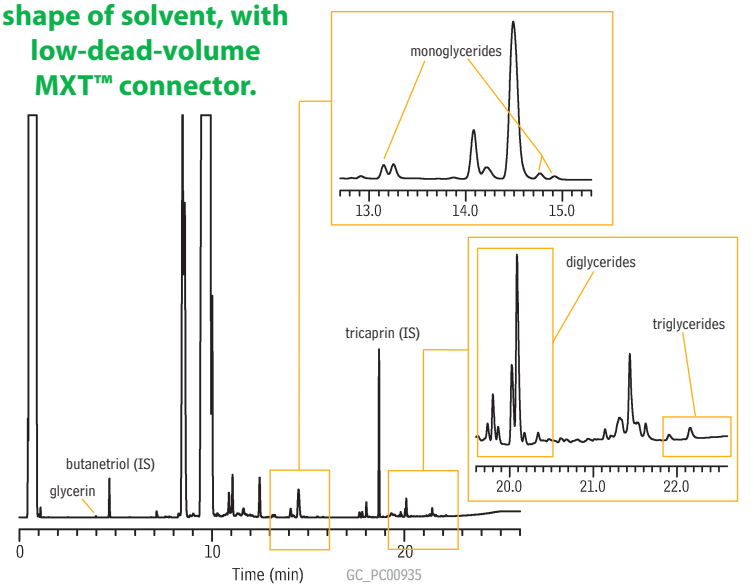
MXT®-Biodiesel TG Columns (Siltek® treated stainless steel)

Description	temp. limits	cat.#	price
14m, 0.53mm ID, 0.16 w/2m Integra-Gap*	-60 to 380/430°C	70289	
10m, 0.32mm ID, 0.10	-60 to 380/430°C	70292	
10m, 0.32mm ID, 0.10 w/2m x 0.53mm Retention Gap**	-60 to 380/430°C	70290	
15m, 0.32mm ID, 0.10	-60 to 380/430°C	70293	
15m, 0.32mm ID, 0.10 w/2m x 0.53mm Retention Gap**	-60 to 380/430°C	70291	
2m x 0.53mm MXT Biodiesel TG Retention Gap		70294	

*Total column length=16 meters.
**Connected with low-dead-volume MXT connector.

Derivatized B100 and internal standards on an MXT®-Biodiesel TG column with 2m x 0.53mm ID retention gap, according to ASTM D6584.

Note perfect peak shape of solvent, with low-dead-volume MXT™ connector.



Column:	MXT®-Biodiesel TG, 10m, 0.32mm ID, 0.1µm with 2m x 0.53mm retention gap (cat.# 70290)
Sample:	B100 + IS butanetriol & tricaprin derivatized with MSTFA as per ASTM D-6584
Inj.:	1.0µL cool on-column
Inj. temp.:	oven track
Carrier gas:	hydrogen, constant flow
Flow rate:	4mL/min.
Oven temp.:	50°C (hold 1 min.) to 180°C @ 15°C/min., to 230°C @ 7°C/min., to 430°C @ 30°C/min. (hold 5 min.)
Det.:	FID @ 430°C

Blood Alcohol Analysis

Rtx®-BAC1/Rtx®-BAC2 (proprietary Crossbond® phase)

- Application-specific columns for blood alcohol analysis—achieve baseline resolution in less than 3 minutes. Also excellent for abused inhalant anesthetics, γ-hydroxybutyrate (GHB)/γ-butyrolactone (GBL), glycols, and common industrial solvents.
- Rtx®-BAC2 confirmation column provides four elution order changes under the same conditions.
- Stable to 260°C.

These columns separate to baseline all blood alcohol compounds in blood, breath, or urine, in less than 3 minutes, under isothermal conditions. Isothermal analysis increases productivity by eliminating the need for oven cycling. Confirmation is easily achieved with this tandem set because there are four elution order changes between the two columns.

restek **innovation**!

Baseline resolution in less than 3 minutes.

similar **phases**

DB-ALC1, DB-ALC2

Rtx®-BAC1 Columns (fused silica)

ID	df (µm)	temp. limits	30-Meter
0.32mm	1.80	-20 to 240/260°C	18003
0.53mm	3.00	-20 to 240/260°C	18001

Rtx®-BAC2 Columns (fused silica)

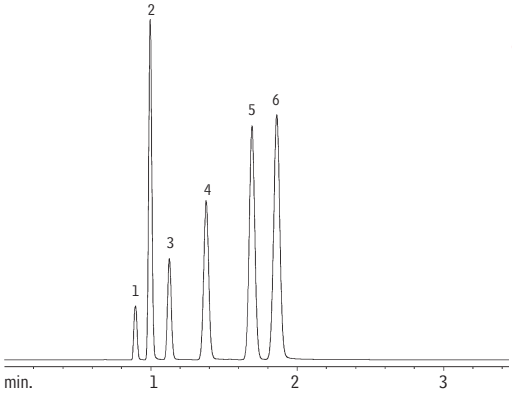
ID	df (µm)	temp. limits	30-Meter
0.32mm	1.20	-20 to 240/260°C	18002
0.53mm	2.00	-20 to 240/260°C	18000

ordering **note**

Get the protection without the connection!
For Rtx®-BAC1 and Rtx®-BAC2 columns with built-in Integra-Guard™ guard columns, see **page 33**.

Rapid, reliable blood alcohol testing, using Rtx®-BAC 1 and Rtx®-BAC2 columns.

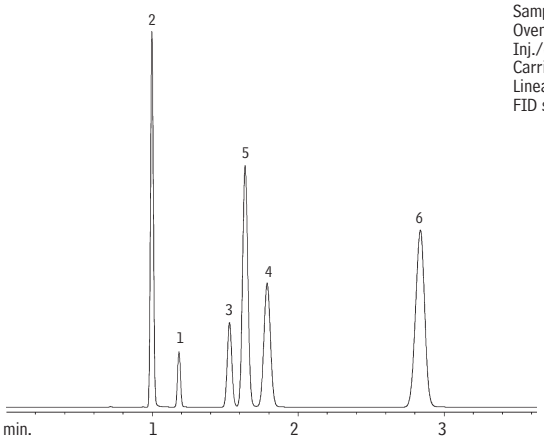
Rtx®-BAC1
30m, 0.53mm ID, 3.0µm (cat.# 18001)



Blood alcohol analysis in less than 3 minutes!

1. methanol
2. acetaldehyde
3. ethanol
4. isopropanol
5. acetone
6. *n*-propanol

Rtx®-BAC2
30m, 0.53mm ID, 2.0µm (cat.# 18000)



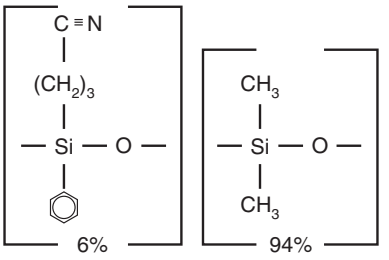
Inj.:	1.0mL headspace sample of a blood alcohol mix
Sample conc.:	0.1% per compound
Oven temp.:	40°C
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	80cm/sec. set @ 40°C
FID sensitivity:	1.28 x 10^{-10} AFS

GC_PH00239

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G43 phase

Rtx®-1301/Rtx®-624 Structure



similar **phases**

DB-1301, DB-624, HP-1301, HP-624, SPB-1301, SPB-624, VF-1301, VF-624ms, CP-1301, CP-Select 624 CB

ordering **note**

Get the protection without the connection!
For Rtx®-1301 and Rtx®-624 columns with built-in Integra-Guard™ guard columns, see **page 33**.

Organic Volatile Impurities (OVI) Analysis

Rtx®-1301/Rtx®-624 (low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

- General purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20°C to 240°C.
- Equivalent to USP G43 phase.

OVI Retention Index p.691

Many analysts feel the Rtx®-1301 and Rtx®-624 columns have the best cyanosilicone bonded stationary phase available, with no other column manufacturer providing lower bleed, longer lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed—even with sensitive detectors such as ECDs and MSDs.

Rtx®-1301 (G43) Columns (fused silica)

(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	30-Meter	60-Meter
0.32mm	1.80	-20 to 240°C	16092	16093
0.53mm	3.00	-20 to 240°C	16085	16088

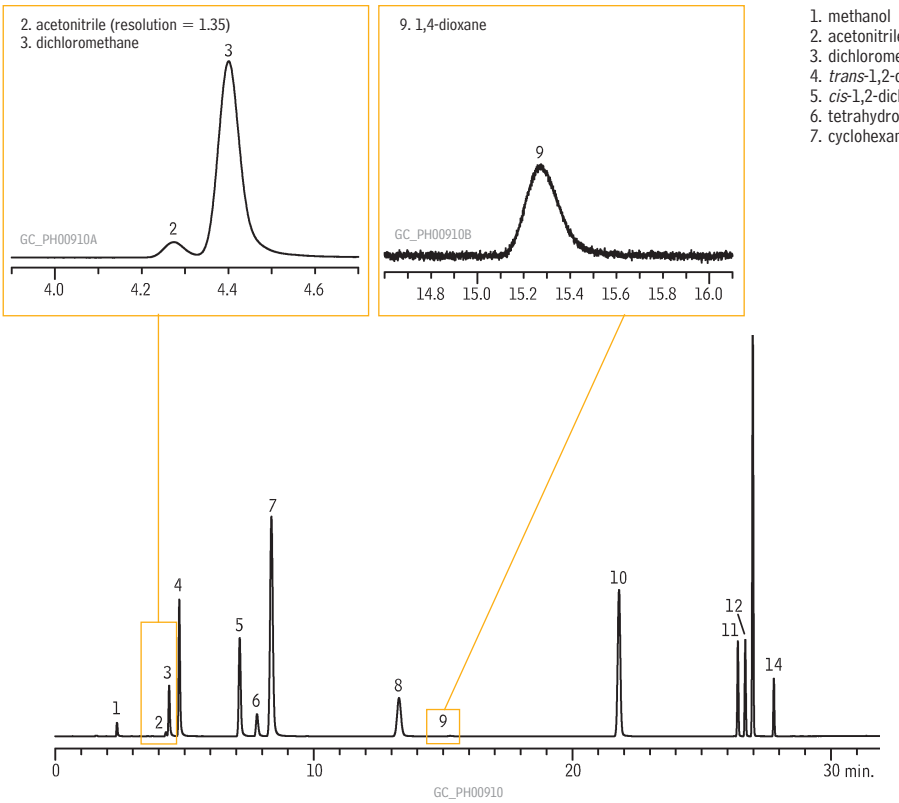
Rtx®-624 Columns (fused silica)

(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter
0.32mm	1.80	-20 to 240°C	10970

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

USP Residual Solvent Class 2 Mixture A standard solution on an Rtx®-624 (G43) column.



1. methanol
2. acetonitrile (resolution=1.35)
3. dichloromethane
4. *trans*-1,2-dichloroethene
5. *cis*-1,2-dichloroethene
6. tetrahydrofuran
7. cyclohexane
8. methylcyclohexane
9. 1,4-dioxane
10. toluene
11. chlorobenzene
12. ethyl benzene
13. *m*-xylene/*p*-xylene
14. *o*-xylene

Column:	Rtx®-624, 30m, 0.32 ID, 1.8µm (cat.# 10970)
Sample:	USP <467> Class 2 Mixture A standard solution (cat.# 36271) in 20mL headspace vial
Inj.:	headspace injection (split ratio 1:5), 1mm split liner, Siltek® deactivated (cat.# 20972-214.1)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.16mL/min., 35.3cm/sec.
Oven temp.:	40°C for 20 min. to 240°C @ 10°C/min. (hold for 20 min.)
Det.:	FID @ 240°C

Headspace Conditions

Instrument:	Tekmar HT3
Transfer line temp.:	105°C
Valve oven temp.:	105°C
Sample temp.:	80°C
Sample equil. time:	45 min.
Vial pressure:	10psi
Pressurize time:	0.5 min.
Loop fill pressure:	5psi
Loop fill time:	2.00 min.
Inject time:	1.00 min.

Organic Volatile Impurities (OVI) Analysis

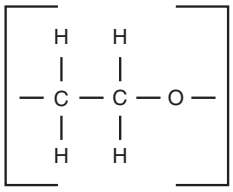
Stabilwax® (polar phase; Crossbond® Carbowax® polyethylene glycol)

- General purpose columns for FAMEs, flavor compounds, essential oils, solvents, xylene isomers, and US EPA Method 603 (acrolein/acrylonitrile).
- Resistant to oxidative damage.
- Temperature range: 40°C to 260°C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Our polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. The bonding mechanisms produce a column that can be rejuvenated by solvent washing. Compared to silicone stationary phases, PEG phases are more resistant to damage from strongly acidic or basic volatile compounds.

G16 phase

Stabilwax® Structure



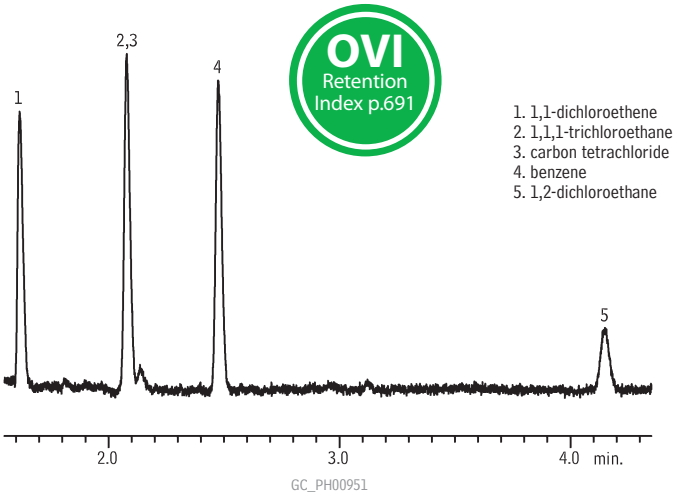
Stabilwax® Columns (fused silica)
(Crossbond® Carbowax® polyethylene glycol)

ID	df (µm)	temp. limits	30-Meter
0.32mm	0.25	40 to 250/260°C	10624
0.53mm	0.25	40 to 250/260°C	10625

similar **phases**

DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10, CP-Wax 52 CB

Residual solvents class 1 on a Stabilwax® (G16) column.



GC_PH00951

Column:	Stabilwax®, 30m, 0.32mm ID, 0.25µm (cat.# 10624)
Sample:	USP Stock Mixture USP<467> Residual Solvents Class 1 Mix (cat.# 36279) in 20mL headspace vial (cat.# 24685), water diluent
Inj.:	headspace injection (split ratio 1:5), 2mm splitless liner IP deactivated (cat.# 20712)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.15mL/min., 35.2cm/sec.
Oven temp.:	50°C for 20 min. to 165°C @ 6°C/min. (hold for 20 min.)
Det.:	FID @ 250°C

Headspace Conditions	
Instrument:	Overbrook Scientific HT200H
Syringe temp.:	100°C
Sample temp.:	80°C
Sample equil. time.:	45 min.
Injection vol.:	1.0mL
Injection speed:	setting 8
Injection dwell:	5 sec.

ordering **note**

Get the protection without the connection!
For Stabilwax® columns with built-in Integra-Guard™ guard columns, see **page 33**.

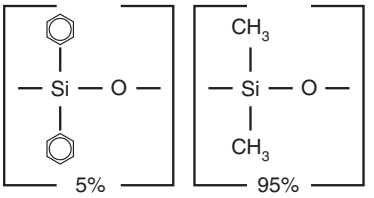
also **available**

Other Dimensions!
For our complete listing of Stabilwax® columns, see **page 57**.

Searching for a chromatogram?
www.restek.com

G27 phase

Rtx®-5 Structure



similar **phases**

DB-5, HP-5, HP-5MS, Ultra-2, SPB-5, Equity-5, MDN-5

super **performer**

For exceptional inertness, ultra-low bleed, and unsurpassed performance, choose Rxi®-5ms columns! See **pages 36-39, 41**.

Organic Volatile Impurities (OVI) Analysis

Rtx®-5 (low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners or (e.g.) Aroclor mixes, essential oils, semivolatiles.
- Temperature range: -60°C to 290°C.
- Equivalent to USP G27 and G36 phases.

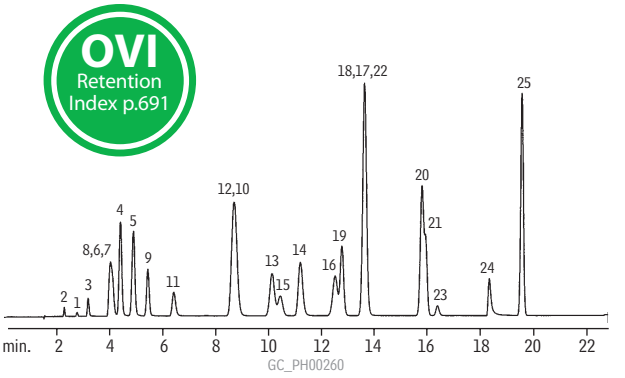
The 5% diphenyl/95% dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

Rtx®-5 Columns (fused silica)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	30-Meter
0.53mm	5.00	-60 to 270/290°C	10279

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Organic volatile impurities on an Rtx®-5 (Rtx®-G27) column.



1. ethylene oxide
2. methanol
3. ethanol
4. diethyl ether
5. 1,1-dichloroethene
6. acetone
7. isopropanol
8. acetonitrile
9. methylene chloride
10. *n*-hexane
11. *n*-propanol
12. methyl ethyl ketone
13. ethyl acetate
14. tetrahydrofuran
15. chloroform
16. 1,1,1-trichloroethane
17. carbon tetrachloride
18. benzene
19. 1,2-dichloroethane
20. heptane
21. trichloroethylene
22. *n*-butanol
23. 1,4-dioxane
24. pyridine
25. toluene

Rtx®-5 (Rtx®-G27) with 5m phenylmethyl Integra-Guard™ guard column, 30m, 0.53mm ID, 5.0µm (cat.# 10279-126)

Inj.:	Headspace injection of common solvents for pharmaceutical processing. Prepared to equal about 500ppm in the bulk pharmaceutical. Samples shaken and heated at 90°C for 15 minutes, 1mL headspace injection.
Oven temp.:	35°C (hold 10 min.) to 100°C @ 5°C/min., to 240°C @ 25°C/min. (hold 5 min.)
Inj./det. temp.:	220°C/240°C
FID sensitivity:	1.05 x 10^{-11} AFS
Carrier gas:	helium, 35cm/sec. set @ 35°C
Split ratio:	2:1

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Pharmaceutical Articles Online
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Organic Volatile Impurities (OVI) Analysis

Rtx®-G27 (Crossbond® 5% diphenyl/95% dimethyl polysiloxane) with Integra-Guard™ Guard Column
Rtx®-G43 (Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane) with Integra-Guard™ Guard Column

- Analytical column with Integra-Guard™ guard column eliminates connecting problems and leaks.
- Rtx®-G27 stable to 290°C; Rtx®-G43 stable to 240°C.

please **note**

Analytical Reference Materials for USP <467> are available. See **pages 479-480**.

Rtx®-G27 Column (fused silica with 5-meter Integra-Guard™ guard column)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
0.53mm	5.00	-60 to 270/290°C	10279-126

Rtx®-G43 Column (fused silica with 5-meter Integra-Guard™ guard column)
(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
0.53mm	3.00	-20 to 240°C	16085-126



free literature

A Technical Guide for Static Headspace Analysis Using GC

Download your free copy from **www.restek.com**.

Technical Guide
lit. cat.# 59895A

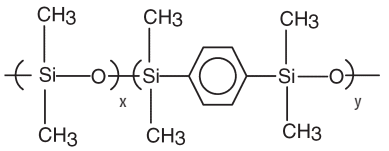


"We work hard to ensure the products you receive are of the highest quality. We are ISO 9001 certified and take pride in making the best columns on the market."

Restek's GC Columns Manufacturing Group
pictured: (top row) Linda Holden, David Rhodes, Sheldon McMurtrie, Kelsea Miller, Tom Barone, Ken Kline, Aaron Decker, Carolyn Williams, Raymond Ciampichini, Pete Rose, Dale Lucas, (bottom row) Tom Gurecki, Jack Haesler, Jackie Glasgow, Tim Wilson, David W. Rhodes, Henry Knepp, Russ Stewart, Jessica Andrus, Kim Shaffer, Santina Newlen (not pictured: Paul Kline, Robert Mattus, Russ Myers, Jessie Sproul, Ron Stricek, Tina Walters, Pat Reed, Shawn Giffin)

Semivolatiles Analysis

Rxi®-5Sil MS Structure



Rxi®-5Sil MS (low polarity Crossbond® silarylene phase; selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

- Engineered to be a low bleed GC/MS column.
- Excellent inertness for active compounds.
- General purpose columns—ideal for GC/MS analysis of polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60°C to 350°C.

similar **phases**

DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS

ordering **note**

Get the protection without the connection!
For Rxi®-5Sil MS columns with built-in Integra-Guard™ guard columns, see **page 33**.

The Rxi®-5Sil MS column is recommended for US EPA Method 8270.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC/MS applications requiring high sensitivity, including use in ion trap systems.

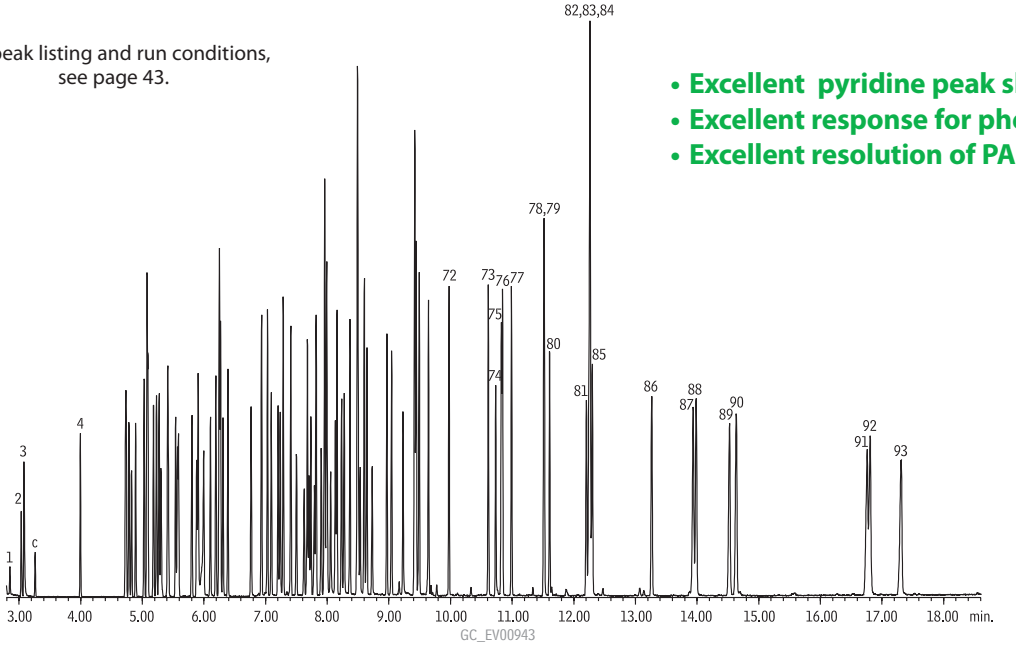
Rxi®-5Sil MS Columns (fused silica)
(Crossbond®, selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-60 to 330/350°C	13605	13608	
	0.25	-60 to 330/350°C	13620	13623	13626
	0.50	-60 to 330/350°C	13635	13638	
	1.00	-60 to 325/350°C	13650	13653	13697
0.32mm	0.25	-60 to 330/350°C	13621	13624	
	0.50	-60 to 330/350°C		13639	
	1.00	-60 to 325/350°C		13654	
0.53mm	1.50	-60 to 310/330°C		13670	

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	43601	
0.18mm	0.18	-60 to 330/350°C		43602
	0.36	-60 to 330/350°C		43604

Semivolatile organics by US EPA Method 8270 on an Rxi®-5Sil MS column.

For peak listing and run conditions, see page 43.



- **Excellent pyridine peak shape.**
- **Excellent response for phenols.**
- **Excellent resolution of PAHs.**

Organophosphorus Pesticides Analysis

Rtx®-OPPesticides/Rtx®-OPPesticides2 (proprietary Crossbond® phases)

- Application-specific columns for organophosphorus pesticides; best column combination for US EPA Method 8141A.
- Low bleed—ideal for GC/FPD, GC/NPD, or GC/MS analyses.
- Stable to 330°C.

FAST efficient analysis of OPPs in EPA Method 8141A

Using sophisticated computer modeling software, we created two stationary phases for separating the 55 organophosphorus pesticides (OPP) listed in EPA Method 8141A. Separation is improved, and analysis time is significantly reduced, compared to other columns. The extended upper temperature limit of these phases (330°C) allows analysts to bake out high molecular weight contamination typically associated with pesticide samples. The low bleed columns are a perfect match for sensitive detection systems.

Rtx®-OPPesticides Columns (fused silica)

ID	df (µm)	temp. limits	30-Meter
0.32mm	0.50	-20 to 310/330°C	11239
0.53mm	0.83	-20 to 310/330°C	11240

restek **innovation**!

- Better separations
- Faster analysis

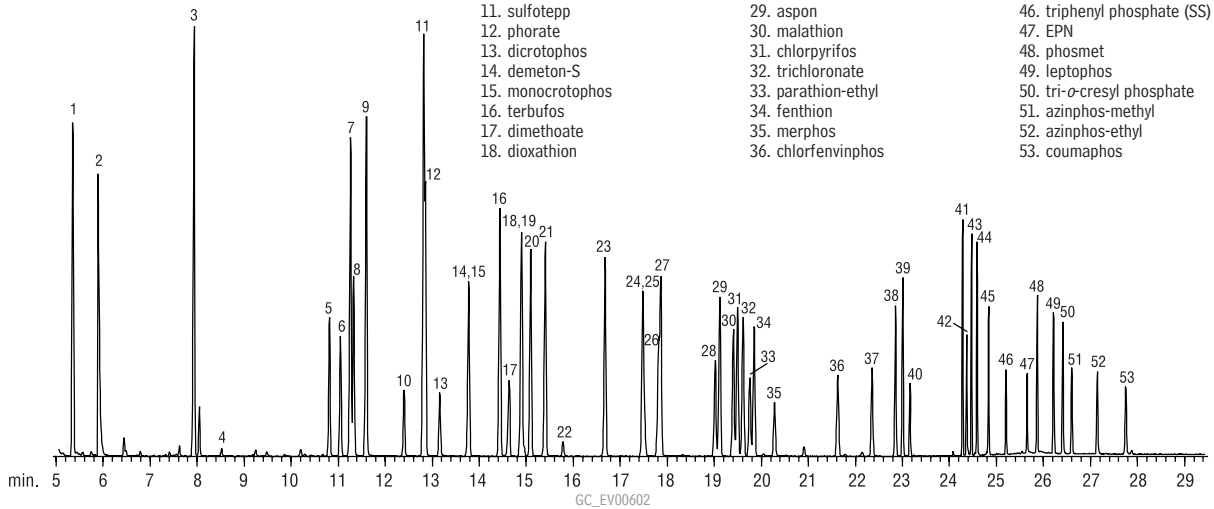
Rtx®-OPPesticides2 Columns (fused silica)

ID	df (µm)	temp. limits	20-Meter	30-Meter
0.18mm	0.20	-20 to 310/330°C	11244	
0.25mm	0.25	-20 to 310/330°C		11243
0.32mm	0.32	-20 to 310/330°C		11241
0.53mm	0.50	-20 to 310/330°C		11242

Organophosphorus pesticides by US EPA Method 8141A on an Rtx®-OPPesticides2 column.

Best column choice to resolve Method 8141A compounds!

1. dichlorvos
2. hexamethylphosphoramide
3. mevinphos
4. trichlorfon
5. TEPP
6. demeton-O
7. thionazin
8. tributyl phosphate (IS)
9. ethoprop
10. naled
11. sulfotepp
12. phorate
13. dicrotophos
14. demeton-S
15. monocrotophos
16. terbufos
17. dimethoate
18. dioxathion
19. fonophos
20. diazinon
21. disulfoton
22. phosphamidon isomer
23. dichlorofenthion
24. chlorpyrifos methyl
25. phosphamidon
26. parathion-methyl
27. ronnel
28. fenitrothion
29. aspon
30. malathion
31. chlorpyrifos
32. trichloronate
33. parathion-ethyl
34. fenthion
35. merphos
36. chlorfenvinphos
37. crotoxyphos
38. stirofos
39. tokuthion
40. merphos oxone (breakdown product)
41. ethion
42. fensulfothion
43. bolstar
44. carbophenothion
45. famphur
46. triphenyl phosphate (SS)
47. EPN
48. phosmet
49. leptophos
50. tri-*o*-cresyl phosphate
51. azinphos-methyl
52. azinphos-ethyl
53. coumaphos



Column: Rtx®-OPPesticides2, 30m, 0.25mm ID, 0.25µm (cat.# 11243)
Sample: US EPA Method 8141A Custom Standard Mix 1µL 100ppm (100ng on column)
Triphenylphosphate Standard (cat.# 32281)
Tributylphosphate Standard (cat.# 32280)
8140/8141 OP Pesticides Calibration Mix A (cat.# 32277)
8141 OP Pesticides Calibration Mix B (cat.# 32278)
Custom Mixes: Call Restek for Information
Inj.: 1.0µL splitless (hold 0.4 min.), 4mm double gooseneck inlet liner (cat.# 20785)

Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1.0mL/min.
Oven temp.: 80°C (hold 0.5 min.) to 140°C @ 20°C/min. to 210°C @ 4°C/min. (hold 1 min.) to 280°C @ 30°C (hold 5 min.)
Det: MS
Transfer line temp.: 280°C
Scan range: 35-400amu
Ionization: EI

Chlorinated Pesticides Analysis

restek **innovation**!

- Very low bleed
- Faster analysis

Rtx®-CLPesticides/Rtx®-CLPesticides2 (proprietary Crossbond® phases)

- Application-specific columns for organochlorine pesticides and herbicides.
- Low bleed—ideal for GC/ECD or GC/MS analyses.
- Baseline separations in less than 10 minutes.
- Stable to 340°C.

Improved resolution and faster analyses, compared to 1701 or phenyl phases, make these the pesticide columns of choice. Rtx®-CLPesticides columns are specially designed to overcome the coelutions and analyte breakdown typically encountered in chlorinated pesticide analyses for EPA Methods 8081, 608, and CLP. By achieving baseline resolution of the 20 target analytes, more accurate qualitative data can be obtained, providing reliable identification without GC/MS.



free literature

Fast GC Analysis of Chlorinated Pesticides

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Flyer
lit. cat.# 59547A

Rtx®-CLPesticides Columns (fused silica)

ID	df (µm)	temp. limits	10-Meter	15-Meter	20-Meter	30-Meter	60-Meter
0.10mm	0.10	-60 to 310/330°C	43101				
0.18mm	0.18	-60 to 310/330°C	42101		42102		
0.25mm	0.25	-60 to 320/340°C		11120		11123	11126
0.32mm	0.32	-60 to 320/340°C				11141	
	0.50	-60 to 320/340°C		11136		11139	
0.53mm	0.50	-60 to 300/320°C		11137		11140	

Rtx®-CLPesticides2 Columns (fused silica)

ID	df (µm)	temp. limits	10-Meter	15-Meter	20-Meter	30-Meter	60-Meter
0.10mm	0.10	-60 to 310/330°C	43301		43302		
0.18mm	0.14	-60 to 310/330°C	42301		42302		
0.25mm	0.20	-60 to 320/340°C		11320		11323	11326
0.32mm	0.25	-60 to 320/340°C		11321		11324	
	0.50	-60 to 320/340°C				11325	
0.53mm	0.42	-60 to 300/320°C		11337		11340	

also **available**

For a wide variety of column connectors, see **pages 213-219**.

Rtx®-CLPesticides Column Kits

(Note: Columns are not preconnected in these kits.)

Purchase one of these recommended combinations of guard and analytical columns and save money.

0.25mm ID Rtx-CLPesticides Kit **cat.# 11199 (kit), 1081.10**

Includes:	cat.#	price
30m, 0.25mm ID, 0.25µm Rtx-CLPesticides Column	11123	
30m, 0.25mm ID, 0.20µm Rtx-CLPesticides2 Column	11323	
Universal Angled "Y" Press-Tight Connector	20403	
5m, 0.25mm ID Siltek Guard Column	10026	

ordering **note**

Add "-530" or "-535" to the catalog number for the kit, to save on the cost of the reference mix.

0.32mm ID Rtx-CLPesticides Kit **cat.# 11196 (kit), 1112.00**

Includes:	cat.#	price
30m, 0.32mm ID, 0.32µm Rtx-CLPesticides Column	11141	
30m, 0.32mm ID, 0.25µm Rtx-CLPesticides2 Column	11324	
Universal Angled "Y" Press-Tight Connector	20403	
5m, 0.32mm ID Siltek Guard Column	10027	

0.53mm ID Rtx-CLPesticides Kit **cat.# 11197 (kit), 1189.20**

Includes:	cat.#	price
30m, 0.53mm ID, 0.50µm Rtx-CLPesticides Column	11140	
30m, 0.53mm ID, 0.42µm Rtx-CLPesticides2 Column	11340	
Universal Angled "Y" Press-Tight Connector	20403	
5m, 0.53mm ID IP Deactivated Guard Column	10045	

Add a reference mix to your kit order and save!

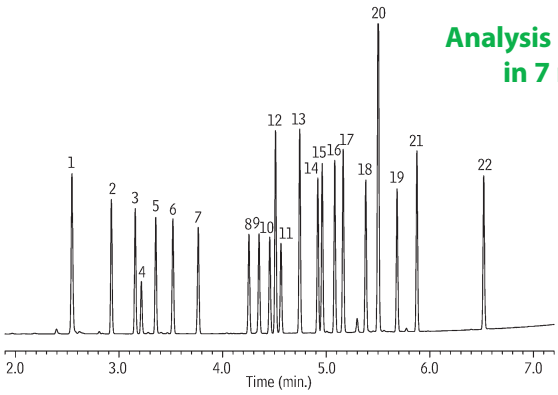
Description	list price	price with/kit	suffix #
Organochlorine Pesticide Mix AB #1 (cat.# 32291)		enquire	-530
Organochlorine Pesticide Mix AB #2 (cat.# 32292)		enquire	-535

Chlorinated Pesticides Analysis

Fast GC analyses of chlorinated pesticides on Rtx®-CLPesticides and Rtx®-CLPesticides2 columns.

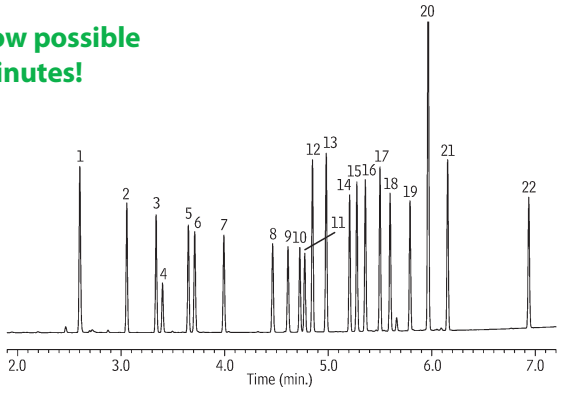
Rtx®-CLPesticides & Rtx®-CLPesticides2 columns (0.32mm ID)

Rtx®-CLPesticides



GC_EV00933

Rtx®-CLPesticides2



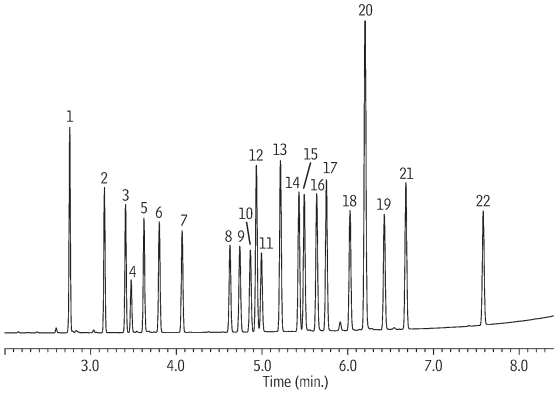
GC_EV00933A

Columns:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141) and Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Deactivated Universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample:	Organochlorine Pesticide Mix AB #2, 8-80µg/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200µg/mL each component in acetone (cat.# 32000)
Inj.:	1.0µL splitless (hold 0.3 min.), 4mm single gooseneck inlet liner (cat.# 20799)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	60cm/sec. @ 120°C
Oven temp.:	120°C to 200°C @ 45°C/min. to 230°C @ 15°C/min. to 330°C (hold 2 min.) @ 30°C/min.
Det.:	ECD @ 330°C

1. 2,4,5,6-tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. heptachlor
7. aldrin
8. heptachlor epoxide (isomer B)
9. γ-chlordane
10. α-chlordane
11. endosulfan I
12. 4,4'-DDE
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. endosulfan sulfate
20. methoxychlor
21. endrin ketone
22. decachlorobiphenyl (SS)

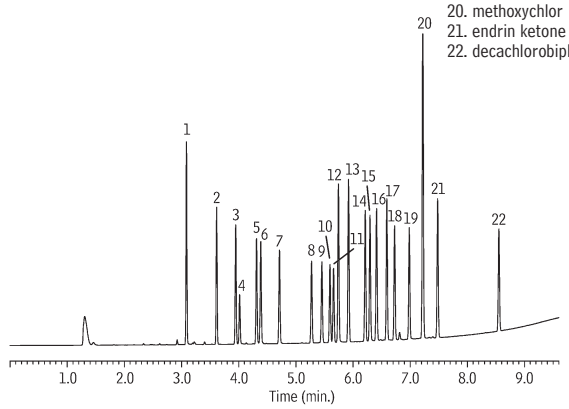
Rtx®-CLPesticides & Rtx®-CLPesticides2 columns (0.53mm ID)

Rtx®-CLPesticides



GC_EV00936

Rtx®-CLPesticides2



GC_EV00937

Columns:	Rtx®-CLPesticides, 30m, 0.53mm ID, 0.50µm (cat.# 11140) and Rtx®-CLPesticides2, 30m, 0.53mm ID, 0.42µm (cat.# 11340) with 5m x 0.53mm ID Rxi® deactivated guard tubing (cat.# 10054), connected using Siltek® Treated Universal "Y" Press-Tight® connector (cat.# 20486)
Sample:	Organochlorine Pesticide Mix AB #2, 8-80µg/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200µg/mL each component in acetone (cat.# 32000)
Inj.:	1.0µL splitless (hold 0.3 min.), 4mm single gooseneck inlet liner (cat.# 20799)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	45cm/sec. @ 120°C
Oven temp.:	120°C to 200°C @ 45°C/min. to 230°C @ 12.5°C/min. to 325°C (hold 2 min.) @ 30°C/min.
Det.:	ECD @ 330°C

Chlorinated Pesticides Analysis

restek **innovation**!

Stx™-CLPesticides/Stx™-CLPesticides2 (proprietary Crossbond® phases)

- Application-specific columns for organochlorine pesticides and herbicides.
- Baseline separations in less than 10 minutes.
- Siltek® surface deactivation enhances responses for endrin, DDT, methoxychlor.
- Stable to 330°C.

Many laboratories analyzing organochlorine pesticides struggle with breakdown and adsorption of endrin, DDT, and methoxychlor caused by active sites throughout the analytical system. Siltek® passivation technology enables these columns to offer unsurpassed inertness and the highest responses for active pesticides.

it's a **fact**

These columns are treated with Siltek® deactivation, which provides better responses for endrin, DDT, and methoxychlor.

Stx™-CLPesticides Columns (fused silica with Siltek® deactivation)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	-60 to 310/330°C	11540	11543
0.32mm	0.32	-60 to 310/330°C		11546
	0.50	-60 to 310/330°C	11541	11544

Stx™-CLPesticides2 Columns (fused silica with Siltek® deactivation)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.20	-60 to 310/330°C	11440	11443
0.32mm	0.25	-60 to 310/330°C	11441	11444

Stx™-CLPesticides Kits

(Note: Columns are not preconnected in these kits.)

kit

0.25mm ID Stx-CLPesticides Kit cat.# 11190 (kit), 1081.10

Includes:	cat.#	price
30m, 0.25mm ID, 0.25µm Stx-CLPesticides Column	11543	
30m, 0.25mm ID, 0.20µm Stx-CLPesticides2 Column	11443	
Universal Angled "Y" Press-Tight Connector	20403	
5m, 0.25mm ID Siltek Guard Column	10026	

kit

0.32mm ID Stx-CLPesticides Kit cat.# 11193 (kit), 1112.00

Includes:	cat.#	price
30m, 0.32mm ID, 0.32µm Stx-CLPesticides Column	11546	
30m, 0.32mm ID, 0.25µm Stx-CLPesticides2 Column	11444	
Universal Angled "Y" Press-Tight Connector	20403	
5m, 0.32mm ID Siltek Guard Column	10027	

ordering **note**

Kits include Siltek® deactivated guard column.



Brominated Flame Retardants Analysis

Rtx®-1614 (5% phenyl methyl)

- Optimized for PBDE analysis by EPA Method 1614.
- Short column option resolves BDE-209 3 times faster, with less thermal breakdown.
- Unique deactivation gives higher BDE-209 response, compared to DB-5HT columns, for greater analytical sensitivity.
- Exceeds EPA Method 1614 resolution criteria for BDE-49 and BDE-71.

NEW!

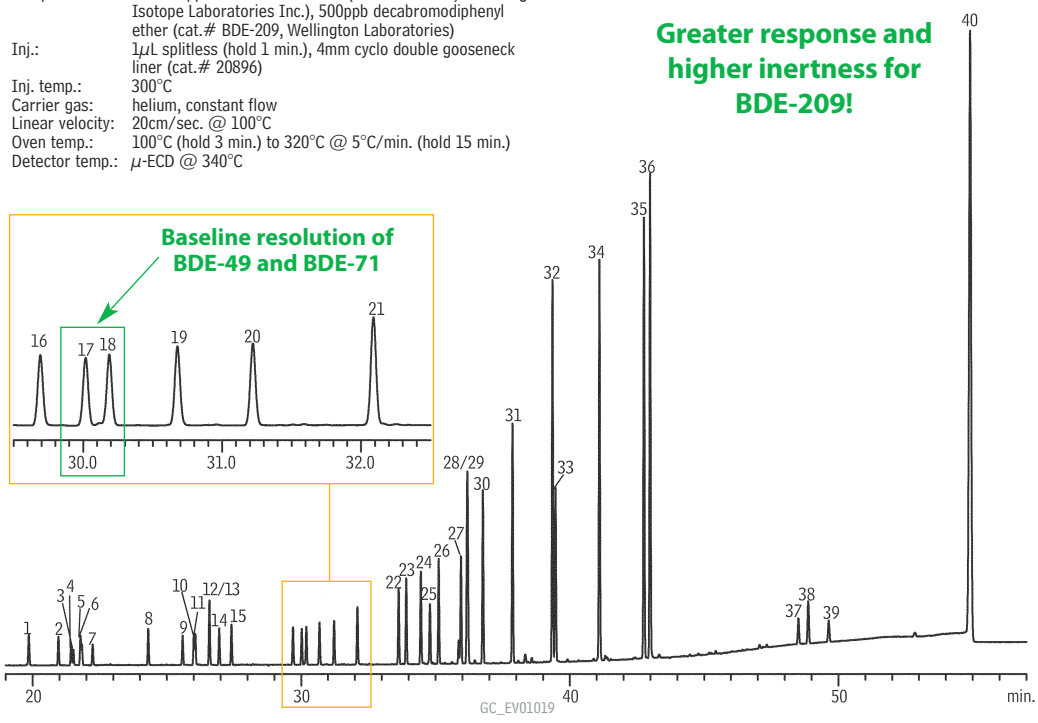
Rtx®-1614 Columns (fused silica)

(5% phenyl methyl)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	-60 to 330/360°C	10296	10295

Separate PBDEs accurately and reliably on an Rtx®-1614 column.

Column: Rtx®-1614, 30m, 0.25mm ID, 0.10µm (cat.# 10295)
Sample: 100-300ppb PBDE PAR Solution (cat.# EO-5113, Cambridge Isotope Laboratories Inc.), 500ppb decabromodiphenyl ether (cat.# BDE-209, Wellington Laboratories)
Inj.: 1µL splitless (hold 1 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.: 300°C
Carrier gas: helium, constant flow
Linear velocity: 20cm/sec. @ 100°C
Oven temp.: 100°C (hold 3 min.) to 320°C @ 5°C/min. (hold 15 min.)
Detector temp.: µ-ECD @ 340°C



1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

Table of Contents for Applications
see page 489

restek **innovation**!

PCB Congeners Analysis

Rtx®-PCB (proprietary Crossbond® phase)

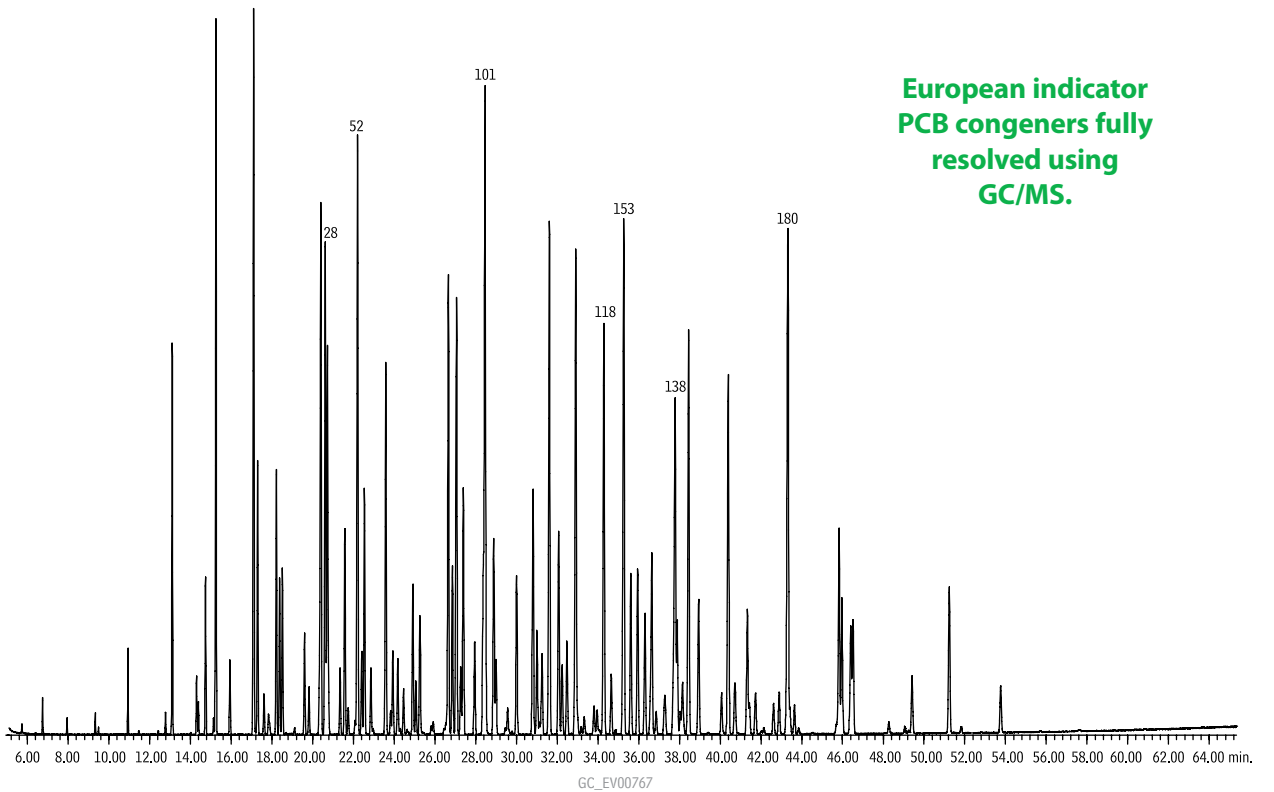
- Unique polymer for PCBs analysis by GC/ECD or GC/MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Stable to 340°C.

Rtx®-PCB Columns (fused silica)

ID	df (µm)	temp. limits*	20-Meter	30-Meter	40-Meter	60-Meter
0.18mm	0.18	30°C to 320/340°C	41302		41303	41304
0.25mm	0.25	30°C to 320/340°C		13223		13226
0.32mm	0.50	30°C to 320/340°C		13239		

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Aroclor 1242/1254/1262 PCBs on Rtx®-PCB: best available resolution of individual congeners.



European indicator PCB congeners fully resolved using GC/MS.

Column:	Rtx®-PCB, 60m, 0.25mm ID, 0.25µm (cat.# 13226)
Sample:	Aroclor 1242 (cat.# 32009), 1254 (cat.# 32011), 1262 (cat.# 32409), 333ppm each
Inj.:	1.0µL splitless (hold 0.75 min.), 4mm single gooseneck inlet liner w/wool (cat.# 22405)
Inj. temp.:	280°C
Carrier gas:	helium, constant flow
Flow rate:	1.1mL/min.
Oven temp.:	100°C (hold 1 min.) to 200°C @ 30°C/min., to 320°C @ 2°C/min. (hold 1 min.)
Det.:	MS
Transfer line temp.:	280°C
Scan range:	50 to 550amu
Ionization:	EI
Mode:	scan

PCB Congeners Analysis

Rxi®-XLB (low polarity proprietary phase)

- General purpose columns exhibiting extremely low bleed. Ideal for many GC/MS applications, including pesticides, PCB congeners or (e.g.) Aroclor mixes, PAHs.
- Unique selectivity.
- Temperature range: 30°C to 360°C.

Improvements in polymer synthesis and tubing deactivation enable us to make inert, stable Rxi®-XLB columns especially well-suited for analyzing active, high molecular weight compounds with sensitive GC/MS systems, including ion trap detectors. Excellent efficiency, coupled with inertness, low bleed, and high thermal stability, make Rxi®-XLB columns ideal for analyzing semivolatile compounds in drinking water (e.g., US EPA Method 525).

also **available**

Other Dimensions!
See **page 44** for our complete listing of Rxi®-XLB columns.

similar **phases**

DB-XLB, VF-Xms

Rxi®-XLB Columns (fused silica)
(low polarity proprietary phase)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	30 to 340/360°C	13705	13708	
	0.25	30 to 340/360°C	13720	13723	13726
	0.50	30 to 340/360°C		13738	
	1.00	30 to 340/360°C	13750	13753	

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	30 to 340/360°C	43701	
0.18mm	0.18	30 to 340/360°C		43702

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.



Dioxin & Furan Congeners Analysis

restek **innovation**!

Rtx®-Dioxin (proprietary Crossbond® phase)

- Replacement column for 5% diphenyl phases.
- Improved separations of dioxin or furan congeners.
- Greater thermal stability than 5% diphenyl phases or high-cyano confirmation columns.

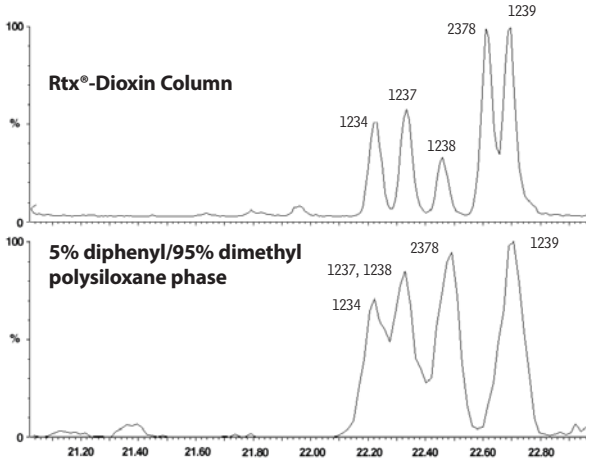
also **available**

Rtx®-Dioxin2 columns.
See **page 87**.

Rtx®-Dioxin Columns (fused silica)

ID	df (µm)	temp. limits	60-Meter
0.25mm	0.15	-60°C to 380°C	10755

Rtx®-Dioxin column separates all five components in the TCDD resolution check mixture.



Temperature program:

	Time (min.)	Rate (°C/min.)	Temp. (°C)
	0	52	200
	10.2	2.9	235
	10	6.9	300
	24		

Injector temp.: 270°C
Flow: 1.2mL/min. (constant pressure)

Column: Rtx®-Dioxin, 40m, 0.18mm ID, 0.11µm
Initial temp.: 130°C
Instrument: Micromass Altima high resolution GC/MS

Chromatography courtesy of Karen MacPherson and Eric Reiner, Ontario Ministry of the Environment, Etobicoke, ON, Canada.



"We test every fused silica, PLOT, and MXT® column against stringent quality standards to ensure you get the best columns on the market."

Restek's Quality Assurance Group
pictured: Sara Eyster, Dianne Shaffer, Lenny Miller, Corby Hillard, Glenn Gerhab, Chris Zucco, Deb Conklin, Trisha Houser, John Kalmbach (not pictured: Kayne Milhomme, Adam Clark, Tyler Brown, Abby Caporuscio, Brett Ripka)

Dioxin & Furan Congeners Analysis

Rtx®-Dioxin2 (proprietary Crossbond® phase)

- Isomer specificity for 2,3,7,8-TCDD and 2,3,7,8-TCDF achieved with one GC column.
- Thermally stable to 340°C for longer lifetime.
- Unique selectivity for toxic dioxin and furan congeners allow use as a primary or confirmation GC column.

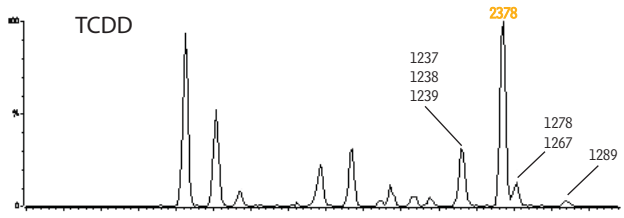
restek **innovation**!

Excellent for dioxins or furans.

Rtx®-Dioxin2 Columns (fused silica)

ID	df (µm)	temp. limits	40-Meter		60-Meter	
0.18mm	0.18	20°C to 340°C	10759		—	—
0.25mm	0.25	20°C to 340°C	—	—	10758	

2,3,7,8-Tetrachlorodibenzodioxin resolved from other TCDD congeners, using an Rtx®-Dioxin2 column.

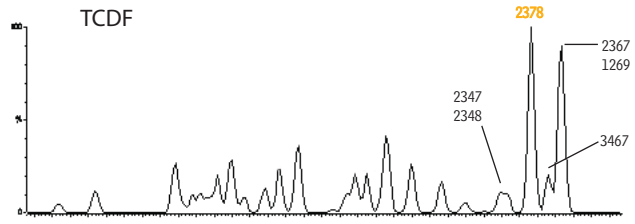


Other peak identifications available upon request.

GC_EV00948

Column: Rtx®-Dioxin2, 60m, 0.25mm ID, 0.25µm (cat.# 10758)
Sample: WMS-01 Reference Material, Wellington Laboratories
Inj.: Splitless
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1.5mL/min.
Oven temp.: 130°C (hold 1.0 min.) to 200°C @ 40°C/min. to 235°C @ 3.0°C/min. to 300°C @ 5°C/min. (hold 10 min.)
Det.: Micromass Ultima high-resolution mass spectrometer
Ionization: EI
Mode: SIR

Tetrachlorodibenzofuran congeners on an Rtx®-Dioxin2 column.

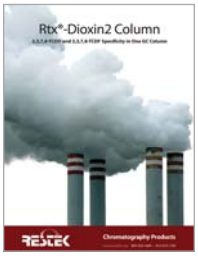


Other peak identifications available upon request.

GC_EV00949

Column: Rtx®-Dioxin2, 60m, 0.25mm ID, 0.25µm (cat.# 10758)
Sample: WMS-01 Reference Material, Wellington Laboratories
Inj.: Splitless
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1.5mL/min.
Oven temp.: 130°C (hold 1.0 min.) to 200°C @ 40°C/min. to 235°C @ 3.0°C/min. to 300°C @ 5°C/min. (hold 10 min.)
Det.: Micromass Ultima high-resolution mass spectrometer
Ionization: EI
Mode: SIR

Chromatograms courtesy of Terry Kolic, Karen MacPherson, Eric Reiner, Ontario Ministry of the Environment, Toronto, Ontario, Canada



free literature

Rtx®-Dioxin2 Column: 2,3,7,8-TCDD and 2,3,7,8-TCDF Specificity in One GC Column

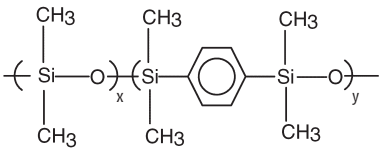
All 128 tetra through octa dioxin and furan congeners acquired on the Rtx®-Dioxin2 column.

Download your free copy from **www.restek.com**

Flyer
lit. cat.# 580119A

Polycyclic Aromatic Hydrocarbon (PAH) Analysis

Rxi™-5Sil MS Structure



similar **phases**

DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS

also **available**

Get the protection without the connection!
For Rxi®-5Sil MS columns with built-in Integra-Guard™ guard columns, see **page 33**.

Other Dimensions!
See **page 42** for our complete listing of Rxi®-5Sil MS columns.

Rxi®-5Sil MS (low polarity Crossbond® silarylene phase; selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

- Engineered to be a low bleed GC/MS column.
- Excellent inertness for active compounds.
- General purpose columns—ideal for GC/MS analysis of polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60°C to 350°C.

Rxi®-5Sil MS Columns (fused silica)
(Crossbond®, selectivity close to 5% diphenyl/95% dimethyl polysiloxane)

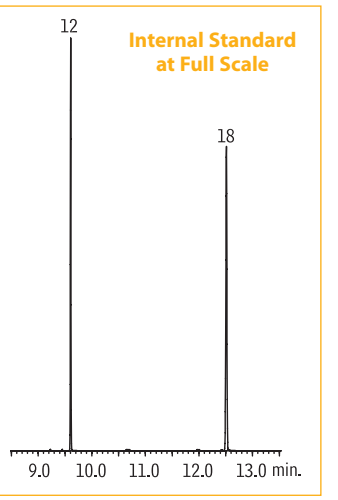
ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-60 to 330/350°C	13605	13608	
	0.25	-60 to 330/350°C	13620	13623	13626
	0.50	-60 to 330/350°C	13635	13638	

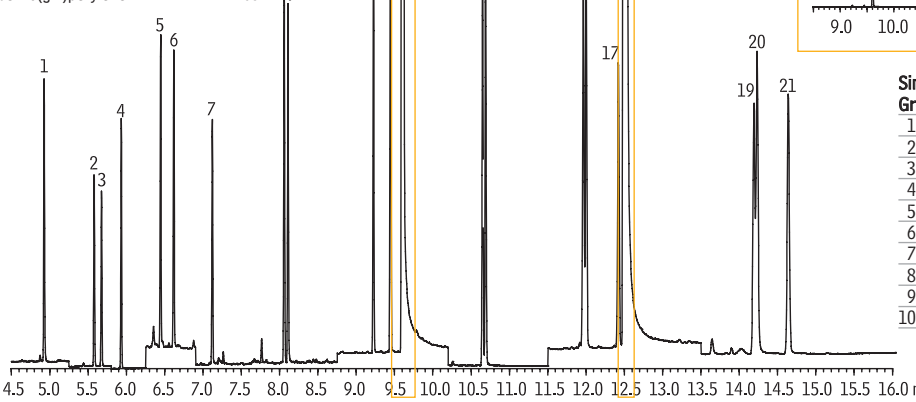
ID	df (µm)	temp. limits	10-Meter	20-Meter
0.10mm	0.10	-60 to 330/350°C	43601	
0.18mm	0.18	-60 to 330/350°C		43602
	0.36	-60 to 330/350°C		43604

Polycyclic aromatic hydrocarbons on an Rxi®-5Sil MS column.

Peak List	Retention Time
1. naphthalene	4.93
2. 2-methylnaphthalene	5.58
3. 1-methylnaphthalene	5.68
4. 2-fluorobiphenyl (SS)	5.93
5. acenaphthylene	6.45
6. acenaphthene	6.62
7. fluorene	7.12
8. phenanthrene	8.06
9. anthracene	8.11
10. fluoranthene	9.23
11. pyrene	9.45
12. *p*-terphenyl-d14 (IS)	9.61
13. benzo(a)anthracene	10.65
14. chrysene	10.69
15. benzo(b)fluoranthene	11.96
16. benzo(k)fluoranthene	12.00
17. benzo(a)pyrene	12.42
18. perylene-d12 (IS)	12.51
19. indeno(1,2,3-cd)pyrene	14.19
20. dibenzo(a,h)anthracene	14.23
21. benzo(ghi)perylene	14.65

Outstanding peak shape and response at 5pg on-column!





GC_EV00970

Single Ion Monitoring Program

Group	Time	Ion(s)	Dwell (ms)
1	4.00	128	100
2	5.25	142	100
3	5.80	172	100
4	6.25	152	100
5	6.90	166	100
6	7.60	178	100
7	8.75	202, 244	100
8	10.2	228	100
9	11.5	252, 264	100
10	13.5	276, 278	100

Column: Rxi®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 13623)
Sample: PAH mix, 1µL of 0.005µg/mL (IS 2µg/mL)
SV Calibration Mix #5 (cat.# 31011)
1-methylnaphthalene (cat.# 31283)
2-methylnaphthalene (cat.# 31285)
2-fluorobiphenyl (cat.# 31091)
Inj.: 1.0µL (5pg on-column concentration),
4mm Drilled Uniliner® (hole near top) inlet liner w/wool (cat.# 21055-200.5),
pulsed splitless: pulse 20psi @ 0.2 min., 60mL/min. @ 0.15 min.

Inj. temp.: 300°C
Carrier gas: helium, constant flow
Flow rate: 1.4mL/min.
Oven temp.: 50°C (hold 0.5 min.) to 290°C @ 25°C/min. to 320°C @ 5°C/min.
Det.: MS
Transfer line temp: 290°C
Ionization: EI
Mode: SIM

Polycyclic Aromatic Hydrocarbon (PAH) Analysis

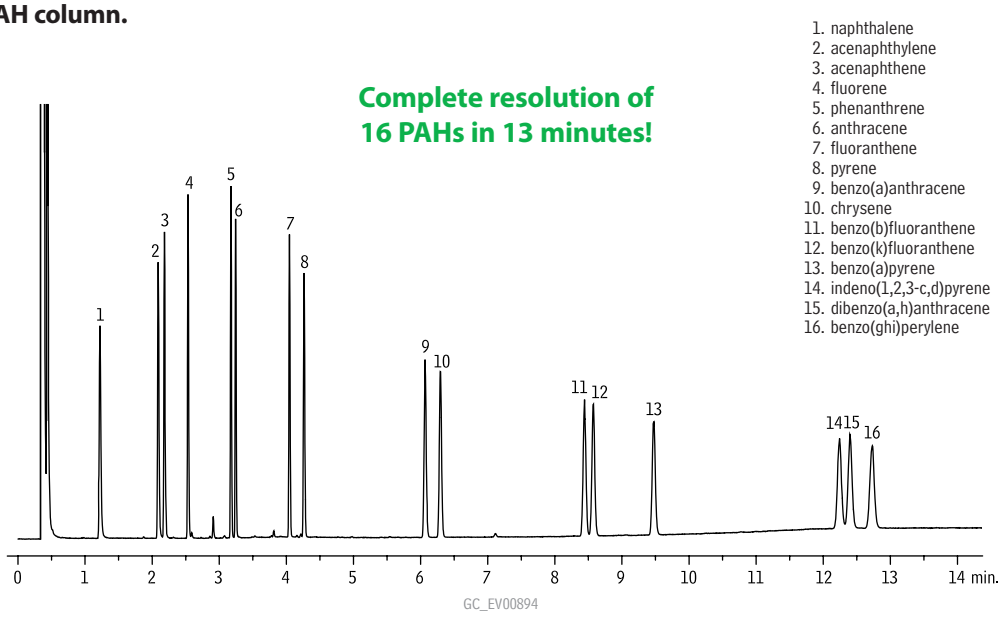
Rt®-PAH (polar, proprietary liquid crystalline phase)

- Specially designed for the analysis of polycyclic aromatic hydrocarbons (PAHs) listed in US EPA methods 610 and 8100.
- Low bleed at 285°C.
- Temperature range: 80°C to 285°C.

Rt®-PAH Columns (fused silica)

ID	df (µm)	temp. limits	12-Meter
0.25mm	0.15	80°C to 285°C	19733

Separation of 16 regulated polycyclic aromatic hydrocarbons (PAHs) in less than 15 minutes on an Rt®-PAH column.



Column:	Rt®-PAH, 12m, 0.25mm ID, 0.15µm (cat.# 19733)
Sample:	16 component EPA Method 610 PAH standard (20ng/µl of each component in dichloromethane)
Inj.:	1.0µL split (split ratio 10:1)
Inj. temp.:	225°C
Carrier gas:	helium, 110kPa column head pressure
Oven temp.:	80°C to 220°C @ 40°C/min., 220°C to 285°C @ 8°C/min. (hold 5 min.)
Detector:	FID @ 290°C

Chromatogram courtesy of J&K Scientific.

Rt®-LC50 (polar, dimethyl (50% liquid crystal) polysiloxane)

- General purpose column with selectivity for dioxin or furan congeners, or PCB congeners.
- Low bleed at 270°C.
- Temperature range: 100°C to 270°C.

The unique liquid crystalline Rt®-LC50 stationary phase resolves compounds of similar structure and boiling point. It has proven effective for resolving many polycyclic aromatic hydrocarbons; other potential applications include dioxin, furan, or PCB congeners.

Rt®-LC50 Columns (fused silica)

ID	df (µm)	temp. limits	10-Meter		20-Meter	
0.10mm	0.10	100°C to 270°C	19736		—	—
0.18mm	0.10	100°C to 270°C	19735		—	—
0.25mm	0.10	100°C to 270°C	—	—	19734	

Volatile Organics Analysis

restek **innovation**!

- First choice for use with dual purge & traps[1]
- EPA recommended surrogate used.

[1]A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

Rtx®-VMS (proprietary Crossbond® phase)

- Application-specific columns for volatile organic pollutants by GC/MS.
- Complete separation of US EPA Method 8260B compounds in less than 10 minutes.
- Stable to 260°C.
- No known equivalent phases.

Rtx®-VMS columns offer lower bleed, better selectivity, and overall faster analysis for separating volatile organic compounds, such as those listed in US EPA Method 8260B. The Rtx®-VMS stationary phase is a highly stable polymer that provides outstanding analysis of volatile compounds, in combination with sensitive ion traps and Agilent 5973 mass spectrometers. 0.18 and 0.25mm ID columns allow sample splitting at the injection port, eliminating the added expense and maintenance of a jet separator. A 0.45mm or 0.53mm ID column can be directly connected to the purge & trap transfer line in a system equipped with a jet separator.

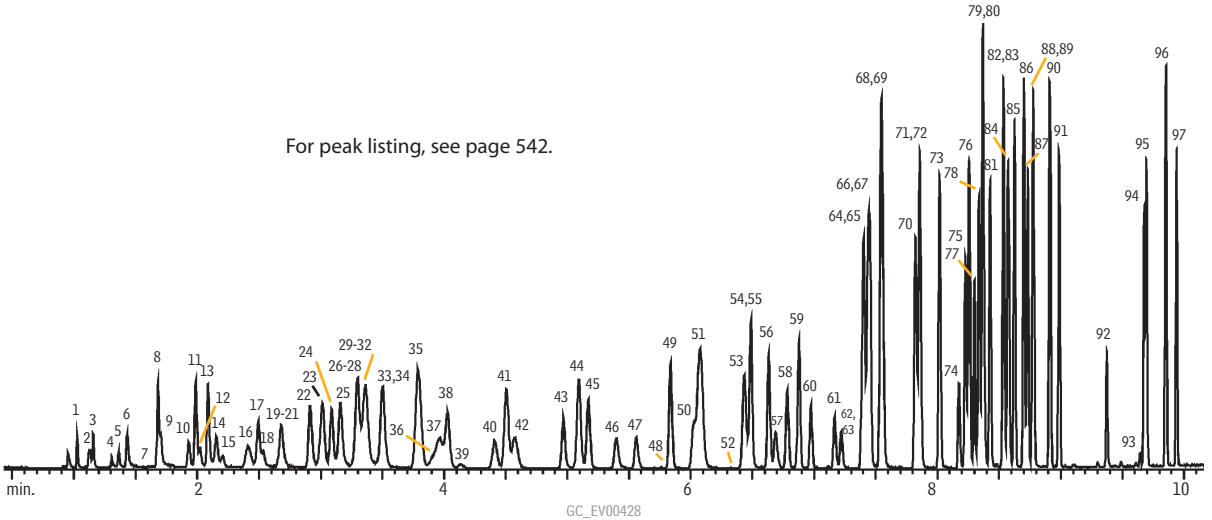
Rtx®-VMS Columns (fused silica)

ID	df (µm)	temp. limits	30-Meter	60-Meter	75-Meter
0.25mm	1.40	-40 to 240/260°C	19915	19916	
0.32mm	1.80	-40 to 240/260°C	19919	19920	
0.45mm	2.55	-40 to 240/260°C	19908	19909	
0.53mm	3.00	-40 to 240/260°C	19985	19988	19974

ID	df (µm)	temp. limits	20-Meter	40-Meter
0.18mm	1.00	-40 to 240/260°C	49914	49915

Rapid analysis of volatile organics in US EPA Method 8260B, on an Rtx®-VMS column.

For peak listing, see page 542.



GC_EV00428

Column:	Rtx®-VMS, 20m, 0.18mm ID, 1.00µm (cat.# 49914)
Conc.:	10ppb in 5mL of RO water unless otherwise noted; ketones at 2.5X
Concentrator:	Tekmar LSC-3100 Purge and Trap
Trap:	Vocarb 3000 (type K)
Purge:	11 min. @ 40mL/min. (ambient temperature)
Dry purge:	1 min. @ 40mL/min.
Desorb preheat:	245°C
Desorb:	250°C for 2 min., flow 40mL/min.
Bake:	260°C for 8 min.
Interface:	0.53mm ID Silcosteel® tubing transfer line 1:40 split at injection port. 1mm ID liner.
Oven temp.:	50°C (hold 4 min.) to 100°C @ 18°C/min. (hold 0 min.) to 230°C @ 40°C/min. (hold 3 min.)
Carrier gas:	helium @ ~1.0mL/min. constant flow Adjust dichlorodifluoromethane to a retention time of 1.03 min. @ 50°C.
Detector:	Agilent 5973 MSD
Scan range:	35-300amu

Volatile Organics Analysis

Rtx®-VRX (proprietary Crossbond® phase)

- Application-specific columns for volatile organic pollutants.
- Excellent for US EPA Method 8021 compounds.
- Stable to 260°C.

The Rtx®-VRX stationary phase and optimized column dimensions provide low bleed, excellent resolution, and fast analysis times for volatile compounds.

Rtx®-VRX Columns (fused silica)
(proprietary Crossbond® phase)

ID	df (µm)	temp. limits	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	1.40	-40 to 240/260°C	19315	19316		
0.32mm	1.80	-40 to 240/260°C	19319	19320		
0.45mm	2.55	-40 to 240/260°C	19308		19309	
0.53mm	3.00	-40 to 240/260°C	19385	19388	19374	19389

ID	df (µm)	temp. limits	20-Meter	40-Meter
0.18mm	1.00	-40 to 240/260°C	49314	49315

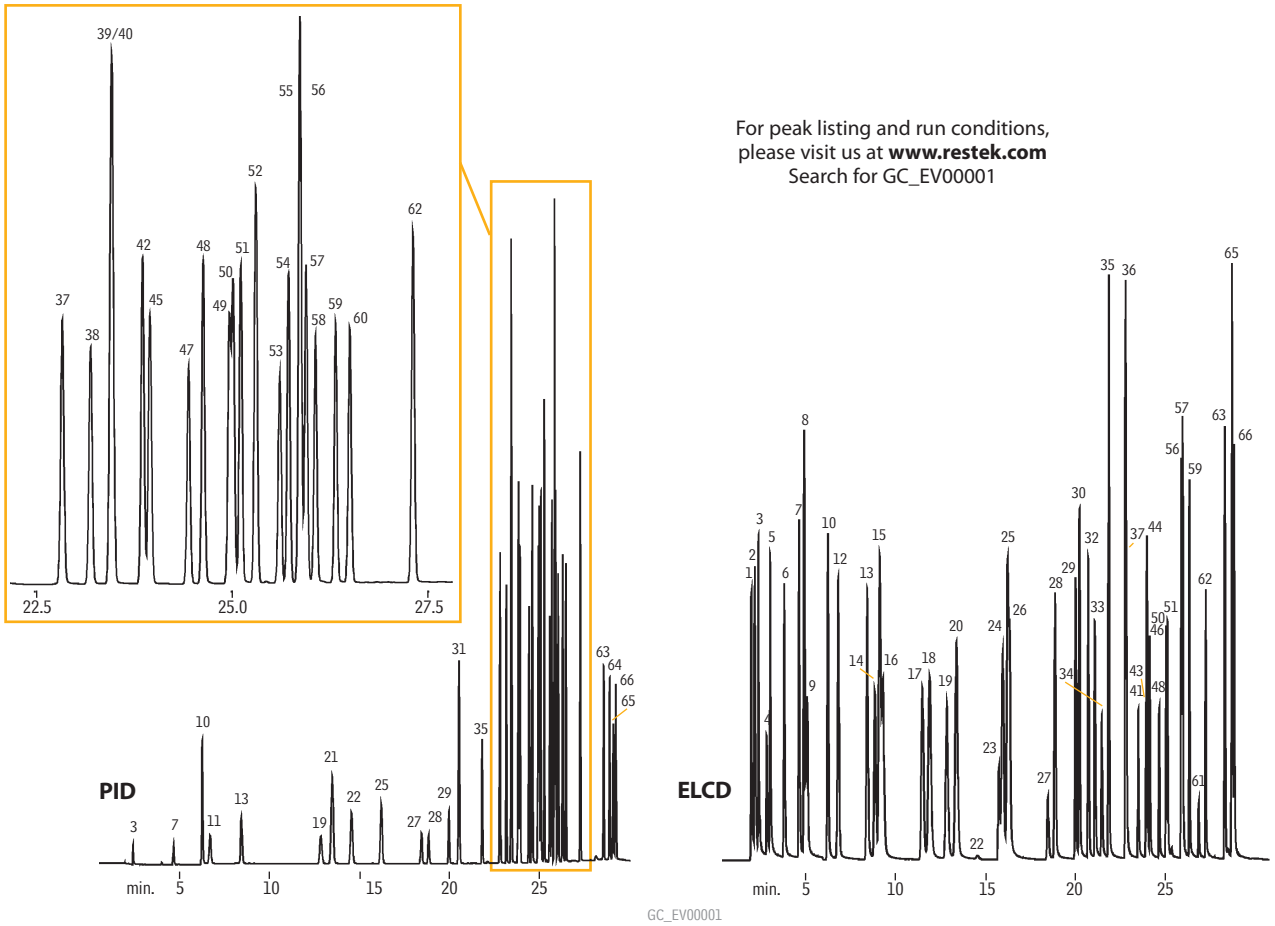
similar **phases**

DB-VRX

Need a column for a volatiles analysis?

see **page 537**

Excellent resolution of EPA Method 8021 volatile organics on an Rtx®-VRX column.



Acknowledgement: Finnigan 9001 GC, µGold Tandem Photoionization/HALL® 2000 Electrolytic Conductivity Detector provided courtesy of Thermo Electron GC & GC/MS Division, 2215 Grand Avenue Pkwy, Austin, Texas 78728

Volatile Organics Analysis

Rtx®-502.2 (proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants. The Rtx®-502.2 column is cited in US EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks.
- Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Stable to 270°C.

An Rtx®-502.2 column will enable you to quantify all compounds listed in US EPA methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-502.2 stationary phase provides low bleed and thermal stability to 270°C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling. Narrow bore columns can interface directly in GC/MS systems.

Rtx®-502.2 Columns (fused silica)
(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

ID	df (µm)	temp. limits	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	1.40	-20 to 250/270°C	10915	10916		
0.32mm	1.80	-20 to 250/270°C	10919	10920		10921
0.45mm	2.55	-20 to 250/270°C			10986	
0.53mm	3.00	-20 to 250/270°C	10908	10909		10910

ID	df (µm)	temp. limits	20-Meter	40-Meter
0.18mm	1.00	-20 to 250/270°C	40914	40915

similar **phase**

DB-502.2

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **pages 111** for our MXT®-502.2 and MXT®- Volatiles columns.

Rtx®-Volatiles (proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Stable to 280°C.

Rtx®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in US EPA methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-Volatiles stationary phase provides low bleed and thermal stability to 280°C. Narrow bore columns can interface directly in GC/MS systems.

Rtx®-Volatiles Columns (fused silica)
(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

ID	df (µm)	temp. limits*	30-Meter	60-Meter	105-Meter
0.25mm	1.00	-20 to 270/280°C	10900	10903	
0.32mm	1.50	-20 to 270/280°C	10901	10904	
0.53mm	2.00	-20 to 270/280°C	10902	10905	10906

similar **phase**

VOCOL

Searching for a chromatogram?
www.restek.com

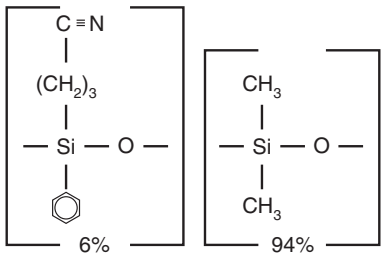
Volatile Organics Analysis

Rtx®-624 (low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/ 94% dimethyl polysiloxane)

- Application-specific columns for volatile organic pollutants. Recommended in US EPA methods for volatile organic pollutants.
- Temperature range: -20°C to 240°C.
- Equivalent to USP G43 phase.

The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first six gases in EPA Methods 8260 and 524.2. This stationary phase is especially well-suited for EPA Method 524.2 revision IV since it resolves 2-nitropropane from 1,1-dichloropropanone, which share quantification ion m/z 43 and must be separated chromatographically.

Rtx®-624 Structure



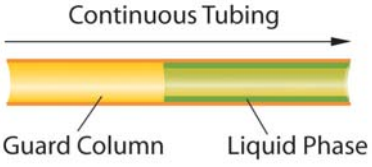
Rtx®-624 Columns (fused silica)
(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits	30-Meter	60-Meter	75-Meter	105-Meter
0.25mm	1.40	-20 to 240°C	10968	10969		
0.32mm	1.80	-20 to 240°C	10970	10972		
0.45mm	2.55	-20 to 240°C			10982	
0.53mm	3.00	-20 to 240°C	10971	10973	10974	10975

ID	df (µm)	temp. limits	20-Meter	40-Meter
0.18mm	1.00	-20 to 240°C	40924	40925

Integra-Guard™ built-in guard column

Get the protection without the connection!
For Rtx®-624 columns with built-in Integra-Guard™ guard columns, see **page 33**.



similar **phases**

DB-1301, DB-624, HP-1301, HP-624, SPB-1301, SPB-624, VF-1301, VF-624ms, CP-1301, CP-Select 624 CB

also **available**

MXT® Columns
Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 111** for our MXT®-624 columns.

Explosives Analysis

Rtx®-TNT/Rtx®-TNT2 (proprietary Crossbond® phase)

- Application-specific columns for explosives in US EPA Method 8095.
- Low bleed—ideal for ECD analysis.
- Complete analysis in less than 20 minutes.
- Rtx®-TNT2 confirmation column provides 8 elution order changes under same conditions.
- Economical 3-packs.
- Stable to 310°C.

We designed Rtx®-TNT and Rtx®-TNT2 columns specifically for analyses of nitroaromatic compounds by GC/ECD, such as the 16 analytes listed in US EPA Method 8095. They provide better resolution and higher thermal stability than any other currently recommended columns. Operate the Rtx®-TNT primary column and Rtx®-TNT2 confirmation column under identical GC oven temperature programs.

Rtx®-TNT Columns (fused silica)

ID	df (µm)	temp. limits	6-Meter/3-pk.
0.53mm	1.50	-20 to 300/310°C	12998

Rtx®-TNT2 Columns (fused silica)

ID	df (µm)	temp. limits	6-Meter/3-pk.
0.53mm	1.50	-20 to 300/310°C	12999

restek **innovation**!

Improved resolution of nitroaromatic compounds such as those listed in US EPA Method 8095.

GC COLUMNS
PLOT COLUMNS

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Porous Polymers 100-101
Rt-Q-BOND, Rt-QS-BOND, Rt-S-BOND, Rt-U-BOND





Top: Kelsea Miller, Caging Technician
Bottom: Kim Shaffer, Manufacturing Group Leader

What's **NEW?** look for this circle

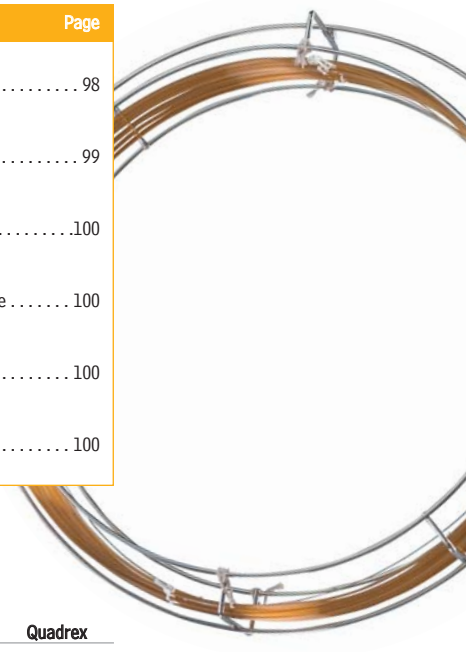
PLOT Column Selection

Features & Benefits of Restek PLOT Columns

Features	Benefits
Highest quality porous materials.	**The most consistent and efficient analyses obtainable.**
Consistency in porosity and uniformity in particle and pore size are major concerns in designing the solid stationary phase. We developed a unique synthesis and selection technology to yield uniform, small diameter particles that are ideal for a specific separation.	
Particles are 100% bonded to the tubing.	**Reduced particle generation and flow restriction.**
Restek coating and bonding techniques produce strong, uniform particle adherence to the inside of the capillary tubing. Customers have described Restek's Rt®-Msieve 5A PLOT column as "bulletproof," meaning that the stationary phase is bonded so strongly that particle generation is minimized.	
Reproducible quality.	**Reproducible performance.**
Because we use advanced technology to make these columns, the entire manufacturing process is simple and stable. Each step of the column-making process is meticulously quality-checked, allowing Restek to offer the best quality PLOT columns available.	

Quick Reference Chart

PLOT Column	Application	Page
Rt-Alumina BOND (Na_2SO_4 deactivation)	C1–C5 hydrocarbons. Purity analysis of ethylene, propylene, butenes, butadiene	98
Rt-Msieve 5A	Permanent gas analysis. He, Ne, Ar, O_2, N_2, Xe, Rn, SF6, and CH_4, C_2H_6, CO	99
Rt-Q-BOND	Nonpolar porous polymer. High retention for solvents, alcohols, polar volatiles, CO_2, sulfur, and ppm water in solvents	100
Rt-QS-BOND	Intermediate polarity porous polymer. Neutral solvents, ketones, esters, hydrocarbons, and baseline separation of ethane, ethene, acetylene	100
Rt-S-BOND	Intermediate polarity porous polymer. Light gases in ethylene and propylene, ketones, esters, hydrocarbons	100
Rt-U-BOND	Polar porous polymer. More retention for polar compounds	100



PLOT Column Phase Cross-Reference: Similar Selectivity

Restek	Porous Layer	Agilent/J&W	Supelco	Alltech	Varian/Chrompack	Quadrex
Rt-Alumina BOND (Na_2SO_4 deactivation)	Aluminum oxide	GS-Alumina, HP PLOT S, HP PLOT M	Alumina-PLOT	AT-Alumina	CP-$A1_2O_3$/NA_2SO_4	——
Rt-Msieve 5A	Molecular sieve 5A	GS-Molsieve, HP PLOT/Molesieve	Molsieve 5A PLOT	AT-Molesieve	CP-Molesieve 5A	PLT-5A
Rt-Q-BOND	DVB porous polymer	——	Supel-Q-PLOT	AT-Q	CP-PoraPlot Q, PoraBond Q	——
Rt-QS-BOND	Intermediate polarity porous polymer	GS-Q	——	——	——	——
Rt-S-BOND	DVB vinylpyridine polymer	——	——	——	CP-PoraPlot S	——
Rt-U-BOND	DVB ethyleneglycol-dimethylacrylate polymer	HP-UPLOT	——	——	CP-PoraPlot U, PoraBond U	——

PLOT Column Selection

New Generation Porous Layer Open Tubular (PLOT) Columns

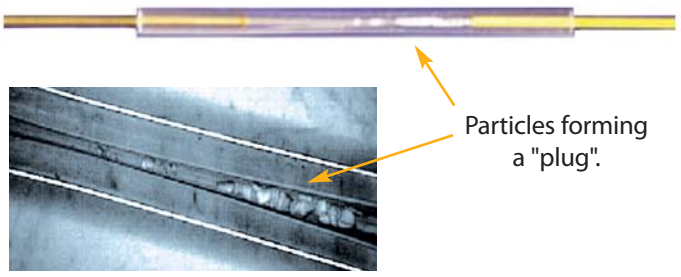
- Stabilized particle layers improve robustness and reproducibility of retention and flow; no retention time changes between columns.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- New manufacturing procedure improves performance of porous polymers and molecular sieves.

Porous layer open tubular (PLOT) columns are very beneficial for solving application problems, especially for the analysis of volatile compounds. PLOT columns have a unique selectivity, allowing for the separation of gaseous compounds at room temperature. Due to the adsorption mechanism of the supports used in PLOT columns, permanent gases and light hydrocarbons can be resolved at room temperature. Columns can then be programmed to higher temperatures to elute higher boiling compounds.

Traditional PLOT Columns Offer Poor Stability

The traditional PLOT column is built with a 5-50µm layer of particles adhered to the tubing walls. Because this layer of particles generally lacks stability, PLOT columns must be used very carefully, as particle release is common and can cause unpredictable changes in retention time and flow behavior. PLOT columns generally must be used in conjunction with particle traps to prevent the contamination of valves, injectors, and GC detectors. Figure 1 shows an example of particle accumulation resulting in a blockage inside a Press-Tight® liner. If particle traps are not used, particles will hit the detector resulting in electronic noise, seen as spikes on the baseline. In the case of valves, particles can become lodged in the valve and result in leaks.

Figure 1 Particles released from traditional PLOT columns can cause blockages.



New Stabilized PLOT Columns Minimize Particle Release

Restek has developed new procedures to manufacture PLOT columns with concentric stabilized adsorption layers. The new generation PLOT columns show a constant flow behavior (permeability) and have significantly improved mechanical stability, resulting in easier operation, better chromatography, and reduced particle release. Greater particle stability means more reproducible retention times, virtually no spiking, and longer column lifetimes. This innovative stabilization chemistry technology is currently applied to Rt®-Alumina BOND, Rt®-MSieve 5A, Rt®-Q-BOND, Rt®-QS-BOND, Rt®-S-BOND, and Rt®-U-BOND columns.

Consistent Flow Restriction Factor (F) Guarantees Reproducible Flow

Thick layers of particles are difficult to deposit in a homogeneous layer and, in traditionally manufactured PLOT columns, this results in variable coating thicknesses. The positions where the layer is thicker act as restrictions and affect flow (Figure 2). Depending on the number and intensity of these restrictions, traditional PLOT columns often show greater variation in flow restriction than wall coated open tubular (WCOT) columns. In practice, conventional PLOT columns with the same dimensions can differ in flow by a factor of 4-6, when operated at the same nominal pressure. For applications where flow is important, such as with Deans switching, the nonreproducible flow behavior of most commercially available PLOT columns is a problem.

Figure 2 Inconsistent coating thicknesses result in restrictions that cause significant variation in flow.



In order to evaluate flow restriction reproducibility, Restek is introducing a new factor: the flow restriction factor (F). The flow restriction factor is based on the retention time of an unretained compound (Equation 1). It can be used to assess the degree of restriction of the column and to evaluate the reproducibility of the column coating process. Percent flow restriction can also be calculated as shown in Equation 2. Figure 3 shows what typically happens when a conventional PLOT column manufacturing process is used. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns generated using the new process (Rt®-QS-BOND, bonded porous polymer). Clearly, the new PLOT column process results in greater consistency in both column coating thickness and flow restriction.

Figure 3 Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses (n=12).

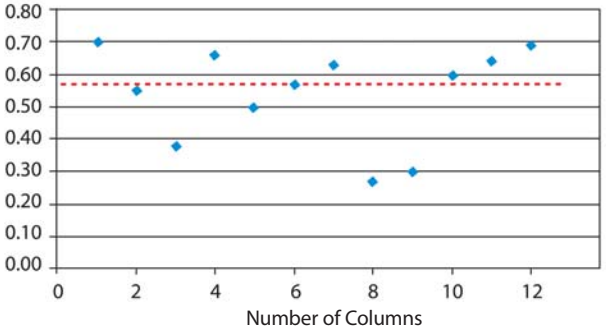
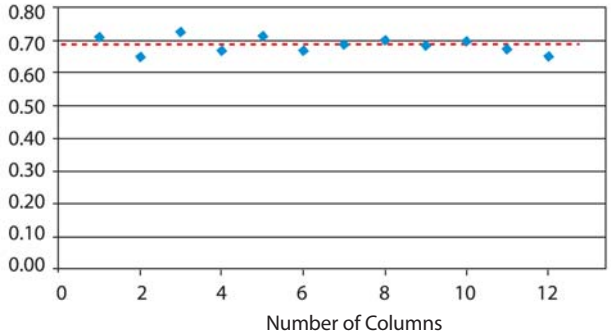


Figure 4 Restek's new stabilized PLOT columns offer consistent flow resistance, giving more reproducible results column-to-column.



In summary, Restek's new PLOT column manufacturing process produces exceptionally robust PLOT columns, featuring concentric stabilized coating layers. These new columns have more consistent flow resistance and are recommended for applications sensitive to variation in retention time or flow. These columns are a significant advance in PLOT column technology and are ideal for more efficient, reproducible analyses of permanent gases, solvents, and hydrocarbons.

Equation 1 Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

t_R = retention time

Note, F values will always be <1 as the coated column always has more restriction than the uncoated column.

Equation 2 Percent flow resctriction of coated column.

$$\% \text{ restriction} = (1 - F) \times 100$$

Rt®-Alumina BOND Columns

NEW! advanced technology

Details on **pages 96-97**.

did you **know**?

Rt®-Alumina BOND columns show unique retention characteristics for hydrocarbons.

tech tip

Trace water in the carrier gas can affect the selectivity and retention of the Rt®-Alumina BOND column. The column can be regenerated by baking out the water (50°C to 200°C @ 8°C/min., 50cm/sec. flow rate). Periodic conditioning ensures excellent run-to-run retention time reproducibility.

The maximum programmable temperature for an Rt®-Alumina BOND column is 200°C. Higher temperatures cause irreversible changes to the porous layer adsorption properties.

NEW! Rt®-Alumina BOND columns now available with KCl deactivation!

Rt®-Alumina BOND Column Characteristics

1. Highly selective for C1-C5 hydrocarbons; separates all unsaturated hydrocarbon isomers above ambient temperatures.
2. Reactivity of aluminum oxide stationary phase is minimized so that column response for polar unsaturates, such as dienes, is optimized. Column sensitivity or response ensures a linear and quantitative chromatographic analysis for these compounds.
3. Strong bonding prevents particle generation. The column can be used in valve switching operations, without release of particles that can harm the injection and detection systems.
4. The Rt®-Alumina BOND column is stable up to 200°C. If water is adsorbed on the column, it can be regenerated by conditioning at 200°C. Full efficiency and selectivity will be restored.

Guaranteed Reproducibility

Each Rt®-Alumina BOND column is tested with a hydrocarbon test mix to ensure proper phase thickness and selectivity. 1,3-Butadiene is used to calculate k (capacity factor), which is a measure of phase thickness. Selectivity is measured using retention indices for propadiene and methyl acetylene. The resolution of *trans*-2-butene and 1-butene is also verified. To measure coating efficiency, plates per meter are checked using 1,3-butadiene.

With our new technology, both Na_2SO_4 and KCl are available with the Rt®-Alumina BOND columns.

Rt®-Alumina BOND Columns (fused silica PLOT)

(Na_2SO_4 deactivation)

ID	df (µm)	temp. limits	30-Meter		50-Meter	
0.32mm	5	to 200°C	19757	enquire	19758	enquire
0.53mm	10	to 200°C	19755	enquire	19756	enquire

Rt®-Alumina BOND Columns (fused silica PLOT)

(KCl deactivation)

ID	df (µm)	temp. limits	30-Meter		50-Meter	
0.32mm	5	to 200°C	19761	enquire	19762	enquire
0.53mm	10	to 200°C	19759	enquire	19760	enquire

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

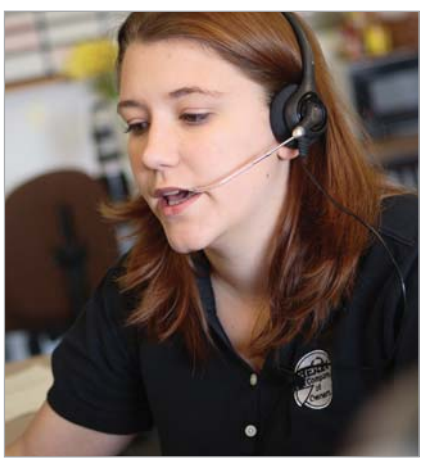
Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com



Melissa Decker, Customer Service

Rt®-Msieve 5A PLOT Columns

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O_2 and other permanent gases, including CH_4, C_2H_6, and CO. Special coating and deactivation procedures ensure chromatographic efficiency and the integrity of the porous layer coating. Molecular sieves have very high retention, allowing separations of permanent gases at temperatures above ambient. Additionally, Restek's unique immobilization process guarantees that the uniform particles remain adhered to the tubing—even after continuous valve-cycling.

Our revolutionary molecular sieve 5A PLOT columns separate Ar/O_2 and H_2/He at ambient temperature or above (see figure). These columns also are an excellent choice for rapid separation of permanent gases in refinery or natural gas.

Our deactivation technology also allows the CO peak to elute as a sharp peak. This is in contrast with other suppliers where CO often tails badly and cannot be quantified below % levels.

NEW! advanced technology

Details on **pages 96-97**.

did you know?

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O_2 and other permanent gases, including CH_4, C_2H_6, and CO.

Rt®-Msieve 5A Columns (fused silica PLOT)

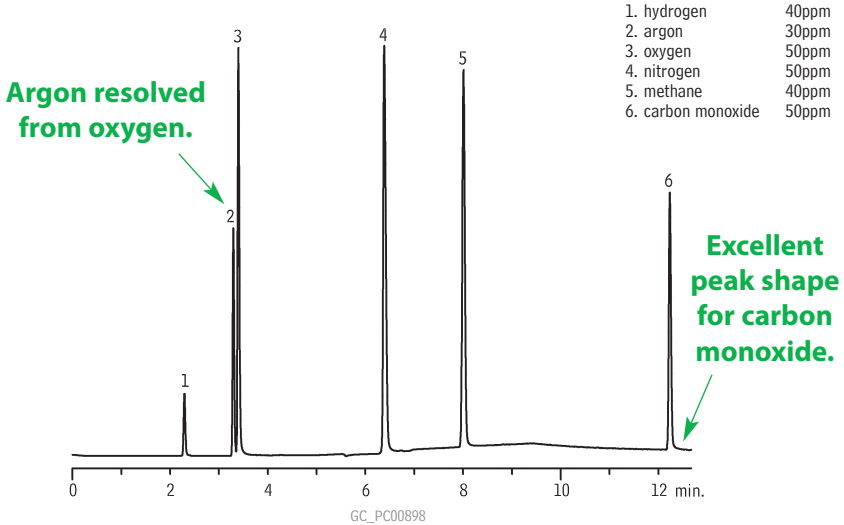
ID	df (µm)	temp. limits	15-Meter	30-Meter
0.32mm	30	to 300°C	19720	19722
0.53mm	50	to 300°C	19721	19723

MXT®-Msieve 5A (Siltek®-treated stainless steel PLOT)

ID	df (µm)	temp. limits	30-Meter	
0.53mm	50	to 300°C	79723	enquire

NEW! Metal PLOT columns are back!

Permanent gases on an Rt®-Msieve 5A PLOT column.



Column:	Rt®-Msieve 5A, 30m, 0.53mm ID, 50µm (cat.# 19723)
Sample:	permanent gases (ppm)
Inj.:	5µL sample loop, 6-port Valco valve, valve temp.: ambient
Inj. temp.:	200°C
Carrier gas:	helium, constant flow
Linear velocity:	5mL/min.
Oven temp.:	27°C (hold 5 min.) to 100°C @ 10°C/min. (hold 5 min.)
Det.:	Valco helium ionization detector @ 150°C

tech tip

Because molecular sieve materials are very hydrophilic, they will adsorb water from the sample or carrier gas. Water contamination can have a detrimental effect on peak symmetry and can reduce the resolution of all compounds. If water contamination occurs, reactivate your Rt®-Msieve 5A PLOT column by conditioning at 300°C with dry carrier gas flow for 3 hours.

did you know?

ShinCarbon ST micropacked columns are another alternative for analyzing permanent gases.

See **page 120** for information.

Searching for a chromatogram?
www.restek.com

Porous Polymer PLOT Columns



Porous Polymers: Rt®-Q-BOND, Rt®-QS-BOND, Rt®-S-BOND, Rt®-U-BOND

Restek chemists have developed a new process for the manufacturing of porous polymer PLOT columns. The process incorporates the particles to the walls of the tubing, so there is virtually no particle generation. Because of the particle adhering to the walls of the tubing, there is reproducible performance from column to column, including selectivity and flow.

NEW! advanced technology

Details on **pages 96-97**.

Rt®-Q-BOND Columns (fused silica PLOT)

100% divinylbenzene

- Nonpolar PLOT column incorporating 100% divinyl benzene.
- Excellent for analysis of C1 to C3 isomers and alkanes up to C12.
- CO_2 and methane separated from $O_2/N_2/CO$ (Note: $O_2/N_2/CO$ not separated at room temperature).
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 320°C.

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.32mm	10	to 300/320°C	19743	19744
0.53mm	20	to 300/320°C	19741	19742

Rt®-QS-BOND Columns (fused silica PLOT)

porous divinyl benzene homopolymer

- Intermediate polarity PLOT column incorporating divinyl benzene homopolymer.
- Separates ethane, ethylene and acetylene to baseline.

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.32mm	10	to 250°C	19739	19740
0.53mm	20	to 250°C	19737	19738

Rt®-S-BOND Columns (fused silica PLOT)

divinylbenzene 4-vinylpyridine

- Midpolarity PLOT column, incorporating divinyl benzene 4-vinylpyridine.
- Use for the analysis of nonpolar and polar compounds.

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.32mm	10	to 250°C	19747	19748
0.53mm	20	to 250°C	19745	19746

Rt®-U-BOND Columns (fused silica PLOT)

divinylbenzene ethylene glycol/dimethylacrylate

- Polar PLOT column, incorporating divinylbenzene ethylene glycol/dimethylacrylate.
- Use for the analysis of polar and nonpolar compounds.

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.32mm	10	to 190°C	19751	19752
0.53mm	20	to 190°C	19749	19750

NEW!

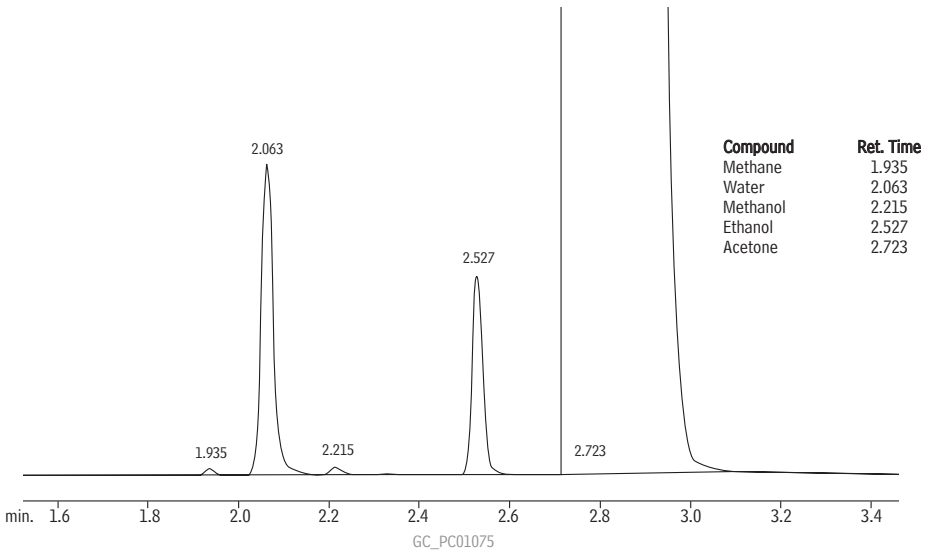
PLOT Column Particle Trap

- Includes two Press-Tight® connectors and a 2.5m column.
- Connect particle trap between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.

The technology used to adhere particles in PLOT columns is excellent; however, there is still a possibility for particles to dislodge. When using PLOT columns with a valve-switching system or GC/MS, we recommend using a particle trap at the outlet end of the column.

Description	qty.	cat.#	price
PLOT Column Particle Trap, 2.5m, 0.32mm ID w/2 Press-Tight Connectors	ea.	19753	enquire
PLOT Column Particle Trap, 2.5m, 0.53mm ID w/2 Press-Tight Connectors	ea.	19754	enquire

Water and ethanol in acetone on an Rt®-Q-BOND PLOT column.



Compound	Ret. Time
Methane	1.935
Water	2.063
Methanol	2.215
Ethanol	2.527
Acetone	2.723

Column:	Rt®-Q-BOND, 30m, 0.53mm ID, 20µm (cat.# 19742)
Sample:	0.5% water and ethanol in acetone
Inj.:	3µL split (split ratio 11:1), 4mm single gooseneck liner w/ wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28.7cm/sec. @ 200°C
Oven temp.:	200°C, isothermal
Det.:	TCD @ 260°C



"Our chemists and process engineers are dedicated to effective scale-up and continuous process improvement. We make sure the exceptional performance of Restek products is maintained from development all the way through manufacturing."

Restek's Process Development Group
pictured: Steve Constable, Wendy Henninger, Brian Salisbury, Rick Crago, Jennifer Weston, Tom Vezza (not pictured: Greg Hargrove)

GC COLUMNS
METAL (MXT®) COLUMNS

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Top: Aaron Decker, Manufacturing Technician
Bottom: Bryan Wolcott, CFO and Tina Welch, HR Director

What's NEW? look for this circle

MXT® Columns Overview

What is an MXT® column?

MXT® columns are made from stainless steel tubing that has had the internal surface treated with our exclusive Siltek® surface treatment. The Siltek® layer makes the surface as inert as deactivated fused silica. The unique Siltek® process enables us to offer MXT® columns in a wide range of internal diameters, including 0.18mm, 0.25mm, 0.32mm, and 0.53mm. Because the Siltek® layer permeates the stainless steel surface, rather than simply coating it, the layer is exceptionally flexible, so the tubing can be coiled to very small diameters. The standard coil diameter for MXT® columns is 4.5 inches. The minimum coil diameter for 0.53mm ID columns is 2.5 inches, and the minimum coil diameter for 0.25mm ID columns is 1.5 inches.



MXT ideal for high-temperature analyses

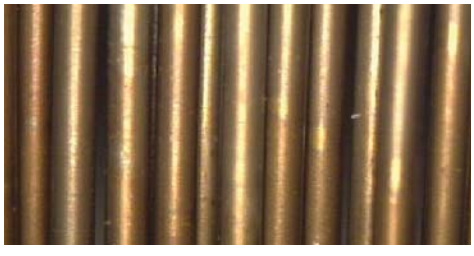
The unique properties of the Siltek® treated surface enable us to treat the tubing with a wide variety of polymer phases. The many choices of MXT® columns include:

- MXT®-1
- MXT®-5
- MXT®-1HT Sim Dist
- MXT®-2887
- MXT®-20
- MXT®-35
- MXT®-50
- MXT®-65
- MXT®-65TG
- MXT®-1301
- MXT®-1701
- MXT®-200
- MXT®-WAX
- MXT®-502.2
- MXT®-Volatiles
- MXT®-624
- MXT®-Biodiesel TG
- Guard tubing

Compare MXT® columns and fused silica columns:

- Metal tubing allows MXT® columns to be used to higher temperatures (430°C) than fused silica columns (standard rating is 360°C). This is because the polyimide resin that encases the fused silica becomes brittle over time at high temperatures. MXT® columns do not become brittle over time.
- Inertness of MXT® columns and fused silica columns is similar, due to the unique properties of the Siltek® surface treatment in MXT® columns.
- Coating efficiency (plates/meter) of MXT® columns is equivalent to that of fused silica.
- MXT® columns will not break under stress, and they can be coiled to small diameters.

MXT®-Biodiesel TG columns are undamaged by high thermal cycles compared to high-temperature fused silica columns which break down under the same conditions.



MXT®-Biodiesel TG columns are undamaged by high thermal cycles.



HT fused silica columns, labeled as stable to 430°C, show pitting and breakdown.

100 temperature cycles to 430°C totaling 500 minutes at maximum temperature.

MXT® columns are your best choice for:

- Situations in which the potential for column breakage is high:
  - field instruments
  - process GC
  - GCs with small ovens, such as portable instruments, requiring tightly coiled columns.
- High temperature chromatography. Siltek® deactivated stainless steel tubing can withstand temperatures exceeding 430°C; the only limitation to oven temperature is the polymer itself.

Custom MXT® columns

We are able to supply 0.18, 0.25, 0.28, 0.32, and 0.53mm ID columns with the phases listed above in many different configurations. If you do not see the column you need listed in the following pages, call us or your Restek representative, and we will be happy to help.

MXT® Guard/Retention Gap Columns

Intermediate-Polarity Deactivated MXT® Guard/Retention Gap Columns/ Transfer Lines (passivated stainless steel)

- Useful for a wide range of applications.
- Use with most common solvents.
- Maximum temperature: 430°C

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter
0.28mm	0.53 ± 0.025mm	70044	70044-600	70046
0.53mm	0.74 ± 0.025mm	70045	70045-600	70047

Hydroguard™ Treated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Extend analytical column lifetime by preventing degradation by harsh "steam-cleaning" water injections.
- Maximum temperature: 430°C.

When transfer lines from purge & trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds such as alcohols and diols.

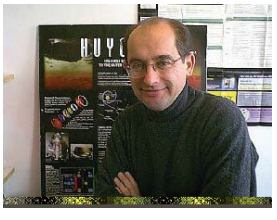
Restek chemists have addressed this concern and found a solution—the Hydroguard™ deactivation process. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard™ deactivation layer effectively prevents water vapor from reaching the fused silica surface beneath. Use Hydroguard™ tubing for connecting GCs to:

- Purge & trap systems.
- Headspace analyzers.
- Air analysis equipment and concentrator units.

Nominal ID	Nominal OD	5-Meter	10-Meter	30-Meter*	60-Meter*†
0.28mm	0.53 ± 0.025mm	70080	70083	70086	70089
0.53mm	0.74 ± 0.025mm	70081	70084	70087	70090

*30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60m guard columns into shorter lengths. Using full length may cause peak distortion.

a **plus 1** story



"Since now almost 15 years , the Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA) of the University of Paris XII has been developing GC subsystems for on-board space probe GCMS experiments dedicated to the *in situ* analysis of extraterrestrial environments. Most of the capillary columns used in these subsystems were and still are provided by the Restek company.

One capillary column, MXT®-1701[1], was aboard the Huygens probe of the Cassini-Huygens mission which explored successfully in 2005 the atmosphere of Titan, the largest moon of Saturn. Four columns, MXT®-1, 20, 1701 and MXT®-UPLOT[2], are "en route" towards the comet Churyumov-Gerasimenko in the frame of the ESA Rosetta mission launched in 2004 to arrive by 2014. They will be used for the first time *in situ* analysis of a cometary nucleus. And finally, so far, 4 other PLOT (MXT® U) and WCOT[3,4] (MXT®-1, 20 and CLP) columns have been selected and are currently being built in the GC of the Sample Analysis at Mars (SAM) Pyr/GCMS instrument, part of the payload of the NASA MSL 2009 Mars exploratory mission.

I would like to mention that all the columns selected for space mission are Silcosteel® treated metal capillary columns and they have all been submitted successfully to space qualification tests such as vibration, radiation and thermal cycles[5], which demonstrated their robustness for space application.

Since the beginning, the Restek company has been more than a manufacturer providing LISA with columns. Indeed, it has been strongly collaborating and helping LISA to develop custom-made columns able to meet the requirements of such an unusual scientific goal for chromatographic columns. That is why LISA is very grateful to Restek for being this ideal partner without the help of which the study and development of chromatographic columns for space use could not have been possible."

Robert STERNBERG
Responsible for the space GC team at LISA (Paris, France)

References

[1]Sternberg, R., C. Szopa, D. Coscia, S. Zubrzycki, F. Raulin, C. Vidal-Madjar, H. Niemann and G. Israel *J. Chromatogr.*, 846, 307-315, (1999)
[2]C. Szopa, R. Sternberg, F. Raulin and H. Rosenbauer *Planetary and Space Science*, 51 (13) 863-877 (2003)
[3]Cabane, M., P. Coll, C. Szopa, G. Israël, F. Raulin, R. Sternberg, P. Mahaffy, A. Person, C. Rodier, R. Navarro-Gonzalez, H. Niemann, D. Harpold and W. Brinckerhoff *Adv. Space Research*, 33, 2240-2245 (2004)
[4]Zampolli, M-G., D. Meunier, R. Sternberg, C. Szopa., F, Raulin, M. C. Pietrogrande, F. Dondi *Chirality* 18 (5):383-394 (2006)
[5]C. Szopa, U.J. Meierhenrich, D. Coscia, L. Janin, F. Goesmann, R. Sternberg, J.-F. Brun, G. Israel, M. Cabane, R. Roll, F. Raulin, W. Thiemann and C. Vidal-Madjar and H. Rosenbauer *J. Chromatogr. A*, 982 303-312 (2002)

Restek Tubing Scorer for MXT® Columns

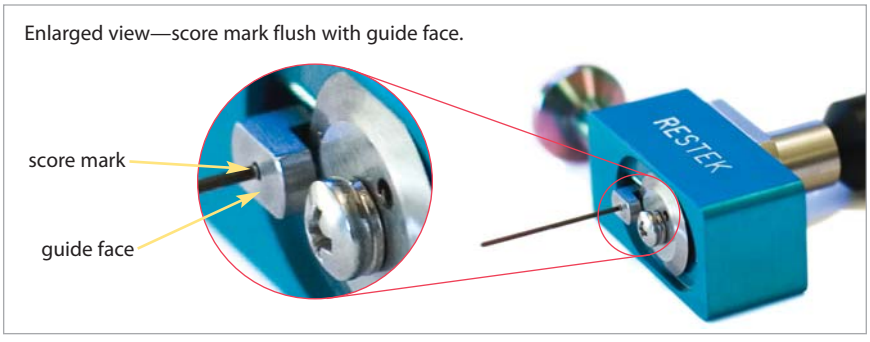
NEW!

- Makes perfect cuts every time.
- Easy to use.
- Leaves column entrance perfectly round.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.



Make a perfect column cut every time!



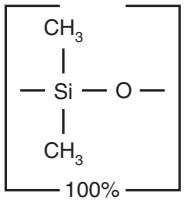
Description	qty.	cat.#	price
Restek Tubing Scorer for MXT Columns (0.25-0.53mm ID & 0.5-0.8mm OD)	ea.	20523	
Replacement Scoring Wheel	ea.	20522	

MXT®-1 (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for solvent impurities, PCB congeners or (e.g.) Aroclor mixes, simulated distillation, drugs of abuse, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Temperature range: -60°C to 430°C.
- Equivalent to USP G1, G2, G38 phases.

MXT®-1 columns exhibit long lifetime and very low bleed at high operating temperatures. A proprietary synthesis process eliminates residual catalysts that could cause degradation and increase bleed.

MXT®-1 Structure



MXT®-1 Columns (Siltek® treated stainless steel)

(Crossbond® 100% dimethyl polysiloxane)

ID	df (µm)	temp. limits	6-Meter	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 330/430°C		70105	70116	70117	70114
	0.25	-60 to 430°C		70120	70123	70126	70129
	0.50	-60 to 400°C		70135	70138	70141	70144
	1.00	-60 to 340/360°C		70150	70153	70156	70159
0.28mm	0.10	-60 to 430°C	70102	70106	70109		
	0.25	-60 to 430°C		70121	70124	70127	
	0.50	-60 to 400°C		70136	70139	70142	
	1.00	-60 to 320/360°C		70151	70154	70157	
	3.00	-60 to 285/360°C		70181	70184	70187	
0.53mm	0.15	-60 to 430°C	70101*	70107			
	0.25	-60 to 430°C		70122	70125	70128	
	0.50	-60 to 400°C		70137	70140	70143	
	1.00	-60 to 320/360°C		70152	70155	70158	
	1.50	-60 to 310/360°C		70167	70170	70173	
	3.00	-60 to 285/360°C		70182	70185	70188	70189
	5.00	-60 to 270/360°C		70177	70179	70183	
	7.00	-60 to 250/360°C		70191	70192	70193	

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	-60 to 330/430°C	71811	71812	71813
	0.40	-60 to 320/400°C	71814	71815	71816

Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

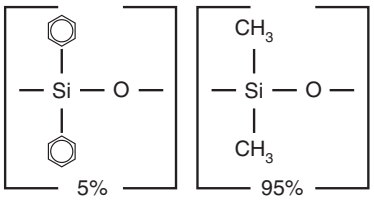
*For simulated distillation.

similar phases

DB-1, DB-1MS, HP-1, HP-1MS, Ultra-1, SPB-1, Equity-1, MDN-1, CP-Sil 5 CB, VF-1ms

MXT®-5, MXT®-2887

MXT®-5 Structure



similar phases

DB-5, HP-5, HP-5MS, Ultra-2, SPB-5, Equity-5, MDN-5, CP-Sil 8 CB

Note: DB-5MS is a silarylene based polymer similar to Rxi®-5Sil MS.

MXT®-5 (low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners or (e.g.) Aroclor mixes, essential oils, and semivolatiles.
- Temperature range: -60°C to 430°C.
- Equivalent to USP G27, G36 phases.

The 5% diphenyl/95% dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the MXT®-5 polymer, providing a tight monomodal distribution and extremely low bleed.

MXT®-5 Columns (Siltek® treated stainless steel)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.10	-60 to 430°C	70205	70208	70211
	0.25	-60 to 430°C	70220	70223	70226
	0.50	-60 to 400°C	70235	70238	70241
	1.00	-60 to 340°C	70250	70253	70256
0.28mm	0.25	-60 to 430°C	70221	70224	70227
	0.50	-60 to 400°C	70236	70239	70242
	1.00	-60 to 325/360°C	70251	70254	70257
	3.00	-60 to 290/360°C	70281	70284	70287
0.53mm	0.25	-60 to 430°C	70222	70225	70228
	0.50	-60 to 400°C	70237	70240	70243
	1.00	-60 to 325/360°C	70252	70255	70258
	1.50	-60 to 300/360°C	70267	70270	70273
	3.00	-60 to 290/360°C	70282	70285	70288
	5.00	-60 to 270/360°C	70277	70279	70283

ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	-60 to 325/430°C	71821	71822	71823
	0.40	-60 to 325/400°C	71824	71825	71826

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-2887 (nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- Application-specific columns for simulated distillation.
- Stable to 400°C.

MXT®-2887 columns' stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements currently specified in ASTM method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times. Manufactured from Siltek®-treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available.

MXT®-2887 Column (Siltek® treated stainless steel)
(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (µm)	temp. limits	10-Meter
0.53mm	2.65	-60 to 400°C	70199

similar phases

DB-2887, Petrocol EX2887, CP-HT-Simdist CB

MXT®-Biodiesel TG

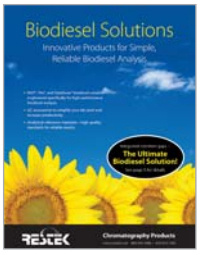
- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430°C for reliable, consistent performance.
- Integra-Gap™ built-in retention gap on 0.53mm ID column eliminates column coupling completely.

NEW! MXT®-Biodiesel TG column now available in more dimensions.

MXT®-Biodiesel TG Columns (Siltek® treated stainless steel)

Description	temp. limits	cat.#	price
14m, 0.53mm ID, 0.16 w/2m Integra-Gap*	-60 to 380/430°C	70289	
10m, 0.32mm ID, 0.10	-60 to 380/430°C	70292	
10m, 0.32mm ID, 0.10 w/2m x 0.53mm Retention Gap**	-60 to 380/430°C	70290	
15m, 0.32mm ID, 0.10	-60 to 380/430°C	70293	
15m, 0.32mm ID, 0.10 w/2m x 0.53mm Retention Gap**	-60 to 380/430°C	70291	
2m x 0.53mm MXT Biodiesel TG Retention Gap		70294	

*Total column length=16 meters.
**Connected with low-dead-volume MXT connector.



free literature

Biodiesel Solutions: Innovative Products for Simple, Reliable Biodiesel Analysis

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Flyer
lit. cat.# 580207

MXT®-1HT Sim Dist/MXT®-1 Sim Dist/MXT®-500 Sim Dist (nonpolar phases)

- Application-specific columns in unbreakable Siltek® treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation (e.g., ASTM Method D2887 Extended).
- MXT®-1HT Sim Dist and MXT®-1 Sim Dist phases offer true methyl silicone polarity; MXT®-500 Sim Dist phase is a carborane siloxane polymer.
- Stable to 430°C.

Manufactured from Siltek® treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available. As outlined in ASTM Method D6352, high temperature simulated distillation requires a column that can withstand temperatures to 430°C. MXT®-1HT Sim Dist and MXT®-500 Sim Dist columns exhibit excellent peak shape and low bleed, even at 430°C! The unique MXT®-1HT Sim Dist methyl silicone polymer gives the correct retention time/boiling point curve. The MXT®-500 Sim Dist carborane siloxane polymer offers a slight shift in the calculated boiling range distribution for petroleum samples containing aromatic hydrocarbons.

MXT®-1HT Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	5-Meter
0.53mm	0.10	-60 to 430°C	70100
	0.20	-60 to 400/430°C	70103

NEW! MXT®-1HT Sim Dist column now available in 0.20µm film thickness.

MXT®-1 Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70101

MXT®-500 Sim Dist Column (Siltek® treated stainless steel)

ID	df (µm)	temp. limits	6-Meter
0.53mm	0.15	-60 to 430°C	70104

similar **phases**

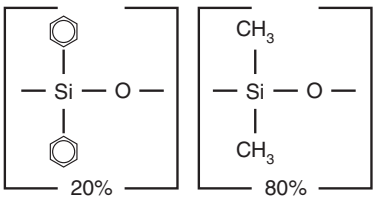
DB-1HT, CP-HT-Simdist CB

Polywax® Calibration Materials

Description	qty.	cat.#	price
Polywax 655 calibration material	1g	36225	
Polywax 1000 calibration material	1g	36227	

MXT®-20, MXT®-35, MXT®-50

MXT®-20 Structure



similar **phases**

SPB-20, VOCOL

MXT®-20 (low to midpolarity phase; Crossbond® 20% diphenyl/80% dimethyl polysiloxane)

- General purpose columns for volatile compounds, flavor compounds, and alcoholic beverages.
- Temperature range: -20°C to 340°C.
- Equivalent to USP G28, G32 phases.

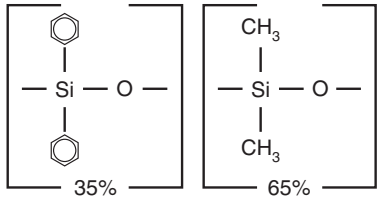
MXT®-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight monomodal distribution and extremely low bleed.

MXT®-20 Columns (Siltek® treated stainless steel)
(Crossbond® 20% diphenyl/80% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-20 to 320/340°C	70320	70323	70326
	1.00	-20 to 300/340°C	70350	70353	70356
0.28mm	0.25	-20 to 310/340°C	70321	70324	70327
	1.00	-20 to 295/340°C	70351	70354	70357
	3.00	-20 to 260/340°C	70381	70384	70387
0.53mm	0.25	-20 to 310/340°C	70322	70325	70328
	1.00	-20 to 295/340°C	70352	70355	70358
	3.00	-20 to 260/340°C	70382	70385	70388

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-35 Structure



similar **phases**

DB-35, HP-35, SPB-35, SPB-608

MXT®-35 (midpolarity phase; Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

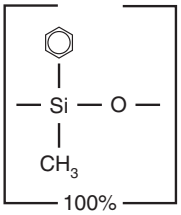
- General purpose columns for organochlorine pesticides, PCB congeners or (e.g.) Aroclor mixes, herbicides, pharmaceuticals, sterols, rosin acids, and phthalate esters.
- Temperature range: 0°C to 340°C.
- Equivalent to USP G42 phase.

MXT®-35 Columns (Siltek® treated stainless steel)
(Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.50	0 to 310/340°C	70435	70438	
	1.00	0 to 300/340°C	70450	70453	
0.53mm	1.00	0 to 260/340°C	70452	70455	70458
	1.50	0 to 250/340°C	70467	70470	70473
	3.00	0 to 240/340°C	70482	70485	70488

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-50 Structure



similar **phases**

HP-17, SPB-50, SP-2250

MXT®-50 (midpolarity phase; Crossbond® 100% methylphenyl polysiloxane)

- General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, and sterols.
- Temperature range: 0°C to 300°C.
- Equivalent to USP G3 phase.

MXT®-50 Columns (Siltek® treated stainless steel)
(Crossbond® 100% methylphenyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.53mm	0.83	0 to 270/300°C		70569	
	1.00	0 to 260/280°C	70552	70555	70558
	1.50	0 to 250/280°C	70567	70570	70573

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

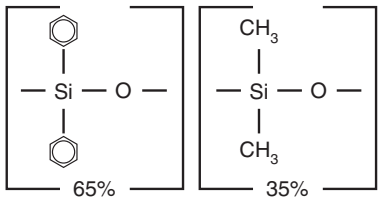
MXT®-65 (mid to high polarity phase; Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

- General purpose columns for phenols and fatty acids.
- Temperature range: 50°C to 300°C.
- Equivalent to USP G17 phase.

MXT®-65 Columns (Siltek® treated stainless steel)
(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.25	50 to 300°C	77020	77023
	0.50	50 to 300°C	77035	77038
	1.00	50 to 280/300°C	77050	77053

MXT®-65/MXT®-65TG Structure



similar phases

TAP-CB, 400-65HT, 007-65HT

MXT®-65TG (high polarity phase; Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370°C.

The MXT®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370°C thermal stability, an MXT®-65TG column should not be used for analyses of compounds that contain active oxygenated groups.

MXT®-65TG Columns (Siltek® treated stainless steel)
(Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	20 to 370°C	77005	77008
0.53mm	0.10	20 to 370°C	77007	77010

MXT®-1301 (low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

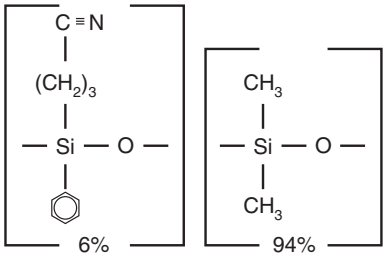
- General purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G43 phase.

MXT®-1301 Columns (Siltek® treated stainless steel)
(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-20 to 280°C	76020	76023	76026
	1.00	-20 to 260/280°C	76050	76053	76056
0.28mm	0.25	-20 to 280°C	76021	76024	76027
	1.00	-20 to 260/280°C	76051	76054	76057
	1.50	-20 to 250/280°C	76066	76069	76072
0.53mm	0.25	-20 to 280°C	76022	76025	76028
	1.00	-20 to 260/280°C	76052	76055	76058
	1.50	-20 to 250/280°C	76067	76070	76073
	3.00	-20 to 240/280°C	76082	76085	76088

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-1301 Structure

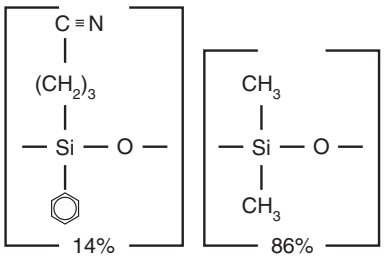


similar phases

DB-1301, DB-624, HP-1301, SPB-1301, SPB-624

MXT®-1701, MXT®-200, MXT®-WAX

MXT®-1701 Structure



similar **phases**

DB-1701, HP-1701, SPB-1701

MXT®-1701 (midpolarity phase; Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

- General purpose columns for alcohols, oxygenates, PCB congeners or (e.g.) Aroclor mixes, and pesticides.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G46 phase.

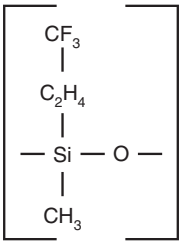
MXT®-1701 Columns (Siltek® treated stainless steel)

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-20 to 280°C	72020	72023	72026
	1.00	-20 to 260°C	72050	72053	72056
0.28mm	0.25	-20 to 280°C	72021	72024	72027
	1.00	-20 to 260°C	72051	72054	72057
	1.50	-20 to 250°C	72066	72069	72072
0.53mm	0.25	-20 to 280°C	72022	72025	72028
	0.50	-20 to 270/280°C	72037	72040	72043
	1.00	-20 to 260°C	72052	72055	72058
	1.50	-20 to 250°C	72067	72070	72073
	3.00	-20 to 240°C	72082	72085	72088

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-200 Structure



similar **phases**

DB-200, DB-210

MXT®-200 (midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, and glycols. Excellent confirmation column with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20°C to 400°C.
- Equivalent to USP G6 phase.

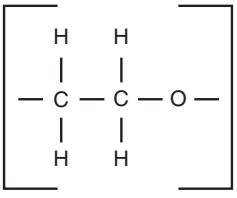
MXT®-200 Columns (Siltek® treated stainless steel)

(Crossbond® trifluoropropylmethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.50	-20 to 400°C	75035	75038	
	1.00	-20 to 310/360°C	75050	75053	
0.53mm	1.00	-20 to 290/360°C	75052	75055	75058
	1.50	-20 to 280/360°C	75067	75070	75073
	3.00	-20 to 260/360°C	75082	75085	75088

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-WAX Structure



similar **phases**

DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10, CP-Wax 52 CB

MXT®-WAX (polar phase; Crossbond® Carbowax® polyethylene glycol)

- General purpose columns for FAMEs, flavor compounds, essential oils, amines, solvents, xylene isomers, and US EPA Method 603 (acrolein/acrylonitrile).
- Resistant to oxidative damage.
- Temperature range: 40°C to 260°C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

MXT®-WAX Columns (Siltek® treated stainless steel)

(Crossbond® Carbowax® polyethylene glycol—provides oxidation resistance)

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter
0.25mm	0.10	40 to 260°C	70605	70608	70611
	0.25	40 to 260°C	70620	70623	70626
	0.50	40 to 260°C	70635	70638	70641
0.28mm	0.25	40 to 250/260°C	70621	70624	70627
	0.50	40 to 250/260°C	70636	70639	70642
	1.00	40 to 240/250°C	70651	70654	70657
0.53mm	0.25	40 to 250/260°C	70622	70625	70628
	0.50	40 to 250/260°C	70637	70640	70643
	1.00	40 to 240/250°C	70652	70655	70658
	1.50	40 to 230/250°C	70666	70669	70672
	2.00	40 to 220/250°C	70667	70670	

MXT®-502.2 (proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants, cited in US EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks. Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Temperature range: -20°C to 320°C.

An MXT®-502.2 column will enable you to quantify all compounds listed in US EPA methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-502.2 stationary phase provides low bleed and thermal stability to 320°C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling.

similar **phase**

DB-502.2

MXT®-502.2 Columns (Siltek® treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

ID	df (µm)	temp. limits	30-Meter	60-Meter	105-Meter
0.25mm	1.40	-20 to 270/320°C	70915	70916	
0.28mm	1.60	-20 to 250/320°C	70919	70920	70921
0.53mm	3.00	-20 to 270/320°C	70908	70909	70910

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.18mm	1.00	-20 to 270/320°C	71891	71892

MXT®-Volatiles (proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Temperature range: -20°C to 320°C.

MXT®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in US EPA methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-Volatiles stationary phase provides low bleed and thermal stability to 320°C.

similar **phase**

VOCOL

MXT®-Volatiles Columns (Siltek® treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

ID	df (µm)	temp. limits*	30-Meter	60-Meter	105-Meter
0.25mm	1.00	-20 to 280/320°C	70900	70903	
0.28mm	1.25	-20 to 280/320°C	70924	70926	70928
0.53mm	2.00	-20 to 280/320°C	70925	70927	70929
	3.00	-20 to 250/320°C	70922	70923	

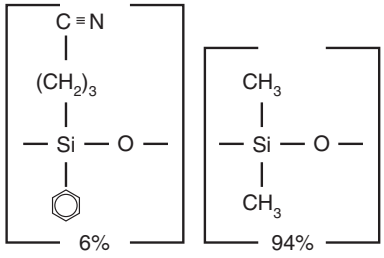
*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

MXT®-624 (low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/ 94% dimethyl polysiloxane)

- Application-specific columns for volatile organic pollutants. Recommended in US EPA methods for volatile organic pollutants.
- Temperature range: -20°C to 280°C.
- Equivalent to USP G43 phase.

The unique polarity of "624" columns makes them ideal for analyses of volatile organic pollutants. Although the MXT®-502.2 column is recommended in many methods, MXT®-624 columns offer the best separation of the early-eluting gases.

MXT®-624 Structure



similar **phases**

DB-624, HP-624

MXT®-624 Columns (Siltek® treated stainless steel)

(Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

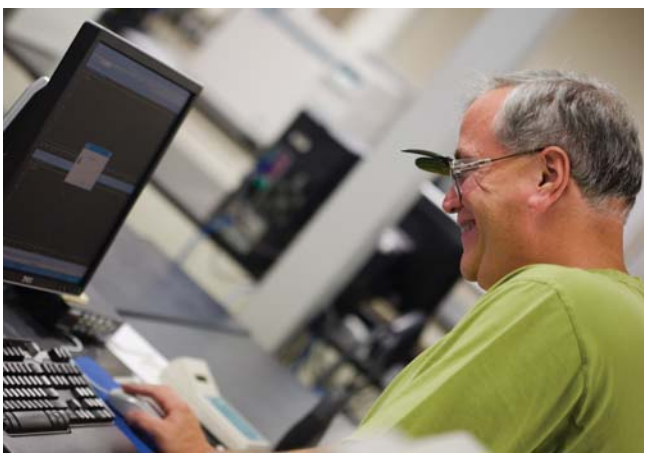
ID	df (µm)	temp. limits	30-Meter	60-Meter
0.25mm	1.40	-20 to 240/280°C	70968	70969
0.53mm	3.00	-20 to 240/280°C	70971	70973

ID	df (µm)	temp. limits	10-Meter	20-Meter
0.18mm	1.00	-20 to 240/280°C	71893	71894

GC COLUMNS
PACKED/ MICROPACKED COLUMNS

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Top: Scott Grossman, Applications Chemist
Bottom: Glenn Gerhab, Quality Assurance

Restek's packed columns deliver the

1-2-3 PUNCH!

1. Bonded stationary phases mean short conditioning times, low bleed, and unsurpassed column lifetimes.

2. SilcoSmooth™ tubing provides the inertness of glass and the durability of stainless steel.

3. Silcoport™ diatomaceous earth provides unsurpassed inertness for trace analysis.

Bonded Stationary Phases

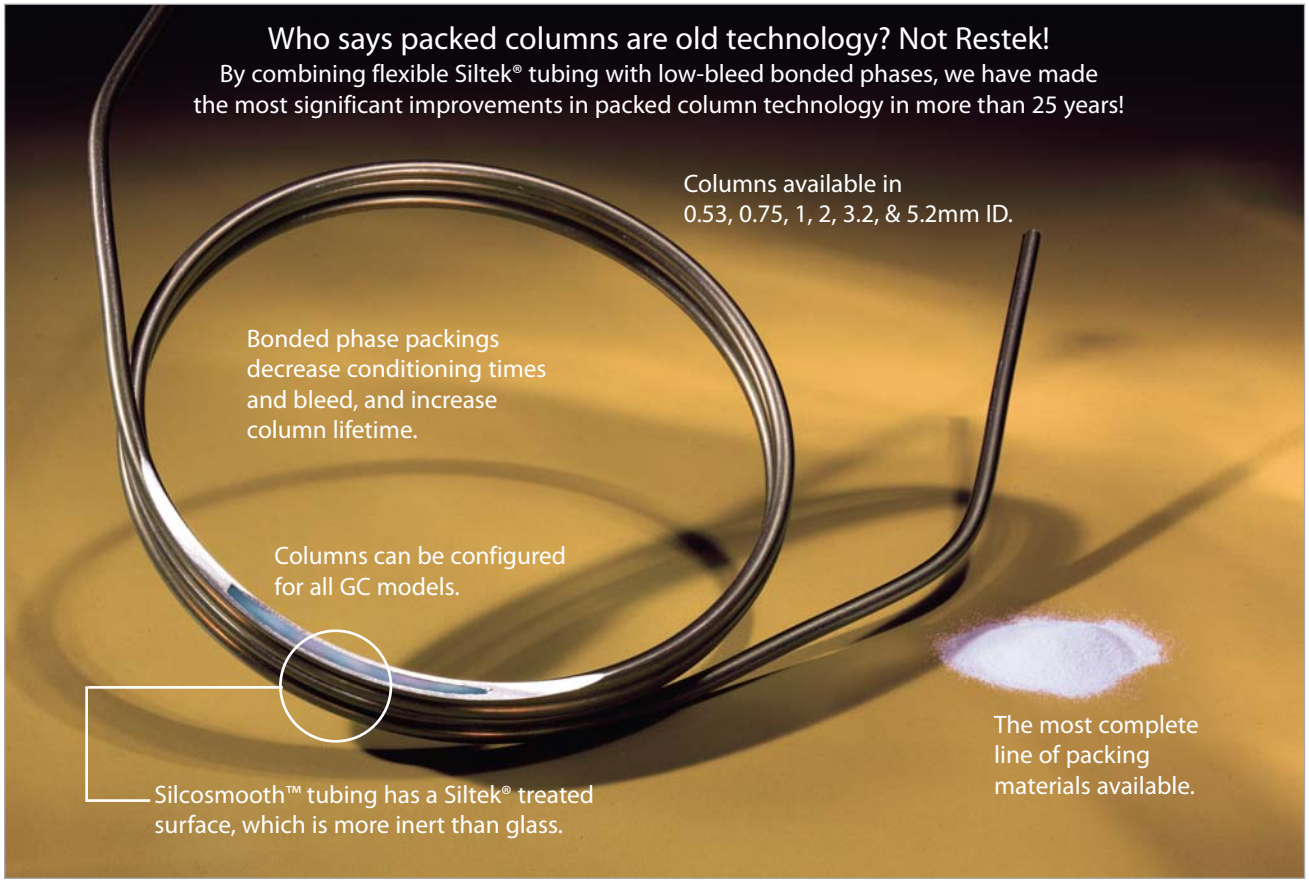
We combined our stationary phase synthesis experience with our unique Silcoport™ packing deactivation process to create bonded phase packings that provide longer lifetimes, lower bleed, and shorter conditioning times.

Bonded methyl silicone phases (Rtx®-1 and Rtx®-5) and bonded Carbowax® phase (Stabilwax®) are completely cross-linked on Silcoport™ packing. We have evaluated Rtx®-1 and Rtx®-5 bonded packed column phases side-by-side with nonbonded phases of comparable polarity; the bonded phases last longer than the equivalent nonbonded packing materials. Table I shows that retention times on an Rtx®-1 bonded packed column are highly repeatable after only 30 minutes of conditioning.

Table I Retention data shows the perfect reproducibility of the bonded phase packed columns with respect to retention times.

	Retention Time			
Hydrocarbon	Min.	Max.	Mean	Stand. Dev.
C5	0.241	0.243	0.242	0.001
C6	0.493	0.497	0.495	0.002
C10	5.746	5.765	5.752	0.005
C20	18.482	18.491	18.486	0.004
C28	25.093	25.103	25.098	0.004
C40	32.160	32.171	32.166	0.004
C44	34.316	34.328	34.326	0.007

n=9 columns



Bonded Packed Column Stationary Phases

- Short conditioning times.
- Low bleed levels.
- Higher sensitivities.
- Longer column lifetimes.
- Unsurpassed inertness for active compounds.

Bonded phases are used in capillary columns because they provide a dramatic increase in column quality. To truly bridge the gap between traditional packed columns and capillary columns, it was necessary to develop bonded liquid phases for packed columns. Packed column chromatographers can expect shorter conditioning times, lower bleed, and longer column lifetimes by using Restek bonded phase packed columns.

Bonded phases also last much longer than nonbonded phases. Bonded phases are more resistant to oxidation than nonbonded phases because of the stronger intermolecular forces produced by cross-linking. Because the material is thoroughly cross-linked, the phase will not migrate or puddle, as often happens with nonbonded phases. Figure 1 shows a comparison of a bonded and a nonbonded methyl silicone column after 170 temperature cycles. The results show the impressive durability of bonded phases.

Restek's packed columns deliver the

1-2-3 PUNCH!

1. Bonded stationary phases mean short conditioning times, low bleed, and unsurpassed column lifetimes.

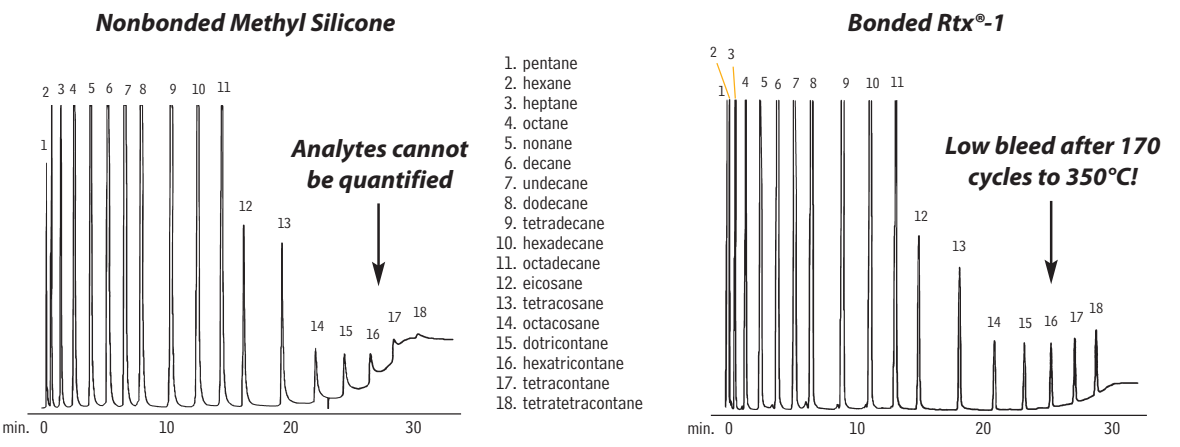
2. SilcoSmooth™ tubing provides the inertness of glass and the durability of stainless steel.

3. Silcoport™ diatomaceous earth provides unsurpassed inertness for trace analysis.

Equivalent Liquid Phases

Rtx-1	BP-1, CC-1, CP-Sil 5CB, DB-1, DC-200, GE-SF-96, HP-1, HP-101, OV-1, OV-101, RSK-150, RH-1, SE-30, SP-2100, SPB-1, UCC W-98
Rtx-5	BP-5, CB-5, CC-5, CP-Sil 8CB, DB-5, HP-5, OV-73, SE-52, SE-54, SPB-5, Ultra-5
Stabilwax	BP-20, CP-Wax, CW-20, DB-Wax, HP-Innowax, PE-Wax, Supelcowax-10

Figure 1 Bonded packed columns exhibit longer lifetime than nonbonded packed columns.



GC_PC00369

25" x 1/8" x 2mm ID Rtx®-1 Sim Dist 2887 SilcoSmooth™ stainless steel (cat.# 80000-800)
1.0µl direct injection, 1–12% (w/w) each component
Oven temp.: 35°C to 350°C @ 10°C/min. (hold 5 min.)
Inj. & det. temp.: 350°C
Carrier gas: helium @ 25mL/min.
FID sensitivity: 256 x 10^{-11} AFS

cat.# 31674 (1% each listed analyte in CS_2) and cat.# 31675 (5% each, neat) meet requirements of ASTM D2887-01.

Packed Column Tubing

Restek offers a wide range of tubing choices for our packed columns, including SilcoSmooth™ (Siltek®-treated stainless steel), stainless steel, Hastelloy®, nickel, copper, and Teflon® tubing. SilcoSmooth™ and stainless steel tubing are our two most popular column materials. SilcoSmooth™ tubing is an excellent replacement for fragile glass columns. Stainless steel tubing works well with most applications for nonreactive compounds.

SilcoSmooth™ Tubing

If your analysis involves reactive compounds, you can use fragile and inflexible glass columns, or you can step up to SilcoSmooth™ tubing which combines the inertness of glass with the strength and flexibility of stainless steel. Made from ultra-smooth, seamless 304 stainless steel and treated with Restek's innovative Siltek® deactivation process, SilcoSmooth™ tubing can replace glass columns for virtually any application.

Stainless Steel Tubing

If you are analyzing hydrocarbons or nonreactive compounds, you can use our rugged, flexible, and economical stainless steel columns. Restek stainless steel columns are made from high-quality weldrawn tubing.

Hastelloy® Tubing

Hastelloy® tubing is a nickel-chromium alloy with excellent inertness. It is normally used only for highly corrosive or oxidizing compounds or gases.

Nickel Tubing

Nickel tubing is often used for analyses of caustic or oxidizing compounds or gases.

Copper Tubing

Copper is a general purpose tubing that is only recommended for nonactive compounds.

Teflon® Tubing

Teflon® tubing is often used for reactive compounds or other special applications. Note that this tubing is permeable to gases.

Table I Packed column tubing dimensions

Material	1/4-inch OD x 5.3mm ID	3/16-inch OD x 3.1mm ID[1]	1/8-inch OD x 2.0mm ID[2]	1/16-inch OD x 1.2mm ID[3]	1/16-inch OD x 1.0mm ID[3]	0.95mm OD x 0.75mm ID[4]
SilcoSmooth	✔	✔	✔		✔	✔
Stainless Steel	✔	✔	✔	✔	✔	✔
Hastelloy			✔			
Nickel			✔			
Copper	✔		✔			
Teflon			✔			

[1] 3/16-inch OD x 3.1mm ID replaces 1/4-inch OD x 4mm ID glass columns.
[2] 1/8-inch OD x 2mm ID replaces 1/4-inch OD x 2mm ID glass columns.
[3] 1/16-inch OD x 1.2mm and 1.0mm ID micropacked columns are designed for packed column injection systems.
[4] 0.95mm OD x 0.75mm ID micropacked columns are designed for capillary injection systems.

1/8- or 3/16-inch OD columns are easily adaptable to 1/4-inch or 5mm ID injection ports, using inexpensive adaptors. All Restek packed columns can be coiled to fit any instrument configuration.

please **note**

We do not offer packed glass columns. SilcoSmooth™ columns offer the inertness of glass, without breakage problems.

did you **know**?

Restek's advanced packed column technology provides columns with unmatched inertness and efficiency.

Packed Column Reduction Fittings

We will weld tubing reducers or VCR fittings to your column. Call Customer Service (ext. 3), or your Restek representative, for pricing & availability.



Welded Tubing Reducers



Welded VCR Fittings

Stock Packed Columns

Bonded Packed Column Stationary Phases

- Low bleed levels.
- Longer column lifetimes.
- Short conditioning times.

Bonded Phase on 100/120 Silcoport W	Stainless Steel Tubing L (ft.)	OD (in.)	ID (mm)	cat.#*	price	SilcoSmooth Tubing** L (m)	OD (in.)	ID (mm)	cat.#*	price
3% Rtx-1	6	1/8	2.1	80441-		2	1/8	2	80401-	
10% Rtx-1	6	1/8	2.1	80442-		2	1/8	2	80405-	
20% Rtx-1	6	1/8	2.1	80443-		2	1/8	2	80409-	
3% Rtx-5	6	1/8	2.1	80444-		2	1/8	2	80477-	
10% Rtx-5	6	1/8	2.1	80445-		2	1/8	2	80478-	
20% Rtx-5	6	1/8	2.1	80446-		2	1/8	2	80479-	
5% Rtx-Stabilwax	6	1/8	2.1	80447-		2	1/8	2	80415-	
10% Rtx-Stabilwax	6	1/8	2.1	80448-		2	1/8	2	80416-	
20% Rtx-Stabilwax	6	1/8	2.1	80449-		2	1/8	2	80417-	
Rtx-1 SimDist 2887***	25"	1/8	2.1	80450-		25"	1/8	2	80000-	

please **note**

These columns are for on-column injections. For not-on-column configurations, add suffix -901.

Chromosorb®-Based Packed Columns

On 100/120 Silcoport W***	Stainless Steel Tubing L (ft.)	OD (in.)	ID (mm)	cat.#*	price	SilcoSmooth Tubing** L (m)	OD (in.)	ID (mm)	cat.#*	price
3% Rt-101	6	1/8	2.1	80461-		2	1/8	2	80400-	
3% Rt-2100	6	1/8	2.1	80462-		2	1/8	2	80420-	
5% Rt-1200/1.75% Bentone 34	6	1/8	2.1	80463-		2	1/8	2	80125-	
5% Rt-1200/5% Bentone 34	6	1/8	2.1	80464-		2	1/8	2	80129-	

for custom **columns**

see **page 131**

On Chromosorb PAW	Mesh	Stainless Steel Tubing L (ft.)	OD (in.)	ID (mm)	cat.#*	price	SilcoSmooth Tubing** L (m)	OD (in.)	ID (mm)	cat.#*	price
10% TCEP	100/120	8	1/8	2.1	80465-		2.5	1/8	2	80126-	
23% Rt-1700	80/100	30	1/8	2.1	80466-		9.2	1/8	2	80128-	

please **note**

Temperature limits for stationary phases are listed on **page 128**.

Porous Polymers

Restek offers a full range of porous polymers, including HayeSep®, Porapak, Chromosorb® Century Series polymers, and Tenax® TA packing, for analyses of volatile components and light solvents. Our QA procedures give you the confidence that every batch you purchase will deliver consistent column-to-column performance.

Porous Polymer Packed Columns

Porous Polymers 80/100 Mesh	Stainless Steel Tubing L (ft.)	OD (in.)	ID (mm)	cat.#*	price	SilcoSmooth Tubing** L (m)	OD (in.)	ID (mm)	cat.#*	price
HayeSep Q	6	1/8	2.1	80467-		2	1/8	2	80433-	
Porapak Q	6	1/8	2.1	80468-		2	1/8	2	80427-	
Porapak QS	6	1/8	2.1	80469-		2	1/8	2	80426-	
Porapak R	6	1/8	2.1	80470-		2	1/8	2	80425-	
Chromosorb 101	6	1/8	2.1	80471-		2	1/8	2	80435-	
Chromosorb 102	6	1/8	2.1	80472-		2	1/8	2	80434-	

also **available**

Chromosorb®, Porapak, HayeSep®, and Tenax® packing materials.
See **pages 126-127.**

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.
***Modified version of Chromosorb W; highest inertness, most consistent performance.

CarboBlack Solid Supports

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbopack and Carbograph supports.

		Stainless Steel Tubing					SilcoSmooth Tubing**				
On CarboBlack B	Mesh	L (ft.)	OD (in.)	ID (mm)	cat.#*	price	L (m)	OD (in.)	ID (mm)	cat.#*	price
5% Carbowax 20M	80/120	—	—	—	—	—	2	1/8	2	80105-	
5% Carbowax 20M	60/80	6	1/8	2.1	88012-		1.8	1/8	2	80106-	
6.6% Carbowax 20M	80/120	6	1/8	2.1	80451-		2	1/8	2	80107-	
4% Carbowax 20M/ 0.8% KOH	60/80	—	—	—	—	—	2	1/8	2	80116-	
1% Rt-1000	60/80	8	1/8	2.1	88013-		2.4	1/8	2	80206-	
1% Rt-1000	60/80	6	1/8	2.1	80452-		2	1/8	2	80207-	
3% Rt-1500	80/120	10	1/8	2.1	80453-		3.05	1/8	2	80211-	
1% Rt-1510	60/80	10	1/8	2.1	80454-		3.05	1/8	2	80216-	
1.5% XE-60/1% H_3PO_4	60/80	6	1/8	2.1	80455-		1.8	1/8	2	80305-	

		Nickel 200 Tubing				
On CarboBlack B	Mesh	L (m)	OD (in.)	ID (mm)	cat.#*	price
5% Krytox (Ni 200 tubing)	60/80	3.05	1/8	2.1	80127-	

		Stainless Steel Tubing					SilcoSmooth Tubing**				
On CarboBlack C	Mesh	L (ft.)	OD (in.)	ID (mm)	cat.#*	price	L (m)	OD (in.)	ID (mm)	cat.#*	price
0.2% Carbowax 1500	60/80	6	1/8	2.1	80456-		2	1/8	2	80121-	
0.2% Carbowax 1500	80/100	6	1/8	2.1	80457-		2	1/8	2	80122-	
0.1% Rt-1000	80/100	6	1/8	2.1	80458-		1.8	1/8	2	80205-	
0.19% picric acid	80/100	6	1/8	2.1	80459-		2	1/8	2	80311-	
0.3% Carbowax 20M/ 0.1% H_3PO_4	60/80	2.5	3/16	3.1	80460-		0.75	3/16	3.1	80111-	

Improved Molecular Sieves

Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. Restek's R&D chemists have developed a process for preparing molecular sieve packings, which result in excellent batch-to-batch reproducibility. In addition, our molecular sieves are preactivated and ready to use. Each column comes with metal end-fittings to prevent water or carbon dioxide from adsorbing into the packing during shipment.

Molecular Sieve Packed Columns

		Stainless Steel Tubing					SilcoSmooth Tubing**				
Molecular Sieve	Mesh	L (ft.)	OD (in.)	ID (mm)	cat.#*	price	L (m)	OD (in.)	ID (mm)	cat.#*	price
Molesieve 5A	60/80	6	1/8	2.1	80473-		2	1/8	2	80428-	
Molesieve 5A	80/100	3	1/8	2.1	88015-		1	1/8	2	80440-	
Molesieve 5A	80/100	6	1/8	2.1	80474-		2	1/8	2	80429-	
Molesieve 5A	80/100	10	1/8	2.1	88014-		3.05	1/8	2	80430-	
Molesieve 13X	60/80	6	1/8	2.1	80475-		2	1/8	2	80480-	
Molesieve 13X	80/100	6	1/8	2.1	80476-		2	1/8	2	80439-	

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Siltek-treated stainless steel.

also available

CarboBlack packing materials. See **page 124**.

Column Instrument Configurations


General Configuration
Suffix -800


Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*


Varian 3700, Vista Series, FID:
Suffix -820



PE 900-3920, Sigma 1,2,3:
Suffix -830



PE Auto System 8300, 8400, 8700 (Not On-Column):
Suffix -840

See page 133 for additional configurations.

Note: Initial 2" of column will be empty, to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1½" void on detector side.

Aromatics Analysis

D3606 Application Column (2 column set)

- Complete resolution of ethanol and benzene, with a resolution value > 3.00.
- Accurate quantification of benzene and toluene.
- Fully conditioned two column set—ready to use out of the box.
- A chromatogram is provided with each column set demonstrating conformance to the method.

Conforms to the specifications established in ASTM method D-3606-06 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.



free
literature

Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

Download your free copy from **www.restek.com**

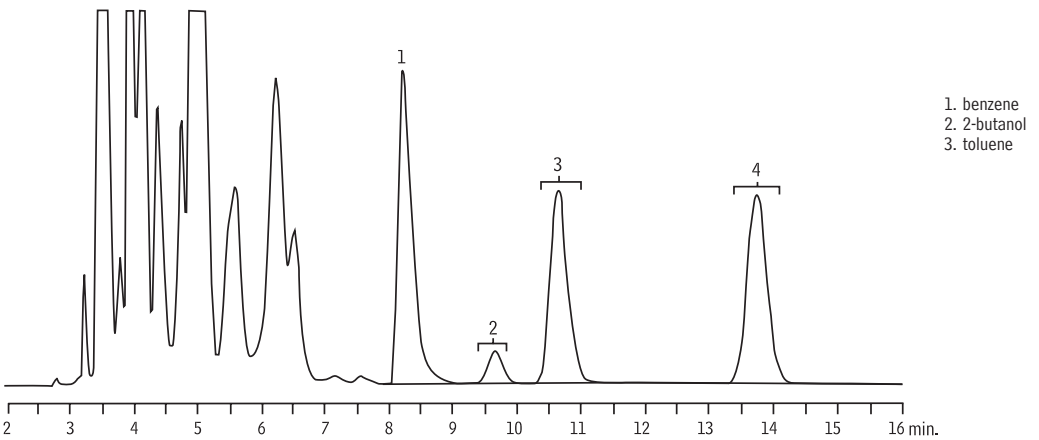
lit. cat.# 580227

D3606 Application Column (2 column set)

Description	cat.#*	price
D3606 Application Column (2 column set)**		
Column 1: 6' (1.8m), 1/8" OD, 2.0mm ID, nonpolar Rtx-1		
Column 2: 16' (4.9m), 1/8" OD, 2.0mm ID, proprietary packing material	83606-	

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 133.
**The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

Gasoline on a D3606 Application Column Set.



GC_PC01079

Column:	D3606 Application Column (2 column set, cat.# 83606-800) Column 1: nonpolar Rtx®-1, 6' (1.8m), 1/8" OD, 2.0mm ID Column 2: proprietary packing material, 16' (4.9m), 1/8" OD, 2.0mm ID
Sample:	1.5µL gasoline
Inj.:	200°C
Backflush:	~1 min.
Carrier gas:	helium, constant flow
Flow rate:	25mL/min.
Oven temp.:	135°C, isothermal
Det.:	TCD @ 200°C

Chromatogram courtesy of Boguslaw Dudek, Conoco Phillips, Linden, NJ.

Light Hydrocarbon Analysis

Special Columns for Unsaturated Light Hydrocarbons

- Faster separations of C1 to C4 hydrocarbons.
- Res-Sil™ packing replaces Porasil materials.

n-Octane on Res-Sil™ C Packed Column

This packed column has unique selectivity for resolving unsaturated light hydrocarbons (Figure 1).

OPN on Res-Sil™ C Packed Column

This column separates the light hydrocarbons, and baseline resolves *cis*-2-butene from 1,3-butadiene (Figure 2).

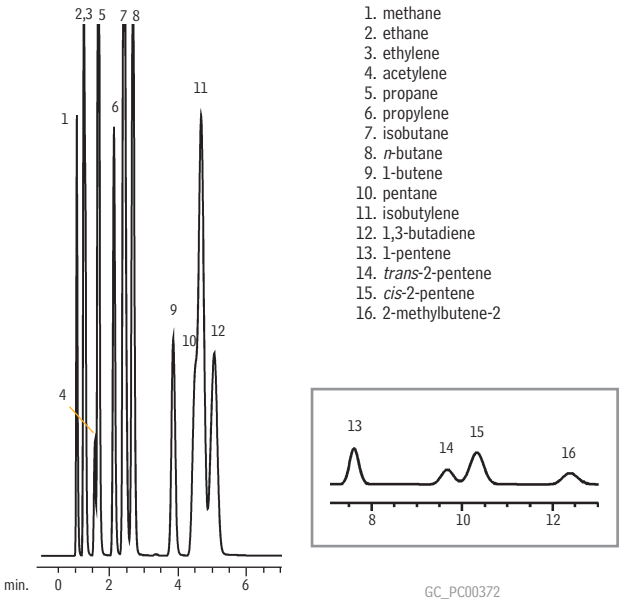
2abc Refinery Gas Column Set

This 3-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons (Figure 3).

Description	cat.#*	price
n-Octane on Res-Sil™ C, 80/100 (20', 2.0mm ID, 1/8" Silcosmooth™ OD)	80436-	
OPN on Res-Sil™ C, 80/100 (12', 2.0mm ID, 1/8" Silcosmooth™ OD)	80437-	
2abc Refinery Gas Column Set (3 column set)**	88000-	

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 133.
**This column set is for a valving system; therefore, packing material is filled to ends of columns.

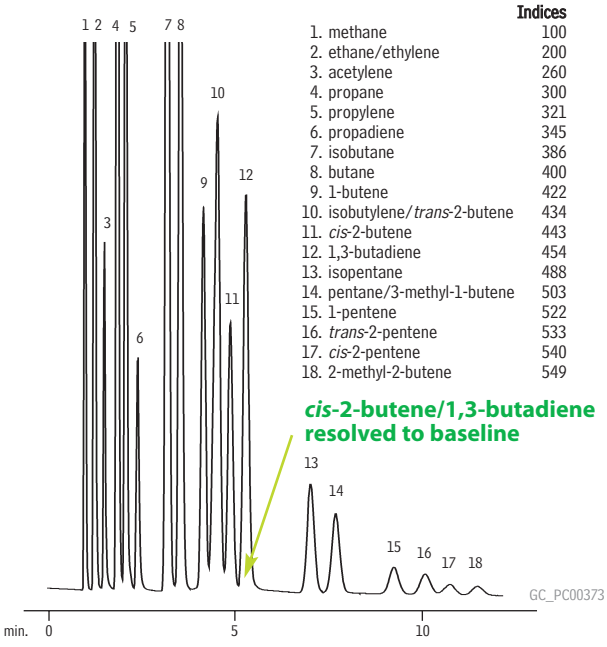
Figure 1 *n*-Octane on Res-Sil™ C packing has unique selectivity for unsaturated light hydrocarbons.



1. methane
2. ethane
3. ethylene
4. acetylene
5. propane
6. propylene
7. isobutane
8. *n*-butane
9. 1-butene
10. pentane
11. isobutylene
12. 1,3-butadiene
13. 1-pentene
14. *trans*-2-pentene
15. *cis*-2-pentene
16. 2-methylbutene-2

n-octane 80/100 Res-Sil™ C
20', 1/8" OD x 2mm ID, SilcoSmooth™ tubing (cat. # 80436)
Oven temp.: 60°C
Inj. temp.: 150°C
Det. temp: 150°C FID
Flow rate: 30mL/min. He
Sample: refinery gas C1-C5
Sample size: 20µL

Figure 2 OPN on Res-Sil™ C packing has unique selectivity for *cis*-2-butene and 1,3-butadiene.

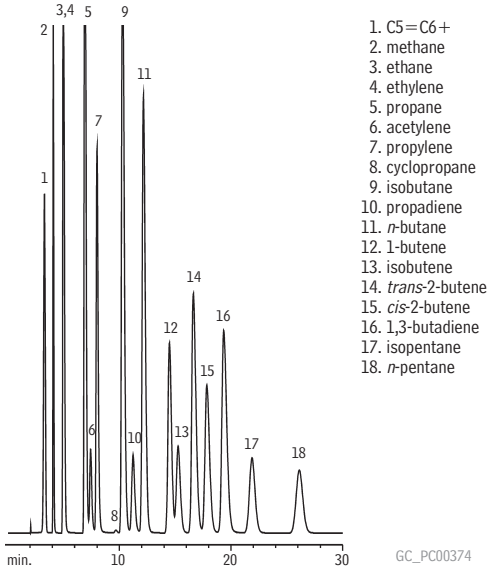


	Retention Indices
1. methane	100
2. ethane/ethylene	200
3. acetylene	260
4. propane	300
5. propylene	321
6. propadiene	345
7. isobutane	386
8. butane	400
9. 1-butene	422
10. isobutylene/*trans*-2-butene	434
11. *cis*-2-butene	443
12. 1,3-butadiene	454
13. isopentane	488
14. pentane/3-methyl-1-butene	503
15. 1-pentene	522
16. *trans*-2-pentene	533
17. *cis*-2-pentene	540
18. 2-methyl-2-butene	549

OPN on Res-Sil™ C, 80/100 mesh, 12' x 2mm ID x 1/8" OD in SilcoSmooth™ tubing (cat.# 80437). 20µL on-column injection of refinery gas.
Concentration: 0.1-6 absolute mole %
Oven temp.: 50°C
Inj. & det. temp.: 200°C
Carrier gas: helium
Flow rate: 30mL/min

Reference standard courtesy of AC Analytical Controls, Bensalem, PA.

Figure 3 Refinery gas calibration standard on a Restek refinery gas packed column set.



1. C5=C6+
2. methane
3. ethane
4. ethylene
5. propane
6. acetylene
7. propylene
8. cyclopropane
9. isobutane
10. propadiene
11. *n*-butane
12. 1-butene
13. isobutene
14. *trans*-2-butene
15. *cis*-2-butene
16. 1,3-butadiene
17. isopentane
18. *n*-pentane

2abc Refinery Gas Column Set (cat.# 88000-875) (3 column set)
Oven temp.: 60°C
Inj. temp.: 150°C
Det. temp: 150°C FID
Flow rate: 30mL/min., helium
Sample: refinery gas
Sample size: 1cc

for **more** info

See **page 125** for more information on Res-Sil™ packing materials.

Permanent Gases & Hydrocarbon Analysis

ShinCarbon ST Packed/Micropacked Columns

- Separate permanent gases, including CO/CO_2, without cryogenic cooling.
- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.

Analyze oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide with one column and at room temperature. ShinCarbon ST material, a high surface area carbon molecular sieve (~1,500 m^2/g), is the ideal medium for separating gases and highly volatile compounds by GSC. The rapid, above-ambient analyses these columns provide will be a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacturing, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

ShinCarbon ST is a highly stable material. Its 330°C upper temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture free environment to prevent contamination. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, minimizes downtime.

ShinCarbon ST 80/100 Packed Columns (SilcoSmooth™ Stainless Steel)*

OD	ID	2-Meter
1/8" Silcosmooth	2.0mm	80486-

ShinCarbon ST 100/120 Micropacked Columns**

OD	ID	1-Meter	2-Meter
1/16"	1.0mm	19809	19808
0.95mm	0.75mm	19810	— —

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Order installation kit separately. See page 123.

it's a **fact**

ShinCarbon ST is an ideal packing material for permanent gases, low molecular weight hydrocarbons, sulfur dioxide, and Freon® gases.

also **available**

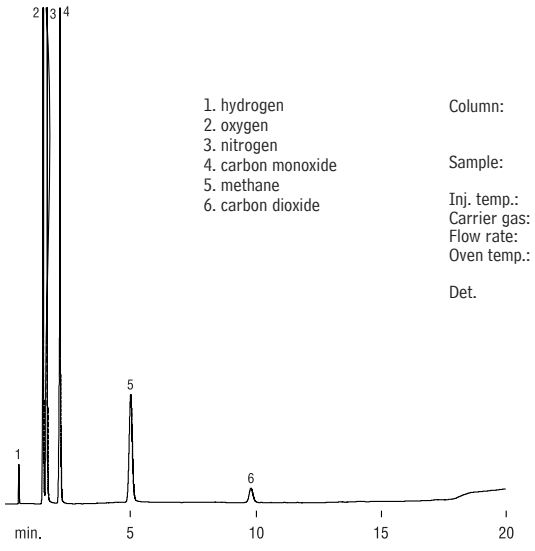
For adapter kits for installing packed/micropacked columns, see **page 123.**

a **plus 1** story

"Being one of the first labs to utilize the ShinCarbon column in a real working environment, I was pleased to find that I was able to do all my permanent gas analysis on one column instead of the customary two. The peaks were sharper than I had experienced in the past and run time was significantly reduced. We are extremely pleased with the performance of the ShinCarbon column and will continue to find even more applications for it."

Bruce Nasser,
Quality Control Chemist, Oxygen Service Spec Lab

Separate permanent gases in 10 minutes, without cryogenics.



1. hydrogen
2. oxygen
3. nitrogen
4. carbon monoxide
5. methane
6. carbon dioxide

Column:	ShinCarbon ST, 100/120 mesh, 2m, 1mm ID micropacked (cat.# 19808)
Sample:	5µL permanent gases mix, approx. 5 mol. percent each
Inj. temp.:	100°C
Carrier gas:	helium
Flow rate:	10mL/min.
Oven temp.:	40°C (hold 3 min.) to 250° @ 8°/min. (hold 10 min.)
Det.	HID @ 200°C

GC_PC00666

please **note**

For additional example applications for ShinCarbon ST columns, see **pages 650, 652, and 654** in the Applications section.

Sulfur Analysis

Rt®-XLSulfur Packed/Micropacked Columns

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for Teflon® tubing.
- Column and end-fittings are Siltek® treated for maximum inertness.

Sulfur analyses are traditionally performed using Teflon® tubing to improve column inertness. Unfortunately, Teflon® tubing is gas permeable, difficult to pack with high efficiency, prone to shrinkage, and has poor thermal stability. The Rt®-XLSulfur packed or micropacked column eliminates these problems. The packing material for Rt®-XLSulfur columns is extensively deactivated for analysis of low ppbv levels of hydrogen sulfide and methyl mercaptan. It is then treated to achieve effective separation of hydrocarbons from sulfur compounds. The interior wall and the end-fittings of the Rt®-XLSulfur column are Siltek® treated, making the column as inert as Teflon®. The extra care taken to manufacture this column ensures more accurate analyses of sulfur compounds.

Rt®-XLSulfur Packed Columns*

OD	ID	1-Meter	2-Meter
1/8"	2.0mm	80484-	80485-
3/16"	3.1mm	80482-	80483-

Rt®-XLSulfur Micropacked Columns**

OD	ID	1-Meter	2-Meter
1/16"	1.0mm	19804	19805
0.95mm	0.75mm	19806	19807

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Order installation kit separately. See page 123.

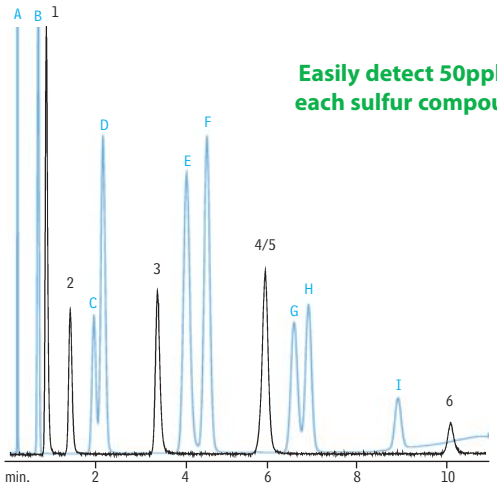
did you **know**?

Rt®-XLSulfur columns are optimized for low ppb-level sulfur analysis!

also **available**

For adapter kits for installing packed/micropacked columns, see **page 123**.

Rt®-XLSulfur micropacked column separates hydrocarbons from sulfur compounds.



GC_PC00436

sulfurs
1. hydrogen sulfide
2. carbonyl sulfide
3. methyl mercaptan
4. ethyl mercaptan
5. dimethyl sulfide
6. dimethyl disulfide

hydrocarbons
A. methane
B. ethane
C. propylene
D. propane
E. isobutane
F. butane
G. isopentane
H. pentane
I. hexane

Column:	Rt®-XLSulfur micropacked column, 1m, 0.75mm ID (cat.# 19806)
Conc.:	50ppb each
Oven temp.:	60°C to 230°C @ 15°C/min.
Carrier gas:	helium
Flow rate:	9mL/min.
Det.:	SCD/FID

Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.

Column Instrument Configurations



General Configuration
Suffix -800



Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*



Varian 3700, Vista Series, FID:
Suffix -820



PE 900-3920, Sigma 1,2,3:
Suffix -830



PE Auto System 8300, 8400, 8700 (Not On-Column):
Suffix -840

See page 133 for additional configurations.

Note: Initial 2" of column will be empty, to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1½" void on detector side.



Micropacked Columns

- Increased efficiency over traditional packed columns.
- Higher capacity than PLOT columns.
- Made from inert, flexible Siltek®-treated stainless steel tubing.
- Siltek®-treated, braided-wire end plug keeps packing intact, even under intense pressure surges during valve switching.
- Wide range of packings available.

Efficient, inert, and flexible

Micropacked columns are highly efficient and provide good sample capacity. With our inert Siltek® treatment, micropacked columns are a powerful tool for solving many difficult application problems. Because the Siltek® treatment permeates the stainless steel surface, the column can be flexed and coiled without any fear of chipping or cracking the inert surface.

Easy to install—multiple internal diameters

Our micropacked columns are designed to fit packed and capillary injection systems. 1mm ID, standard wall ($^1/_{16}$-inch OD) micropacked columns offer improved efficiency in packed column instruments, without the expense of converting to capillary injection systems. 0.75mm ID, thin wall (0.95mm OD) micropacked columns install easily into a capillary injector, using slightly larger ferrules. Micropacked columns operate at flows exceeding 10cc/min., for trouble-free operation.

Braided wire end plugs

Glass wool end plugs can be dislodged easily by carrier gas pressure surges. Restek's chemists insert braided wire into the column and secure it by making a small crimp near the column outlet. End plugs are Siltek® treated—the sample contacts only inert surfaces.

also **available**

For adapter kits for installing micropacked columns, see **page 123**.

Made with INERT SilcoSmooth tubing!

All micropacked columns are made with inert SilcoSmooth™ tubing, see **page 115**.

Micropacked Columns

		ID	OD	Temp. Range	0.56-Meter	
20% TCEP on 80/100 Chromosorb PAW		0.75mm	$^1/_{16}$"	0–120°C	19040	
	Mesh	**ID**	**OD**	**Temp. Range**	**1-Meter**	**2-Meter**
HayeSep R	100/120	0.75mm	0.95mm	up to 250°C	19014	19015
HayeSep R	100/120	1.00mm	$^1/_{16}$"	up to 250°C	19012	19013
HayeSep Q	100/120	0.75mm	0.95mm	up to 275°C	19018	19019
HayeSep Q	100/120	1.00mm	$^1/_{16}$"	up to 275°C	19016	19017
HayeSep N	100/120	0.75mm	0.95mm	up to 165°C	19022	19023
HayeSep N	100/120	1.00mm	$^1/_{16}$"	up to 165°C	19020	19021
HayeSep S	100/120	0.75mm	0.95mm	up to 250°C	19010	19011
HayeSep S	100/120	1.00mm	$^1/_{16}$"	up to 250°C	19008	19009
Molesieve 5A	80/100	0.75mm	0.95mm	up to 300°C	19002	19003
Molesieve 5A	80/100	1.00mm	$^1/_{16}$"	up to 300°C	19000	19001
Molesieve 13X	80/100	0.75mm	0.95mm	up to 350°C	19006	19007
Molesieve 13X	80/100	1.00mm	$^1/_{16}$"	up to 350°C	19004	19005

also **available**

0.53mm ID micropacked columns. Please contact Technical Service for more information.

Searching **for a product**?

Don't see the column you need?

Contact our Technical Service team at 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative, to obtain the column needed for your application.

Packed/Micropacked Column Installation Kits

Packed Column Inlet Adaptor Kits

- Use 1/8" and 3/16" OD columns in 1/4" on-column injection ports.
- Centers column perfectly in injection port to eliminate bent syringe needles.
- Slotted design prevents carrier gas occlusion.
- Vespel®/graphite reducing ferrules make installation easy.
- Includes all nuts & ferrules used to attach tubing to the injector or detector.



Adaptor kit centers the packed column in the injection port, so the syringe will not scrape the sides of the column.

	For 1/8" Columns			For 3/16" Columns		
Description	**qty.**	**cat.#**	price	**qty.**	**cat.#**	price
Packed Column Inlet Adaptor Kit for 1/4" Injection Ports	kit	21651		kit	21650	
Packed Column Inlet Adaptor Kit for Shimadzu 5mm Injection Ports	kit	21119		kit	21120	
Packed Column Inlet Adaptor Kit for Carlo-Erba GCs	kit	21129		kit	21130	

Installation Kits

Description	**qty.**	**cat.#**	**price**
Micropacked Column Installation Kit for 0.75mm ID columns; for valve applications. Kit contains: 1/16" Valco nut (1), 1/16" Vespel/graphite ferrule (1), 1/16" graphite ferrule (1), 1/16" Sulfinert union (1), 1/16" to 1/16" stainless steel union (1), Sulfinert tubing, 1/16" OD x 0.04" ID (1ft/0.3m), stainless steel ferrule (1), graphite ferrules (2), Vespel/graphite ferrules (2).	kit	21062	
Micropacked Column Installation Kit for 0.75mm ID columns; for split applications. Kit contains: graphite ferrules (2), Vespel/graphite ferrules (2).	kit	21063	
Micropacked Column Installation Kit for 0.75mm ID columns; for all Agilent GCs. Kit contains: graphite ferrule (1), graphite ferrule (1), Vespel/graphite ferrule (1), Vespel/graphite ferrule (1).	kit	21064	
Micropacked Column Installation Kit for 1mm ID columns; for valve applications. Kit contains: 1/16" Valco nut (1), 1/16" stainless steel nut (1), 1/16" Vespel/graphite ferrule (1), 1/16" graphite ferrule (1), stainless steel ferrule (1), 1/16" stainless steel front ferrule (1), 1/16" stainless steel back ferrule (1).	kit	21065	
Micropacked Column Installation Kit for 1mm ID columns; for direct injections. Kit contains: 1/16" stainless steel nuts (2), 1/16" Vespel/graphite ferrules (2), 1/16" graphite ferrules (2), 1/16" stainless steel front ferrules (2), 1/16" stainless steel back ferrules (2).	kit	21066	
Packed Column Installation Kit for 2mm ID columns; for valve applications. Kit contains: 1/8" stainless steel nut (1), stainless steel Valco nut (1), 1/8" Vespel/graphite ferrule (1), stainless steel Valco ferrule (1), 1/8" stainless steel front ferrule (1), 1/8" stainless steel back ferrule (1).	kit	21067	

Micropacked Inlet Conversion Kits

Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.

- For use with Agilent 5890 and 6890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	**qty.**	**cat.#**	price
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424	
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425	
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4mm splitless liner, intermediate polarity deactivated	kit	22426	
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427	
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428	
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel Ring Inlet Seals, large bore (2)	2-pk.	22429	
Replacement Metal Liner Installation Guide for On-Column Injection Siltek treated metal liner installation guide	ea.	22430	
Replacement 4mm Splitless Liner	ea.	20772	

*For use with packed column FIDs only.



Large-Bore Dual Vespel® Ring Inlet Seals



1/4" SS Nut



Large-Bore FID Adaptor



1/4" Vespel®/Graphite Ferrule



1/16" SS Nut



Large-Bore Reducing Nut



1/16" Vespel®/Graphite Ferrules



22430



20772

Packed Column Packing Materials



Silcoport™ Support Materials Outperform Any Deactivated Diatomaceous Earth Supports Available!

- Superior deactivation technology for improved inertness.
- Available in 80/100 and 100/120 mesh.
- Uniform particle distribution for maximum efficiency.

restek **innovation!**

The increased sensitivity of modern detection systems and the desire to reduce detection limits requires a solid support to meet the challenging demands faced by analysts. Unlike conventional dimethyldichlorosilane (DMDCS) deactivation, Silcoport™ incorporates our proprietary fused silica deactivation technology on diatomaceous earth solid supports. Silcoport™ supports were developed using a special mixture of deactivants that yields the highest inertness without changing the polarity of the stationary phase. Silcoport™ supports from Restek are the perfect match for highly inert SilcoSmooth™ tubing.

did you **know**?

Silcoport support replaces
- Supelcoport
- Chromosorb W HP
- GasChrom Q 2

Silcoport W BW support replaces
- GasChrom Q

Silcoport™ Packing Materials

Description	Temp. Limit (°C)	Mesh	Min. Qty.†	cat.#	price/g
Silcoport P*	400	80/100	100g	25641	
	400	100/120	100g	25642	
Silcoport W**	400	80/100	100g	25689	
	400	100/120	100g	25673	
Silcoport W BW***	400	100/120	100g	25674	

*Prepared from Chromosorb P; Restek acid washed deactivation.
**Prepared from Chromosorb W; Restek acid washed deactivation.
***Prepared from Chromosorb W; Restek base washed deactivation.
†Bulk quantities are available.

please **note**

Silcoport™ is available uncoated or coated with the liquid stationary phase of your choice on 80/100 or 100/120 mesh sizes. Call Restek at 800-356-1688 or 814-353-1300, ext. 3, or contact your Restek representative, for pricing and availability.

CarboBlack Packing Materials

Description	Temp. Limit (°C)	Mesh	Min. Qty.	cat.#	price/g
CarboBlack B	500	60/80	10g	25500	
	500	80/120	10g	25501	
CarboBlack C	500	60/80	10g	25502	
	500	80/100	10g	25503	
CarboBlack BHT-100	150	40/60	10g	25504	
CarboBlack III (F)	175	80/100	10g	25506	
5% Carbowax 20m on CarboBlack B	225	80/120	10g	25507	
6.6% Carbowax 20m on CarboBlack B	225	80/120	10g	25508	
4% Carbowax 20m / 0.8% KOH on CarboBlack B	220	60/80	10g	25509	
0.19% picric acid on CarboBlack C	120	80/100	10g	25510	
4% Carbowax 20m on CarboBlack B-DA	200	80/120	10g	25511	

Res-Sil™ C Packings

- Unique separation of saturated and unsaturated hydrocarbons.
- Innovative bonding chemistry for batch-to-batch reproducibility, excellent thermal stability, and long life.
- Wide range of bonded phases available.
- Equivalent to Waters Durapak packings.

Bonded silica packings with *n*-octane or cyanopropyl (OPN) functional groups yield faster separations of C1 to C4 hydrocarbons, higher thermal stability, shorter conditioning times, and longer lifetimes than conventional packings. However, bonded silica packings have had inconsistent reproducibility and limited availability. Restek's research team has solved these age-old problems by developing Res-Sil™ C packings for consistent performance.

Unique Selectivity for Process GC and High-Speed Analysis of Petrochemicals
Res-Sil™ C bonded packings are ideal for fast resolution of difficult-to-separate saturated and unsaturated C4 hydrocarbons (e.g., see page 119). This unique selectivity, when combined with other columns in series, provides petroleum and petrochemical method developers with a powerful tool for fast determination of C1 to C5 hydrocarbons.[1]

Innovative Research and Stringent QA Provide Batch-to-Batch Consistency
Restek's synthesis procedure eliminates batch-to-batch variations. The amount of bonded liquid phase is precisely controlled in every batch, for reproducible retention times and separations. Each production batch of Res-Sil™ C packing is tested with a complex hydrocarbon mixture to meet demanding retention time and retention index specifications. Column bleed is also evaluated to ensure that there are no retention shifts or high baselines.

OPN on Res-Sil™ C Packing—the Latest in a Line of Bonded GC Phases
Restek offers a wide range of bonded packings for packed column GC, including Rtx®-1, Stabilwax®, and Carbowax® phases. We have extended this technology to make *n*-octane on Res-Sil™ C packing, and OPN on Res-Sil™ C packing. Each of these packings has low bleed, conditioning times of less than 30 minutes, long lifetime, and consistent batch-to-batch reproducibility.

Res-Sil™ Packing Materials

Description	Temp. Limit (°C)	Mesh	Min. Qty.	cat.#	price/g
Res-Sil C	300	60/80	10g	25400	
	300	80/100	10g	25028	
Res-Sil B	300	60/80	10g	25401	
	300	80/100	10g	25080	
1% TCEP on Res-Sil B	175	80/100	10g	25081	
OPN on Res-Sil C	150	80/100	10g	25042	
n-Octane on Res-Sil C	150	80/100	10g	25030	
2% Carbowax 1540 on Res-Sil C	150	80/100	10g	25044	

[1]N.C. Saha, S.K. Jain, and R.K. Dua. J. Chromat. Sci 1978, 323-328.

also available

Custom packing materials are also available. See page 130.

did you know?

Res-Sil replaces
- Porasil B
- Porasil C

Packed Column Packing Materials



Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

Outside the U.S.

Contact your Restek representative.

Chromosorb® Diatomaceous Earth Supports

Restek offers the full line of Chromosorb® solid supports. Choosing the appropriate support will depend on your application. Need assistance? Call Technical Service at 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative.

Chromosorb® P (used to prepare Silcoport™ P)
Chromosorb® P support is manufactured from hard firebrick, making it a rugged material. This support is available acid washed (AW), nonacid washed (NAW), and traditional dimethyldichlorosilane (DMDCS) treated. Chromosorb® P support can hold up to 30 weight% of liquid stationary phase, making it the highest loading support available.

Chromosorb® W (used to prepare Silcoport™ W and Silcoport™ BW)
Chromosorb® W support is a flux-calcinated diatomite. This solid support is very fragile but offers the highest inertness of all diatomaceous earth supports. It can be prepared with up to 25 weight% of liquid stationary phase. Chromosorb® W support is available in AW, NAW, and DMDCS, or treated with Restek's proprietary (Silcoport™) deactivation. Chromosorb® W-HP is an acid washed, silanized version of Chromosorb® W.

Chromosorb® G
Chromosorb® G support is the hardest support available and has the lowest surface area of all the diatomaceous earth supports. Chromosorb® G support is available as AW, NAW, and DMDCS-treated. It can hold up to 10 weight% of liquid stationary phase.

Chromosorb® T
Chromosorb® T support is made from Teflon® material and is an extremely inert solid support.

Chromosorb® G and Chromosorb® T are available as custom products. Contact us for more information.

Chromosorb® Packings

Description	Mesh	gm/btl.*	cat.#	price
Chromosorb PNAW	45/60	100g	25629	
	60/80	100g	25630	
	80/100	100g	25631	
	100/120	100g	25632	
Chromosorb PAW	60/80	100g	25634	
	80/100	100g	25635	
	100/120	100g	25636	
Chromosorb PAW/DMDCS	60/80	100g	25638	
	80/100	100g	25639	
	100/120	100g	25640	
Chromosorb WNAW	60/80	100g	25657	
	80/100	100g	25658	
	100/120	100g	25659	
Chromosorb WAW	60/80	100g	25661	
	80/100	100g	25662	
	100/120	100g	25663	
Chromosorb WAW/DMDCS	60/80	100g	25665	
	80/100	100g	25666	
	100/120	100g	25667	
Chromosorb W-HP	60/80	100g	25668	
	80/100	100g	25669	
	100/120	100g	25670	

*Please call for larger quantities (>100gm bottles) of Chromosorb packings.

NAW—nonacid washed
AW—acid washed
DMDCS—dimethyldichlorosilane
BW—base washed

Packed Column Packing Materials

Chromosorb® Century Packings

Description	Temp. Limits (°C)	g/btl.	Mesh 60/80 cat.#	price	Mesh 80/100 cat.#	price	Mesh 100/120 cat.#	price
Chromosorb 101	275/325	50g	25608		25609		25610	
Chromosorb 102	250/300	50g	25611		25612		25613	
Chromosorb 103	275/300	50g	25614		25615		25616	
Chromosorb 104	(equivalent to HayeSep C)							
Chromosorb 105	250/275	50g	25617		25618		25619	
Chromosorb 106	250/275	50g	25620		25621		25622	
Chromosorb 107	250/275	50g	25623		25624		25625	
Chromosorb 108	250/275	50g	25626		25627		25628	

Porapak Series Packings

Description	Temp. Limit (°C)	g/btl.	Mesh 50/80 cat.#	price	Mesh 80/100 cat.#	price	Mesh 100/120 cat.#	price
Porapak P	250	20g	25576		25577		25578	
Porapak PS	250	20g	25579		25580		25581	
Porapak Q	250	26g	25582		25583		25584	
Porapak QS	250	26g	25585		25586		25587	
Porapak R	250	24g	25588		25589		25590	
Porapak S	250	26g	25591		25592		25593	
Porapak N	190	29g	25594		25595		25596	
Porapak T	190	31g	25597		25598		25599	

HayeSep® Series Packings

Description	Temp. Limit (°C)	g/btl.	Mesh 60/80 cat.#	price	Mesh 80/100 cat.#	price	Mesh 100/120 cat.#	price
HayeSep A	165	24g	22560		25032		25033	
HayeSep B	190	24g	25561		25034		25035	
HayeSep C	250	24g	25562		25036		25037	
HayeSep D	290	24g	25563		25038		25039	
HayeSep DIP	290	24g	25564		25565		25566	
HayeSep DB	290	24g	25567		25568		25569	
HayeSep DOX	(Use HayeSep DB)							
HayeSep N	165	24g	25570		25045		25046	
HayeSep P	250	24g	25571		25047		25048	
HayeSep Q	275	24g	25572		25049		25050	
HayeSep R	250	24g	25573		25051		25052	
HayeSep S	250	24g	25574		25053		25054	
HayeSep T	165	24g	25575		25055		25056	

Tenax® Packings

Description	Temp. Limit (°C)	Min. Qty.	Mesh 60/80 cat.#	price/g	Mesh 80/100 cat.#	price/g
Tenax-TA	350	10g	25550	/g	25551	/g
Tenax-GR	350	10g	25552	/g	25553	/g

also **available**

Custom packing materials are also available.
See **page 130**.



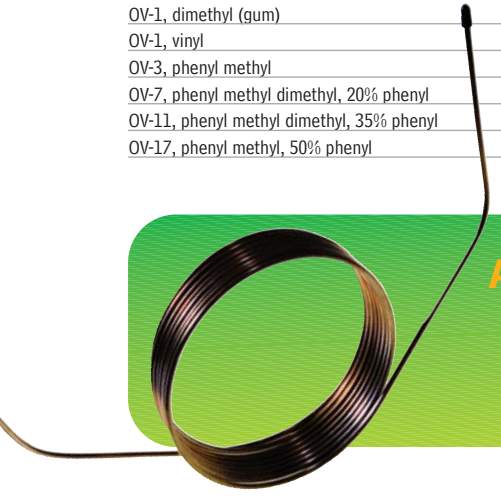
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Visit **www.restek.com/seminars**

Liquid Phases

We can prepare packed columns from the extensive list of liquid phases shown here. We have many more liquid phases. If you don't see the phase you need, call technical service or contact your Restek representative for availability.

Phase	min./max. temp. (°C)
Apiezon L	50/300
p,p'-Azoxydiphenetole	132/140
BC-120	0/125
Bentone-34	0/180
bis (2-ethoxyethyl) adipate	0/150
bis (2-ethylhexyl) phthalate	150 max.
bis (2-methoxyethyl) adipate	20/100
n,n'-Bis(*p*-methoxylbenzylidene)-α,α'-bi-*p*-toluidine (BMBT)	189/225
Carbowax 1000	40/150
Carbowax 1540	50/175
Carbowax 20M	60/225
Carbowax 20M-terephthalic acid	60/225
Carbowax 400	10/100
Carbowax 600	30/125
Cyclohexanedimethanol succinate	100/250
DC-11	0/300
DC-200	0/200
DC-550	20/250
DEGS-PS	20/200
Dexsil 300 carborane/methyl silicone	50/540
Di(2-ethylhexyl)sebacate	0/125
Diethylene glycol succinate (DEGS)	20/200
Diethylene glycol adipate (DEGA)	0/200
Diisodecyl phthalate	0/175
2,4-Dimethylsulfolane	0/50
Di-*n*-decyl phthalate	10/175
Dinonyl phthalate	20/150
Ethylene glycol adipate	100/225
Ethylene glycol phthalate	100/200
Ethylene glycol succinate	100/200
FFAP	50/250
Fluorad FC-431, 50% solution in ethyl acetate	40/200
Hallcomid M-18-OL	8/150
Halocarbon 10-25	20/100
Halocarbon K-352	0/250
Halocarbon wax	50/150
Igepal CO-880 (Nonoxynol)	100/200
Igepal CO-890	100/200
Krytox	-30/260
Neopentyl glycol adipate	50/225
Neopentyl glycol sebacate	50/225
Neopentyl glycol succinate	50/225
Nonoxynol (Igepal CO-880)	100/200
β,β-Oxydipropionitrile	0/75
OV-1, dimethyl (gum)	100/350
OV-1, vinyl	100/350
OV-3, phenyl methyl	0/350
OV-7, phenyl methyl dimethyl, 20% phenyl	0/350
OV-11, phenyl methyl dimethyl, 35% phenyl	0/350
OV-17, phenyl methyl, 50% phenyl	0/375

Phase	min./max. temp. (°C)
OV-22, phenyl methyl diphenyl, 65% phenyl	0/350
OV-25, phenyl methyl diphenyl, 75% phenyl	0/350
OV-61, diphenyl, 33% phenyl	0/350
OV-73, 5.5% diphenyl	0/325
OV-101, dimethyl (fluid)	0/350
OV-105, cyanopropyl methyl	0/275
OV-202, trifluoropropyl (fluid)	0/275
OV-210, trifluoropropyl (fluid)	0/275
OV-215, trifluoropropyl (gum)	0/275
OV-225, cyanopropyl methylphenyl methyl	0/265
OV-275, dicyanoallyl	25/250
OV-330, silicone - Carbowax	0/250
OV-351	50/270
OV-1701, vinyl	0/250
Phenyldiethanolamine succinate	0/230
Polethylene glycol adipate (EGA)	100/225
Polyphenyl ether (5 rings) OS-124	0/200
Polyphenyl ether (6 rings) OS-138	0/225
Polypropylene glycol	0/150
Rtx-1 (Rt-101)	0/350
Rt-1000	50/250
Rt-1200	25/200
Rt-1220	50/200
Rt-1500, Rt-1510	50/230
Rt-2100	0/350
Rt-2300	20/275
Rt-2330, Rt-2340	25/275
Rt-608Pkd	0/275
Rt-Sebaconitrile	25/110
Rt-XLSulfur	300 max.
SE-30, SE-52, SE-54	50/300
Silar 5 CP, Silar 10 CP	0/250
Sorbitol	150 max.
Squalane	20/100
Squalene	0/100
Stabilwax	40/240
Tetracyanoethylated pentaerythritol	30/175
THEED (Tetrahydroxyethlenediamine)	0/125
β,β-Thiodipropionitrile (TDPN)	100
Tricresyl phosphate	20/125
1,2,3-Tris (2-cyanoethoxy) propane (TCEP)	0/175
Triton X-100, Triton X-305	0/200
UC W982	0/300
UCON 50-HB-2000	0/200
UCON 50-HB-280-X	0/200
UCON 50-HB-5100	0/200
UCON HB-1800-X	200 max.
UCON LB-550-X	0/200
Versamid 9000	190/275



Advantages of using Restek packed columns

- Reasonably priced.
- Low-bleed, long-lifetime bonded phases.
- Wide variety of supports and packings.
- Produced by experienced packed column chromatographers.

USP Liquid Phase & Solid Support Cross-Reference

Restek can meet all of your packed column needs for US Pharmacopeia methods. Commonly used USP liquid phases and supports are listed below. Call Restek or your representative for a quote on your next packed column for pharmaceuticals.

USP	Phase Description	Restek-Supplied Equivalent
G1	dimethylpolysiloxane oil	Rt-2100, OV-101, Rtx-1
G2	dimethylpolysiloxane gum	OV-1, Rtx-1
G3	50% phenyl-50% methylpolysiloxane	Rt-2250, OV-17
G4	diethylene glycol succinate polyester	Rt-DEGS
G5	3-cyanopropylpolysiloxane	Rt-2340
G6	trifluoropropylmethylpolysiloxane	Rt-2401, OV-210
G7	50% 3-cyanopropyl-50% phenylmethylsilicone	Rt-2300
G8	80% bis (3-cyanopropyl)-20% phenylpolysiloxane	Rt-2330
G9	methylvinylpolysiloxane	UCW 98
G10	polyamide	polyamide
G11	bis(2 ethylhexyl) sebecate polyester	bis(2 ethylhexyl) sebecate polyester
G12	phenyldiethanolamine succinate polyester	phenyldiethanolamine succinate polyester
G13	sorbitol	sorbitol
G14	polyethylene glycol (average mol. wt. 950-1050)	Carbowax 1000
G15	polyethylene glycol (average mol. wt. 3000-3700)	Carbowax 4000
G16	polyethylene glycol compound (average mol. wt. 15,000), a high molecular weight compound of polyethylene glycol and a diepoxide linker	Carbowax 20M
G17	75% phenyl-25% methylpolysiloxane	OV-25
G18	polyalkylene glycol	UCON LB 550X
G19	25% phenyl-25% cyanopropyl-50% methylsilicone	OV 225
G20	polyethylene glycol (average mol. wt. 380-420)	Carbowax 400
G21	neopentyl glycol succinate	neopentyl glycol succinate
G22	bis(2 ethylhexyl) phthalate	bis(2 ethylhexyl) phthalate
G23	polyethylene glycol adipate	EGA
G24	diisodecyl phthalate	diisodecyl phthalate
G25	polyethylene glycol compound TPA, a high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with terephthalic acid	Carbowax 20M TPA
G26	25% 2-cyanoethyl-75% methylpolysiloxane	Rt-XE 60
G27	5% phenyl-95% methylpolysiloxane	SE-52, Rtx-5
G28	25% phenyl-75% methylpolysiloxane	DC 550
G29	3,3'-thiodipropionitrile	TDPN
G30	tetraethylene glycol dimethyl ether	tetraethylene glycol dimethyl ether
G31	nonylphenoxypoly(ethyleneoxy)ethanol (average ethyleneoxy chain length is 30): nonoxynol 30	Igepal CO 880
G32	20% phenylmethyl-80% dimethylpolysiloxane	OV-7
G33	20% Carborane®-80% methylsilicone	Dexsil 300
G34	diethylene glycol succinate polyester stabilized with phosphoric acid	Rt-DEGS PS
G35	a high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with nitroterephthalic acid	Rt-1000
G36	1% vinyl-5% phenylmethylpolysiloxane	SE 54, Rtx-5
G37	polyimide	polyimide
G38	phase G1 containing a small amount of tailing inhibitor	Rt-2100/0.1% Carbowax 1500
G39	polyethylene glycol (average mol. wt. 1500)	Carbowax 1500
G40	ethylene glycol adipate	Rt-EGA

USP	Support Description	Restek-Supplied Equivalent
S1A	siliceous earth, see method for details on treatment	Silcoport W
S1AB	siliceous earth, treated as S1A and both acid- and base-washed	Silcoport WBW
S1C	crushed firebrick, calcined or burned with a clay binder >900°C, acid-washed, may be silanized	Chromosorb PAW or PAW DMDCS
SINS	untreated siliceous earth	Chromosorb W- Non Acid Washed
S2	styrene-divinylbenzene copolymer with nominal surface area of less than 50m^2/g and an average pore diameter of 0.3 to 0.4μm	Chromosorb 101
S3	ethylvinylbenzene-divinylbenzene copolymer with nominal surface area of 500 to 600m^2/g and an average pore diameter of 0.0075μm	Hayesep Q
S4	styrene-divinylbenzene copolymer with aromatic -O and -N groups having a nominal surface area of 400 to 600m^2/g and an average pore diameter of 0.0076μm	Hayesep R
S5	high molecular weight tetrafluorethylene polymer, 40- to 60-mesh	Chromosorb T
S6	styrene-divinylbenzene copolymer having a nominal surface area of 250 to 350m^2/g and an average pore diameter of 0.0091μm	Chromosorb 102
S7	graphitized carbon having a nominal surface area of 12m^2/g	CarboBlack C
S8	copolymer of 4-vinyl-pyridine and styrene-divinylbenzene	Hayesep S
S9	porous polymer based on 2,6-diphenyl-*p*-phenylene oxide	Tenax TA
S10	highly cross-linked copolymer of acrylonitrite and divinylbenzene	HayeSep C
S11	graphitized carbon having a nominal surface area of 100m^2/g, modified with small amounts of petrolatum and polyethylene glycol compound	CarboBlack B 80/120 3% Rt 1500
S12	graphitized carbon having a nominal surface area of 100m^2/g	CarboBlack B

Custom Coated Packing Materials



Custom Coated Packing Materials

Custom coated packing materials can be made with any of the supports listed below. The liquid stationary phases available are listed on page 128 and the coating ranges are listed in the chart. Coated packings are available in minimum orders of 20 grams.

To order, please call your Restek representative for pricing and specify the following:

1) stationary phase and stationary phase concentration
2) support and support mesh size
3) amount of packing needed

Ordering Example: (3%) (Rtx®-1) (Silcoport™ P) (80/100) (20g).

Support	Max. Coating %	Mesh Sizes
CarboBlack B	1–10%*	60/80, 80/120
CarboBlack B HT	1–10%	40/60
CarboBlack C	0.1–1%*	60/80, 80/100
Chromosorb 101-108	5%*/10%**	60/80, 80/100, 100/120
Chromosorb W HP	20%	45/60, 60/80, 80/100, 100/120
Chromosorb G HP	20%	45/60, 60/80, 80/100, 100/120
Chromosorb G, P or W (AW or NAW)	10% (G) 25% (W) 30% (P)	45/60, 60/80, 80/100, 100/120
Chromosorb G, P or W (AW or DMDCS)	10% (G) 25% (W) 30% (P)	45/60, 60/80, 80/100, 100/120
Chromosorb T	15%	40/60
HayeSep	15%	60/80, 80/100, 100/120
Porapak	15%	50/80, 80/100, 100/120
Silcoport P	30%	80/100, 100/120
Silcoport W BW	20%	80/100, 100/120
Silcoport W (replacement for Chromosorb 750)	20%	80/100, 100/120

*Nonsilicone phase.
**Silicone phase.

For coatings over 15% or quantities over 50 grams, please call your Restek representative.

NAW—nonacid washed
AW—acid washed
DMDCS—dimethyldichlorosilane
BW—base washed
DA—deactivated for acidic compounds

please **note**

Special phases that require a surcharge: OV®-275, OV®-330, OV®-225, BMBT, 2,4-dimethylsulfolane, Silar, OV®-1701, XE-60, and Dexsil®

ordering **note**

Mesh Size

When ordering a packed column solid support, please specify mesh size. Refer to this chart to convert microns to mesh size.

Example:
150–180 micron particles = 80/100 mesh

(µm)	Mesh Size
850	20
710	25
600	30
500	35
425	40
355	45
300	50
250	60
212	70
180	80
150	100
125	120
106	140
90	170
75	200
63	230
53	270

Custom Packed/Micropacked Columns

Custom Packed Columns

To order, contact your Restek representative and specify the following:

1) column dimensions (length, ID) and tubing material
2) packing description (percent coating and phase, support mesh size, and treatment)
3) column configuration (instrument manufacturer, model number, on-column injection or not) and with or without nuts and ferrules

Ordering Example: (6' x 1/8") (stainless steel) (3%) (Rtx®-1) (Silcoport™ P) (80/100) (Agilent 6890) (on-column injection) (fittings kit).

Please use the custom order form on page 132.



ordering **note**

For international pricing on custom packed or micropacked columns, please contact your Restek representative.

Custom Micropacked Columns

To order, contact your Restek representative and specify the following:

1) physical dimensions (length, OD, ID, and tubing material)
2) packing description (percent coating and phase, support mesh size, and treatment)
3) installation kit (see page 123)

Ordering Example: (2m x 1/16" OD x 1.00mm ID) (Siltek®-treated tubing) (5%) (Carbowax® 20M) (CarboBlack B) (80/120) (installation kit for valve applications, cat. #21065)

Please use the custom order form on page 132.

Packed/Micropacked Column Custom Order Form

Order: _____ Quote: _____ Reference # from previous order (if available): _____

Date: _____
Restek Account #: _____
Contact: _____
Company: _____
Address: _____
_____
Phone: _____
Fax: _____

Restek Use Only:
Custom No.: _____
Stock No.: _____
Price: _____
Fitting Costs: _____
Authorization:
_____

Number of Columns: _____

1) Column Dimensions:
   Length _____ OD x ID: _____
2) Tubing (choose one): ❍ SilcoSmooth™ ❍ Stainless Steel ❍ Hastelloy® ❍ Nickel ❍ Copper ❍ Teflon®

3) Packing Description:
   Liquid Phase A (% + description): _____
   Liquid Phase B (% + description): _____
   Liquid Phase C (% + description): _____
   Solid Support: _____ Mesh: _____

4) Column Configuration:
   Instrument (mfr. + model): _____
   Inlet: Packed Full? ❍ Yes ❍ No, leave_____" void (for on-column injection)
   Outlet: Packed Full? ❍ Yes ❍ No, leave_____" void
   Do you want this column preconditioned? ❍ Yes (additional charge) ❍ No
   Standard configuration suffix number (next page)**:**
   Special configuration (next page): Figure: _____ Dimensions: _____
   Welded Tubing Reducers ❍ (additional charge)
   Special Instructions: _____
   _____

Fittings (check appropriate circle)

❍ **KIT 1S**
1/4" brass nuts
1/4" to 1/8" V/G reducing ferrules
No additional charge

❍ **KIT 2S**
1/4" brass nuts
1/4" to 3/16" V/G reducing ferrules
No additional charge

❍ **KIT A**
1/8" brass nuts
1/8" V/G ferrules
No additional charge

❍ **KIT B**
1/8" brass nuts
1/8" brass front & back ferrules
No additional charge

❍ **KIT C**
1/8" stainless steel nuts
1/8" stainless steel front & back ferrules
Additional charge

❍ **KIT D**
1/8" stainless steel nuts
1/8" V/G ferrules
Additional charge

❍ **KIT E**
1/4" stainless steel nuts
1/4" to 1/8" V/G reducing ferrules
Additional charge

❍ **KIT F**
1/4" stainless steel nuts
1/4" to 3/16" V/G reducing ferrules
Additional charge

❍ **KIT V**
1/8" VCR fitting
check appropriate circle:
❍ Stainless Steel (additional charge)
❍ Nickel (additional charge)

V/G = Vespel®/graphite

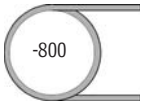
for a **quote:**

Complete this form and fax to Restek at 814-353-1309, or to your Restek representative.

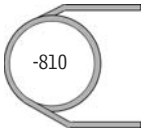
Column Configurations

Standard Configurations (choose one)

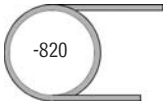
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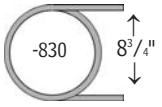
Agilent 5880, 5890, 5987, 6890, 7890



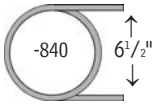
Varian 3700, Vista Series, FID



PE 900-3920, Sigma 1,2,3



PE Auto System 8300, 8400, 8700



-810 Agilent 5880, 5890, 5987, 6890, 7890
-811 Agilent 6850
-820 Varian 3700,Vista Series, FID
-821 Varian 3800
-830 PerkinElmer 900-3920, Sigma 1,2,3
-840 PerkinElmer Auto System 8300, 8400, 8700, Clarus 500 (C500)
-841 PerkinElmer Auto Sys XL
-845 ABB 3100, AAI (4" coil)
-850 Shimadzu 14A, 2014
-851 Shimadzu 8A
-852 Shimadzu 9A
-853 Shimadzu 17A, 2010
-854 Shimadzu Mini 2
-860 Thermo Scientific - TRACE 2000
-865 Carlo Erba
-870 Tremetrics/Tracor
-874 HNU 310 & 311 (4.5" coil)
-875 Analytical Controls Configuration
-880 Carle 40030
-881 Hitachi 263
-885 Pye Unicam 4500
-890 Gow Mac 590
-891 Gow Mac 550
-892 Gow Mac 750
-893 Gow Mac 816 (3" coil, 3" spread on the arms, and a total height of 5")
-894 Gow Mac 580
-895 SRI 8610C
-895R SRI 8610C Dual GC Right Side
-895L SRI 8610C Dual GC Left Side
-896 SRI 9300

Custom Configurations (Please provide dimensions on order form, page 132.)

Figure 1

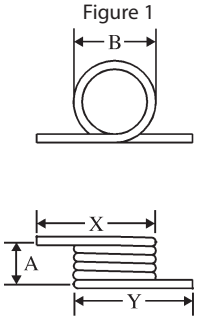


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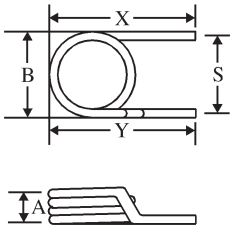


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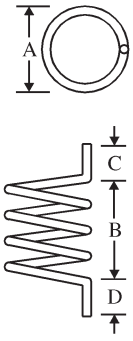


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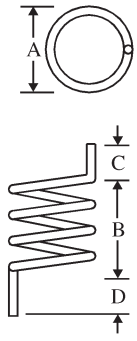


Figure 5

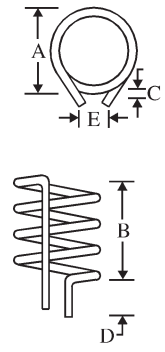


Figure 6

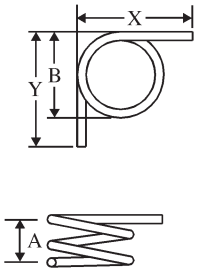


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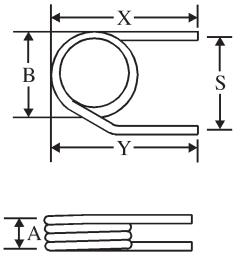


Figure 8

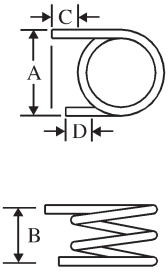


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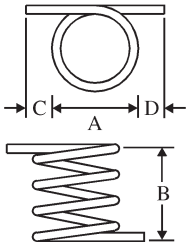


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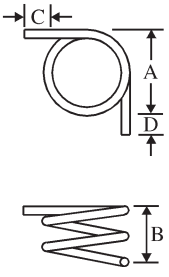


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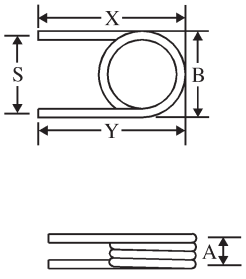


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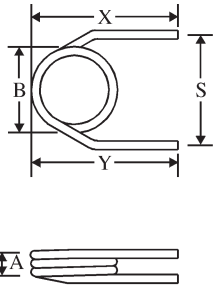


Figure 13

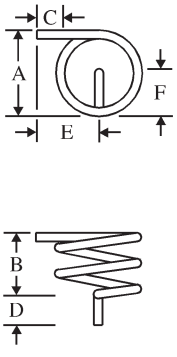


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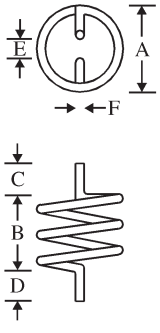
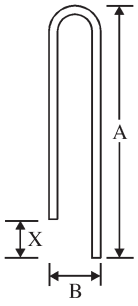


Figure 15





GC Accessories

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Purge & Trap Supplies 199
PID Lamps 199





Top: Greg Dawson, Regulatory Technician
Bottom: Kim Dawson, Manufacturing Technician

What's **NEW?** look for this circle

Restek Electronic Leak Detector

Why have a small leak turn into a costly repair? Protect your data and analytical column by using a Restek Leak Detector.

Features & Benefits include:

- Optimized sample flow path.
- New ergonomic, hand-held design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Longer lasting battery, up to 6 hours of continuous use.
- Automatic shut-off.
- A convenient carrying and storage case.
- Easy to clean probe assembly.
- A universal charger set (US, European, UK, and Australian plugs included).

Backed by a 1-year warranty, the new Restek Leak Detector sets an industry standard for performance and affordability in hand-held leak detectors.



22839

Leak Detector Facts

Detectable gases:	helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
Warranty:	one year
Certifications:	CE, Japan
Compliance:	WEEE, RoHS


22839

Carrying/storage case included with purchase of unit.

Limits of Detection

These gases can be detected with the Restek Electronic Leak Detector at the following leak rates.

Gas	Minimum Detectable Leak Rate (atm cc/sec.)	Indicating LED Light Color
Helium	1.0×10^{-5}	Red
Hydrogen*	1.0×10^{-5}	Red
Nitrogen	1.4×10^{-3}	Yellow
Argon	1.0×10^{-4}	Yellow
Carbon Dioxide	1.0×10^{-4}	Yellow

Description	qty.	cat.#	price
Leak Detector with Universal Charger Set (US, UK, European, Australian)	ea.	22839	
Soft-Side Carry/Storage Case	ea.	22657	
Small Probe Adaptor	ea.	22658	

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. The Restek Electronic Leak Detector may be used for determining trace amounts of hydrogen in a GC environment only.



22657

Optional soft-side storage case is ideal for storing your leak detector in smaller spaces, such as your tool box.



Checking for leaks maintains the integrity of a GC system.



Verify hard-to-reach leaks using the small probe adaptor.


22658

tech tip

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.

HANDY
septum size chart

Instrument	Septum Diameter (mm)
Agilent (HP)	
5880A, 5890, 6850, 6890, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5
Thermo Scientific	
TRACE GC	17
GCQ w/TRACE, PTV	17
8000 series	17
Finnigan (TMQ)	
GC 9001	9.5
GCQ	9.5
QCQ	9.5
TRACE 2000	9.5
Gow-Mac	
6890 series	11
All other models	9.5
PerkinElmer	
Sigma series	11
900,990	11
8000 series	11
Auto SYS	11
Auto SYS XL	11
Pye/Unicam	
All models	7
Shimadzu	
All models	Plug
SRI	
All models	Plug
Tracor	
540	11.5
550,560	9.5
220,222	12.5
Varian	
Injector type:	
Packed column	9.5/10
Split/splitless	
1078/1079	10/11
1177	9
1075/1077	11

tech tip

Tips for Handling Septa

All septa, regardless of composition, puncturability, or resistance to thermal degradation will fail if they are mishandled. Overtightening a septum nut invariably will reduce septum lifetime by increasing coring/splitting. All septa contain volatile materials (e.g., phthalates) that are released when the septum is heated (septum bleed). Because most GCs are equipped with a septum purge, septum bleed generally will disappear within 30 minutes after installing a new septum and exposing it to normal injector temperatures. All Restek septa are preconditioned and are ready to use without delay.

Restek Thermolite® Septa

Precision molded!



- Usable to 340°C inlet temperature.
- Precision molding assures consistent, accurate fit.
- Excellent puncturability.
- Preconditioned and ready to use.
- Do not adhere to hot metal surfaces.
- Packaged in precleaned glass jars.

Septum Diameter	25-pk. /price	50-pk. /price	100-pk. /price
5mm (3/16")	27120	27121	27122
6mm (1/4")	27123	27124	27125
7mm	27126	27127	27128
8mm	27129	27130	27131
9mm	27132	27133	27134
9.5mm (3/8")	27135	27136	27137
10mm	27138	27139	27140
11mm (7/16")	27141	27142	27143
11.5mm	27144	27145	27146
12.5mm (1/2")	27147	27148	27149
17mm	27150	27151	27152
Shimadzu Plug	27153	27154	27155

Restek IceBlue® Septa

Precision molded!



- Usable to 250°C inlet temperature.
- Precision molding assures consistent, accurate fit.
- General-purpose septa.
- Excellent puncturability.
- Preconditioned and ready to use.
- Do not adhere to hot metal surfaces.
- Packaged in precleaned glass jars.
- Ideal for SPME.

Septum Diameter	50-pk. /price	100-pk. /price
9mm	27156	27157
9.5mm (3/8")	27158	27159
10mm	27160	27161
11mm (7/16")	27162	27163
11.5mm	27164	27165
12.5mm (1/2")	27166	27167
17mm	27168	27169
Shimadzu Plug	27170	27171

BTO® Septa

Precision molded!



- Usable to 400°C inlet temperature.
- Precision molding assures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Do not adhere to hot metal surfaces.
- Packaged in precleaned glass jars.
- Each batch GC/FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC/MS applications.

Septum Diameter	50-pk. /price	100-pk. /price
5mm CenterGuide	27100	27101
6mm (1/4")	27102	27103
9mm CenterGuide	27104	27105
9.5mm (3/8")	27106	27107
10mm	27108	27109
11mm (7/16") CenterGuide	27110	27111
11.5mm CenterGuide	27112	27113
12.5mm (1/2") CenterGuide	27114	27115
17mm CenterGuide	27116	27117
Shimadzu Plug	27118	27119

Make Life Easier (MLE) Capillary Tool Kits, Inlet and FID Maintenance Kits

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.



22186

MLE Make Life Easier!



22181

All MLE Capillary Tool Kits include these components:

- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

MLE Capillary Tool Kit for Agilent GCs (cat.# 22186) also includes:

- capillary installation gauge for Agilent GCs
- injector wrench for Agilent GCs
- septum nut removal tool
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for PerkinElmer GCs (cat.# 22185) also includes:

- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for Shimadzu GCs (cat.# 22182) also includes:

- capillary installation gauge for Shimadzu GCs
- injector wrench for Shimadzu GCs
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench

MLE Capillary Tool Kit for Thermo Scientific GCs (cat.# 22183) also includes:

- capillary installation gauge for Thermo Scientific GCs
- liner cap removing tool for Thermo Scientific GCs
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench

MLE Capillary Tool Kit for Varian GCs (cat.# 22184) also includes:

- capillary installation gauge for Varian GCs
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

Inlet kit (cat.# 22181) includes:

- 0.4, 0.5, and 0.8mm ID graphite ferrules
- Viton® O-rings
- Capillary nuts
- Inlet seals
- Reducing nut
- Scoring wafer
- 11mm Thermolite® septa
- 4.0mm single gooseneck liner
- 4.0mm split liner with wool
- Capillary column caps
- 1/4" x 5/16" wrench
- Septum puller
- Installation gauge
- Wire cleaning brush
- Jet reamers/ferrule removers
- Inlet liner removal tool
- Septa nut removal tool



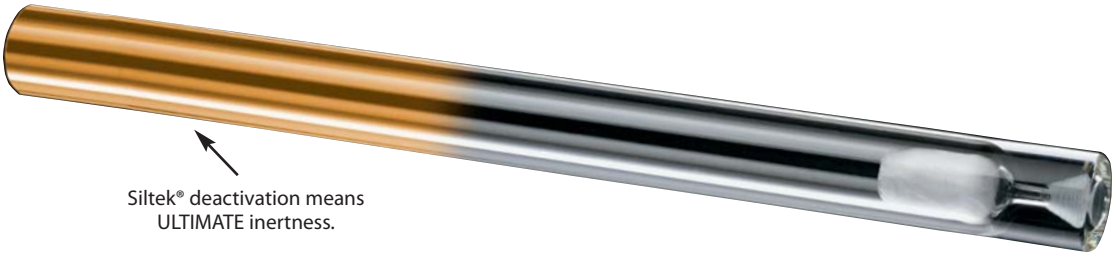
22179

FID kits (cat.#s 22180, 22179) include:

- 1/4", 0.4, 0.5, and 0.8mm ID graphite ferrules
- FID/NPD capillary adaptor
- Capillary nuts
- Jet reamers/ferrule removers
- 1/4" nut
- Scoring wafer
- Capillary column caps
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs
- FID flow measuring adaptor
- 1/4" x 5/16" wrench
- Installation gauge
- Wire cleaning brush
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs
- Spanner wrench
- FID jet removal tool

Description	qty.	cat.#	price
Inlet Maintenance Kit for Agilent 5890/6850/6890/7890 GCs	kit	22181	
FID Maintenance Kit for Agilent 5890 GCs	kit	22180	
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179	
MLE Capillary Tool Kit for Agilent GCs	kit	22186	
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185	
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182	
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183	
MLE Capillary Tool Kit for Varian GCs	kit	22184	

Liner Anatomy



Let's Begin

To correctly diagnose which inlet liner is right for your application, let's first consider the method of sample introduction.

Split Injections
Split injections are a fast, efficient way to transfer a portion of the sample onto the column for analysis. Split injection is often used for dirty samples or highly concentrated samples.

Splitless Injections
Splitless injection involves an initial hold time where the split vent flow is turned off and the incoming sample flow is forced onto the column. It is an excellent technique for low concentration samples and commonly is used in drug screening and pesticide residue methods.

Direct Injections
Direct injection is an alternative to splitless injection. It is an excellent technique for trace samples, especially those that are prone to degradation inside the injection port.

Programmable Temperature Vaporization (PTV)
PTV injection techniques offer a means to inject a sample into a cold injection port that can be rapidly heated to transfer analytes into the GC. These techniques can reduce sample degradation, increase reproducibility, and allow for larger volumes of sample to be introduced, ultimately increasing sensitivity.

Gaseous Sample Introduction
Purge and trap and headspace techniques that sweep a gaseous sample through the injection port onto the column require fast flow through the liner and very small liner volumes to minimize band broadening effects. Split flow operation is typically used to achieve this effect.

Deactivation

Liners and their packing materials need to provide highly inert pathways to guard against sample adsorption (reversible or irreversible) and sample degradation. There are three prominent deactivation options.

Siltek® Deactivation
Siltek® deactivated liners offer the most chemically inert sample pathway—perfect for low-level analyses or highly active compounds, where preventing sample loss and degradation is critical.

Intermediate Polarity (IP) Deactivation
IP deactivation offers good recovery and reproducibility for both polar and nonpolar compounds—making IP an excellent general-purpose deactivation.

Base Deactivation (BD)
Base deactivation (BD) is ideal for the analysis of basic compounds, such as amines and basic drugs. It prevents analyte adsorption which manifests as either irreproducible results or peak tailing. Couple BD liners with BD columns for best results.

restek **exclusive**!

Siltek® treated metal inlet liners



Packing Options

Proper selection of liner packing material and position improves sample vaporization, prevents nonvolatile compounds from entering the column, and permits large volume injections in programmable temperature vaporization applications. Sample characteristics and injection technique will dictate packing use. Analyses of high molecular weight analytes, especially in split mode, benefit from the use of packing.

Packing Material

Glass wool is the most common packing material. Properly deactivated glass wool provides an inert means of effectively vaporizing a sample, improving reproducibility and decreasing high molecular weight discrimination. An alternative to glass wool is Carbofrit packing (highly dense and inert).

Packing Position

- Packing placed near the bottom of the liner prevents nonvolatile compounds and septum particles from entering the column. Liners designed for splitless applications often have packing near the bottom, since the long analyte residence time in the liner is usually adequate to vaporize the sample.

- Packing near the middle of the liner enhances vaporization and can improve reproducibility. Precision™ liners are designed with built-in stops, keeping the wool properly positioned when wiping the needle. This ensures precise sample delivery each time. Good needle maintenance is critical as a burred needle can pull the packing out of position, eliminating its effectiveness.



Precision™ liners keep wool in position injection after injection.

Packing in PTV Injections

Packing material used in liners for PTV injection can serve as vaporization aides and a means of trapping nonvolatile compounds. Additionally, the packing can act as a reservoir for large volume injections, making it possible to inject greater than 100µL of sample.

Volume and Inner Diameter

Sample expansion volume and linear velocity should be considered when choosing liner dimensions.

Sample Expansion Volume

When a liquid sample is vaporized inside an inlet liner, its volume expands considerably. Care should be taken to match the effective liner volume and the expanded volume of the injected sample. If the liner volume is exceeded, the sample will be forced back into the gas lines, causing irreproducible peak areas and sample carryover.

Solvent expansion volumes based on an injection port temperature of 250°C and a 10 psig head-pressure.

For a straight 4mm ID x 78.5mm long liner, the effective liner volume is approximately 500µL.

Injection Volume (µL)	Expansion Volume (µL)				
	H_2O	C_2S	CH_2Cl_2	Hexane	Isooctane
0.5	~~710~~	212	200	98	78
1.0	~~1420~~	423	401	195	155
2.0	~~2840~~	~~846~~	~~802~~	390	310
5.0	~~7100~~	~~2120~~	~~2000~~	~~975~~	~~775~~

— indicates expansion volume exceeds effective liner volume.

Linear Velocity

Choosing a liner with a narrow inner diameter will give a faster linear velocity (for a given flow rate), which will move the sample onto the column quickly, improving efficiency and helping keep peak widths narrow. This is particularly important for gaseous samples introduced via purge-and-trap or static headspace techniques, or when 0.18mm, 0.15mm, and 0.10mm ID columns are used.

Geometry

Many inlet liners are designed with special geometries. Generally liner geometries are intended to aid sample vaporization and protect the sample, especially during splitless injections. Additionally for PTV applications, liners provide wetable surface area for large volume injections.

Enhance Vaporization
To avoid molecular weight (MW) discrimination (a phenomenon where high MW compounds are not vaporized efficiently and are therefore under-represented in the analyzed sample), some liners are designed with complex flow paths to aid vaporization.

Protect the sample
Some samples are prone to degradation inside of the injector, especially when in contact with hot metal surfaces. Several liners are designed specifically to minimize contact with the injection port.

Cyclosplitter®



Gooseneck



Laminar Cup



Double Gooseneck



Cyclo Double Gooseneck

Some liners combine both features! ⟶



Baffles in PTV Liners
The baffles in PTV liners can act as a means to help vaporize a sample during a hot split or splitless injection, but typically they act as "wells" where liquid sample can be retained during cold injections. In this way, the baffle liners allow for larger volume injections to be made, typically on the order of 10µL.

Direct Injections with Uniliner® and Drilled Uniliner® Inlet Liners

Unliner® and Drilled Uniliner® inlet liners allow a fused silica column to be connected directly to the liner through a seal made between the inner glass wall of the liner and the polyimide coating on the outside of the column.

This configuration maximizes the amount of sample transferred to the GC column and is a good choice for trace analyses. It also minimizes sample exposure to hot injection port parts, potentially improving sample stability and reproducibility.

Use the Drilled Uniliner® inlet liner with the hole near the bottom for semivolatile analyses or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® inlet liner with the hole near the top for chlorinated pesticides analyses, aqueous injections, and analyses in which the compounds of interest elute away from the solvent peak.



Drilled Uniliner® with hole near bottom



Drilled Uniliner® with hole near top

Instruments equipped with electronic pressure control must use Drilled Uniliner® inlet liners.

Liner Maintenance

Inlet liners are key to injection port maintenance and need to be changed regularly to avoid the following problems:

- Sample degradation resulting in poor response.
- Sample adsorption resulting in poor peak shape (tailing).
- Sample discrimination.
- Irreproducibility.
- Extraneous peaks from contamination or cored septum particles.

Be sure to condition your liners at 20°C higher than the operating inlet temperature for a minimum of 10 minutes to prepare them for use.

Liner Deactivations Available from Restek

Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every Restek liner is IP deactivated unless otherwise requested.

Base Deactivation

- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, and Stabilwax®-DB columns.

Siltek® Deactivation

- Revolutionary, proprietary deactivation for difficult matrices and reactive compounds.
- Inertness retained over a wide sample range.
- Minimal bleed.
- Ideal for chlorinated pesticide analysis.
- Recommended for use with Rtx®-CLPesticides, Stx™-CLPesticides, and Rtx®-TNT columns.

All liners are **100% deactivated**

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Siltek® Deactivation for Liners

- Maximizes the inertness of the sample pathway.
- Minimizes breakdown.
- Low bleed.
- Thermally stable.
- "Clean and green"—manufactured without the use of harmful organic solvents.

Our patented Siltek® deactivation process for liners produces a highly inert glass surface that features high temperature stability, extreme durability, and low bleed. Try Siltek® liners, guard columns, and connectors for better recovery of sample analytes.



Siltek® Coated Liners

For Siltek® deactivated inlet liners, add the corresponding suffix number to the liner catalog number.

qty.	Siltek Liner	Siltek Liner w/Wool	Siltek Liner w/CarboFrit
each	-214.1 enquire addl. cost	-213.1 enquire addl. cost	-216.1 enquire addl. cost
5-pk.	-214.5 enquire addl. cost	-213.5 enquire addl. cost	-216.5 enquire addl. cost
25-pk.	-214.25 enquire addl. cost	-213.25 enquire addl. cost	-216.25 enquire addl. cost

Base-Deactivated Inlet Liners

For base-deactivated inlet liners, add the corresponding suffix number to the liner catalog number.

qty.	Base-Deactivated Liner	Base-Deactivated Liner w/ Base-Deactivated Wool	Base Deactivated Liner w/CarboFrit
each	-210.1 enquire addl. cost	-211.1 enquire addl. cost	-229.1 enquire addl. cost
5-pk.	-210.5 enquire addl. cost	-211.5 enquire addl. cost	-229.5 enquire addl. cost
25-pk.	-210.25 enquire addl. cost	-211.25 enquire addl. cost	-229.25 enquire addl. cost

Ideal for amines and basic compounds!

tech tip

Minimizing Backflash

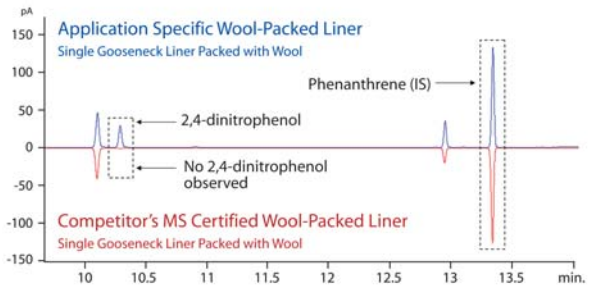
Backflash occurs when the volume of the sample vapor exceeds the effective volume of the injection liner. This phenomenon causes poor reproducibility, tailing analyte peaks, a broad solvent peak, ghost peaks, and nonlinear responses. You can minimize backflash by using a solvent that has a low expansion volume, injecting less sample, installing an injector liner with a larger volume, or reducing the injector temperature.

Application Specific Deactivated Wool

NEW!

New deactivated wool gives excellent inertness for semivolatile analysis. The acidic compounds are reactive and can be difficult to quantify with wool placed in the inlet liner. With the new deactivation used for wool, the response of 2,4-dinitrophenol is excellent and an improvement over other competitor deactivated wool for semivolatile analysis. As shown in Figure 1, the response of 10ng of 2,4-dinitrophenol using the new wool in the liner is 0.21, where the competitive "MS Certified Liner with Wool" liner shows virtually no response.

Figure 1 Response of 10ng of 2,4-dinitrophenol compared to phenanthrene using a flame ionization detector.



To order the new Application Specific Wool in prepacked liners, add the corresponding suffix number to the liner catalog number.

qty.	IP Deactivated Liner with Application Specific Wool	Siltek Liner with Application Specific Wool
each	-231.1 enquire addl. cost	-232.1 enquire addl. cost
5-pk.	-231.5 enquire addl. cost	-232.5 enquire addl. cost
25-pk.	-231.25 enquire addl. cost	-232.25 enquire addl. cost

Deactivated Wool

This deactivated wool is more inert than our traditional fused silica wool. This wool can be used to vaporize a sample in a liner prior to introduction into a capillary column.



Description	qty.	cat.#	price
Deactivated Wool	10 grams	24324	

Base-Deactivated Wool

Ideal for amines and other basic compounds.



Description	qty.	cat.#	price
Base-Deactivated Wool	10 grams	20999	



please **note**

Liner packing materials and their uses in various liners are described on **page 141**.

Prepacked Inlet Liners

Let Restek do the work! Just add the appropriate suffix to the liner catalog number.

qty.	Wool	CarboFrit†	price
ea.	-200.1	-209.1	enquire addl. cost
5-pk.	-200.5	-209.5	enquire addl. cost
25-pk.	-200.25	-209.25	enquire addl. cost

†CarboFrit inserts require a neck greater than 2mm.

CarboFrit™ Inlet Liner Packing Material



- Highly inert.
- Extends analytical column lifetime.
- Enhances reproducibility of split and splitless injection.
- Uniform pore size and consistent packing density guarantee consistent flow through the liner.
- Easy to install in any liner with an ID >3.5mm when using puller-inserter tool listed below.*

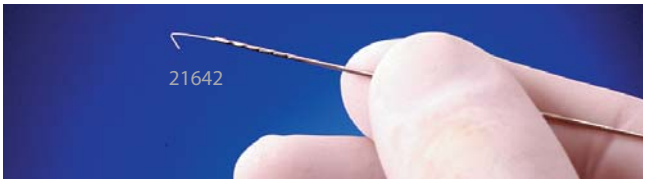
Add the corresponding suffix number to the liner catalog number.

Description	suffix	price
each	-209.1	enquire addl. cost
5-pk.	-209.5	enquire addl. cost
25-pk.	-209.25	enquire addl. cost

*Liners with IDs less than 3.5mm are difficult to pack. We will pack them on a custom basis (minimum neck ID of 2mm required).

Replacement CarboFrit™ Inserts

Description	qty.	cat. #	price
Frits for liner ID ≤4mm	10-pk.	20295	
Frits for liner ID >4mm	10-pk.	20294	



CarboFrit™ Puller/Inserter Tool

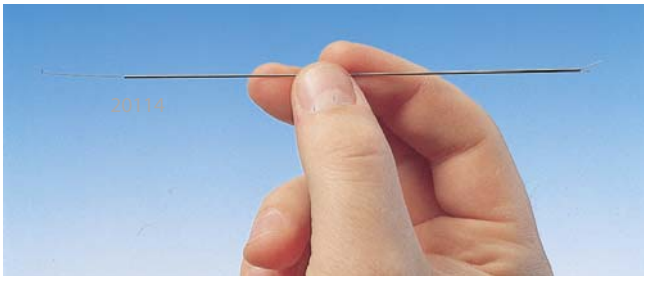
- Hook end for removing CarboFrit™ inserts.
- Bent end (90°) for inserting CarboFrit™ inserts.

Description	qty.	cat.#	price
CarboFrit Puller/Inserter Tool	ea.	21642	

tech tip

Use of Packings with Autosampler

We recommend using an injection port liner with wool or CarboFrit™ packing when making injections with an autosampler. If there is no packing material in the liner, the solvent droplets act like water on a hot iron: they bounce around until vaporized (Leidenfrost phenomenon). Because autosamplers make rapid injections, samples can be incompletely vaporized, leading to nonreproducible peak response and tailing. You can prevent this by using wool or CarboFrit™ packing material in the splitless liner, to provide a surface for the solvent droplets to "sit" on until the heat from the injector vaporizes them.



Mini Wool Puller/Inserter

Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.





Description	qty.	cat.#	price
Mini Wool Puller/Inserter	2-pk.	20114	



Eliminates user variation!

Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturer's liners.



Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.



Place a plug of loosely bound wool at the top of the inlet liner.



Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#	price
Inlet Liner Packing Tool	ea.	20339	



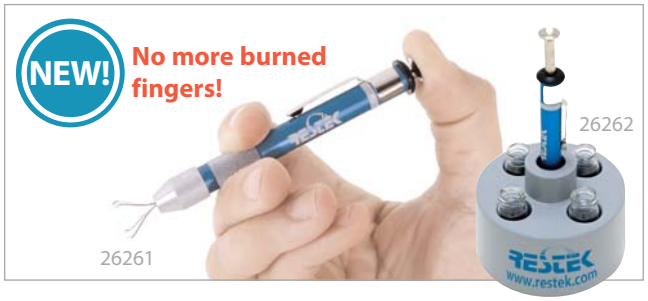
No more burned fingers!



Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

Description	qty.	cat.#	price
Inlet Liner Removal Tool	3-pk.	20181	



The Claw and The Claw Holder Kit



- Easily removes hot liners from injection ports.
- 4mL vials (not included) can be changed out and disposed of when dirty.

Never again will you have to burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4mL vial situated in the Claw holder until ready for reuse.

Description	qty.	cat. #	price
The Claw	ea.	26261	
The Claw Holder Kit (includes The Claw and holder)	kit	26262	
4.0mL Clear Vial, White Graduated Marking Spot	100-pk.	24658	

tech tip

Injector Maintenance

Approximately ninety percent of "bad" chromatography is traceable to problems in the injection port. These problems include contaminated carrier gas, incorrect injector flows, active or dirty sites on inlet seals and liners, improper use of wool, leaks, backflash, discrimination, incorrect injector temperature, poor column installation, and use of the wrong injection technique. To minimize injection port problems, set up a routine maintenance schedule and be sure to investigate the injector first when troubleshooting.

Supplies for Agilent GCs: Liners

COLUMN INSTALLS THIS END

Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	cat.#/price ea.	5-pk.	25-pk.
 2mm Splitless	trace samples <2µL	2.0mm 6.5mm x 78.5mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	20712	20713	20714
 4mm Splitless	trace samples >2µL	4.0mm 6.5mm x 78.5mm	210-3003 (ea.) 210-3003-5 (5-pk.)	20772	20773	20774
 4mm Splitless w/Wool	trace samples >2µL	4.0mm 6.5mm x 78.5mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	22400	22401	22402
 2mm Splitless (quartz)	trace samples <2µL	2.0mm 6.5mm x 78.5mm	18740-80220 (ea.) 5183-4707 (5-pk.)	20914	20915	—
 4mm Splitless (quartz)	trace samples >2µL	4.0mm 6.5mm x 78.5mm	—	20912	20913	—
 4mm Splitless (quartz) w/Wool	trace samples >2µL	4.0mm 6.5mm x 78.5mm	—	22403	22404	—
 Gooseneck Splitless (2mm)	trace samples <2µL	2.0mm 6.5mm x 78.5mm	—	20795	20796	20797
 Gooseneck Splitless (4mm)†	trace samples >2µL	4.0mm 6.5mm x 78.5mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	20798	20799	20800
 Gooseneck Splitless (4mm) w/Wool†	trace samples >2µL	4.0mm 6.5mm x 78.5mm	5062-3587 (ea.) 5183-4693 (5-pk.) 5183-4694 (25-pk.)	22405	22406	22407
 Double Gooseneck Splitless (4mm)	trace, active samples >2µL	4.0mm 6.5mm x 78.5mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	20784	20785	20786
 Cyclo Double Gooseneck (2mm)	trace, active, dirty samples <2µL	2.0mm 6.5mm x 78.5mm	—	20907	20908	—
 Cyclo Double Gooseneck (4mm)	trace, active, dirty samples >2µL	4.0mm 6.5mm x 78.5mm	—	20895	20896	20997
 Recessed Gooseneck (2mm)**	base easily packs with wool for dirty samples <2µL	2.0mm 6.5mm x 78.5mm	—	20980	20981	20982
 Recessed Gooseneck (4mm)**	base easily packs with wool for dirty samples >2µL	4.0mm 6.5mm x 78.5mm	—	20983	20984	20985
 Recessed Gooseneck (4mm) w/Wool**	base easily packs with wool for dirty samples >2µL	4.0mm 6.5mm x 78.5mm	—	22408	22409	22410
 Recessed Double Gooseneck (4mm)**	trace, active samples >2µL	4.0mm 6.5mm x 78.5mm	—	20986	20987	20988

*Nominal ID at syringe needle expulsion point.
**Use with two-hole ferrule for dual-column analysis.
†Use this liner for increased sensitivity.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.



Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.



Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

Supplies for Agilent GCs: Liners

COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part#	ea.	cat.# /price 5-pk.	25-pk.
 1mm Split**	for purge & trap inlet splitting or sample <1µL	1.0mm 6.3mm x 78.5mm	18740-80200 (ea.) 5183-4709 (5-pk.)	20972	20973	—
 4mm Split w/Wool	universal, use with Agilent 7673 autosampler	4.0mm 6.3mm x 78.5mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	20781	20782	20783
 Laminar Cup Splitter	high MW compounds	4.0mm 6.3mm x 78.5mm	—	20801	20802	—
 *mini*-Lam Split	high MW compounds	4.0mm 6.3mm x 78.5mm	—	20990	20991	—
 Cup Splitter	high & low MW compounds	4.0mm 6.3mm x 78.5mm	18740-80190 (ea.) 5183-4699 (5-pk.)	20709	20710	—
 Cyclosplitter	dirty samples, many injections before cleaning required	4.0mm 6.3mm x 78.5mm	—	20706	20707	20708
 2mm Split Precision Liner w/Wool	dirty samples, trace samples	2.0mm 6.3mm x 78.5mm	—	20823	20824	—
 4mm Split Precision Liner w/Wool	dirty samples, trace samples	4.0mm 6.3mm x 78.5mm	210-4004-5 (5-pk.)	21022	21023	20979
 4mm Gooseneck Precision Liner	dirty samples, trace samples	4.0mm 6.3mm x 78.5mm	210-4022-5 (5-pk.)	22983	22984	22985

Split/Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	ea.	cat.# /price 5-pk.	25-pk.
 Low Pressure Drop Liner w/Wool	universal	4.0mm 6.3mm x 78.5mm	—	21032	21033	—
 Low Pressure Drop Liner w/Wool	universal	4.0mm 6.3mm x 78.5mm	5183-4647 (ea.) 5183-4701 (5-pk.)	20994	20995	20996

CIS4 and PTV Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part#	ea.	cat.# /price 5-pk.	10-pk.
 PTV On-Column Liner	allows on-column injection with a 0.53mm ID column	1.7mm 3.0mm x 71mm	—	24976	24977	—
 Straight Glass	general use	2.0mm 3.0mm x 71mm	5183-2036	—	—	21157
 Baffled Glass	active compounds, drugs, pesticides	1.5mm 3.0mm x 71mm	5183-2037	—	—	21704
 Glass w/Wool	large volume injections	2.0mm 3.0mm x 71mm	5183-2038	—	—	21156

SPME Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	cat.# /price ea.	cat.# /price 5-pk.
 SPME Liner	ideal for low-volume SPME applications	0.75mm 6.35mm x 78.5mm	21110	21111

*Nominal ID at syringe needle expulsion point.
**Use this liner for increased sensitivity.

Supplies for Agilent GCs: Liners

COLUMN INSTALLS THIS END

DI Liners for Agilent GCs** (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	cat.#/price ea.	5-pk.	25-pk.
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	—	21054	21055	20998
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	G1544-80730	20756	20771	—
 Double Gooseneck Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	—	20508	20509	—
 Double Gooseneck Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	G1544-80700	20954	20989	—
 Drilled Cyclo-Uniliner (hole near top)	trace, dirty, high MW, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	NEW!	22979	22980	—
 1mm Uniliner	trace, active samples, samples <1µL	1.0mm 6.3mm x 78.5mm		21052	21053	
 Uniliner	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm		20335	20336	
 Cyclo-Uniliner	trace, dirty, high MW active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm		20337	20338	
 Open-top Uniliner w/Wool	trace, dirty, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm		20843	20844	

*Nominal ID at syringe needle expulsion point.
**Hole in Drilled Uniliner liner makes direct injection possible with EPC-equipped Agilent 6890 & 7890 GCs!

tech tip

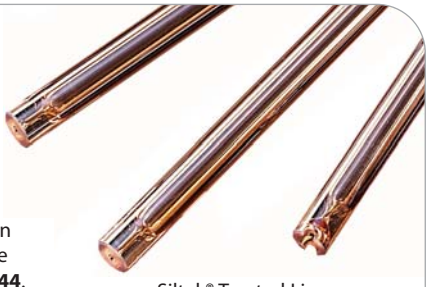
Drilled Uniliner® Liners
Use the Drilled Uniliner® liner with the hole near the bottom for semivolatile analysis or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® liner with the hole near the top for chlorinated pesticides analysis, aqueous injections, as well as for analysis in which the compounds of interest elute away from the solvent peak.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.


Siltek® Treated Liners



Siltek® Metal Inlet Liners for Agilent GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (5.2mm ID x 6.3mm OD x 78.5mm)	5-pk.	25-pk.
Cyclo/Single Gooseneck	20974	20975
Single Gooseneck	21702	21703
Cyclosplitter	20726	20729
Split/Splitless w/Wool	21700	21701

Viton® O-Rings for Agilent GCs



- Fit split (6.3mm OD) or splitless (6.5mm OD) liners.

Description	Max. temp.	Similar to Agilent part #	qty.	cat.#	price
Viton O-Rings for Agilent GCs	250°C	5180-4182	25-pk.	20377	

Graphite O-Rings for Agilent and Varian 1177 Injectors



- Excellent thermal stability at injection port temperatures up to 450°C!

Description	Max. temp.	Similar to Agilent part #	10-pk. cat.#	price	50-pk. cat.#	price
6.35mm ID Graphite O-rings for split liners	450°C	5180-4168	20296		20297	
6.5mm ID Graphite O-rings for splitless liners	450°C	5180-4173	20298		20299	

Liner Seals for CIS4 and PTV



Description	Max. temp.	Similar to Agilent part #	Similar to Gerstel part #	qty.	cat.#	price
Liner Seals for CIS4 and PTV	450°C	5182-9749	007541-005-00	5-pk.	22684	

Replacement Viton® O-Rings for use with the Agilent Flip Top Inlet Sealing System



Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Viton O-Rings for use with the Agilent Flip Top Inlet Sealing System	5188-5366	10-pk.	22336	

Injector/Detector Plug Nuts



- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.

Description	Similar to Agilent part#	qty.	cat.#	price
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883	



IceBlue® Septa



Thermolite® Septa



BTO® Septa

Septa for Agilent GCs

- Preconditioned and ready to use.
- Packaged in precleaned glass jars.

Now precision molded!

Septum Diameter	25-pk. price	50-pk. price	100-pk. price
Thermolite Septa (usable to 340°C inlet temp.)			
5mm (3/16")	27120	27121	27122
9.5mm (3/8")	27135	27136	27137
10mm	27138	27139	27140
11mm (7/16")	27141	27142	27143
IceBlue Septa (usable to 250°C inlet temp.)			
9.5mm (3/8")		27158	27159
10mm		27160	27161
11mm (7/16")		27162	27163
BTO Septa (usable to 400°C inlet temp.)			
5mm CenterGuide		27100	27101
9.5mm (3/8")		27106	27107
10mm		27108	27109
11mm (7/16") CenterGuide		27110	27111

HANDY septum size chart

Agilent Instrument	Septum Diameter (mm)
5880A, 5890, 6890, 6850, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5

Merlin Microseal Septa for Agilent GCs



Nut

Septa

- Allow operation from 2 to 100psi (400 Series) or 2 to 30psi (300 Series).
- Maximum temperature—Agilent 7890, 6890, 5890 Series II: 325°C; Agilent 5890A: 300°C.

Microseal High-Pressure Septa, 400 Series (100psi)	Merlin #	Similar to Agilent#	cat.#	price
Standard kit (nut, 2 septa)	404	Not offered	22810	
Starter kit (nut, 1 septum)	405	5182-3442	22811	
Nut kit (1 nut, fits 300 & 400 series septa)	403	5182-3445	22809	
High-pressure replacement septum (1 septum)	410	5182-3444	22812	

Microseal Septa, 300 Series (30psi)	Merlin #	Similar to Agilent#	cat.#	price
Standard kit (nut, 2 septa)	304	5181-8833	22813	
Starter kit (nut, 1 septum)	305	5181-8816	22814	
Microseal replacement septum (1 septum)	310	5181-8815	22815	

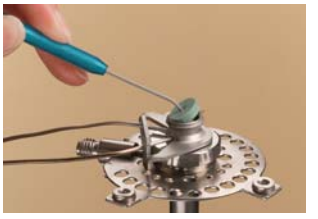


20117

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory—can be used in many different ways.





Description	qty.	cat.#	price
Septum Puller	ea.	20117	

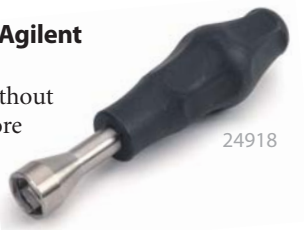
Septum Nuts for use with Agilent 5890/6890/6850/7890 Split/Splitless Injectors


21309

- Needle guide allows easy penetration and prevents septum coring.
- Manual injection septum nut allows use of 26-gauge needles for on-column injections.
- Made of high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
Autosampler & PTV Septum Nut (for 23-gauge needles)	18740-60835	ea.	20631	
Manual Injection Septum Nut (for 26-gauge needles)	18740-60835	ea.	21309	

Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs


24918

- Easily remove the septum nut without touching the heated nut—no more burned fingers!
- Unique, ergonomic handle—easy to grip.
- Nut remains in tool for quick reattachment.

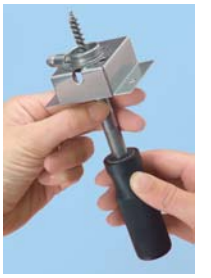
Description	qty.	cat.#	price
Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs	ea.	24918	

Injector Wrench for Agilent 5890/6890/6850 GCs


22065

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065	





21393

Injection Port Repair Tool for Agilent Split/Splitless Injection Ports

- Remove contaminants, achieve a better seal.
- Cleans critical inlet seal areas.

Description	qty.	cat.#	price
Injection Port Repair Tool for Agilent Split/Splitless Injection Ports	ea.	21393	
Replacement Sanding Disks (5 fine & 5 medium)	10-pk.	22689	
Replacement Bore Brushes (one 6.5mm & one 7mm)	2-pk.	21353	

Rethreading Tool for Agilent Split/Splitless Injection Ports


23018

- Repair worn or damaged threads in injection ports, fittings, etc.
- Built-in guide to prevent cross-threading.

Worn & damaged threads can allow oxygen into the system—compromising analytical results and destroying columns.



Make your injection port threads like new!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#	price
Rethreading Tool for 1/4" compression fittings (Agilent split/splitless injection ports)	ea.	23018	

tech tip

Minimizing Injector Discrimination

When an injected sample is not completely vaporized, lower percentages of compounds that are less volatile (i.e., compounds with high boiling points or high molecular weights) are transferred into the analytical column. As a result, these later-eluting compounds will have progressively decreased peak areas. You can minimize injector discrimination by reducing injector flows, increasing the injector temperature, using pressure pulse injection or a fast autosampler, or using an injector liner that aids in vaporization (e.g., a laminar cup splitter or a liner packed with wool).





Capillary Column Nuts for Agilent 5890/6890/7890 GCs

Available in brass or stainless steel.



for use with "compact" Agilent-style ferrules



for use with standard ferrules

Description	Similar to Agilent part #	qty.	cat.#	price
For use with "compact" Agilent-style ferrules.				
Stainless Steel Capillary Column Nut	5181-8830	2-pk.	21884	
Brass Capillary Column Nut	5181-8830	2-pk.	21878	
For use with standard 1/16"-type ferrules.*				
Stainless Steel Capillary Column Nut	05921-21170	2-pk.	20883	
Brass Capillary Column Nut	05921-21170	2-pk.	21879	

*Designed to fit a wider variety of 1/16" ferrules



21882

Capillary Column Nuts for Agilent 6850 GCs

- Meet or exceed original manufacturer's performance.
- High-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
Capillary Column Nuts for Agilent 6850 GCs	5183-4732	2-pk.	21882	



22347

Hot Swap Capillary Column Nuts

- No more burned fingers!
- No more downtime waiting for injector parts to cool down.

Never worry again about burned fingers or having to wait for the injector to cool down. Now the Hot Swap Capillary Column Nut allows you to change your capillary column while the injector temp is still hot.

Description	qty.	cat.#	price
For use with "compact" Agilent-style ferrules.			
Hot Swap Capillary Column Nut	ea.	22348	
For use with standard 1/16"-type ferrules.			
Hot Swap Capillary Column Nut	ea.	22347	

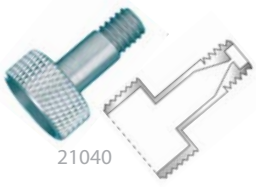


21312

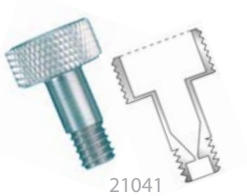
Finger-Tight Capillary Column Nuts

- Rapidly tighten without wrenches; avoid stripped threads.
- Either version can be used with 0.25, 0.32, or 0.53mm ID columns.

Description	qty.	cat.#	price
For use with "compact" Agilent-style ferrules.			
Finger-Tight Capillary Column Nut	ea.	21311	
For use with standard 1/16"-type ferrules.			
Finger-Tight Capillary Column Nut	ea.	21312	



21040



21041

Finger-Tight Capillary Column Nuts

- Allow wrench-free column installations.
- Work with standard or compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
For use with "compact" Agilent-style ferrules.				
Finger-Tight Capillary Column Nuts	5020-8293 5020-8292	2-pk.	21040	
For use with standard 1/16"-type ferrules.				
Finger-Tight Capillary Column Nuts	5020-8293 5020-8292	2-pk.	21041	



21034



21399

Capillary Installation Gauge

- Seats graphite* ferrules onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#	price
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034	
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399	

*Recommended for use with graphite ferrules.

restek **innovation**!



21240 21238 21248

Patented.



A Dual Vespel® Ring Inlet Seal eliminates the need for a washer!



22083 22085 22087

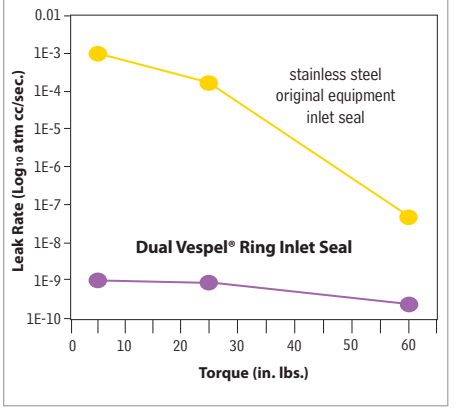


Unique Features	Restek Dual Vespel Ring Inlet Seal	Replacement Inlet Seals with Washers
Does not require a separate washer.	✓	
Requires less torque to seal.	✓	
Does not require retightening of reducing nut after several oven cycles.	✓	
Extends column lifetime by preventing oxygen from reaching the column.	✓	
Same price as the regular inlet seals with washers.	✓	NA

Dual Vespel® Ring Inlet Seals for Agilent GCs

Our patented Dual Vespel® Ring Inlet Seal greatly improves injection port performance—it stays sealed, even after repeated temperature cycles, without retightening the reducing nut! This seal features two soft Vespel® rings, one embedded in its top surface and the other embedded in its bottom surface. These rings eliminate the need for a washer, and ensure very little torque is needed to make a leak-tight seal. The rings will not harm the critical seal in the injector body, or any other surface, and are outside the sample flow path. Tests using a high sensitivity helium leak detector show Dual Vespel® Ring Inlet Seals will seal equally effectively at torques from 5 in. lb. to 60 in. lb. (Figure 1).

Figure 1 The Dual Vespel® Ring Inlet Seal achieves leak-tight seals even at low torque, reducing the chance of leak-related problems.



Use a stainless steel seal for analyses of unreactive compounds. To reduce breakdown and adsorption of active compounds, use a gold-plated or Siltek®-treated seal.

0.8mm ID Dual Vespel Ring Inlet Seal	2-pk. /price	10-pk. /price
Gold-Plated	21240	21241
Siltek Treated	21242	21243
Stainless Steel	21238	21239
1.2mm ID Dual Vespel Ring Inlet Seal	**2-pk. /price**	**10-pk. /price**
Gold-Plated	21246	21247
Siltek Treated	21248	21249
Stainless Steel	21244	21245

Dual Vespel® Ring Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications.
- Washerless, leak-tight seals.

0.8mm ID Dual Vespel Ring Cross-Disk Inlet Seal	2-pk. /price	10-pk. /price
Gold-Plated	22083	22084
Siltek Treated	22085	22086
Stainless Steel	22087	22088

Replacement Inlet Seals with Washers

- Special grade of stainless steel that is softer, creating a better seal.
- Siltek® treatment provides inertness similar to fused silica.
- All seals include washers.



Note: The 1.2mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

Replacement Inlet Seals for Agilent GCs

The inlet seal at the base of the Agilent 5890/6890/7890 GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

To reduce breakdown and adsorption of active compounds, use Siltek® or gold-plated seals.

Single-Column Installation (0.8mm Opening) Replacement Inlet Seal	Similar to Agilent part #	2-pk. /price	10-pk. /price
Gold-Plated	18740-20885	21317	21318
Siltek Treated		21319	21320
Stainless Steel	18740-20880	21315	21316
0.25/0.32mm ID Dual-Column Installation (1.2mm Opening) Replacement Inlet Seal		**2-pk.** /price	**10-pk.** /price
Gold-Plated		21305	21306
Siltek Treated		21307	21308
Stainless Steel		20390	20391
0.53mm ID Dual-Column Installation (1/16-inch Opening) Replacement Inlet Seal		**2-pk.** /price	**10-pk.** /price
Stainless Steel		20392	20393

All seals include washers.

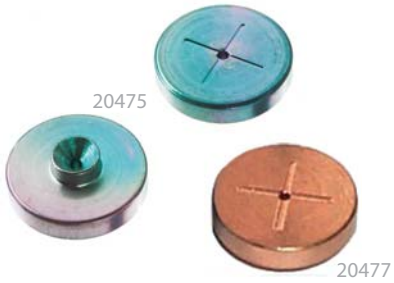
Replacement Inlet Seal Washers

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Inlet Seal Washers	5061-5869	15-pk.	21710	



Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications on Agilent 5890 GCs.
- All seals include washers.



0.8mm ID Cross-Disk Inlet Seal	Similar to Agilent part #	2-pk. /price	10-pk. /price
Gold-Plated	5182-9652	20477	20476
Siltek Treated	—	20475	20474
1.2mm ID Cross-Disk Inlet Seal	**Similar to Agilent part #**	**2-pk.** /price	**10-pk.** /price
Gold-Plated	—	21009	21010
Siltek Treated	—	21011	21012

Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent part #	qty.	cat.#	price
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409	



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Supplies for Agilent GCs: Injection Port

Direct Replacement and Siltek® Treated Split/Splitless Injection Ports for Agilent GCs

Would you like better performance from your injector? Our Siltek® treated split/splitless injector is a direct replacement for Agilent 5890 and 6890/6850 GCs, but Siltek® treatment passivates the metal surface to ensure an inert pathway for the sample, delivering increased performance. The injector is manufactured from high-quality stainless steel and meets or exceeds Agilent original equipment performance.





Direct Replacement and Siltek® Treated Split/Splitless Injection Port for Agilent 5890 GCs

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Weldment*	19251-60575	ea.	20265	
Siltek Weldment*	19251-60575	ea.	20267	
Replacement Shell Weldment	19251-80570	ea.	20266	
Siltek Shell Weldment	19251-80570	ea.	20268	









Direct Replacement and Siltek® Treated Split/Splitless Injection Port for Agilent 6890/6850 GCs

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Weldment with EPC	G1544-60575	ea.	22674	
Siltek Weldment with EPC	G1544-60575	ea.	22672	
Replacement Weldment*	19251-60575	ea.	20265	
Siltek Weldment*	19251-60575	ea.	20267	
Replacement Shell Weldment	G1544-80570	ea.	22673	
Siltek Shell Weldment	G1544-80570	ea.	22671	
Split/Splitless Weldment (for use with large canister type filter)	G1544-60585	ea.	22686	
Siltek Split/Splitless Weldment (for use with large canister type filter)	G1544-60585	ea.	22670	

*For use with manual flow or EPC on Agilent 5890 GCs. For use with manual flow only on Agilent 6890/6850 GCs.

Injection Port Weldments for Agilent GCs for use with Purge and Trap Systems

Easily attach your purge and trap with pre-installed low dead volume fittings.





For Agilent GCs with Tekmar Purge and Trap Systems

Description	qty.	cat.#	price
Weldment for Agilent 6890 GCs	ea.	22664	
Weldment for Agilent 6890 GCs with large canister type filter	ea.	22668	
Weldment for Agilent 5890 GCs	ea.	22666	





For Agilent GCs with OI Purge and Trap Systems

Description	qty.	cat.#	price
Weldment for Agilent 6890 GCs	ea.	22665	
Weldment for Agilent 6890 GCs with large canister type filter	ea.	22669	
Weldment for Agilent 5890 GCs	ea.	22667	

tech tip

Installing a New Weldment

To eliminate possible leaks and damage to the weldment, always replace the split vent line, nut, and ferrule when installing a new shell weldment.

NEW!



1/16-Inch Capillary Inlet Adaptor Fitting Kit

(Split/splitless fitting for capillary columns)

- 1/16-inch split/splitless fitting that accepts standard capillary ferrules.
- Easier to install capillary columns because the nut protrudes farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, capillary nut, gold plated 0.8mm ID Dual Vespel® Ring Inlet Seal, and one 0.4mm ID ferrule.

Description	qty.	cat.#	price
1/16-Inch Capillary Inlet Adaptor Fitting Kit	kit	27184	
0.8mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21240	
	10-pk.	21241	



Direct Replacement Reducing Nut

- Made from high-quality stainless steel.
- Meets original manufacturer's equipment performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Reducing Nut	18740-20800	ea.	22078	



EPC Test Kit for Agilent 6890 GCs

- Kit includes 3 O-rings, 2 plugs, 1 mounting screw and 1 test block.

Description	Similar to Agilent part #	qty.	cat.#	price
EPC Test Kit for Agilent 6890 GCs	G1530-60960*	kit	24323	

*Similar to Agilent part # G1530-60960, but not exact equivalent. Kits differ in parts.



Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	ea.	22068	
Injector/FID Heater	19231-60620	ea.	22069	
Injector/FID PRT Sensor	19231-60660	ea.	23035	



Heat Sink for Agilent 5890 GC Split/Splitless Injector

- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Heat Sink for Agilent 5890 GCs	18740-20940	ea.	20409	



Catch the Buzz

Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Supplies for Agilent GCs: Replacement Parts



Heater Block Retaining Nuts for Agilent GC Split/Splitless Injectors

- Aluminum construction.
- Meet or exceed manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Heater Block Retaining Nut for Agilent 5890 GCs	19251-20620	ea.	22080	
Heater Block Retaining Nut for Agilent 6890/6850 GCs	G1544-20590	ea.	23042	



Oven Temperature Sensor Assembly

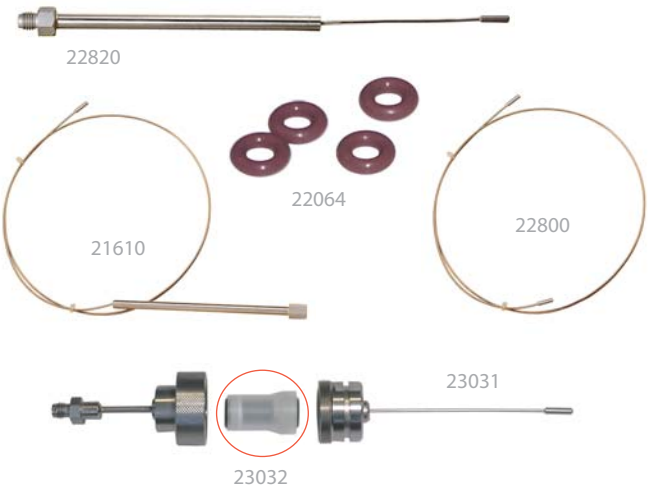
Description	Similar to Agilent part #	qty.	cat.#	price
Oven Temperature Sensor for Agilent 5890 GC	05890-61030	ea.	23040	
Oven Temperature Sensor for Agilent 6890 GC	G1530-61030	ea.	23039	



60psig Backpressure Regulator Kit

Increase the versatility of your Agilent 5890 GC by replacing the existing 30psig (207kPa) backpressure regulator and gauge with our 60psig (414kPa) regulator. Enables you to use longer 60m and 105m columns as well as shorter 10m columns. Includes complete instructions.

Description	Similar to Agilent part #	qty.	cat.#	price
Backpressure Regulator Kit	19246-60630	kit	20634	



Replacement Chemical Traps for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Split Vent Trap for Agilent 6890/6850 GCs	G1544-80550	ea.	22820	
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610	
Split Vent Line for Agilent GCs (32-inch) (Includes all installation hardware.)	19251-80525 G1544-20620	2-pk.	22800	
O-rings for Agilent Trap Fittings	5180-4181	25-pk.	22064	
Optional Split Vent Trap Assembly for Agilent 6890/6850 GCs	G1544-60610	kit	23031	
Replacement Traps (2) and O-rings (4)	G1544-80530	kit	23032	

also **available**

Looking for septa for Agilent GCs?
See **page 149** or visit **www.restek.com** and search on septa.




22995


22996

Oven Flapper Assemblies for Agilent 5890/6890 GCs

- Insulation is replaceable, using Restek's Oven Flapper Assemblies.
- Ensure even and consistent column heating, run after run, by replacing the oven flapper assembly when the insulation becomes damaged or worn.
- Replacement Insulation Gasket and Hardware Kit includes the insulation gasket, 2 screws and 2 nuts.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Oven Flapper Assembly for Agilent 5890 GCs	05890-80560	ea.	22994	
Oven Flapper Assembly for Agilent 6890 GCs	G1530-80560	ea.	22995	
Replacement Insulation Gasket and Hardware Kit*		kit	22996	

*Fits Restek's Oven Flapper Assembly only.


22076

Air Diverter for Agilent GCs

- Divert GC exhaust heat up and away from the lab bench.
- Meets or exceeds original manufacturer's performance.
- Easy to install—no tools required.

Description	Similar to Agilent part #	qty.	cat.#	price
Air Diverter for Agilent 5890/6890/7890 GCs	19247-60510 G1530-80650	ea.	22076	

Injector Wrench for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.


22065

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065	

Rethreading Tool

- Repair worn or damaged threads in injection ports, fittings, etc.
- Built-in guide to prevent cross-threading.


23018

Worn & damaged threads can allow oxygen into the system—compromising analytical results and destroying columns.



Make your injection port threads like new!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#	price
Rethreading Tool for 1/4" compression fittings (Agilent split/splitless injection ports)	ea.	23018	

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.







No more burned fingers!

Description	qty.	cat.#	price
Inlet Liner Removal Tool	3-pk.	20181	



The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4mL vials (not included) can be changed out and disposed of when dirty.



Never again will you have to burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4mL vial situated in the Claw holder until ready for reuse.

Description	qty.	cat. #	price
The Claw	ea.	26261	
The Claw Holder Kit (includes The Claw and holder)	kit	26262	
4.0mL Clear Vial, White Graduated Marking Spot	100-pk.	24658	



Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit for Agilent GCs

Includes:

- capillary installation gauge for Agilent GCs
- injector wrench for Agilent GCs
- septum nut removal tool
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

Description	qty.	cat.#	price
MLE Capillary Tool Kit for Agilent GCs	kit	22186	



also **available**

Looking for autosampler vials?
Restek carries a full line of autosampler vials for Agilent autosamplers. See **pages 253 to 267** or visit **www.restek.com** and search on autosampler vial.

Direct Injection (DI) Inserts and Liner Adaptor for 1/4-Inch Packed Column Injection Ports (for 0.25, 0.32, & 0.53mm ID columns)



DI Glass Inserts for Agilent 5890 Packed Column GC

- Tolerances closely controlled.
- Can be removed from the septum nut weldment.

Description	Similar to Agilent part #	qty.	cat.#	price
DI Glass Inserts for Agilent 5890 Packed Column GC (1.7mm ID x 3.0mm OD x 93mm)	5181-3382 5080-8732	5-pk.	20967	



DI Uniliner® Liners for Agilent 5890 Packed Column GC

- Press-Tight® taper forms dead-volume-free connection to column.
- Minimizes solvent and peak tailing.
- Use with 0.25, 0.32, and 0.53mm ID capillary columns.
- Can be removed from the septum nut weldment.

Description	Fits same liner adaptor as Agilent part #	qty.	cat.#	price
DI Uniliner Liner for Agilent 5890 Packed Column GC (1.7mm ID x 3.0mm OD x 93mm)	5181-3382 5080-8732	ea.	20964	
		5-pk.	20965	
		25-pk.	20966	

DI Liner Adaptor for Agilent 5890 Packed Column GC

- Uses standard 1/16-inch capillary nut and ferrules.
- Convenient wrench pad at base.
- Includes 1/4-inch graphite ferrule and stainless steel nut.
- Use with Agilent or Restek DI glass inserts or Restek DI Uniliner® liners for an Agilent 5890 packed column GC.



Description	Similar to Agilent part #	qty.	cat.#	price
DI Liner Adaptor for Agilent 5890 Packed Column GC	19244-80540	ea.	21303	

Siltek® Septum Packed Purge Port Weldment for Agilent 5890 GCs

Siltek® treatment makes welment inert and eliminates adsorption of sensitive compounds (e.g., DDT and Endrin). Order Viton® O-rings (below) and appropriate septa (page 149) separately.



Description	Similar to Agilent part #	qty.	cat.#	price
Siltek Septum Packed Purge Port Weldment for Agilent 5890 GCs	19243-80570	ea.	21691	
Viton Replacement O-rings	5080-8898	10-pk.	21685	

Micropacked Inlet Conversion Kits

Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.

- For use with Agilent 5890 and 6890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	qty.	cat.#	price
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424	
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425	
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4mm splitless liner, intermediate polarity deactivated	kit	22426	
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: Dual Vespel Ring Inlet Seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427	
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428	
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel Ring Inlet Seals, large bore (2)	2-pk.	22429	
Replacement Metal Liner Installation Guide for On-Column Injection Siltek treated metal liner installation guide	ea.	22430	
Replacement 4mm Splitless Liner	ea.	20772	

*For use with packed column FIDs only.



Large-Bore Dual Vespel® Ring Inlet Seals



1/4" SS Nut



Large-Bore FID Adaptor



1/4" Vespel®/Graphite Ferrule



1/16" SS Nut



Large-Bore Reducing Nut



1/16" Vespel®/Graphite Ferrules



22430



20772

also available

Looking for more information or products on converting packed columns to capillary columns? See **pages 193-195**.

Dual-Column *mini*-Lam Direct Injection Tee

(for 1/4-inch packed column inlets)

- Inverted cup design offers complete sample vaporization.
- Permits larger sample volumes.
- Incorporates a Press-Tight® taper in each outlet leg, to make a perfect, dead-volume-free connection to each analytical column (ODs ranging from 0.4 to 0.8mm).
- Allows visual confirmation of the column connection.
- Open-top design makes it easy to pack with glass wool, keeping sample residue from contaminating the cup.


20436

Description	qty.	cat.#	price
mini-Lam DI Tee Kit (includes all fittings and ferrules)	kit	20436	
Replacement 4mm *mini*-Lam DI Tee	ea.	20435	

Dual-Column Direct Injection Tee

(for 1/4-inch packed column inlets)

- Designed with a glass spiral to promote sample vaporization and provide even sample distribution to the two columns.
- Traps sample residue and minimizes the need for guard columns.
- Press-Tight® taper in each outlet leg facilitates a perfect dead-volume-free connection to each analytical column (OD 0.4 to 0.8mm) and allows visual confirmation of the column connection.


20412

Description	qty.	cat.#	price
DI Tee Kit (includes all fittings/ferrules)	kit	20412	
Replacement Tee	ea.	20411	

NEW!


27185

Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors

(Split/splitless fitting for capillary columns)

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2mm ID Dual Vespel® Ring Inlet Seal, and one 0.4mm ID two-hole ferrule.

Description	qty.	cat.#	price
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185	
1.2mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246	
	10-pk.	21247	


For use with 0.53mm ID columns.
20645

1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/splitless fitting for 0.53mm ID capillary columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8mm ID two-hole ferrule.
- Use recessed gooseneck liners with this adaptor.

Description	qty.	cat.#	price
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645	
0.53mm ID Dual-Column Installation	2-pk.	20392	
(1/16-inch Opening) Replacement Inlet Seal	10-pk.	20393	

Two-Hole Ferrules—For 1/8-Inch and 1/16-Inch Compression-Type Fittings



- Use 1/16-inch, two-hole ferrules with the 1/16-Inch Capillary Inlet Adaptor Fitting Kit (cat.# 27185)
- Use 1/8-inch, two-hole ferrules with the 1/8-Inch Capillary Inlet Adaptor Fitting Kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4mm	0.25/0.28mm	5-pk.	24848
1/16"	0.5mm	0.32mm	5-pk.	24849
1/8"	0.8mm	0.45/0.53mm	5-pk.	20246

also **available**

Looking for more information or products on dual column analyses?
See **pages 196-198**.

EZ No-Vent™ GC Column-Mass Spectrometer Connector

- Change GC/MS columns in minutes without venting—100µm transfer line throttles vacuum and eliminates the need to vent.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- Deactivated transfer line keeps analytes focused.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.
- Available for Agilent GCs with 5971/5972, 5973, or 5975 GC/MS.

We designed the EZ No-Vent™ GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent™ connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as in other manufacturer's vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change. This can save nearly a day of down-time with each column change. The EZ No-Vent™ connector easily attaches to the MS source without special tools or extra plumbing. Figure 1 shows the internal structure of the connector. Figure 2 illustrates the high performance achieved with the EZ No-Vent™ Connector.

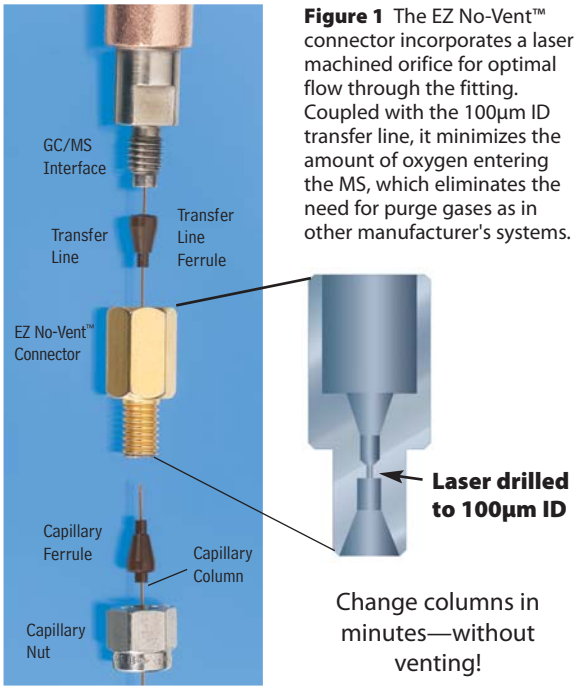
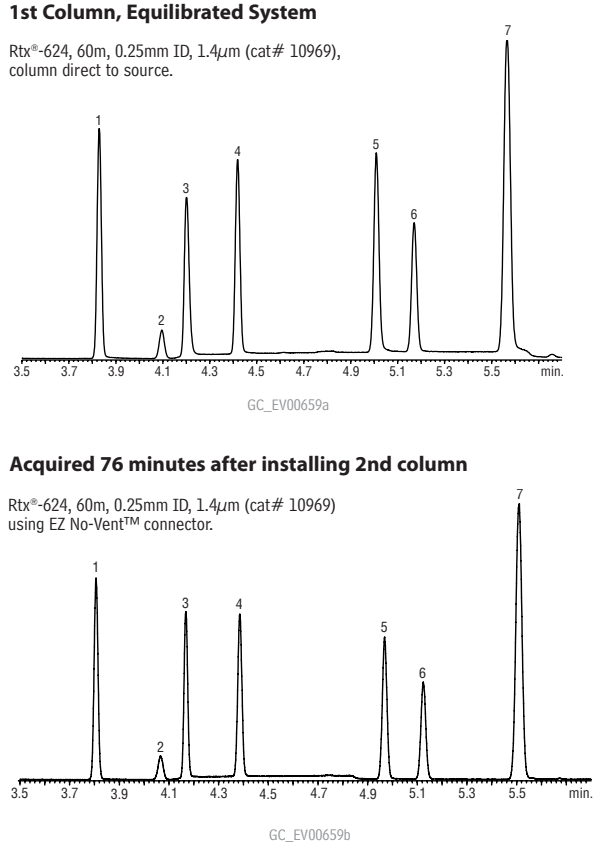


Figure 1 The EZ No-Vent™ connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases as in other manufacturer's systems.

Change columns in minutes—without venting!

Figure 2 Sharp, symmetric peaks for gases show the EZ No-Vent™ connector does not add dead volume and allows rapid column changes.

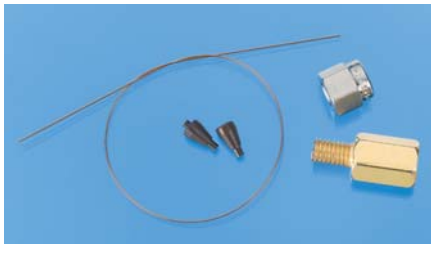


1. dichlorodifluoromethane
2. 1,2-dichlorotetrafluoroethene (Freon® 114)
3. chloromethane
4. vinyl chloride
5. bromomethane
6. chloroethane
7. trichlorofluoromethane

Sample:	Volatile Gas Mix 502.2 Calibration Mix#1 (gases) cat# 30042	Oven temp.:	60°C isothermal
		Det:	Agilent 5973 GC/MS
		Transfer line temp.:	280°C
Inj.:	Purge & Trap	Scan range:	35-550amu
GC	Agilent 6890	Tune	BFB
Inj. temp.:	300°C	Ionization:	EI
Carrier gas:	helium, constant flow		
Flow rate:	1.0mL/min.		

Description	qty.	cat.#	price
EZ No-Vent Connector Kit for Agilent 5971/5972, 5973, or 5975 GC/MS Kit includes: EZ No-Vent Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	21323	
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:			
0.4mm ID (Polyimide)	2-pk.	21015	
0.5mm ID (Polyimide)	2-pk.	21016	
Replacement ferrules for connecting transfer line to EZ No-Vent Connector: 0.4mm ID	2-pk.	21043	
Replacement 100µm deactivated transfer line	3 ft.	21018	
Replacement EZ No-Vent Column Nut	5-pk.	21900	
Replacement EZ No-Vent Plug	2-pk.	21915	
Open-End Wrenches (1/4" x 5/16")	2-pk.	20110	

restek
innovation!
Kit installs easily, without special tools or plumbing.



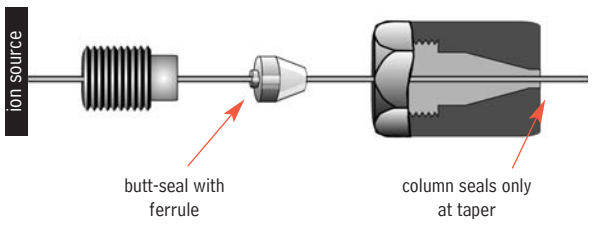
Restek MSD Conversion Fitting


21314

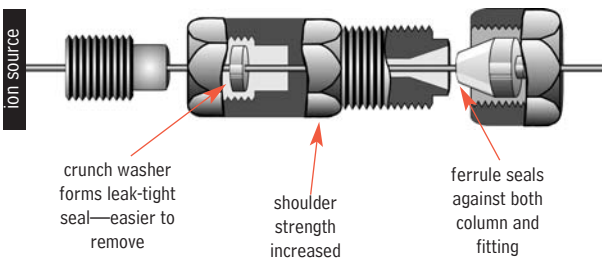
- A flat, soft aluminum sealing ring deforms and butt-seals against the MSD interface.
- A standard Vespel® ferrule seals the column and 1/16-inch stainless steel nut.
- Fitting is constructed of nickel-plated brass for longevity and softness.
- Use any standard Vespel® or Vespel®/graphite 1/16-inch ferrule.
- Includes a 1/16-inch stainless steel nut and two replacement sealing rings. Order ferrules separately.
- Improved design reduces chance of leaks.

Agilent's MSD interface uses a butt-seal to seal the MSD source to the capillary column. This system is prone to leakage. Restek's MSD conversion fitting is designed with two separate seals to reduce the chance of leaks: a crunch washer seals the MSD conversion fitting to the source; a ferrule seals the capillary tubing to the conversion fitting.

Agilent Design



Improved Restek Design



Description	qty.	cat.#	price
MSD Conversion Fitting	ea.	21314	
Replacement Ring Seal for MSD Conversion Fitting	2-pk.	21313	

For Vespel ferrules, see page 210.

Restek MSD Source Nut


20643

- 1.2mm nut bore permits easy removal of ferrules with a standard tapered-needle file (cat.# 20106, page 208).
- Made of brass to prevent thread-stripping on the transfer line.
- Design enhances ease of threading onto the transfer line and improves overall lifetime.

Description	Similar to Agilent part #	qty.	cat.#	price
(Detector) MSD Source Nut	05988-20066	2-pk.	20643	

restek **innovation**!


21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.


Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end.


Tighten the nut. (not depicted)


Score and remove the exposed end of the column, then loosen the nut.

Description	Similar to Agilent part #	qty.	cat.#	price
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894	


24699

Gold Tip Transfer Line

- For use with Agilent 5971/5972 MS Systems.
- Gold-plated for inertness.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Gold Tip Transfer Line	05971-20305	ea.	24699	


22659

Replacement Interface with Bellows for Agilent 5971/5972 MS

- Meets or exceeds manufacturer's performance.
- Made of high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Interface with Bellows for Agilent 5971/5972 MS	05971-60302	ea.	22659	

ETP Electron Multipliers for Mass Spectrometry

NEW!



23074

The multi-dynode approach of all ETP multipliers results in longer lifetimes and better sensitivities compared with channel multipliers because of greater surface area.

- Air stable.
- 2-year shelf life guarantee.
- Discrete dynode design results in extended operating life.

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a 2-year shelf life warranty (stored in original sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps the instrument downtime to a minimum.

did you **know**?

A typical ETP electron multiplier has a total active dynode surface area of ~1,000mm² compared to a standard continuous dynode multiplier that only has a total channel surface area of around 106mm². The increased surface area of the ETP slows the aging process and improves operating life.

Description	qty.	cat.#	price
Electron Multipliers for Agilent GC/MS and LC/MS			
For Agilent 5970 GC/MS	ea.	23072	
For Agilent 5971, 5972, GC GC/MS	ea.	23073	
For Agilent 5973 & 5975 GC/MS (includes mount for initial installation)*†	ea.	23074	
For Agilent 5973 & 5975 GC/MS and LC/MSD (Replacement Multiplier)*†	ea.	23075	
For Agilent LC/MSD (includes mount for initial installation)*†	ea.	23076	

*Note: The electron multipliers have been specifically developed to retrofit the original manufacturer's equipment. The detector incorporates a modular design to facilitate ease of replacement and additional innovations intended to enhance performance. First time installation requires a mount which includes the mechanical housing. After initial installation, only the replacement electron multiplier is required.
†This unit is designed for use in the 5975, 5973 GC and the LC/MSD.

also **available**

Other ETP Electron Multipliers are available upon request. Call us if you do not see your instrument listed.



22660

Replacement Interface Guide Tube for Agilent 5971/5972 MS

- Meets or exceeds manufacturer's performance.
- Made of high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Interface Guide Tube for Agilent 5971/5972 MS	05971-20307	ea.	22660	



22661

Replacement Cold Sensor for Agilent 5971/5972 MS Diffusion Pump

- Meets or exceeds manufacturer's performance.
- Made of high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Cold Sensor for Agilent 5971/5972 MS Diffusion Pump	3103-0145	ea.	22661	



Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.
Phone: 1-800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

Outside the U.S.
Contact your Restek representative.


22662

Replacement Diffusion Pump Fan Assemblies for Agilent 5971/5972 MS

- 110/120 VAC

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Diffusion Pump Fan Assembly for Agilent 5971 MS	05971-60540	ea.	22662	
Replacement Diffusion Pump Fan Assembly for Agilent 5972 MS	05972-60540	ea.	22663	

Inland 45 is the highest quality rough pump oil you can use for your mass spectrometer.

Inland 45 Pump Oil

NEW!

Recommended for most mass spectrometers.

- Ease at cold start.
- Low vapor pressure 10^{-7} torr.
- Nontoxic and noncorrosive.
- Compatible with buna-N, neoprene, and Viton® seals.
- Optimum vacuum pump performance.
- Lowest mass spectrometer background.
- Recommended for optimum mass spec performance.



24819

Description	Similar to Agilent part #	qty.	cat.#	price
Inland 45 Pump Oil	6040-0834	1 liter	24819	

Rough Pump Oil #19 for MSD Pumps, Oil Vacuum Pump

- Formulated from crude oil stocks known for their durability and line lubricating qualities.
- Use in Agilent 5973/5972/5971 and GCD mass spec systems, or in other manufacturers' MSD systems that require rough pump oil.
- Under average use, the oil in the foreline rough pump should be replaced every six months.



22687

Description	qty.	cat.#	price
Rough Pump Oil for MSD Pumps	1 liter	22687	

Ion Source Cleaning Powder

Use this aluminium oxide powder to clean surfaces that contact the sample or ion beam when you encounter poor sensitivity and inadequate abundances at high masses.


22685

Description	Similar to Agilent part #	qty.	cat.#	price
Ion Source Cleaning Powder	8660-0791	1 kg	22685	



27194

GC/MS Cleaning Kit

Poor sensitivity, loss of sensitivity at high masses, or high multiplier gain during an auto tune are all indicators that your mass spectrometer source may need to be cleaned. Restek has assembled all of the necessary components for cleaning and polishing your ion source.

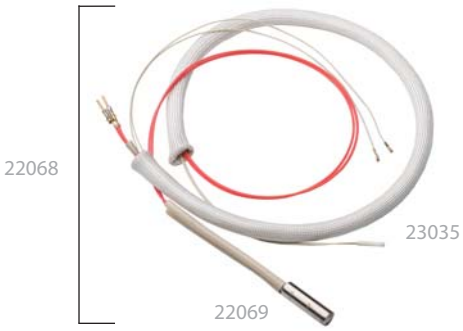
The Restek GC/MS Cleaning Kit (cat.#s 27194, 27195) includes:

- lint free nylon gloves (small-2pair)
- lint free nylon gloves (large-2 pair)
- lint free cotton cloth, 9 x 9 (10-pk.)
- micro mesh 4 x 6 sheet (4-pk.)
- aluminum oxide (75 gram jar)
- cotton tip applicators
- tweezers, large
- tweezers, small
- septum puller
- Dremel® tool, battery-operated (optional, 27194)
- tool kit bag

Reorder Kit (cat.# 27196) includes:

- lint free nylon gloves (small-2pair)
- lint free nylon gloves (large-2 pair)
- lint free cotton cloth, 9 x 9 (10-pk.)
- micro mesh 4 x 6 sheet (4-pk.)

Description	qty.	cat.#	price
Mass Spec Cleaning Kit with Dremel Tool	kit	27194	
Mass Spec Cleaning Kit without Dremel Tool	kit	27195	
Mass Spec Cleaning Kit Replacement Parts Kit (includes cloths, micro mesh sheets, small and large gloves)	kit	27196	



Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	ea.	22068	
Injector/FID Heater	19231-60620	ea.	22069	
Injector/FID PRT Sensor	19231-60660	ea.	23035	



FID Collector Housing Kits for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Collector Housing Kit for Agilent 5890 GCs (includes collector body, spanner nut, and silicone washer—order mount separately)	19231-20920	kit	23037	
FID Collector Housing Kit for Agilent 6890/7890 GCs (includes collector body, silicone washer, nut, and mount)	G1531-20550	kit	23045	
FID Collector Housing for Agilent 6890/7890 GCs	G1531-20740	ea.	23044	
Replacement Silicone Washers for FID Collector Housing for Agilent 5890/6890/7890 GCs	5180-4165	12-pk.	23064	



FID Collector Mount for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Collector Mount for Agilent 5890 GCs	19231-20930	ea.	23036	
FID Collector Mount for Agilent 6890/7890 GCs	G1531-20550	ea.	23043	



FID Base Weldment for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Includes brass nut.
- Available for Agilent 5890, 6850, or 6890 GCs.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Base Weldment for Agilent 5890 GCs	19231-80580	ea.	23041	
FID Base Weldment, Pack Column FID, for Agilent 6850/6890 GCs	G1531-80580	ea.	23052	
FID Base Weldment, Capillary Column FID, for Agilent 6850/6890 GCs	G1531-80630	ea.	23053	

Note: 6890 GC connections to EPC modules are not compatible with the 7890 EPC modules.

Spanner Wrench for Agilent 5890/6890/6850/7890 FID Collector Assemblies



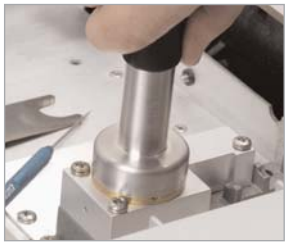
- Easily remove the nut from the FID collector without damaging the nut.
- Unique, ergonomic handle—easy to grip.
- Fits all instrument models.



Remove FID ignitor castle.



Easily loosen the nut by aligning the two pins on the bottom of the wrench with the two open slots on the nut...



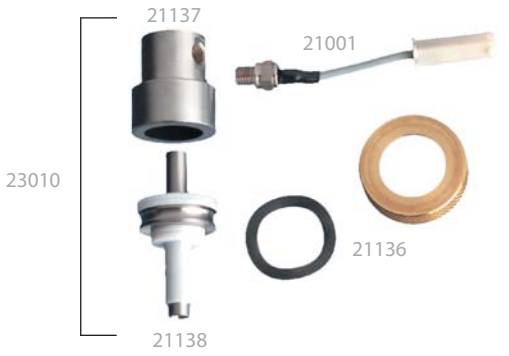
...then turn counterclockwise...



...and remove.

Description	Similar to Agilent part #	qty.	cat.#	price
Spanner Wrench for Agilent 5890/6890/6850/7890 FID Collector Assembly	19231-00130	ea.	22329	

Supplies for Agilent GCs: FID



FID Collector Assembly Kit for Agilent 5890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Collector Assembly Kit (includes insulators)	19231-60690	kit	23010	
FID Collector Assembly Kit w/Siltek Ignitor Castle	—	kit	21131	
FID Collector (includes insulators)	19231-20970 19231-20960 19231-20950	ea.	21138	
FID Collector Nut and Washer	19231-20940 5181-3311	set	21136	
FID Ignitor*	19231-60680	ea.	21001	
FID Ignitor Castle	19231-20910	ea.	21137	
Siltek FID Ignitor Castle	—	ea.	21135	

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).



21000

FID Flow Measuring Adaptor for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Flow Measuring Adaptor	19301-60660	ea.	21000	

FID Gauge Pack for Agilent 5890 GCs

- Pressure regulators and gauges for air & hydrogen.
- 1/8-inch bulkhead allows easy hookup to instrument.
- Rated for inlet pressures to 250psi (1,724kPa).
- Rated for outlet pressures of 0 to 60psi (0-414kPa).



22071

Description	qty.	cat.#	price
FID Gauge Pack for Agilent 5890 GCs	ea.	22071	



FID Collector Assembly Kit for Agilent 6890/6850/7890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Collector Assembly Kit (includes insulator)	G1531-60690	kit	21699	
FID Collector Assembly Kit w/Siltek Ignitor Castle	—	kit	21132	
FID Collector (includes insulators)	G1531-20690 G1531-20700	ea.	21139	
FID Collector Nut and Washer	19231-20940 5181-3311	set	21136	
FID Ignitor*	19231-60680	ea.	21001	
FID Ignitor Castle	19231-20910	ea.	21137	

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).

FID Maintenance Kits for Agilent GCs

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance by instrument manufacturer's parts.
- Parts list makes reordering easy.

FID kits include:

- 1/4", 0.4, 0.5, and 0.8mm ID graphite ferrules.
- FID/NPD capillary adaptor.
- Capillary nuts.
- Jet reamers/ferrule removers.
- 1/4" nut.
- Scoring wafer.
- Capillary column caps.
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs.
- FID flow measuring adaptor.
- 1/4" x 5/16" wrench.
- Installation gauge.
- Wire cleaning brush.
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs.
- Spanner wrench.
- FID jet removal tool.



22179

Description	qty.	cat.#	price
FID Maintenance Kit for Agilent 5890 GCs	kit	22180	
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179	

FID Replacement Jets

Standard Version

- Engineered with a fluted tip to guide the capillary column into the jet.
- Threads specially coated for easy installation and removal.
- Special processing ensures the highest degree of cleanliness.
- Meets or exceeds original manufacturer's performance.

High-Performance Version—Siltek® Treated

- Similar to the standard version, but Siltek® treated.
- Extremely inert, for use with active compounds.

Capillary Adaptable FID Replacement Jet for Agilent 5890/6890/6850 GCs



Similar to Agilent part #	qty.	cat.#	price	qty.	cat.#	price
Standard, 0.011-Inch ID Tip						
19244-80560	ea.	20670		3-pk.	20671	
High-Performance Siltek Treated, 0.011-Inch ID Tip						
19244-80560	ea.	20672		3-pk.	20673	

Capillary Dedicated FID Replacement Jet for Agilent 6890/6850/7890 GCs



Similar to Agilent part #	qty.	cat.#	price	qty.	cat.#	price
Standard, 0.011-Inch ID Tip						
G1531-80560	ea.	21621		3-pk.	21682	
High-Performance Siltek Treated, 0.011-Inch ID Tip						
G1531-80560	ea.	21620		3-pk.	21683	
High-Temperature, 0.018-Inch ID Tip NEW!						
G1531-80620	ea.	23078		3-pk.	23079	

Packed Column FID Replacement Jets for Agilent 5890/6890/6850 GCs



- 0.018-inch ID jets: Used for most general-purpose packed column applications.
- 0.030-inch ID jets: For packings that exhibit high bleed and that frequently clog the tip of smaller 0.018-inch jets.

Similar to Agilent part #	qty.	cat.#	price	qty.	cat.#	price
Standard, 0.018-Inch ID Tip						
18710-20119	ea.	21694		3-pk.	21695	
High-Performance Siltek Treated, 0.018-Inch ID Tip						
18710-20119	ea.	21696		3-pk.	21697	
Similar to Agilent part #	**qty.**	**cat.#**	**price**	**qty.**	**cat.#**	**price**
Standard, 0.030-Inch ID Tip						
18789-80070	ea.	21688		3-pk.	21689	
High-Performance Siltek Treated, 0.030-Inch ID Tip						
18789-80070	ea.	21686		3-pk.	21687	

tech tip

Which FID Jet Should I Use?

There are two FID jet configurations for Agilent GCs. The longer "adaptable" jet fits both 5890 and 6890 GCs, and can be used with capillary or packed columns. The shorter "dedicated" jet is for the FID in the 6890/7890 GC that is designed only for use with capillary columns.

restek **innovation**!



FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs

- Securely grips jet in socket for easy removal or installation.
- Unique, ergonomic handle—easy to hold.



Slip tool over FID jet... ...loosen jet... ...and remove.

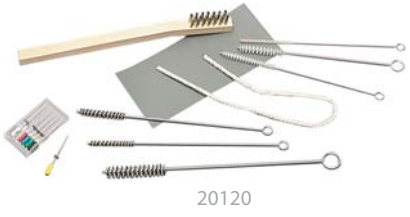
Description	qty.	cat.#	price
FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs	ea.	22328	

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.



Description	qty.	cat.#	price
Torx Screwdriver Set	set	23034	



Use with **ANY** injection port!

FID/Injector Cleaning Kit

The FID/Injector Cleaning Kit includes:

- Nylon tube brushes (1/8", 3/16", 1/4").
- Pipe cleaner.
- Stainless steel tube brushes (3/8", 3/16", 1/4").
- Stainless steel surface brush.
- Stainless steel jet reamers.
- Emery cloth.

Description	qty.	cat.#	price
FID/Injector Cleaning Kit	kit	20120	

Injector/Detector Plug Nuts

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.


21883

Description	Similar to Agilent part#	qty.	cat.#	price
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883	


20884

FID/NPD Adaptor Fitting

- Easy to use, sturdy, compact stainless steel fitting.
- 1/16-inch nut uses standard graphite or Vespel®/graphite ferrules.
- Wrench pad won't turn when installing a capillary column.
- Includes 1/4- and 1/16-inch stainless steel nuts, and 1/4-inch Vespel® and 0.4mm ID graphite ferrules.

Description	qty.	cat.#	price
FID/NPD Adaptor Fitting	kit	20884	


22077

FID/NPD Capillary Adaptor Fitting for Agilent 5890/6890/6850 GCs

- High-quality stainless steel construction.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
FID/NPD Capillary Adaptor Fitting	19244-80610	ea.	22077	


21300


21324


21301


21302

27192

27190

ECD/FID Dual-Purpose Make-Up Gas Kit for Agilent 5890 GCs

Each kit below offers different combinations of fittings and supplies based on your individual instrument needs.

Description	Similar to Agilent part #	qty.	cat.#	price
ECD/FID Dual-Purpose Make-Up Gas Kit Includes: make-up gas fitting, Siltek treated guide, 1/4" nut and ferrule, 1/16" nut, 0.4mm ID graphite ferrule, and fine metering valve		kit	21300	
Replacement Make-up Gas Fitting Kit Includes: make-up gas fitting, 1/4" nut and ferrule, 1/16" nut, 0.4mm ID graphite ferrule		kit	21324	
ECD/FID Replacement Fitting Kit with Flow Manifold Connection Includes: replacement fitting, 1/4" nut, Vespel/graphite ferrule, 1/16" nut, 0.4mm ID graphite ferrule, Siltek treated guide		kit	21301	
Replacement ECD Siltek Metal Guide		2-pk.	21302	
Replacement ECD Fused Silica Liner	19233-20625	ea.	27192	
		5-pk.	27193	
Replacement Micro ECD Liner	G2397-20540	ea.	27190	
		5-pk.	27191	

also **available**

Looking for more detector replacement parts? See **page 199**.



Catch the Buzz

Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Replacement Cables for Agilent GCs, Integrators, & Autosamplers

- Considerable savings over original manufacturer's equipment.
- Instructions and wiring diagrams included.
- Manufactured with only the highest-quality components.

PIN schematics included



Connect an Agilent 5890 GC to an Agilent integrator (for second Inet integrator).

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	35900-60610	6 ft.	ea.	20650	
Replacement Cables	35900-60610	6 ft.	2-pk.	20651	



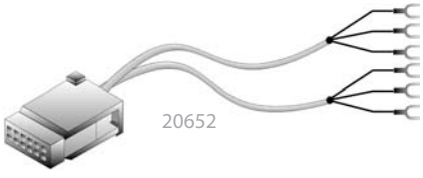
Connect an Agilent 5890 GC to an Agilent 3396 integrator to enable remote starts (non-Inet connection from GC to integrator).

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	03394-60560	6 ft.	ea.	20654	



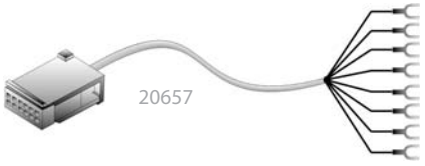
Connect an Agilent 3396 integrator to remote-start another piece of equipment or to start the Agilent 3396 integrator from that other piece of equipment.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	03394-60540	6 ft.	ea.	20655	
Replacement Cables	03394-60540	6 ft.	2-pk.	20656	



Connect an Agilent 5890 GC to a non-Agilent integrator or standard strip chart recorder.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	05890-60800	6 ft.	ea.	20652	
Replacement Cables	05890-60800	6 ft.	2-pk.	20653	



Connect an Agilent 5890 GC to remote-start another piece of equipment or to start the Agilent 5890 GC from that piece of equipment.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	05890-61080	6 ft.	ea.	20657	



Connect an Agilent 3396 integrator to a non-Agilent GC.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	35900-60630	6 ft.	ea.	20658	
Replacement Cables	35900-60630	6 ft.	2-pk.	20659	



Connect an Agilent 5890 GC to an Agilent 35900C Interface or to an Agilent 7673A Autosampler to enable remote starts.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	35900-60700	6 ft.	ea.	20660	
Replacement Cables	35900-60700	6 ft.	2-pk.	20661	



Automatic liquid sampler stop/start cable for Agilent GCs.

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	G1530-60930	7 ft.	ea.	20929	



Connect an Agilent 6890 GC to a PC 9F/9F (RS232).

Description	Similar to Agilent part #	length	qty.	cat.#	price
Replacement Cable	G1530-60600	6 ft.	ea.	22694	

Replacement Parts for Agilent Autosamplers

- All parts meet or exceed original manufacturer's performance.



Injector Mounting Posts and Parking Post for Agilent 7673 & 7683 Autosamplers

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 5890 GCs	18597-60805	ea.	21236	
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 6890 GCs	07673-21140	ea.	21237	
Injector Mounting Post for Agilent 7683 Series Autosamplers for use with 6850/6890 GCs	G2613-20500	ea.	21172	
Parking Post for Agilent 7673/7683 Series Autosamplers for use with 5890/6890/7890 GCs	05890-61525	ea.	22343	


22855

Turret Tray Assembly for Agilent 5890/6890 GC

- Holds sample, waste, and solvent vials.

Description	Similar to Agilent part #	qty.	cat.#	price
Turret Tray Assembly for Agilent 5890/6890 GC	07673-60605	ea.	22855	


22695

Autosampler Plunger Carrier Belt for Agilent 7673A & 7673B Autosamplers

Description	Similar to Agilent part #	qty.	cat.#	price
Autosampler Plunger Carrier Belt for Agilent 7673A and 7673B	07673-61275	ea.	22695	


22692

Carriage Motor Belt for Agilent 7673A & 7683B Autosamplers

Description	Similar to Agilent part #	qty.	cat.#	price
Carriage Motor Belt for Agilent 7673A and 7673B	1500-0676	ea.	22692	


22332

Z-Belt for Agilent 7673B Autosampler

Description	Similar to Agilent part #	qty.	cat.#	price
Z-Belt for Agilent 7673B Autosampler	1500-0803	ea.	22332	


22693

Carriage Motor for Agilent 7673A & 7673B Autosamplers

Description	Similar to Agilent part #	qty.	cat.#	price
Carriage Motor for Agilent 7673A and 7673B	07673-60890	ea.	22693	


22337

Injector Turret Motor for Agilent 7673A & 7673B Injectors

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Turret Motor for Agilent 7673A & 7673B Injectors	07673-60810	ea.	22337	

COLUMN INSTALLS THIS END

Splitless Liners for Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	ea.	cat.# / price 5-pk.	25-pk.
 2mm Splitless	trace samples <2µL	2.0mm 6.3mm x 74mm	190010905	20721	20722	20723
 4mm Splitless	trace samples >2µL	4.0mm 6.3mm x 74mm	—	20904	20905	20906
 Double Gooseneck	trace, active samples up to 4µL	4.0mm 6.3mm x 74mm	—	20847	20848	20849
 Cyclo Double Gooseneck	trace, dirty, active samples up to 4µL	4.0mm 6.3mm x 74mm	—	20897	20898	—

Split Liners for Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	ea.	cat.# / price 5-pk.	25-pk.
 1mm Split	purge & trap inlet splitting or samples <1µL	1.0mm 6.3mm x 72mm	—	20970	20971	—
 Splitter w/Wool	universal, use with rapid autosamplers	4.0mm 6.3mm x 72mm	190010901	20792	20793	20794
 Laminar Cup Splitter	high MW compounds	4.0mm 6.3mm x 72mm	190010902	20803	20804	—
 Cup Splitter	high & low MW compounds	4.0mm 6.3mm x 72mm	—	20724	20725	—
 Cyclosplitter	dirty samples, many injections before cleaning required	4.0mm 6.3mm x 72mm	—	20727	20728	—
 Frit Splitter	dirty samples, non-active compounds	4.0mm 6.3mm x 72mm	190010903	20715	20716	20717
 Baffle Splitter	compounds with close boiling points	4.0mm 6.3mm x 72mm	190010904	20718	20719	20720
 Split Precision Liner w/Wool	dirty samples, active samples	4.0mm 6.3mm x 72mm	—	21030	21031	—

DI Liners for Varian 1075/1077 S/SL Injection Ports (0.32/0.53mm ID)	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	ea.	cat.# / price 5-pk.	25-pk.
 Uniliner	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 72mm	—	20345	20346	—
 Cyclo-Uniliner	trace, dirty, high MW, active samples, linearity	4.0mm 6.3mm x 72mm	—	20347	20348	—
 Open-top Uniliner w/Wool	trace, dirty, active samples, high recovery & linearity	4.0mm 6.3mm x 72mm	—	20845	20846	—

SPME Liners for Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	ea.	cat.# / price 5-pk.	25-pk.
 SPME Liner	ideal for low-volume SPME applications	0.75mm 6.30mm x 74mm	—	21112	21113	—

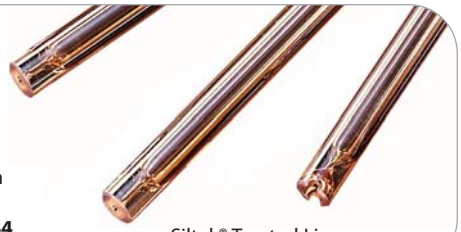
*Nominal ID at syringe needle expulsion point.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.


Siltek® Treated Liners

Supplies for Varian GCs: Liners

COLUMN INSTALLS THIS END

SPI Liners for Varian S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	cat.# ea.	cat.# 5-pk.	cat.# 25-pk.
0.5mm SPI	high linearity for 0.25 & 0.32mm ID columns	0.53mm 4.6mm x 54mm	190010906	20775	20776	20777
0.8mm SPI	high linearity for 0.53mm ID columns	0.80mm 4.6mm x 54mm	190010907	20778	20779	20780
SPI with Buffer	dirty samples >1µL, fits 0.25, 0.32 & 0.53mm ID columns	2.4mm 4.6mm x 54mm	190010908	20850	20851	20852

Liners for Varian 1177 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	cat.# ea.	cat.# 5-pk.	cat.# 25-pk.
4mm Split w/Glass Frit	universal	4.0mm 6.3mm x 78.5mm	—	21045	21046	—
4mm Split w/Wool	universal	4.0mm 6.3mm x 78.5mm	392611934	—	21079	—
4mm Split Precision Liner w/Wool	dirty samples, trace samples	4.0mm 6.3mm x 78.5mm	—	20759	20762	—
Low Pressure Drop Precision Liner w/Wool	trace samples <2µL, dirty samples	2.0mm 6.3mm x 78.5mm	—	22421	22422	—
Laminar Cup Splitter	high MW compounds	4.0mm 6.3mm x 78.5mm	—	20765	20768	—
2mm Splitless w/Wool	trace samples <2µL	2.0mm 6.5mm x 78.5mm	392599903	—	21077	—
Gooseneck Splitless (4mm)	trace samples <2µL	4.0mm 6.5mm x 78.5mm	392611927	21896	21897	—
Gooseneck Splitless (4mm) w/Wool	trace samples <2µL	4.0mm 6.5mm x 78.5mm	392611936	21896-200.1	21897-200.5	—
Double Gooseneck Splitless (4mm)	trace, active samples <2µL	4.0mm 6.5mm x 78.5mm	—	21891	21892	—

DI Liners for Varian 1177 S/SL Injection Ports (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Varian part #	cat.# ea.	cat.# 5-pk.
Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	—	21470	21471
Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0mm 6.3mm x 78.5mm	—	21468	21469

*Nominal ID at syringe needle expulsion point.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

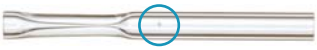
Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

COLUMN INSTALLS THIS END

Liners for Varian 1078/1079 Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Varian part #	cat.# /price ea.	cat.# /price 5-pk.	25-pk.
 1078/1079 Split w/Frit	dirty samples, non-active compounds	3.4mm 5.0mm x 54mm	392611946	21708	21709	—
 1078/1079 Splitless	trace samples <2µL	2.0mm 5.0mm x 54mm	392611947	21711	21712	—
 Open 0.5mm ID	trace samples <1µL	0.5mm 5.0mm x 54mm	392611949	20992	20993	—
 1078/1079 Split–No Frit	active samples	3.4mm 5.0mm x 54mm	392611945	20859	20901	20909
 Open 0.75mm ID	trace, low volume samples	0.75mm 5.0mm x 54mm	392611948	21714	21715	21716
 1078/1079 Split Precision Liner w/Wool	dirty samples, trace samples	3.4mm 5.0mm x 54mm	—	21024	21025	—

DI Liners for Varian 1078/1079 Injection Ports (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Varian part #	cat.# /price ea.	cat.# /price 5-pk.
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 54mm	—	24974	24975
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 54mm	—	22280	22281

*Nominal ID at syringe needle expulsion point.

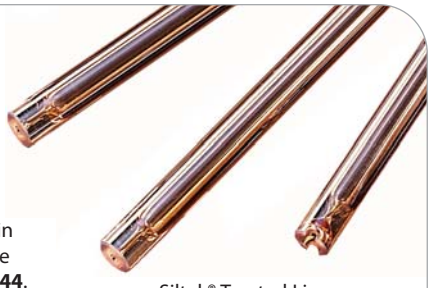
tech tip

Drilled Uniliner® Liners

Use the Drilled Uniliner® liner with the hole near the bottom for semivolatile analysis or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® liner with the hole near the top for chlorinated pesticides analysis, aqueous injections, as well as for analysis in which the compounds of interest elute away from the solvent peak.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

Siltek® Treated Metal Inlet Liners for Varian GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (3.8mm ID x 5.0mm OD x 54mm)	qty.	cat.# /price
Split/Splitless	5-pk.	20711
Splitless Gooseneck	5-pk.	21002





Inlet Liner Seals for Varian 1177 Injectors

- Meets or exceeds original manufacturer's performance.

Description	Max. temp.	Similar to Varian part #	10-pk. cat.#	price	50-pk. cat.#	price
6.35mm ID Graphite O-rings for split liners	450°C	—	20296		20297	
6.5mm ID Graphite O-rings for splitless liners	450°C	39-26119-40	20298		20299	



Liner Seals for Varian 1078/1079

Description	Max. temp.	Similar to Varian part #	qty.	cat.#	price
5mm Graphite Liner Seals for Varian 1078/1079 GCs	450°C	392611919 392534201	10-pk.	22683	



Septa for Varian GCs

- Precision molding assures consistent, accurate fit.
- Preconditioned and ready to use.
- Does not adhere to hot metal surfaces.
- Packaged in precleaned glass jars.

Septum Diameter	25-pk. price	50-pk. price	100-pk. price
Thermolite Septa (usable to 340°C inlet temp.)			
9mm	27132	27133	27134
9.5mm (3/8")	27135	27136	27137
10mm	27138	27139	27140
11mm (7/16")	27141	27142	27143
IceBlue Septa (usable to 250°C inlet temp.)			
9mm	—	27156	27157
9.5mm (3/8")	—	27158	27159
10mm	—	27160	27161
11mm (7/16")	—	27162	27163
BTO Septa (usable to 400°C inlet temp.)			
9mm CenterGuide	—	27104	27105
9.5mm (3/8")	—	27106	27107
10mm	—	27108	27109
11mm (7/16") CenterGuide	—	27110	27111

HANDY septum size chart

Injector Type	Septum Diameter (mm)
Packed Column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11



Capillary Nuts for Varian GCs

- Choose brass or stainless steel construction.

Description	Similar to Varian part #	qty.	cat.#	price
Brass Capillary Nuts	03-949551-00	2-pk.	20881	
Stainless Steel Capillary Nuts	03-949551-00	2-pk.	20882	



Siltek® Treated Inlet Support Springs for Varian 1075/1077 Split Injectors

- Siltek® treated to eliminate sample adsorption.

Description	Similar to Varian part #	qty.	cat.#	price
Siltek Treated Inlet Support Springs for Varian	03-949786-00	3-pk.	21690	



Capillary Installation Gauge for Varian GCs for use with 1/16" ferrules

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#	price
Capillary Installation Gauge for Varian GCs for use with 1/16" ferrules	ea.	22335	

*Recommended for use with graphite ferrules.

also available

Looking for ferrules?
See **pages 210-212**.



also available

Looking for packed column accessories for Varian instruments?
See **pages 193-195**.

Everything you need in one complete kit!



Make Life Easier (MLE) Capillary Tool Kit for Varian GCs

Includes:

- capillary installation gauge for Varian GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

Description	qty.	cat.#	price
MLE Capillary Tool Kit for Varian GCs	kit	22184	

Rethreading Tool

- Repair worn or damaged threads.
- Multiple uses (injection ports, fittings, etc.).
- Built-in guide to prevent cross-threading.





Make your injection port threads like new!

Simply screw the rethreading tool onto the part, unscrew, and inspect the threads. Repeat as necessary. When done, wipe threads clean with methanol to remove any debris.

Description	qty.	cat.#	price
Rethreading Tool for 7/16" compression fitting (Varian injection ports)	ea.	23019	
Rethreading Tool for 1/4" Varian-style capillary column fittings	ea.	21893	

restek **innovation**!

Kit installs easily, without special tools or plumbing.



EZ No-Vent™ GC Column-Mass Spectrometer Connector

- Change GC/MS columns in minutes without venting—100µm transfer line throttles vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- Deactivated transfer line keeps analytes focused; high-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.
- For Varian Saturn 2000 Series Mass Spectrometers.

We designed the EZ No-Vent™ GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent™ connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as in other manufacturer's vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change. This can save nearly a day of downtime with each column change. The EZ No-Vent™ connector easily attaches to the MS source without special tools or extra plumbing.

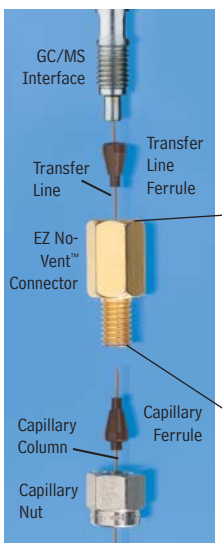


Figure 1 The EZ No-Vent™ connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.



Laser drilled to100µm ID

Change columns in minutes—without venting!

Description	qty.	cat.#	price
EZ No-Vent Connector Kit for Varian Saturn 2000 Series MSs Kit includes: EZ No-Vent Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	22423	
Replacement ferrules for connecting capillary column to EZ No-Vent Connector: 0.4mm ID (Polyimide)	2-pk.	21015	
0.5mm ID (Polyimide)	2-pk.	21016	
Replacement ferrules for connecting transfer line to EZ No-Vent Connector: 0.4mm ID	2-pk.	21043	
Replacement 100µm deactivated transfer line	3 ft.	21018	
Replacement EZ No-Vent Column Nut	5-pk.	21900	
Replacement EZ No-Vent Plug	2-pk.	21915	
Open-End Wrenches (1/4" x 5/16")	2-pk.	20110	

Supplies for Shimadzu GCs: Liners

COLUMN INSTALLS THIS END

Split Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# /price 5-pk.	25-pk.
 Split	universal, for most common analyses	3.5mm 5.0mm x 99mm	221-32544-01	20860	20861	20862
 Cyclosplitter	dirty samples, many injections before cleaning required	3.5mm 5.0mm x 99mm	—	20870	20871	—
 Laminar Cup Splitter	high MW compounds	3.5mm 5.0mm x 99mm	—	20868	20869	—

Splitless Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# /price 5-pk.	25-pk.
 3.5mm Splitless	trace samples	3.5mm 5.0mm x 99mm	221-32544-00	20863	20864	20865

DI Liners for Shimadzu 14A GCs (0.25/0.32/0.53mm ID)	Benefits/Uses	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# /price 5-pk.	25-pk.
 Uniliner	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 99mm	—	20876	20877	—
 Cyclo-Uniliner	trace, dirty, high MW active samples, high recovery & linearity	3.5mm 5.0mm x 99mm	—	20893	20894	—

Split Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# /price 5-pk.	25-pk.
 1mm Split	purge & trap, fast GC	1.0mm 5.0mm x 95mm	—	20976	20977	20978
 3.5mm Split	universal, for most common analyses	3.5mm 5.0mm x 95mm	221-41444-01	22283	22284	22285
 Split Precision Liner w/Wool	dirty samples, trace samples	3.5mm 5.0mm x 95mm	—	21020	21021	—
 Cyclosplitter	dirty samples, many injections before cleaning required	3.5mm 5.0mm x 95mm	—	22072	22073	—
 Laminer Cup Splitter	high MW compounds	3.5mm 5.0mm x 99mm	NEW!	22981	22982	—

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# /price 5-pk.	
 2mm Gooseneck Splitless	universal, trace samples	2.0mm 5.0mm x 95mm	NEW!	22276	22277	—
 3.5mm Gooseneck Splitless	universal, trace samples	3.5mm 5.0mm x 95mm	221-48335-01	22286	22287	—
 Double Gooseneck Splitless	reduces backflash and catalytic decomposition	3.5mm 5.0mm x 95mm	NEW!	22274	22275	—

*Nominal ID at syringe needle expulsion point.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

Supplies for Shimadzu GCs: Liners

COLUMN INSTALLS THIS END

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	cat.# / price ea.	5-pk.	25-pk.
Split/Splitless w/Wool	universal, for most common analyses	3.5mm 5.0mm x 95mm	221-41444-00	20955	20956	20957

SPME Liner for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses	ID* OD x Length	Similar to Shimadzu part #	cat.# / price ea.	5-pk.	25-pk.
SPME Liner	ideal for low volume SPME applications	.75mm 5.0mm x 95mm	—	22278	22279	—

Liners for Shimadzu 17A PTV GCs	Benefits/Uses	ID* OD x Length	Similar to Shimadzu part #	cat.# / price ea.	5-pk.	25-pk.
17A PTV Liner w/Wool	trace, dirty, high & low MW active samples	1.6mm 4.0mm x 95mm	225-09212-01	21705	21706	21707

DI Liners for Shimadzu 17A, 2010, and 2014 GCs (0.25/0.32/0.53mm ID)	Benefits/Uses	ID* OD x Length	Similar to Shimadzu part #	cat.# / price ea.	5-pk.	25-pk.
Uniliner w/Wool	trace, dirty, high MW active samples, high recovery & linearity	3.5mm 5.0mm x 95mm	—	21713	21719	—
Open-top Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 95mm	—	21285	21286	—
Open-top Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 95mm	—	21287	21288	—
Gooseneck Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 95mm	—	21289	21290	—
Gooseneck Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 95mm	—	21291	21292	—

*Nominal ID at syringe needle expulsion point.

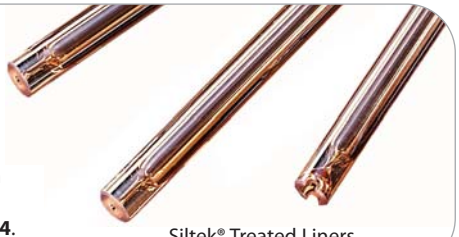
tech tip

Drilled Uniliner® Liners

Use the Drilled Uniliner® liner with the hole near the bottom for semivolatile analysis or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® liner with the hole near the top for chlorinated pesticides analysis, aqueous injections, as well as for analysis in which the compounds of interest elute away from the solvent peak.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

Siltek® Treated Metal Inlet Liners for Shimadzu GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (3.5mm ID x 5.0mm OD x 95mm)	qty.	cat.# / price
95mm Split/Splitless Siltek Treated Metal Inlet Liners w/Wool	5-pk.	21003



Viton® O-Rings for Shimadzu 17A, 2010, and 2014 GCs



Description	Max. temp.	Similar to Shimadzu part #	qty.	cat.#	price
Viton O-Rings for Shimadzu 17A, 2010, and 2014 GCs	250°C	036-11203-84	10-pk.	24899	

Graphite O-Rings for Shimadzu 17A, 2010, and 2014 GCs



Description	Max. temp.	Similar to Shimadzu part #	qty.	cat.#	price
Graphite O-Rings for Split Liners	450°C	221-48393-91	5-pk.	20243	
Graphite O-Rings for Splitless Liners	450°C	221-47222-91	5-pk.	20244	



Plug Septa for Shimadzu GCs

Thermolite Septa usable to 340°C inlet temp.			IceBlue Septa usable to 250°C inlet temp.			BTO Septa usable to 400°C inlet temp.		
qty.	cat.#	price	qty.	cat.#	price	qty.	cat.#	price
25-pk.	27153		50-pk.	27170		50-pk.	27118	
50-pk.	27154		100-pk.	27171		100-pk.	27119	
100-pk.	27155							


22079

Septum Nut for Shimadzu 17A, 2010, and 2014 GCs

- One piece design for ease of installation and removal.
- Made of clear anodized aluminum and high-quality stainless steel.

Description	Similar to Shimadzu part #	qty.	cat.#	price
Septum Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41286-00 221-44584-00	ea.	22079	


21895

Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs

- Includes 17A injector nut, 0.4mm graphite ferrule, and $^{1}/_{16}$-inch stainless steel capillary nut.

Description	qty.	cat.#	price
Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	21895	
Siltek Treated Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	22331	



22688

Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs

- Meets original manufacturer's performance.

Description	Similar to Shimadzu part #	qty.	cat.#	price
Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	22688	



20375

Restek Enhanced Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs

- Restek's design eliminates the slot, increasing lifetime and durability.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Shimadzu part #	qty.	cat.#	price
Restek Enhanced Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	20375	


21121

5mm Ferrules for Shimadzu 17A GCs

- For use with packed columns.
- Graphite composition.

Description	qty.	cat.#	price
5mm Ferrules for Shimadzu 17A GCs	10-pk.	21121	

NEW!


24829

Graphite Ferrules for Shimadzu 17A, 2010, & 2014 GCs

- Graphite 2-piece construction.
- Available in 0.4, 0.5, and 0.8mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	qty.	cat.#	price
0.4mm	0.25mm and less	10-pk.	24827	
0.5mm	0.32mm	10-pk.	24828	
0.8mm	0.53mm	10-pk.	24829	



20312

5mm Stainless Steel Uniliner® Liner Adaptor Fitting for Shimadzu Packed Column GCs

Shimadzu GCs do not require a standard 1/4-inch Uniliner® liner adaptor because the injection port cavity will accept 5mm Uniliner® liners. This specially-designed fitting allows a Shimadzu packed column injection port to accept 0.53mm ID columns. Use a Shimadzu 5mm nut and ferrule to install the adaptor fitting into the injection port. Includes a 1/16-inch nut and 0.8mm ID graphite ferrule.

Description	qty.	cat.#	price
5mm Stainless Steel Uniliner Liner Adaptor Fitting for Shimadzu Packed Column GCs	ea.	20312	



21159

Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu part #	qty.	cat.#	price
Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159	



22333

Capillary Installation Gauge for Shimadzu 17A, 2010, & 2014 GCs

- Seats ferrule onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.
- For use with graphite ferrules.

Description	qty.	cat.#	price
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333	



did you **know**?

Restek offers a full line of Parker gas generators. Gas generators are a safe and cost-effective alternative to gas cylinders. See **pages 230-233** for more information.



22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#	price
1/4" x 5/16" and 10mm x 11mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334	



Everything you need in one complete kit!

22182

Make Life Easier (MLE) Capillary Tool Kit for Shimadzu GCs

Includes:

- capillary installation gauge for Shimadzu GCs
- injector wrench for Shimadzu GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

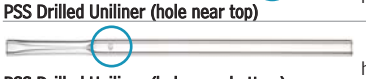
Description	qty.	cat.#	price
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182	

Supplies for PerkinElmer GCs: Liners

COLUMN INSTALLS THIS END

Split Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# / price 5-pk.	25-pk.
 Baffle Splitter	universal, for most common analyses	3.5mm 5.0mm x 100mm	N6502008	20736	20737	—
 Cup Splitter	high & low MW compounds	3.5mm 5.0mm x 100mm	—	20739	20740	—
 Cyclosplitter	dirty samples, many injections before cleaning required	3.5mm 5.0mm x 100mm	—	20745	20746	—
 Auto SYS Splitter w/Wool	universal for most common analyses	4.0mm 6.2mm x 92.1mm	N6502009	20832	20833	20834
 Auto SYS Cup Splitter	high & low MW compounds	4.0mm 6.2mm x 92.1mm	N6502011	20835	20836	—
 Auto SYS Cyclosplitter	dirty samples, many injections before cleaning required	4.0mm 6.2mm x 92.1mm	N6502012	20910	20911	—
 Auto SYS Laminar Cup Splitter	high MW compounds	4.0mm 6.2mm x 92.1mm	—	20827	20828	—
 Auto SYS Split Precision Liner w/Wool	dirty samples, trace samples	4.0mm 6.2mm x 92.1mm	N6121020	21026	21027	—

Splitless Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# / price 5-pk.	25-pk.
 Splitless (2mm ID)	trace samples	2.0mm 5.0mm x 100mm	N6502007	20730	20731	20732
 Auto SYS Splitless	headspace & purge & trap	1.0mm 6.2mm x 92.1mm	N6502006	21272	21273	21274
 Auto SYS Splitless w/Wool (2mm ID)	trace samples	2.0mm 6.2mm x 92.1mm	N6121021	20829	20830	20831 enquire
 Auto SYS Double Gooseneck	trace, active samples up to 4µL	4.0mm 6.2mm x 92.1mm	N6502003	20853	20854	—
 Auto SYS Cyclo Double Gooseneck	trace, dirty, active samples, up to 4µL	4.0mm 6.2mm x 92.1mm	N6502005	20899	20900	—

PSS Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# / price 5-pk.	25-pk.
 PSS Split/Splitless (1mm ID)	trace samples	1.0mm 4.0mm x 86.2mm	N6121006	20738	20741	—
 Auto SYS XL PSS Split/Splitless w/Wool	most common analyses	2.0mm 4.0mm x 86.2mm	N6121004	21717	21718	—
 PSS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	2.0mm 4.0mm x 86.2mm	—	22986	22987	—
 PSS Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	2.0mm 4.0mm x 86.2mm	—	22988	22989	—

*Nominal ID at syringe needle expulsion point.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.



Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.



Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

COLUMN INSTALLS THIS END

Zero Dilution Liners for PerkinElmer Auto SYS and Clarus GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# /price 5-pk.	25-pk.
 Zero Dilution Inner Liner	headspace analysis	1.0mm 2.0mm x 73mm	N1011446	22990	22991	—
 Zero Dilution Outer Liner	headspace analysis	2.5mm 6.2mm x 90mm	N1011445	22992	22993	—

Zero Dilution Liners for PerkinElmer GCs with PSS Inlets	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# /price 5-pk.	25-pk.
 Zero Dilution Inner Liner	headspace analysis	1.0mm 2.0mm x 73mm	N1011446	22990	22991	—
 Zero Dilution Outer Liner	headspace analysis	2.5mm 4.2mm x 83mm	N1011447	24978	24979	—

PTV Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# /price 5-pk.	25-pk.
PTV Press-Tight	high linearity for 0.25, 0.32, & 0.53mm ID columns	1.0mm 2.0mm x 88mm	—	20733	20734	20735
1.0mm PTV Liner	high linearity	1.0mm 2.0mm x 88mm	—	20742	20743	20744

DI Liners for PerkinElmer GCs (0.32/0.53mm ID)	Benefits/Uses:	ID* OD x Length	Similar to PE part#	ea.	cat.# /price 5-pk.	25-pk.
Uniliner	trace, active samples, high recovery & linearity	3.5mm 5.0mm x 100mm	N6502018	20855	20856	—
Cyclo-Uniliner	trace, dirty, active samples, high linearity	3.5mm 5.0mm x 100mm	N6502019	20857	20858	—
Auto SYS Open-top Uniliner w/Wool	trace, dirty, active samples, high recovery & linearity	4.0mm 6.2mm x 92.1mm	N6502016	20837	20838	—
 Auto SYS Cyclo-Uniliner	trace, dirty, high MW active samples, high linearity	4.0mm 6.2mm x 92.1mm	N6502017	20839	20840	—

DI Liners for PerkinElmer GCs (For 0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to PE part #	ea.	cat.# /price 5-pk.	25-pk.
 Auto SYS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0mm 6.2mm x 92.1mm	N6121022	20819	20822	—
 Auto SYS Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0mm 6.2mm x 92.1mm	N6502013	21293	21294	—
 Auto SYS Gooseneck Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0mm 6.2mm x 92.1mm	N6502014	21295	21296	—
 Auto SYS Gooseneck Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0mm 6.2mm x 92.1mm	N6502015	21297	21298	—

*Nominal ID at syringe needle expulsion point.

tech tip

Drilled Uniliner® Liners

Use the Drilled Uniliner® liner with the hole near the bottom for semivolatile analysis or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® liner with the hole near the top for chlorinated pesticides analysis, aqueous injections, as well as for analysis in which the compounds of interest elute away from the solvent peak.

Supplies for PerkinElmer GCs: Inlet, FID

Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs with PSS Injector



Description	Max. temp.	Similar to PE part #	qty.	cat.#	price
Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs w/PSS Injector	450°C	N610-1751	10-pk.	21475	
	450°C	N610-1751	25-pk.	21476	

Viton® O-Rings for PerkinElmer PSS Injector



Description	Max. temp.	Similar to PE part #	qty.	cat.#	price
Viton O-Rings for PerkinElmer PSS Injector	250°C	N6101747	10-pk.	20366	

Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus with CAP Injector



Description	Max. temp.	Similar to PE part #	qty.	cat.#	price
Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus with CAP Injector	250°C	N6101374	10-pk.	20262	



11mm Septa for PerkinElmer GCs

- Preconditioned and ready to use.
- Packaged in precleaned glass jars.

Thermolite Septa usable to 340°C inlet temp.			IceBlue Septa usable to 250°C inlet temp.			BTO Septa usable to 400°C inlet temp.		
qty.	cat.#	price	qty.	cat.#	price	qty.	cat.#	price
25-pk.	27141		50-pk.	27162		50-pk.	27110	
50-pk.	27142		100-pk.	27163		100-pk.	27111	
100-pk.	27143							

HANDY
septum size chart

PerkinElmer Instrument	Septum Diameter (mm)
Sigma series	11
900,990	11
8000 series	11
Auto SYS	11
Auto SYS XL	11

Septum Cap for PerkinElmer Auto SYS XL

- Made of clear anodized aluminum and high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.



Description	Similar to PE part #	qty.	cat.#	price
Septum Cap for PerkinElmer Auto SYS XL	N6100153	ea.	22322	





Injector Adaptor for PerkinElmer Auto SYS XL

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.
- Siltek® treated version available for increased inertness.

Description	Similar to PE part #	qty.	cat.#	price
For use with PE style capillary nuts				
Injector Adaptor for PerkinElmer Auto SYS XL	N6100157	ea.	22318	
Siltek Treated Injector Adaptor for PerkinElmer Auto SYS XL	—	ea.	22320	
For use with 1/16" compression style nuts				
Injector Adaptor for PerkinElmer Auto SYS XL	—	ea.	22319	
Siltek Treated Injector Adaptor for PerkinElmer Auto SYS XL	—	ea.	22321	



FID Capillary Column Adaptor for PerkinElmer Auto SYS XL

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

Description	Similar to PE part #	qty.	cat.#	price
For use with PE style capillary nuts				
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	N6120020	ea.	22608	
For use with 1/16" compression style nuts				
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	—	ea.	22609	



also **available**

Looking for packed column parts for PerkinElmer instruments?
See **pages 193-195**.

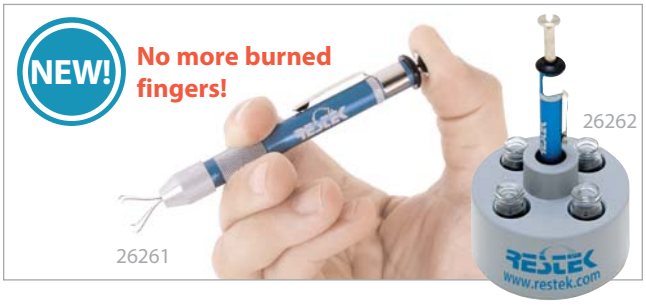


23038

FID Replacement Parts for PerkinElmer Auto SYS XL and Clarus 500

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

Description	Similar to PE part #	qty.	cat.#	price
FID Jet for PerkinElmer Auto SYS XL and Clarus 500	N6100361	ea.	23038	
Auto-Ignite FID Replacement Part Kit for PerkinElmer Auto SYS XL and Clarus 500	N6103167 N6103175 N6101085 N6001204 09912223	kit	23061	
Nozzle Insulator for PerkinElmer Auto SYS XL and Clarus 500	N6101085	ea.	23062	
FID Body for PerkinElmer Auto SYS XL and Clarus 500	N6100364	ea.	23063	



The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4mL vials (not included) can be changed out and disposed of when dirty.

Never again will you have to burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4mL vial situated in the Claw holder until ready for reuse.



Description	qty.	cat. #	price
The Claw	ea.	26261	
The Claw Holder Kit (includes The Claw and holder)	kit	26262	
4.0mL Clear Vial, White Graduated Marking Spot	100-pk.	24658	





also **available**

Restek now carries Swagelok fittings in brass & stainless steel. See **pages 237-239** or visit **www.restek.com** and search on Swagelok.



22185

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit for PerkinElmer GCs

Includes:

- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

Description	qty.	cat.#	price
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185	



20387

Open-End Wrench Set

High-quality 1/4" x 5/16", 3/8" x 7/16", 7/16" x 1/2", and 1/2" x 9/16" wrenches for tightening a wide variety of chromatography fittings.

Description	qty.	cat.#	price
Open-End Wrench Set	set	20387	

Supplies for Thermo Scientific GCs: Liners

COLUMN INSTALLS THIS END

Split Liners for Thermo Scientific 4000-5000-6000 Series GCs	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# / price 5-pk.	25-pk.
 Laminar Cup Splitter	high MW compounds	4.0mm 5.4mm x 79.5mm	—	20809	20810	—
 Cyclosplitter	dirty samples, many injections before cleaning required	4.0mm 5.4mm x 79.5mm	—	20817	20818	—
 Cup Splitter Gooseneck	high & low MW compounds	4.0mm 5.4mm x 79.5mm	—	20885	20886	—

Splitless Liners for Thermo Scientific 4000-5000-6000 Series GCs	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# / price 5-pk.	25-pk.
 Splitless (2mm ID)	trace samples	2.0mm 5.4mm x 79.5mm	—	20811	20812	20813
 Splitless (4mm ID)	trace samples	4.0mm 5.4mm x 79.5mm	—	20814	20815	20816

DI Liners for Thermo Scientific 4000-5000-6000 Series GCs (0.32/0.53 ID)	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# / price 5-pk.	25-pk.
 Open-top Uniliner w/Wool	trace, dirty, active samples, high recovery & linearity	4.0mm 5.4mm x 79.5mm	—	20841	20842	—

Split Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# / price 5-pk.	25-pk.
 1mm Split	purge & trap & fast GC	1.0mm 8.0mm x 105mm	453 20075	20916	20917	—
 3mm Split	universal	3.0mm 8.0mm x 105mm	453 20031	20936	20937	20938
 5mm Split	universal	5.0mm 8.0mm x 105mm	453 20030	20939	20940	20941
 Laminar Cup Splitter	high MW compounds	4.0mm 8.0mm x 105mm	—	20948	20949	—
 Cup Splitter	high & low MW compounds	4.0mm 8.0mm x 105mm	—	20950	20951	—
 5mm Split Precision Liner w/Wool	dirty samples, trace samples	5.0mm 8.0mm x 105mm	—	22288	22289	—

Splitless Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# / price 5-pk.	25-pk.
 Splitless (3mm ID)	trace samples	3.0mm 8.0mm x 105mm	453 20032	20942	20943	20944
 Splitless (5mm ID)	trace samples	5.0mm 8.0mm x 105mm	453 20033	20945	20946	20947
 Double Gooseneck	trace, active samples up to 4µL	4.0mm 8.0mm x 105mm	—	20952	20953	—
 5mm Splitless Precision Liner w/Wool	dirty samples, trace samples	5.0mm 8.0mm x 105mm	—	21028	21029	—

*Nominal ID at syringe needle expulsion point.

All liners are **100%** deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

See next page for ordering information.

Supplies for Thermo Scientific GCs: Liners

COLUMN INSTALLS THIS END

Split Liners for Thermo Scientific TRACE PTV	Benefits/Uses:	ID* OD x Length	Similar to TS part #	cat.# /price ea.	5-pk.	25-pk.
1mm ID Glass Liner	trace samples, high recovery & linearity	1.0mm 2.75mm x 120mm	453 22054	21114	21115	—
2mm ID Glass Liner	universal	2.0mm 2.75mm x 120mm	453 22045	21116	21117	—
Baffle Liner	trace samples	2.0mm 2.75mm x 120mm	—	22074	22075	—

DI Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL (0.32 & 0.53mm ID columns)	Benefits/Uses:	ID* OD x Length	Similar to TS part #	cat.# /price ea.	5-pk.	25-pk.
Uniliner w/Wool	trace, active samples, high recovery, & linearity	5.0mm 8.0mm x 105mm	—	21005	21006	—
Drilled Uniliner (hole near top)	trace, active samples, high recovery, & linearity	5.0mm 8.0mm x 105mm	—	22411	22412	—
Drilled Uniliner (hole near bottom)	trace, active samples, high recovery, & linearity	5.0mm 8.0mm x 105mm	—	22413	22414	—

*Nominal ID at syringe needle expulsion point.

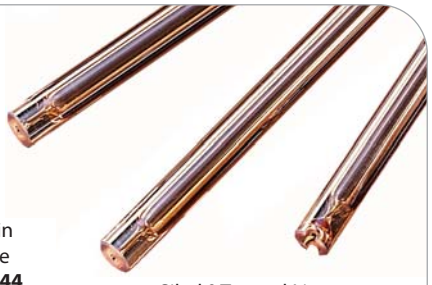
tech tip

Drilled Uniliner® Liners

Use the Drilled Uniliner® liner with the hole near the bottom for semivolatile analysis or when compounds of interest could be affected by a tailing solvent peak. Use the Drilled Uniliner® liner with the hole near the top for chlorinated pesticides analysis, aqueous injections, as well as for analysis in which the compounds of interest elute away from the solvent peak.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.



Siltek® Treated Liners

Siltek® Treated Metal Inlet Liners for Thermo Scientific GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (5.0mm ID x 8.0mm OD x 105mm)	ea. /price	5-pk. /price
5mm ID Split/Splitless Siltek Treated Metal Inlet Liners w/Wool	—	21004
Liner Type (2.75mm OD x 120mm)	**ea. /price**	**5-pk. /price**
1mm ID Split/Splitless Siltek Treated Metal Inlet Liners*	21080	21081
2mm ID Split/Splitless Siltek Treated Metal Inlet Liners*	21082	21083
Liner Type (0.8mm ID x 2.75mm OD x 120mm)	**ea. /price**	**5-pk. /price**
SPME Siltek Treated Metal Inlet Liner for TRACE 2000 GCs & PTV Inlets	22598	22599

*Works with PTV injectors.



Inlet Liner Seals for Thermo Scientific TRACE PTV



Description	Max. temp.	Similar to TS part #	qty.	cat.#	price
Inlet Liner Seals for Thermo Scientific TRACE PTV	450°C	29013417	2-pk.	21392	

Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL Instruments



Description	Max. temp.	Similar to TS part #	qty.	cat.#	price
Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	450°C	290-334-06	ea.	21898	
	450°C	290-334-06	2-pk.	21899	



Septa for Thermo Scientific GCs

- Preconditioned and ready to use.
- Packaged in precleaned glass jars.

Septum Diameter	25-pk. price	50-pk. price	100-pk. price
Thermolite Septa (usable to 340°C inlet temp.)			
9mm	27132	27133	27134
9.5mm (3/8")	27135	27136	27137
17mm	27150	27151	27152
IceBlue Septa (usable to 250°C inlet temp.)			
9mm	—	27156	27157
9.5mm (3/8")	—	27158	27159
17mm	—	27168	27169
BTO Septa (usable to 400°C inlet temp.)			
9mm CenterGuide	—	27104	27105
9.5mm (3/8")	—	27106	27107
17mm CenterGuide	—	27116	27117

tech tip

BTO® septa is recommended for Thermo Scientific instruments, due to the average injection port temperature.

HANDY septum size chart

Instrument	Septum Diameter (mm)
Thermo Scientific	
TRACE GC, 8000, 8000 TOP, GCQ w/TRACE, PTV, 8000 series	17
Finnigan (TMQ)	
GC 9001, GCQ, QCQ, TRACE 2000	9.5

Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL



Description	Similar to TS part #	qty.	cat.#	price
Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	350 01 050	ea.	24971	



Septa Holder Kits for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

- Includes septum support and holder.
- Made from high-quality stainless steel.
- Silcosteel®-AC treated version helps prevent septum retention.

Description	Similar to TS part #	qty.	cat.#	price
Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	233 030 15 350 054 335	kit	21299	
Silcosteel-AC Treated Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	233 030 15 350 054 33	kit	24972	

NEW!

Gold-Plated Liner Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL



Description	Similar to TS part #	qty.	cat.#	price
Gold-Plated Liner Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	290 042 90	ea.	22089	



Silver Seals for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Description	Similar to TS part #	qty.	cat.#	price
Silver Seal for Split/Splitless Injector	29033629	10-pk.	23057	
	29033629	20-pk.	23058	
Silver Seal for Capillary Detector Base Body	29037100	10-pk.	23059	
	29037100	20-pk.	23060	



Adapters for Capillary Columns on Thermo Scientific TRACE and Focus SSL

- Use same installation distance as manufacturer's adapters.
- Made of high-quality stainless steel.
- Siltek® treated version available for additional inertness.

Description	Similar to TS part #	qty.	cat.#	price
For use with standard 1/16" ferrules.				
Adapter for Capillary Column on Detector Base	—	ea.	24916	
Adapter for Capillary Column on Split/Splitless Injector	—	ea.	24917	
Siltek Treated Adapter for Capillary Column on Split/Splitless Injector	—	ea.	20543	
For use with M4 ferrules.				
Adapter for Capillary Column on Detector Base	347 25 436	2-pk.	24969	
Adapter for Capillary Column on Split/Splitless Injector	347 05 451	ea.	24970	
Siltek Treated Adapter for Capillary Column on Split/Splitless Injector	—	ea.	20544	

Nut for Terminal Fitting for Thermo Scientific TRACE GCs



Description	Similar to TS part #	qty.	cat.#	price
Nut for Terminal Fitting for Thermo Scientific TRACE GCs	350 221 25	2-pk.	24896	

Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

- Made of high-quality stainless steel.



Description	Similar to TS part #	qty.	cat.#	price
Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	350 32 423	5-pk.	24973	

Graphite Ferrules—For M4 Fittings for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs



Ferrule ID	Fits Column ID	Similar to TS part #	Graphite 2-pk.	price	Graphite 10-pk.	price
0.3mm	0.10/0.15mm	—	22221		22222	
0.4mm	0.18/0.28mm	29013488 (2-pk.) 29053488 (10-pk.)	20280		20281	
0.5mm	0.32mm	29013487 (2-pk.) 29053487 (10-pk.)	20282		20283	
0.8mm	0.45/0.53mm	29013486 (2-pk.) 29053486 (10-pk.)	20284		20285	

FID Jet for Thermo Scientific TRACE and Focus GCs

NEW!

- Meets or exceeds original manufacturer's performance.



Description	Similar to TS part #	qty.	cat.#	price
FID Jet for Thermo Scientific TRACE and Focus GCs	404 043 01	ea.	23080	

Jet Removing Tool for Thermo Scientific GCs: Focus GC / TRACE GC / Ultra/TRACE GC x GC

- Unique, ergonomic handle—easy to grip.
- Easily loosens the FID jet.




Remove FID cell assembly.


Slip tool over FID jet.


Turn counter-clockwise to loosen jet.


Use tweezers (cat. #20101) to remove jet.

Description	Similar to TS part #	qty.	cat.#	price
Jet Removing Tool for Thermo Scientific GCs	205 019 00	ea.	24936	

Liner Cap Removing Tool for Thermo Scientific GCs: Focus GC / TRACE GC / Ultra/TRACE GC x GC

- Easily loosens the liner cap from the injector.
- Unique, ergonomic handle—easy to grip.


24937


Remove septum cap, septum holder, septum, and septum support.


Place tool on liner cap. Align two pins on bottom of tool with two open slots on liner cap.


Turn counter-clockwise to loosen liner cap.


Use tweezers (cat. #20101) to remove liner cap.

Description	Similar to TS part #	qty.	cat.#	price
Liner Cap Removing Tool for Thermo Scientific GCs	205 070 10	ea.	24937	


22997

Metric Wrench Set

High-quality 6 x 7mm, 8 x 10mm, and 16 x 17mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#	price
Metric Wrench Set	set	22997	


22999

Metric 9 Piece Ball-Point Hex Key Set

Includes 9 metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10mm.

Description	qty.	cat.#	price
Metric 9 Piece Ball-Point Hex Key Set	set	22999	


22330

Capillary Installation Gauge for Thermo Scientific TRACE and Focus SSL (M4 Ferrules)

- Seats ferrule onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.



Install nut and ferrule onto column. Cut column end squarely. Slide column into installation gauge to recommended insertion distance. Finger-tighten column nut.

Tighten assembly to ensure a properly seated ferrule. Loosen assembly and remove column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#	price
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330	



22183

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit for Thermo Scientific GCs

Includes:

- capillary installation gauge for Thermo Scientific GCs
- liner cap removing tool for Thermo Scientific GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

Description	qty.	cat.#	price
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183	

NEW!



ETP Electron Multipliers for Mass Spectrometry

The multi-dynode approach of all ETP multipliers results in longer lifetimes and better sensitivities compared with channel multipliers because of greater surface area.

- Air stable.
- 2-year shelf life guarantee.
- Discrete dynode design results in extended operating life.

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a 2-year shelf life warranty (stored in original sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps the instrument downtime to a minimum.

Electron Multiplier for Thermo Scientific GC/MS	qty.	cat.#	price
For Thermo TRACE DSQ, DSQII, and Polaris-Q GC/MS	ea.	23081	

did you **know**?

A typical ETP electron multiplier has a total active dynode surface area of ~1,000mm^2 compared to a standard continuous dynode multiplier that only has a total channel surface area of around 106mm^2. The increased surface area of the ETP slows the aging process and improves operating life.

Other ETP Electron Multipliers are available upon request. Call us if you do not see your instrument listed.



22082

Transfer Line Reducing Kit for Thermo Scientific TRACE and Focus DSQ Mass Spectrometers

- Meets or exceeds original manufacturer's performance.

Description	Similar to TS part #	qty.	cat.#	price
Transfer Line Reducing Kit for Thermo Scientific TRACE and Focus DSQ Mass Spectrometers	76458-2014s 76458-2009s A0101-03151	kit	22082	

EZ No-Vent™ GC Column-Mass Spectrometer Connector



22454

- Change GC/MS columns in minutes without venting—100µm transfer line throttles vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- Deactivated transfer line keeps analytes focused; high-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.
- For Thermo Scientific Focus DSQ GC Mass Spectrometers.

We designed the EZ No-Vent™ GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent™ connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as in other manufacturer's vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change. This can save nearly a day of downtime with each column change. The EZ No-Vent™ connector easily attaches to the MS source without special tools or extra plumbing.

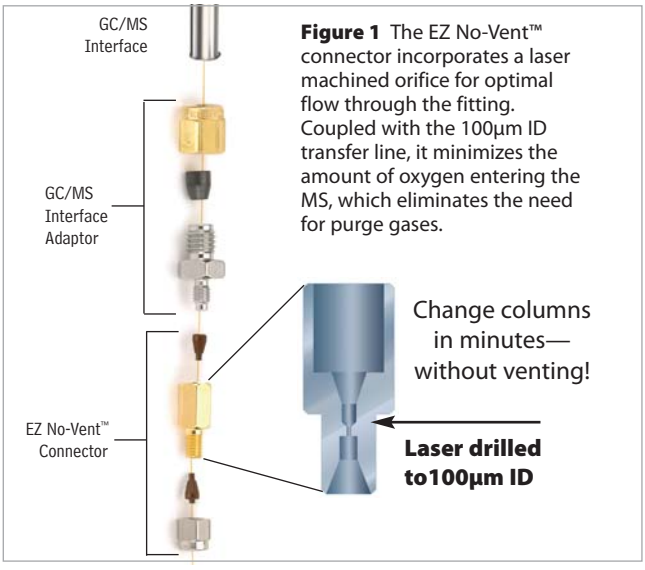


Figure 1 The EZ No-Vent™ connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#	price
EZ No-Vent Connector Kit for Thermo Scientific Focus DSQ GC Mass Spectrometers Kit includes: EZ No-Vent Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	22454	
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:			
0.4mm ID (Polyimide)	2-pk.	21015	
0.5mm ID (Polyimide)	2-pk.	21016	
Replacement ferrules for connecting transfer line to EZ No-Vent Connector: 0.4mm ID	2-pk.	21043	
Replacement 100µm deactivated transfer line	3 ft.	21018	
Replacement EZ No-Vent Column Nut	5-pk.	21900	
Replacement EZ No-Vent Plug	2-pk.	21915	
Open-End Wrenches (1/4" x 5/16")	2-pk.	20110	
Open-End Wrenches (3/8" x 7/16")	2-pk.	22455	

Supplies for ATAS and APEX: Liners & Tools

Liners for ATAS Injectors

COLUMN INSTALLS THIS END

Liners for ATAS Injectors	Benefits/Uses:	ID* OD x Length	Similar to ATAS part #	ea.	cat.# / price 5-pk.
 ATAS Open Liner, 3mm	universal	3.0mm 5.0mm x 80mm	—	22415	22416
 ATAS Open Liner, 1mm	trace, active samples <1µL	1.0mm 5.0mm x 80mm	A100049	22417	22418
 ATAS Fritted Gooseneck	dirty samples	3.0mm 5.0mm x 80mm	A100126	22419	22420

Liners for APEX ProSep 800 & ProSep 800 Plus GCs

COLUMN INSTALLS THIS END

APEX Liners for ProSep 800 & ProSep 800 Plus GCs	Benefits/Uses:	ID* OD x Length	Similar to APEX part #	cat.# / price ea.
 Mega IV (4.0mm ID)	injections ≤125µL	4.0mm 6.0mm x 243mm	L-00410	21075
 Micro I (1.0mm ID)	injections ≤5µL	1.0mm 6.0mm x 243mm	L-00110	21073
 MIDI II (2.0mm ID)	injections ≤25µL	2.0mm 6.0mm x 243mm	L-00210	21074

*Nominal ID at syringe needle expulsion point.

ordering **note**

For additional liner ordering information, see **pages 140-144**.

Viton® O-Rings for Apex Liners



Description	Max. temp.	qty.	cat.#	price
Viton O-rings for APEX liners	250°C	25-pk.	22067	

Deactivated Wool

This deactivated wool is more inert than our traditional fused silica wool. This wool can be used to vaporize a sample in a liner prior to introduction into a capillary column.



Description	qty.	cat.#	price
Deactivated Wool	10 grams	24324	

restek **innovation**!

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.



20181



Gently push the liner removal tool onto the liner in the injection port, with a slight circular motion.



Slowly pull the liner out of the injection port.



Use the liner removal tool to place a new liner into the injection port, avoiding hot metal surfaces.

Description	qty.	cat.#	price
Inlet Liner Removal Tool	3-pk.	20181	



20117

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory—can be used in many different ways.



Remove septum without damaging an expensive weldment.



Dislodge a stuck ferrule quickly and easily—without scoring the fitting.

Description	qty.	cat.#	price
Septum Puller	ea.	20117	

Converting Packed Inlets to Capillary Column Use

Two types of inlet conversion kits are available for a 1/4-inch packed column injection port to fit either 0.32 or 0.53mm ID capillary columns: the Vu-Tight liner and the Uniliner® liner with adaptor (next page). The Vu-Tight liner fits directly into the 1/4-inch injection port and allows visual confirmation of the connection between the column and the liner. The Uniliner® liner and adaptor work together to allow either direct or on-column injection when using 0.53mm ID columns. Both systems incorporate a Press-Tight® connection between the liner and column inlet, minimize dead volume, and reduce solvent peak tailing.

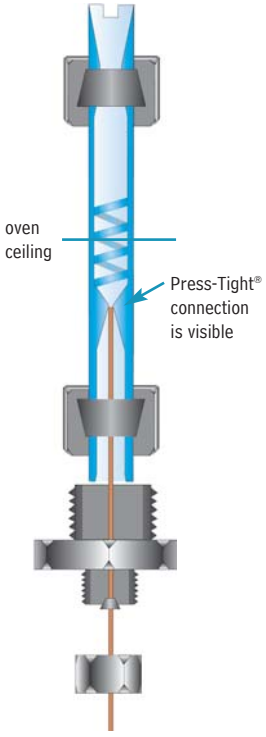
Features of Both Conversion Kits:

- Fit Agilent, Varian, and other common GCs with 1/4-inch packed column injection ports (with maximum insertion depth of 4 inches).
- Install easily within fifteen minutes.
- Accommodate either 0.32 or 0.53mm ID fused silica columns (tubing OD ≥ 0.5mm).
- Liners are deactivated and extremely inert.
- Liners designed to accept dirty samples are available for either system.
- Press-Tight® connections between the liner and column inlet minimize dead volume, reduce solvent peak tailing, and sharpen early-eluting components.

it's a **fact**

Vu-Tight Inlet Liners

The 1/4-inch Vu-Tight liner fits directly into a 1/4-inch injection port. The connection between the liner and the column is in the GC oven, allowing visual confirmation of the seal. Problems, such as a crushed column end in the Press-Tight® taper, can be detected easily, making proper installation worry-free. The Cyclo Vu-Tight liner prevents nonvolatile residue from contaminating the column.



Vu-Tight Inlet Liners for 1/4-Inch Packed Injection Port Conversion

- Visually observe the Press-Tight® connection between the column end and liner.
- Fit 0.32 and 0.53mm ID capillary columns (column ODs from 0.5mm to 0.8mm).
- Slotted top prevents obstruction of carrier gas flow.
- Two designs available.
- Operate in the direct injection mode.



Vu-Tight Inlet Liners for 1/4-Inch Packed Injection Port Conversion

Can easily be packed with wool for dirty samples.

Description	qty.	cat.#	price
Vu-Tight DI Liner	ea.	20342	
Vu-Tight DI Liner	5-pk.	20343	
Vu-Tight DI Liner	25-pk.	20344	

Cyclo Vu-Tight DI Liner (1/4-inch OD)

Ideal for dirty samples. Spiral bore prevents nonvolatile residue from contaminating the column.

Description	qty.	cat.#	price
Cyclo Vu-Tight DI Liner	ea.	20787	
Cyclo Vu-Tight DI Liner	5-pk.	20788	



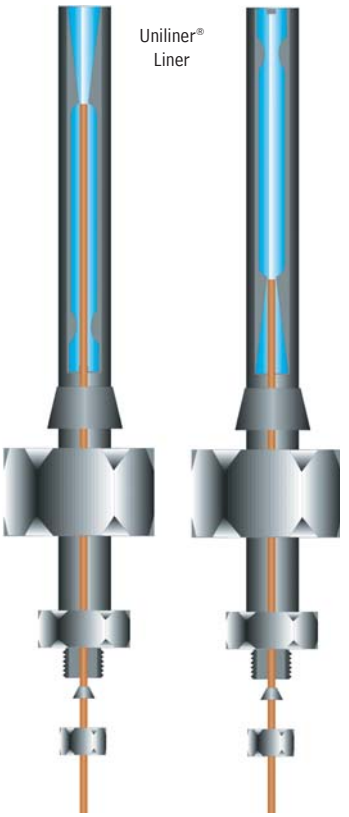
Vu-Tight Installation Fittings Kit

Includes a 1/4-inch stainless steel nut and graphite ferrule for attaching the liner to the GC inlet and a 1/4 to 1/16-inch stainless steel reducer, plus a 1/4-inch and 0.5mm ID graphite ferrule for attaching the column to the liner.

Description	qty.	cat.#	price
Vu-Tight Installation Fittings Kit	kit	20504	

it's a **fact**

5mm Uniliner® liners fit into the 1/4-inch Uniliner® Liner Adaptor, which fits into a 1/4-inch injection port. The Uniliner® liner can be inserted in one direction for direct injections or inverted for on-column injections. Because the 1/4-inch injection port ferrule seals against the metal liner adaptor surface, it is virtually impossible to crack the glass Uniliner® liner during installation.



Uniliner® Liner for 1/4-Inch Packed Injection Port Conversion

- Reduces solvent tailing.
- Versatile—0.53mm ID version can be used in the direct (DI) or on-column (OC) injection mode.
- Incorporates a gentle taper that seals the column and reduces dead volume in direct injection mode.
- Available in various designs.

On-column injections can be performed only with 0.53mm ID columns because 26-gauge needles do not fit into the bore of 0.32mm ID columns, or into the Unliner® liner taper.

Description	Column ID Injection Mode*	ea. cat.# /price	5-pk. cat.# /price
Uniliner Liner (small buffer volume chamber 60mm long, for injections ≤2µL) 	0.53mm DI or OC	20902	20903
Uniliner Liner (large buffer volume chamber 85mm long, for injections ≤4µL) 	0.32 & 0.53mm DI only	20308	20309
	0.53mm DI or OC	20301	20305
Cyclo-Uniliner Liner (for active, dirty samples) 	0.32 & 0.53mm DI only	20319	20320
Open-Top Uniliner Liner (packed with wool) 	0.32 & 0.53mm DI only	20315	20316
Low Volume/Purge & Trap Uniliner Liner (1mm ID x 5mm OD: use in 1/4" injection ports to troubleshoot purge & trap units) 	0.32 & 0.53mm DI only	20307	20314

Uniliner Liner Adaptor (required for installing Uniliner liners in 1/4" injection ports) 

Includes 1/4-inch nut & graphite ferrule, 1/16-inch nut, and 0.8mm ID graphite ferrule.

	Stainless Steel	Siltek-Treated
For injection ports <8cm	20310	22282
For injection ports 8-15cm	20311	
For Shimadzu	20312	

1/4" Ferrules for Uniliner Liner Adaptor cat.# 20234 (5-pk.)

*DI = direct injection, OC = on-column injection

Note: a Uniliner liner must be used with a Uniliner Liner Adaptor (cat.# 20310 or 20311) for 1/4-inch injection ports. Remember to include a liner adaptor when ordering a Uniliner liner, unless you are purchasing replacement Uniliner liners.



also **available**

Looking for other packed column accessories for Agilent GCs?
See **page 161**.

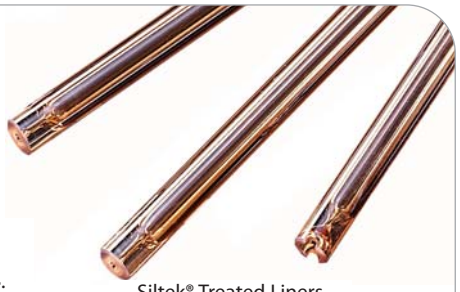
Injection Port Conversion Chart

	Uniliner Liner Set-Up			Vu-Tight Fitting	
Instrument	Uniliner Liner: cat.# 20301, 20305, 20308, 20309, 20315, 20316, 20319, 20320, 20902, & 20903	Liner Adaptor: cat.# 20310	Liner Adaptor Fitting*: cat.# 20312	Vu-Tight Fitting Kit: cat.# 20504 Liner: cat.# 20342, 20343, 20344, 20787, & 20788	Vu-Tight Fitting Kit: cat.# 20504
Agilent GCs (1/4-inch injection ports) Models: 5700, 5710, 5711, 5712, 5830, 5840, 5880, 5890, 6850, 6890	✓	✓		✓	✓
Varian GCs (1/4-inch injection ports) Models: 1200, 1400, 2100, 2400, 3300-3700, 4400, 4600, 6000	✓	✓		✓	✓
Tracor GCs (1/4-inch injection ports) Models: 540, 550, 560, 565, 570	✓	✓		✓	✓
Packard Becker GCs (1/4-inch injection ports) Models: 427, 428, 429, 430, 433, 436, 437, 438	✓	✓		✓	✓
Gow-Mac GCs (1/4-inch injection ports) Models: 69-750, 69-550	✓	✓		✓	✓
HNU GCs (1/4-inch injection ports) Models: 301, 401, 421	✓	✓		✓	✓
Shimadzu Packed Column GCs (5mm injection ports)** Models: GC-4, GC-6 thru 9, GC-14, GC-15, GC-16, GC-17, Mini, 2010	✓		✓		
PerkinElmer GCs (1/4-inch injection ports) Models: Sigma, 1B-4B, 300, 2001, 2100	✓	✓		✓	✓
PerkinElmer Auto SYS*	✓				

*Does not require Uniliner liner adaptor.
**See page 181 for 5mm Stainless Steel Uniliner Liner Adaptor Fitting.

Restek can provide any of the liners shown deactivated according to any of our three proprietary processes, including our highly inert Siltek® coating. The processes are described on **page 140** and ordering information is on **page 143**.

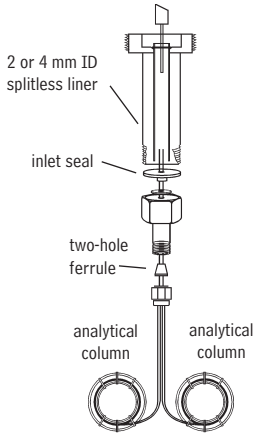
Packing materials, including wool and CarboFrits™, can be provided in any liner—subject to the liner ID and geometry. Packing materials are described on **page 141** and ordering information is on **pages 143-144**.


Siltek® Treated Liners

Dual-Column Analysis: Which technique is right for you?

Split/Splitless Injection

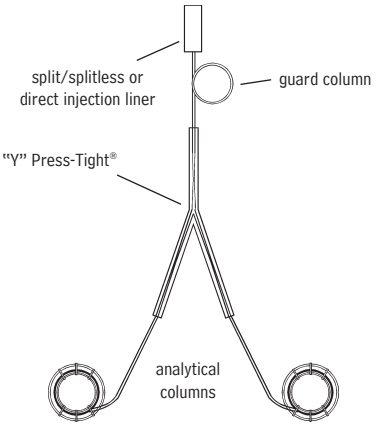
Two-hole ferrules allow dual-column confirmational analysis in the same split/splitless inlet.



0.25 and 0.32mm ID columns can be used with standard 1/16-inch inlet fittings (cat. # 27185). 0.53mm ID columns require 1/8-inch fittings (cat. # 20645) to allow both columns to fit side by side in the injector. Use either straight or extended gooseneck split/splitless liners.

Split/Splitless or Direct Injection

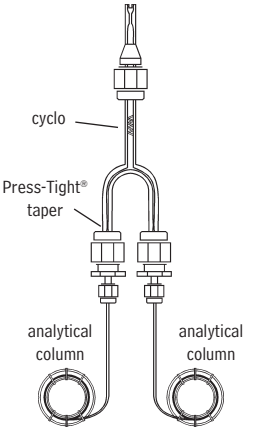
The "Y" Press-Tight® configuration allows dual columns to be used in either a split/splitless or direct injection inlet.



The "Y" Press-Tight® configuration offers versatility because it allows any diameter column or guard column to be connected to a split/splitless or direct injection liner.

Direct Injection

The direct injection "T" allows two 0.32 or 0.53mm ID columns to be connected to one 1/4-inch packed column inlet.



The direct injection "T" incorporates a glass spiral to ensure complete vaporization prior to splitting the sample onto two columns. The dual sealing mechanisms increase ease of use and confidence in the connection relative to the "Y" Press-Tight® configuration.

Analyzing the same sample on two columns of different polarity can increase both the qualitative and quantitative reliability. However, having to repeat the analysis on a second column will significantly reduce sample throughput. The simple solution to improving analytical reliability without reducing sample throughput is to use a simultaneous dual-column technique. This involves connecting two capillary columns to one GC inlet and connecting each column to its own detection system. Both columns are usually of the same internal diameter so the flow rates are balanced and similar amounts of the analytes are directed onto each column. This approach will result in confirmational analysis without reducing sample throughput. Simultaneous dual-column analysis has become a more routine technique used by laboratories involved with complex analyses in complicated matrices.

Split or Splitless Injectors

Split or splitless injections are the easiest dual-column analyses to perform. Both columns can be inserted into the split/splitless inlet fitting and terminate in the inlet liner. Columns with internal diameters of 0.32mm or less (or 0.5mm OD) can be inserted directly into the 1/16-inch standard capillary fitting (cat.# 27185, page 197) by using a two-hole capillary ferrule. Columns with internal diameters of 0.53mm cannot be inserted into a standard 1/16-inch capillary fitting because the outside column diameter (0.8mm) is too large for both to fit simultaneously. Special fittings that use a 1/8-inch fitting and 1/8-inch, two-hole ferrule can be used for 0.53mm ID column (cat.# 20645, page 197).*

On-column or Direct Injections

On-column or direct injections require a Press-Tight® connection to the inlet liner. Usually a section of 0.53mm ID guard tubing is attached to one leg of a Press-Tight® "Y" connector (cat.# 20405, page 198). Analysts must use columns of equivalent length and ID so that the flow through both legs of the "Y" is similar, or the detector response will differ. Another approach is to use a Dual-Column Direct Injection Tee (cat.# 20412, page 197) or *mini*-Lam Direct Injection Tee (cat.# 20436, page 197), that is installed into the injector, with each column connected to the remaining legs of the tee. The Dual-Column Direct Injection Tee has a vaporization chamber to reduce sample backflash and a glass spiral to ensure sufficient vaporization and to reduce discrimination or preferential splitting. The *mini*-Lam Direct Injection Tee is similar—it incorporates an inverted cup in place of the glass spiral. More information on these types of injection tees is given on the facing page.

*Instrument-specific fittings for performing dual column analyses can be found in the Supplies for Agilent and Supplies for Varian sections.

Packed Column Inlet Fittings
(Direct Injection into 0.32 or 0.53mm ID Capillary Columns)

Dual-Column Direct Injection Tee
(for 1/4-inch packed column inlets)

- Designed with a glass spiral to promote sample vaporization and provide even sample distribution to the two columns.
- Traps sample residue and minimizes the need for guard columns.
- Press-Tight® taper in each outlet leg facilitates a perfect dead-volume-free connection to each analytical column (OD 0.4 to 0.8mm) and allows visual confirmation of the column connection.


20412

Description	qty.	cat.#	price
DI Tee Kit (includes all fittings/ferrules)	kit	20412	
Replacement Tee	ea.	20411	

Dual-Column *mini*-Lam Direct Injection Tee
(for 1/4-inch packed column inlets)

- Inverted cup design offers complete sample vaporization.
- Permits larger sample volumes.
- Incorporates a Press-Tight® taper in each outlet leg, to make a perfect, dead-volume-free connection to each analytical column (ODs ranging from 0.4 to 0.8mm).
- Allows visual confirmation of the column connection.
- Open-top design makes it easy to pack with glass wool, keeping sample residue from contaminating the cup.


20436

Description	qty.	cat.#	price
mini-Lam DI Tee Kit (Includes all fittings and ferrules)	kit	20436	
Replacement 4mm *mini*-Lam DI Tee	ea.	20435	

Graphite Replacement Ferrules



ID	fitting size	qty.	cat.#	price
0.5mm	1/16"	10-pk.	20201	
	1/16"	50-pk.	20228	
0.8mm	1/16"	10-pk.	20202	
	1/16"	50-pk.	20224	
1/4-inch	1/4"	10-pk.	20210	

Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors
(Split/splitless fitting for capillary columns)



27185

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2mm ID Dual Vespel® Ring Inlet Seal, and one 0.4mm ID two-hole ferrule.

Description	qty.	cat.#	price
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185	
1.2mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246	
	10-pk.	21247	


20645

1/8-Inch Capillary Inlet Adaptor Fitting Kit
(Split/splitless fitting for 0.53mm ID capillary columns)

Our specially engineered high-precision, 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut. This design makes column installation easy because the nut protrudes farther from the insulated injection port chamber. The column insertion depth is the same as the original equipment.

Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8mm ID two-hole ferrule.

Description	qty.	cat.#	price
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645	
0.53mm ID Dual-Column Installation (1/16-inch Opening) Replacement Inlet Seal	2-pk.	20392	
	10-pk.	20393	

Two-Hole Ferrules— For 1/8-Inch and 1/16-Inch Compression-Type Fittings



0.4mm and 0.5mm

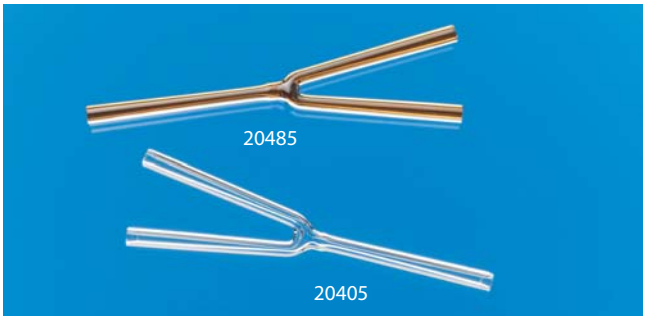
Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4mm	0.25/0.28mm	5-pk.	24848
1/16"	0.5mm	0.32mm	5-pk.	24849
1/8"	0.8mm	0.45/0.53mm	5-pk.	20246

also **available**

Please see our detailed GC column ferrule product listing on **pages 210–212**.

Press-Tight® Connectors

- Deactivated Press-Tight® connectors assure better recovery of polar and nonpolar compounds.
- Siltek® treated connectors are ideal for organochlorine pesticides analysis.
- Fit column ODs from 0.33–0.74mm (Restek 0.1mm–0.53mm ID).

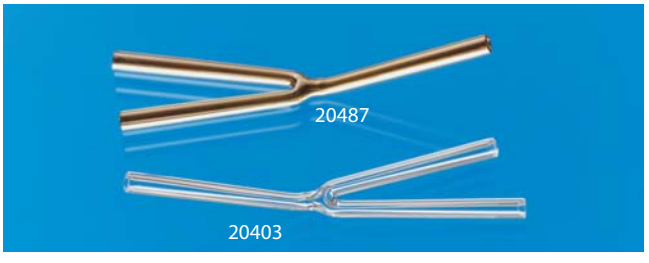


Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns.
- Split a single column flow to two detectors—perform confirmation analysis with a single injection.

Description	ea. /price	3-pk. /price
Universal "Y" Press-Tight Connector	20405	20406
Deactivated	20405-261	20406-261
Siltek Treated	20485	20486



Universal Angled "Y" Press-Tight® Connectors

- Perform confirmation analysis with a single injection.
- Made from inert fused silica.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

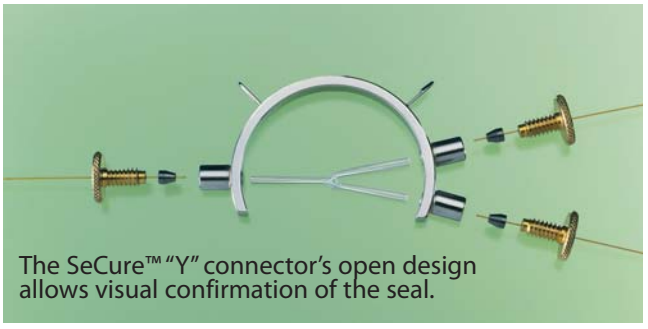
Description	ea. /price	3-pk. /price
Universal Angled "Y" Press-Tight Connector	20403	20404
Deactivated	20403-261	20404-261
Siltek Treated	20487	20469

Polyimide Resin

- Securely connects a Press-Tight® connector to a fused silica column.

Description	Max. Temp.	qty.	cat.#	price
Polyimide Resin	350°C	5 grams	20445	





The SeCure™ "Y" connector's open design allows visual confirmation of the seal.

SeCure™ "Y" Connector Kits

- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and $^{1}/_{16}$" graphite ferrules.
- Reliable seal integrity, will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400°C.

Kits include: SeCure™ "Y" connector body, 3 knurled nuts, "Y" Universal Press-Tight® union, 3 ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#	price
SeCure "Y" Connector Kit	0.18/0.25/0.28mm	kit	20276	
SeCure "Y" Connector Kit	0.32mm	kit	20277	
SeCure "Y" Connector Kit	0.45/0.53mm	kit	20278	
Knurled nut		3-pk.	20279	

MXT™ "Y"-Union Connector Kits for Fused Silica Columns



- Low-dead-volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 360°C.
- Available in union and "Y" configurations.

Each kit contains the MXT™ union, three $^{1}/_{32}$-inch nuts and three one-piece fused silica adaptors.

Description	qty.	cat.#	price
For 0.25mm ID Fused Silica Columns	kit	21389	
For 0.32mm ID Fused Silica Columns	kit	21388	
For 0.53mm ID Fused Silica Columns	kit	21387	

also **available**

See the complete connector product listing on **pages 213–219**.

Replacement Accessories for Hall 1000



ELCD Nickel Reaction Tubes

- Pretreated for maximum sensitivity.
- Quality-controlled for reliability.
- Available for many popular models.

To replace these instrument part numbers:		Order these Restek part numbers:		
ELCD Model #	Instrument #	qty.	cat.#	price
	PerkinElmer #N660-1072 Shimadzu # 220-90435-00 Tremetrics # 117459-0003			
Hall 1000	Varian # 00-997625-12	2-pk.	21581	
O.I. 4420	O.I. Analytical # 260323	2-pk.	21582	

ELCD Nickel Reaction Tube Nut



High-quality stainless steel ELCD nut mounts nickel reaction tube into ELCD.

Description	qty.	cat.#	price
ELCD Nickel Reaction Tube Nut	2-pk.	21584	

1/16-Inch Vespel®/Graphite Sealing Ring



Installs onto the nickel reaction tube after the screw. Easily compresses on the reaction tube to provide a leak-tight seal and prevent detector oxidation.

Description	qty.	cat.#	price
1/16-Inch Vespel/Graphite Sealing Ring	2-pk.	21583	

Cleaned Teflon® Transfer Lines for ELCDs



We stringently clean our ELCD Teflon® transfer lines with an HCl solution to remove any contaminants, then rinse with methanol. Convenient 6.5-inch precut pieces directly interface the nickel reaction tube and conductivity cell in Tracor, Tremetrics, O.I., and many other ELCDs.

Description	qty.	cat.#	price
Teflon Transfer Lines for ELCDs, 1/16" OD x 0.020" ID (five 6.5-inch lines)	5-pk.	20121	

Purge-and-Trap Spargers for Tekmar 2000, 3000, or 3100



- Available with uniform frits, to ensure maximum purging efficiency.
- Use nonfritted spargers for wastewater samples.
- Manufactured to tight tolerances to ensure a leak-tight seal.

Description	qty.	cat.#	price
Fritted Spargers			
5mL Fritted Sparger, 1/2-inch mount	ea.	21150	
10mL Fritted Sparger, 1/2-inch mount	ea.	26138	
25mL Fritted Sparger, 1/2-inch mount	ea.	21151	
Non-Fritted Spargers			
5mL Non-Fritted Sparger, 1/2-inch mount	ea.	26139	
10mL Non-Fritted Sparger, 1/2-inch mount	ea.	26140	
25mL Non-Fritted Sparger, 1/2-inch mount	ea.	26141	



Moisture Control By-Pass Lines for Tekmar Instruments

- Increase response for ketones, alcohols, and acetates.
- Silcosteel®-deactivated tubing for increased inertness.
- Suitable for US EPA Methods 8260, 524.2, and OLM4.1.
- Easily attaches in minutes.

Description	qty.	cat.#	price
Moisture Control By-Pass Line for Tekmar 3000	ea.	21035	
Moisture Control By-Pass Line for Tekmar 3100	ea.	21109	



Photoionization Lamps

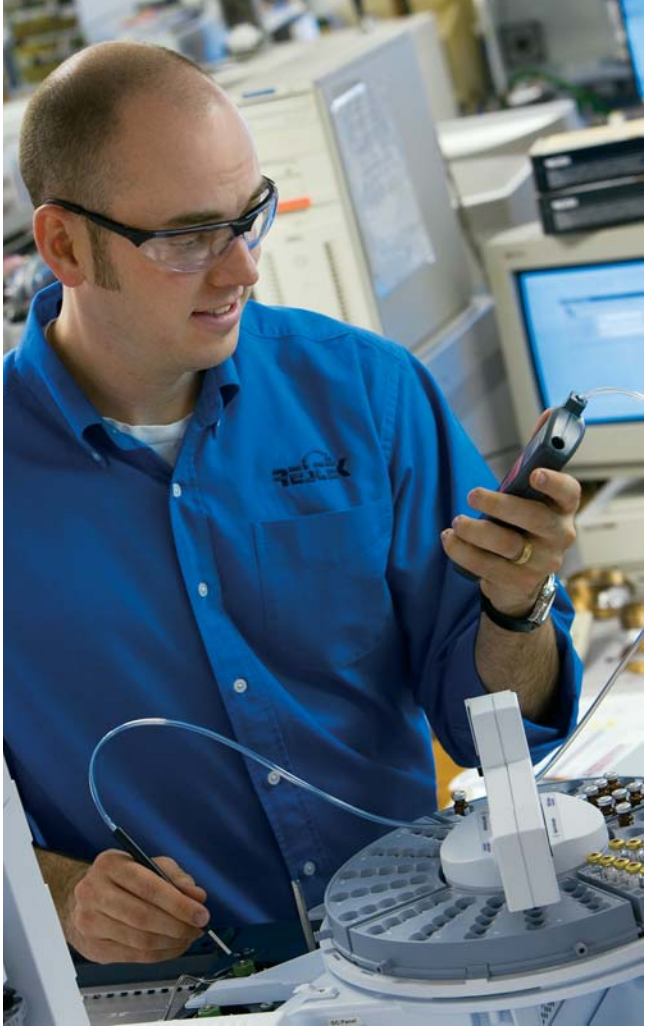
Model 108-10.0/10.6 offers both 10.0 and 10.6 eV potential, has a 0.781" base diameter, and is used in Tracor, OI, and Baseline instruments. Model 103 has a 1.375" base and is used in HNU and SRI detectors. Model 108-BTEX lamp's higher output makes it ideal for detection of BTEX compounds.

Features	Benefits
Longer life.	More for your money with each lamp.
Model 108-BTEX has 33% more output than older models.	Operate continuously at 1 ma and 250°C for 6 months and still have better than 50% of the initial output.
Lamps individually tested.	Your lamp will work to specifications.
Variety of models.	Among the best lamps available for most instrumentation.

Description	eV Rating	Base	qty.	cat. #	price
PID Lamp, Model 103 C	10.2	1.375"	ea.	20676	
PID Lamp, Model 108	10.0/10.6	0.781"	ea.	20675	
PID Lamp, Model 108-BTEX	10.0/10.6	0.781"	ea.	23020	
PID Lamp Polishing Kit (contains iron oxide cleaning compound, swabs, and instructions)			kit	20674	

GC ACCESSORIES
COLUMN INSTALLATION

Leak Detector & Flow Meters 201-202
Column Installation Tools & Tool Kits 202-209
Ferrules 210-212
Connectors 213-219





Top: Scott Grossman, Applications Chemist
Bottom: Evan Johnstone, Shipping Technician

What's **NEW?** look for this circle

Restek Electronic Leak Detector

Why have a small leak turn into a costly repair? Protect your data and analytical column by using a Restek Leak Detector.

Features & Benefits include:

- Optimized sample flow path.
- New ergonomic, hand-held design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Longer lasting battery, up to 6 hours of continuous use.
- Automatic shut-off.
- A convenient carrying and storage case.
- Easy to clean probe assembly.
- A universal charger set (US, European, UK, and Australian plugs included).

Backed by a 1-year warranty, the new Restek Leak Detector sets an industry standard for performance and affordability in hand-held leak detectors.



22839

Leak Detector Facts

Detectable gases:	helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
Warranty:	one year
Certifications:	CE, Japan
Compliance:	WEEE, RoHS


22839

Carrying/storage case included with purchase of unit.

Limits of Detection

These gases can be detected with the Restek Electronic Leak Detector at the following leak rates.

Gas	Minimum Detectable Leak Rate (atm cc/sec.)	Indicating LED Light Color
Helium	1.0×10^{-5}	Red
Hydrogen*	1.0×10^{-5}	Red
Nitrogen	1.4×10^{-3}	Yellow
Argon	1.0×10^{-4}	Yellow
Carbon Dioxide	1.0×10^{-4}	Yellow

Description	qty.	cat.#	price
Leak Detector with Universal Charger Set (US, UK, European, Australian)	ea.	22839	
Soft-Side Carry/Storage Case	ea.	22657	
Small Probe Adaptor	ea.	22658	

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. The Restek Electronic Leak Detector may be used for determining trace amounts of hydrogen in a GC environment only.



22657

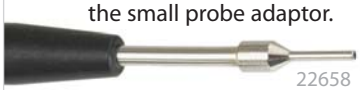
Optional soft-side storage case is ideal for storing your leak detector in smaller spaces, such as your tool box.



Checking for leaks maintains the integrity of a GC system.



Verify hard-to-reach leaks using the small probe adaptor.


22658

tech tip

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.



Soap Film Bubble Flowmeter

- 1mL flowmeter for flows between 0.1 and 10cc/min.
- 50mL flowmeter for flows between 10 and 300cc/min.
- Includes a reservoir bulb, twenty-four inches (60cm) of $^1/_4$-inch ID tubing, adaptor tubes for $^1/_8$-inch tubing and 0.53mm ID capillary columns, and Velcro® fasteners.

Description	qty.	cat.#	price
1mL Bubble Flowmeter	ea.	20135	
50mL Bubble Flowmeter	ea.	20136	

Methane Cylinder Kit

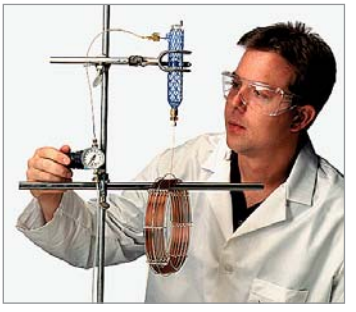
(For optimizing linear velocity)

Setting the column flow rate by injecting methane and optimizing linear velocity is a preferred method for establishing reproducible retention times (ASTM Method E1510-93). The kit includes a Scotty® 14 cylinder containing 1% methane in helium, a MINICYL regulator, a syringe adaptor, and a package of twenty-five septa for the adaptor.



20197

Description	qty.	cat.#	price
Methane Cylinder Kit	kit	20197	
Replacement Septa for Syringe Adaptor	25-pk.	20198	
Replacement Methane Cylinder	ea.	20199	



Column not included.

Capillary Column Rinsing Reservoir Kit

Restore the performance of bonded-phase capillary columns by dissolving and removing soluble, nonvolatile residue, using this reservoir kit. The 50mL rinsing reservoir is equipped with $^1/_4$-inch inlet and outlet connections and includes a built-in fritted disk to prevent particulate matter from contaminating the column. The kit includes: reservoir, pressure regulator, fittings, ferrules, and tubing. Reservoir also available separately.

Description	qty.	cat.#	price
Rinsing Reservoir Complete Kit	kit	20612	
Rinsing Reservoir only	ea.	20613	



21000

FID Flow Measuring Adaptor for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
FID Flow Measuring Adaptor	19301-60660	ea.	21000	

Inlet and FID Maintenance Kits for Agilent GCs

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

Inlet kit includes:

- 0.4, 0.5, and 0.8mm ID graphite ferrules.
- Viton® O-rings.
- Capillary nuts.
- Inlet seals.
- Reducing nut.
- Scoring wafer.
- 11mm Thermolite® septa.
- 4.0mm single gooseneck liner.
- 4.0mm split liner with wool.
- Capillary column caps.
- $^1/_4$" x $^5/_{16}$" wrench.
- Septum puller.
- Installation gauge.
- Wire cleaning brush.
- Jet reamers/ferrule removers.
- Inlet liner removal tool.
- Septa nut removal tool.



22181

FID kits include:

- $^1/_4$", 0.4, 0.5, and 0.8mm ID graphite ferrules.
- FID/NPD capillary adaptor.
- Capillary nuts.
- Jet reamers/ferrule removers.
- $^1/_4$" nut.
- Scoring wafer.
- Capillary column caps.
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs.
- FID flow measuring adaptor.
- $^1/_4$" x $^5/_{16}$" wrench.
- Installation gauge.
- Wire cleaning brush.
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs.
- Spanner wrench.
- FID jet removal tool.



22180



22179

Description	qty.	cat.#	price
Inlet Maintenance Kit for Agilent 5890/6850/6890/7890 GCs	kit	22181	
FID Maintenance Kit for Agilent 5890 GCs	kit	22180	
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179	


22185


22186


22182


22184

MLE
Make Life Easier!

MLE Tool Kits conveniently provide the tools that make it easier to install and maintain capillary columns at a discounted price compared to buying the tools individually!


22183

Make Life Easier (MLE) Capillary Tool Kits

Everything you need in one complete kit!

All kits include these components:

- 1/8", 3/16", 1/4" nylon brushes
- 1/4", 3/8", 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers with handles
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

MLE Capillary Tool Kit for Agilent GCs (cat.# 22186) also includes:

- capillary installation gauge for Agilent GCs
- injector wrench for Agilent GCs
- septum nut removal tool
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for PerkinElmer GCs (cat.# 22185) also includes:

- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for Shimadzu GCs (cat.# 22182) also includes:

- capillary installation gauge for Shimadzu GCs
- injector wrench for Shimadzu GCs
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench

MLE Capillary Tool Kit for Thermo Scientific GCs (cat.# 22183) also includes:

- capillary installation gauge for Thermo Scientific GCs
- liner cap removing tool for Thermo Scientific GCs
- 6mm x 7mm open end wrench
- 8mm x 10mm open end wrench
- 16mm x 17mm open end wrench

MLE Capillary Tool Kit for Varian GCs (cat.# 22184) also includes:

- capillary installation gauge for Varian GCs
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

Description	qty.	cat.#	price
MLE Capillary Tool Kit for Agilent GCs	kit	22186	
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185	
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182	
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183	
MLE Capillary Tool Kit for Varian GCs	kit	22184	

Scoring Wafer with Handle

- Ceramic wafer is serrated on one side and straight-edged on the other to cut both fused silica and metal tubing cleanly.
- Unique, ergonomic handle is made of soft, comfortable rubber.


23015


Hold tubing firmly in one hand, allowing about two inches to extend freely. Hold the scoring wafer at a 45° angle to the tubing. Exert just enough pressure to put a slight arc in the tubing. Pull perpendicularly across the tubing.


The tubing should fall off on its own, or it should easily break at the score with a slight tap of the wafer.


Check the cut against the white of the scoring wafer. Look for a clean, square cut.

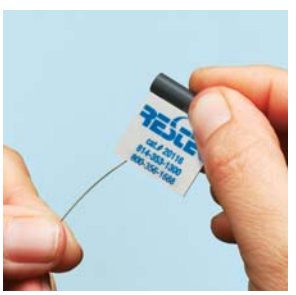
Description	qty.	cat.#	price
Scoring Wafer with Handle	2-pk.	23015	

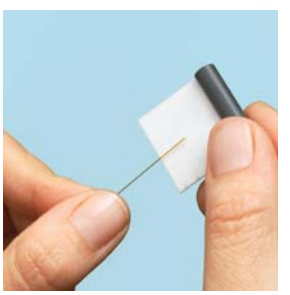
Ceramic Scoring Wafer

- Four straight scoring edges for cutting fused silica tubing and four serrated edges for cutting MXT® metal capillary columns.
- Sure-grip handle included.



20116


Exert just enough pressure to put a slight arc in the tubing. The tubing should fall off or break with a slight tap of the wafer.

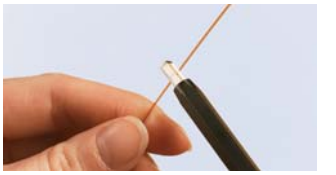

Check the cut against the white of the scoring wafer. Look for a clean, square cut.

Description	qty.	cat.#	price
Ceramic Scoring Wafers	5-pk.	20116	

Sapphire Scribe

- Cuts fused silica tubing.
- Produces a clean, square cut.


20182


One quick stroke...


...and just a tap leaves a clean, square end.

Description	qty.	cat.#	price
Sapphire Scribe	ea.	20182	

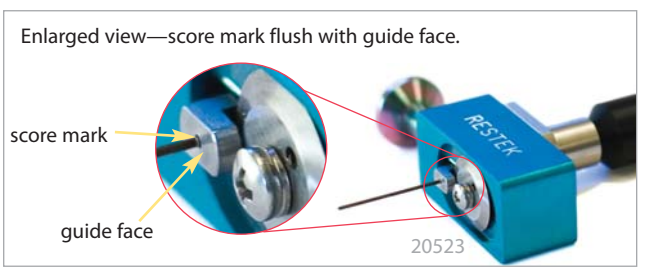

23027


23026

Shortix® Capillary GC Column Cutter

- Consistently make precise, clean, square cuts with a diamond blade.
- Built-in magnifier to verify square cut.
- Use with 0.25mm ID to 0.53mm ID tubing (0.78mm OD maximum).

Description	qty.	cat.#	price
Shortix Capillary GC Column Cutter	ea.	23026	
Maintenance Kit for Shortix Capillary GC Column Cutter (includes diamond cutting wheel, O-rings, and a tool to open the column cutter)	kit	23027	



Restek Tubing Scorer for MXT® Columns

NEW!

- Makes perfect cuts every time.
- Easy to use.
- Leaves column entrance perfectly round.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.

Description	qty.	cat.#	price
Restek Tubing Scorer for MXT Columns (0.25-0.53mm ID & 0.5-0.8mm OD)	ea.	20523	
Replacement Scoring Wheel	ea.	20522	

Easily seat ferrules for consistent installations!


21034


21399


22330


22335


22333

Capillary Installation Gauge

- Seats ferrules onto column for consistent installations.*
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Using the capillary installation gauge for Agilent-style fittings.


Install the column nut and ferrule onto the column. Slide the column into the installation gauge to the recommended insertion distance. Finger-tighten the nut.


Tighten the assembly to ensure a properly seated ferrule. Loosen the assembly and remove the column and column nut.


The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#	price
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034	
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399	
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330	
Capillary Installation Gauge for Varian GCs for use with 1/16" ferrules	ea.	22335	
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333	

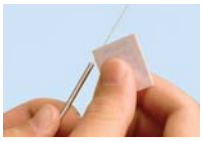
*Recommended for use with graphite ferrules.

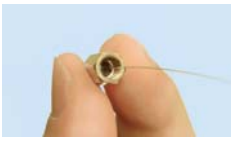

21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.


Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end, then tighten the nut on to the gauge.


Score and remove the exposed end of the column, then loosen the nut.


The ferrule will be properly seated and should remain in place when light force is applied. Install the column into the GC/MS interface.

Description	Similar to Agilent part #	qty.	cat.#	price
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894	

NEW!


22858


21044

Capillary Column Caps

- Attach to the column in seconds to form an airtight seal.
- Increase column lifetime—prevent moisture and air from entering the column during storage.
- Two styles to choose from: glass or silicone material.
- Glass caps are color-coded for identifying detector and injector ends.
- Not recommended for reuse.

Description	qty.	cat.#	price
Capillary Column Caps (glass)	10-pk.	21044	
Capillary Column Caps (silicone)	10-pk.	22858	



did you **know**?

Restek carries a complete line of replacement parts for Agilent GCs. See **pages 146-172** for more information.

restek
innovation!
No more burned fingers!



20181

Inlet Liner Removal Tool
- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.


Gently push the liner removal tool onto the liner in the injection port, with a slight circular motion.

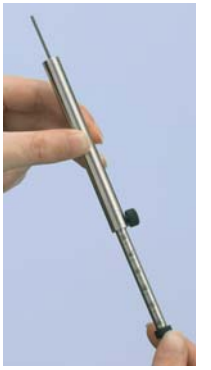

Slowly pull the liner out of the injection port.


Use the liner removal tool to place a new liner into the injection port, avoiding hot metal surfaces.

Description	qty.	cat.#	price
Inlet Liner Removal Tool	3-pk.	20181	


20339

Inlet Liner Packing Tool
- Position wool reproducibly every time.
- Accurate to a specific, measured depth.


Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.


Place a plug of loosely bound wool at the top of the inlet liner.


Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Eliminates user variation!

Description	qty.	cat.#	price
Inlet Liner Packing Tool	ea.	20339	

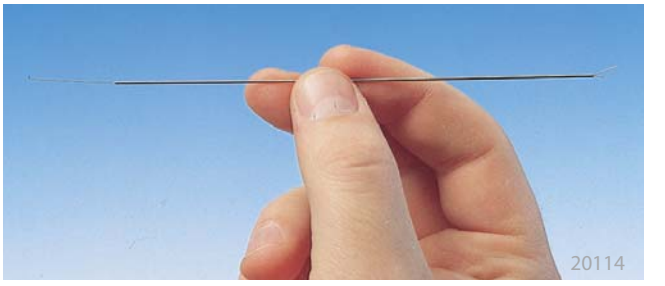


The Claw and The Claw Holder Kit
- Easily removes hot liners from injection ports.
- 4mL vials (not included) can be changed out and disposed of when dirty.

Never again will you have to burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4mL vial situated in the Claw holder until ready for reuse.



Description	qty.	cat. #	price
The Claw	ea.	26261	
The Claw Holder Kit (includes The Claw and holder)	kit	26262	
4.0mL Clear Vial, White Graduated Marking Spot	100-pk.	24658	


20114

Mini Wool Puller/Inserter
Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.

Description	qty.	cat.#	price
Mini Wool Puller/Inserter	2-pk.	20114	

Injector/Detector Plug Nut
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.


21883

Description	Similar to Agilent part#	qty.	cat.#	price
Detector Plug Nut	5020-8294	2-pk.	21883	

Rethreading Tool

- Repair worn or damaged threads.
- Multiple uses (fittings, injectors, detectors, etc.)
- Built-in guide to prevent cross-threading.


23018

Repeated installation, removal, and temperature changes cause wear and damage to threads on GC parts. This can cause a poor seal, and oxygen can enter the system, compromising analytical results and possibly destroying expensive analytical columns.



Achieve a better seal!

Simply screw the rethreading tool onto the part, unscrew, and inspect the threads. Repeat as necessary. When done, wipe threads clean with methanol to remove any debris.

Description	qty.	cat.#	price
Rethreading Tool for 1/16" compression fitting	ea.	23016	
Rethreading Tool for 1/8" compression fitting	ea.	23017	
Rethreading Tool for 1/4" compression fittings (Agilent split/splitless injection ports)	ea.	23018	
Rethreading Tool for 7/16" compression fitting (Varian injection ports)	ea.	23019	
Rethreading Tool for 1/4" Varian-style capillary column fittings	ea.	21893	

Injector Wrench for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.


22065

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065	


21159

Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu part #	qty.	cat.#	price
Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159	


22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#	price
1/4" x 5/16" and 10mm x 11mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334	


20387

Open-End Wrench Set

High-quality 1/4" x 5/16", 3/8" x 7/16", 7/16" x 1/2", and 1/2" x 9/16" wrenches for tightening a wide variety of chromatography fittings.

Description	qty.	cat.#	price
Open-End Wrench Set	set	20387	


20110

Open-End Wrenches

High-quality wrenches for tightening capillary fittings.

Description	qty.	cat.#	price
Open-End Wrenches (1/4" x 5/16")	2-pk.	20110	
Open-End Wrenches (3/8" x 7/16")	2-pk.	22455	


22997

Metric Wrench Set

High-quality 6 x 7mm, 8 x 10mm, and 16 x 17mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#	price
Metric Wrench Set	set	22997	


22999

Metric 9 Piece Ball-Point Hex Key Set

Includes 9 metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10mm.

Description	qty.	cat.#	price
Metric 9 Piece Ball-Point Hex Key Set	set	22999	


22998

12 Piece Ball-Point Hex Key Set

Includes 12 hex keys (Allen wrenches): .050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#	price
12 Piece Ball-Point Hex Key Set	set	22998	


23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#	price
Torx Screwdriver Set	set	23034	

Torx is a registered trademark of Textron Inc.


20109

High-Temperature String

- Withstands temperatures to 400°C.
- Use to restring capillary columns, attach column connectors to column cages, or hold a column in the GC oven.

Description	qty.	cat.#	price
High-Temperature String	10m	20109	
High-Temperature String	450m	20618	


20101

Slide-Lock Tweezers and 15cm Compact Steel Ruler

- "Lock" capillary columns to the correct insertion distance recommended by the instrument manufacturer during installation.
- Useful for many laboratory tasks.

Description	qty.	cat.#	price
Slide-Lock Tweezers and 15cm Compact Steel Ruler	set	20101	


20112

Stainless Steel Tube Brushes/Surface Brush

Unlike brass brushes that can leave a metal residue, these stainless steel tube brushes (3/8-, 3/16-, and 1/4-inch) work well for cleaning dirty collectors, injector ports, and detector ports. The surface brush can be used to remove residue that builds up on metal detector jets and electronic contacts.

Description	qty.	cat.#	price
Stainless Steel Tube Brushes/Surface Brush	4-piece set	20112	


20108

Nylon Tube Brushes and Pipe Cleaner

Use to remove small septum fragments and residue from dirty glass inlet liners. Brushes are 1/8-, 3/16-, and 1/4-inch in diameter; pipe cleaner is one foot (30cm) long.

Description	qty.	cat.#	price
Nylon Tube Brushes and Pipe Cleaner	4-piece set	20108	


20106

4" Tapered Needle Files

These files can be used for many purposes. They are especially useful for removing ferrules that are lodged in injector or detector ports.

Description	qty.	cat.#	price
4" Tapered Needle Files	2-pk.	20106	


21601

MXT™ Needle Files

Multi-purpose files especially useful for cutting Siltek® treated stainless steel columns.

Description	qty.	cat.#	price
MXT Needle Files	2-pk.	21601	



Mini Hand Drill Set

Drill ferrules to the proper ID in seconds! Includes three drills, for use with 0.25, 0.32, and 0.53mm ID (0.4, 0.5, and 0.8mm OD) capillary columns.

Description	qty.	cat.#	price
Mini Hand Drill Set	3-piece set	20122	



Stainless Steel Jet Reamers

A great tool for cleaning detector jets or removing stuck ferrules from other small orifices. Serrated design is optimal for removing silica deposits and other contaminants.

Description	qty.	cat.#	price
Stainless Steel Jet Reamers	6-piece set	20113	

Pocket Magnifier

- Small and easy to handle.
- 10x magnification makes it easy to see the column end to verify a square cut.



Description	qty.	cat.#	price
Pocket Magnifier	ea.	20124	

GC Oven Thermometer

- Verify GC oven temperature.
- Quick measurements via sensor in the measuring tip.
- Swivel head can turn 180°.
- Wide measuring range: -50°C to +350°C.



Description	qty.	cat.#	price
GC Oven Thermometer	ea.	22066	

Flashlight with Swivel Head

- Ideal for tight spaces—like inside a GC oven.
- Uses two AA batteries (included).



Description	qty.	cat.#	price
Flashlight with Swivel Head	ea.	22187	

Septum Puller

- Keep several on hand in your laboratory—can be used in many different ways.
- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or fragments.



Remove septum without damaging an expensive weldment.



Dislodge a stuck ferrule quickly and easily—without scoring the fitting.



Description	qty.	cat.#	price
Septum Puller	ea.	20117	

MLE Make Life Easier!

save **money**!

You can save money on column installation tools by purchasing the MLE Capillary Tool Kits described on **page 203.**

restek **innovation**!



Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs

- Easily remove the septum nut without touching the heated nut—no more burned fingers!
- Unique, ergonomic handle—easy to grip.

Description	qty.	cat.#	price
Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs	ea.	24918	

restek **innovation**!



Liner Cap Removing Tool for Thermo Scientific GCs: Focus GC / TRACE GC / Ultra/TRACE GC x GC

- Easily loosens the liner cap from the injector.
- Unique, ergonomic handle—easy to grip.

Description	Similar to TS part #	qty.	cat.#	price
Liner Cap Removing Tool for Thermo Scientific GCs	205 070 10	ea.	24937	

Ferrules

tech tip

Choosing the Right Ferrule

Although graphite and Vespel®/graphite ferrules each have advantages and disadvantages, the choice of ferrule composition is largely a personal preference. Graphite ferrules are soft, easy to seal, stable to 450°C, and contain no binders that might off-gas. Vespel®/graphite ferrules work better for vacuum and high-pressure applications (e.g., GC/MS) because they will not fragment or allow oxygen to permeate into the system, whereas graphite ferrules will. Because Vespel®/graphite ferrules are made from a harder material, they might require retightening after several temperature cycles. Alumaseal™ ferrules are ideal for GC/MS. They will not crack or fragment and require no retightening after temperature cycles.

Vespel® Ferrules

- 100% high-temperature polyimide.
- Stable to 350°C.
- Durable, leak-tight.



Vespel® ferrules

Graphite Ferrules

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450°C.

Vespel®/Graphite Ferrules

- 60%/40% Vespel®/graphite blend, offering the best combination of sealing and ease of workability.
- Seal with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
- Stable to 400°C.
- Recommended for mass spec transfer lines.



graphite ferrules

Capillary Ferrules—For 1/16-Inch Compression-Type Fittings

Available in Vespel®, graphite, or Vespel®/graphite.

Ferrule ID	Fits Column ID	qty.	Vespel		Graphite		Vespel/Graphite	
0.3mm	< 0.18mm	10-pk.	22213		20233		20275	
0.4mm	0.18/0.25/0.28mm	10-pk.	22214		20200		20211	
0.4mm	0.18/0.25/0.28mm	50-pk.	—	—	20227		20229	
0.5mm	0.32mm	10-pk.	22215		20201		20212	
0.5mm	0.32mm	50-pk.	—	—	20228		20231	
0.6mm	0.28mm**	10-pk.	—	—	—	—	20232	
0.8mm	0.45/0.53mm	10-pk.	22216		20202		20213	
0.8mm	0.45/0.53mm	50-pk.	—	—	20224		20230	
1.0mm	0.75mm*	10-pk.	22217		21058		24912	
1.2mm	0.75mm	10-pk.	22218		—	—	—	—
1.6mm	1.00mm*	10-pk.	—	—	21060		—	—

Reusable!



graphite ferrules

Encapsulated Ferrules—For 1/16-Inch Compression Fittings

- Reusable—will not deform and stick in fittings.
- Less torque needed to seal ferrule.
- Restek's unique blend of graphite minimizes fragmentation and outgassing.

Ferrule ID	Fits Column ID	qty.	cat.#	price
0.4mm	0.25mm	10-pk.	21036	
0.5mm	0.32mm	10-pk.	21037	
0.8mm	0.53mm	10-pk.	21038	



graphite ferrules

Compact Ferrules—For Agilent 5890/6890/6850/7890 GCs

Available in graphite or Vespel®/graphite.

Ferrule ID	Fits Column ID	qty.	Graphite	Vespel/Graphite
0.4mm	0.25/0.28mm	10-pk.	20250	20238
0.4mm	0.25/0.28mm	50-pk.	20251	20239
0.5mm	0.32mm	10-pk.	21007	20248
0.5mm	0.32mm	50-pk.	21008	20249
0.8mm	0.45/0.53mm	10-pk.	20252	20263
0.8mm	0.45/0.53mm	50-pk.	20253	20264
1.0mm	0.75mm*	10-pk.	21059	21056
1.6mm	1.00mm*	10-pk.	21061	21057

*For micropacked columns.
**For 0.28mm MXT columns.

Standard Ferrules—For 1/16-, 1/8-, and 1/4-Inch Fittings

Available in Vespel®, graphite, or Vespel®/graphite.



Fitting Size	Ferrule ID	qty.	Vespel		Graphite		Vespel/Graphite
1/4"	3/16"	5-pk.	—	—	—	—	20258
1/16"	1/16"	10-pk.	22210		20207		20218
1/8"	1/8"	10-pk.	22211		20208		20219
1/8"	reduce to 1/16"	10-pk.	—	—	20209		20220
1/4"	1/4"	10-pk.	22212		20210		20221
1/4"	reduce to 1/8"	10-pk.	22219		20225		20222
1/4"	reduce to 1/16"	10-pk.	—	—	20226		20223

Two-Hole Ferrules—For 1/8-Inch and 1/16-Inch Compression-Type Fittings

NEW! 0.4mm and 0.5mm



Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4mm	0.25/0.28mm	5-pk.	24848
1/16"	0.5mm	0.32mm	5-pk.	24849
1/8"	0.8mm	0.45/0.53mm	5-pk.	20246

Reducing Ferrules

Available in graphite or Vespel®/graphite.



Fitting Size	Ferrule ID	Fits Column ID	qty.	Graphite	Vespel/Graphite	
1/8"	0.4mm	0.25mm	5-pk.	20205	20254	
1/8"	0.5mm	0.32mm	5-pk.	20205	20255	
1/8"	0.8mm	0.53mm	5-pk.	20206	20215	
1/4"	0.4mm	0.25mm	5-pk.	20203	—	—
1/4"	0.5mm	0.32mm	5-pk.	20203	20257	
1/4"	0.8mm	0.45/0.53mm	5-pk.	20204	20217	

Blank Ferrules—For 1/16-Inch Fittings



Fitting Size	Ferrule ID	qty.	Vespel/Graphite
1/16"	no hole	10-pk.	20240

Alumaseal™ Ferrules*

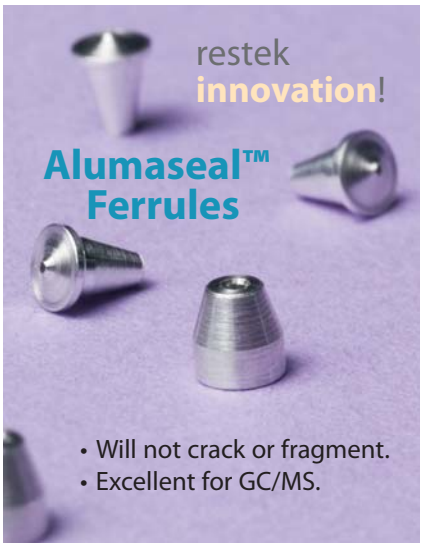
- Aluminum construction—will not crack or fragment.
- No retightening required after temperature cycles—excellent for GC/MS.
- Eliminate out-gassing, make leak-tight seals, for less detector noise.
- Unique two-piece design permanently locks on fused silica tubing without causing breakage.
- Will not stick in fittings, unlike Vespel® or graphite.
- Stable to 550°C.
- Use with any 1/16" compression-type fitting.

Ferrule ID	Fits Column ID	qty.	cat.#	price
0.4mm	0.25mm	10-pk.	21472	
0.5mm	0.32mm	10-pk.	21473	
0.8mm	0.53mm	10-pk.	21474	

*Patent pending.









Teflon® Ferrules

- Upper temperature limit 250°C.
- 100% Teflon®; completely inert.
- One-piece design requires no back ferrule.

Fitting Size	Ferrule ID	qty.	cat.#	price
1/16"	1/16"	10-pk.	21122	
1/16"	0.4mm	10-pk.	21123	
1/16"	0.5mm	10-pk.	21124	
1/16"	0.8mm	10-pk.	21125	
1/8"	1/8"	10-pk.	21126	
3/16"	3/16"	10-pk.	21127	
1/4"	1/4"	10-pk.	21128	

Graphite Ferrules—M4 Fittings for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs



Ferrule ID	Fits Column ID	Similar to TS part #	Graphite 2-pk.	price	Graphite 10-pk.	price
0.3mm	0.10/0.15mm	—	22221		22222	
0.4mm	0.18/0.28mm	29013488 (2-pk.) 29053488 (10-pk.)	20280		20281	
0.5mm	0.32mm	29013487 (2-pk.) 29053487 (10-pk.)	20282		20283	
0.8mm	0.45/0.53mm	29013486 (2-pk.) 29053486 (10-pk.)	20284		20285	



5mm Ferrules for Shimadzu 17A GCs

- For use with **packed columns**.
- Graphite construction.

Description	qty.	cat.#	price
5mm Ferrules for Shimadzu 17A GCs	10-pk.	21121	



Graphite Ferrules for Shimadzu 17A, 2010, & 2014 GCs

- Graphite 2-piece construction.
- Available in 0.4, 0.5, and 0.8mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	qty.	cat.#	price
0.4mm	0.25mm and less	10-pk.	24827	
0.5mm	0.32mm	10-pk.	24828	
0.8mm	0.53mm	10-pk.	24829	

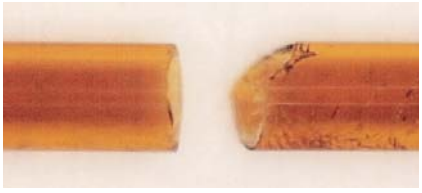
also **available**

Restek now carries Swagelok fittings in brass & stainless steel.
See **pages 237-239** or visit **www.restek.com** and search on Swagelok.

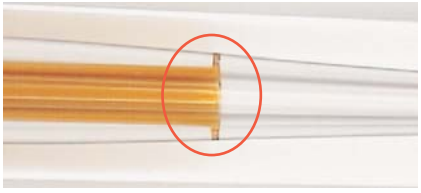
Restek Press-Tight® Connectors

Press-Tight® connectors are lightweight, quickly installed, and easy to use. They connect fused silica tubing having outside diameters ranging from 0.33 to 0.74mm (Restek 0.1 to 0.53mm ID). Press-Tight® connectors do not cause solvent tailing, or adsorb active compounds.

Press-Tight® connectors most often are used to connect a guard column to an analytical column. They also are used to connect columns differing in polarity, for unique separations, or to repair a broken column.



Make a clean, square cut for optimum connector performance. The cut on the right will produce a poor seal.



A brown ring indicates a proper seal.

Obtaining a leak-tight seal:

To achieve optimum performance from these connectors, begin with a properly cut fused silica column or retention gap end. Even if you use polyimide resin (cat.# 20445, page 214) for extra insurance, a poorly cut capillary column will make an inadequate seal.

Press the cut ends into the connector, then establish a flow, and leak-check the seal with a Restek Electronic Leak Detector (cat.# 22839, page 201) before heating the system. The seal is made permanent as the polyimide resin coating on the column bonds to the inner surface of the connector after several thermal cycles to 200°C.

Turn the page for a complete list of Restek Press-Tight® Connectors.



What is the maximum temperature for a Press-Tight® connector?

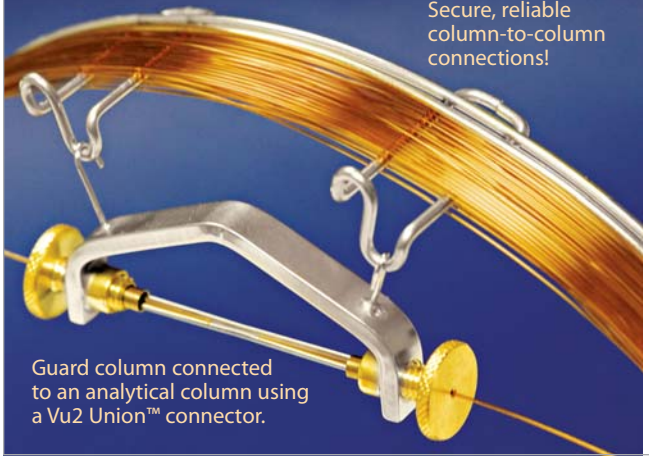
Press-Tight® connectors are effective at oven temperatures to 325°C, the temperature at which the polyimide coating on the column decomposes and the connection will begin to leak. We strongly recommend using a Vu2 Union™ (page 215) or SeCure™ "Y" Connector (page 216) connector if oven temperatures will exceed 325°C for prolonged periods of time.

Can Press-Tight® connectors be used with MXT® columns?

No. To achieve a leak-tight fused silica to stainless steel connection, we recommend an MXT™ connector (see page 218).

Let Restek Make the Connection!

Secure, reliable column-to-column connections!



Guard column connected to an analytical column using a Vu2 Union™ connector.

Restek will connect a guard column/transfer line to any analytical column, using a Vu2 Union™ connector. We will leak-check the connection and confirm analytical integrity by analyzing a test mixture. To order a preconnected guard column/transfer line, add the three-digit suffix from the chart below to any analytical column catalog number. Example: A 5m, 0.32mm ID guard column connected to a 30m, 0.32mm ID, 1.0µm Rtx®-5 column is cat.# 10254-163.

5m Guard Column	cat.# suffix	Additional Cost*
0.15mm ID	-160	enquire
0.18mm ID	-161	enquire
0.25mm ID	-162	enquire
0.32mm ID	-163	enquire
0.53mm ID	-164	enquire

10m Guard Column	cat.# suffix	Additional Cost*
0.25mm ID	-165	enquire
0.32mm ID	-166	enquire
0.53mm ID	-167	enquire

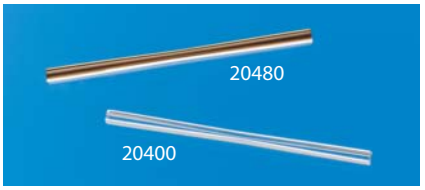
Guard columns listed are intermediate polarity (IP) deactivated.

For more information about guard columns and other deactivations, see **pages 29–33**.

*Additional cost will be added to the price of the column.

Press-Tight® Connectors

- Deactivated Press-Tight® connectors assure better recovery of polar and nonpolar compounds.
- Siltek® treated connectors are ideal for organochlorine pesticides analysis.
- Fit column ODs from 0.33–0.74mm (Restek 0.1mm–0.53mm ID).
- Made from inert fused silica.



Universal Press-Tight® Connectors

- Connect a guard column to an analytical column.
- Repair a broken column.
- Connect a column outlet to a transfer line.

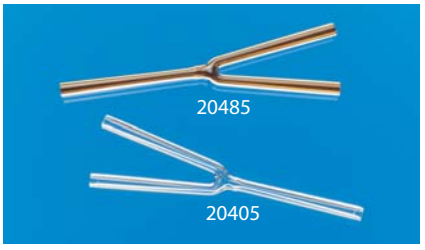
Description	5-pk. /price	25-pk. /price	100-pk. /price
Universal Press-Tight Connectors	20400	20401	20402
Deactivated, Universal Press-Tight Connectors	20429	20430	
Siltek Treated Universal Press-Tight Connectors	20480	20449	



Universal Angled Press-Tight® Connectors

- Ideal for connecting a guard column to an analytical column.
- Angle approximates the curvature of a capillary column, reduces strain on column-end connections.

Description	5-pk. /price	25-pk. /price	100-pk. /price
Universal Angled Press-Tight Connectors	20446	20447	20448
Deactivated Universal Angled Press-Tight Connectors	20446-261	20447-261	20448-261
Siltek Treated Universal Angled Press-Tight Connectors	20482	20483	20484



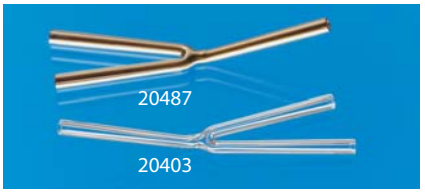
Single injection confirmational analyses!

Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns.
- Split a single column flow to two detectors—perform confirmation analysis with a single injection.

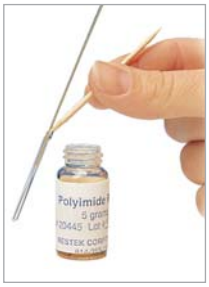
Description	ea. /price	3-pk. /price
Universal "Y" Press-Tight Connector	20405	20406
Deactivated Universal "Y" Press-Tight Connector	20405-261	20406-261
Siltek Treated Universal "Y" Press-Tight Connector	20485	20486



Universal Angled "Y" Press-Tight® Connectors

- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

Description	ea. /price	3-pk. /price
Universal Angled "Y" Press-Tight Connector	20403	20404
Deactivated Universal Angled "Y" Press-Tight Connector	20403-261	20404-261
Siltek Treated Universal Angled "Y" Press-Tight Connector	20487	20469



Polyimide Resin

- Securely connects a Press-Tight® connector to a fused silica column.

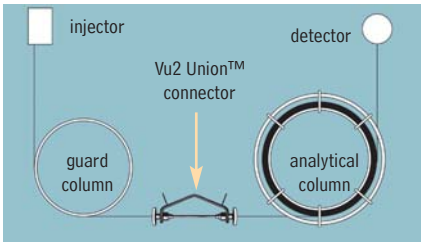
Description	Max. Temp.	qty.	cat.#	price
Polyimide Resin	350°C	5 grams	20445	

Vu2 Union™ Connectors

- Connect a guard column to an analytical column.
- Connect a column to a transfer line.
- Connect two columns in series.
- Repair a broken column.
- New format will fit both Restek cage designs.

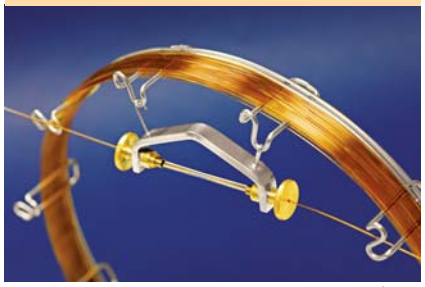
Restek's Vu2 Union™ connector combines the simplicity of a Press-Tight® union with the strength of a metal union.

A guard column connected to an analytical column by a Vu2 Union™ connector.





Updated to fit both Restek cage designs.



Patent pending.

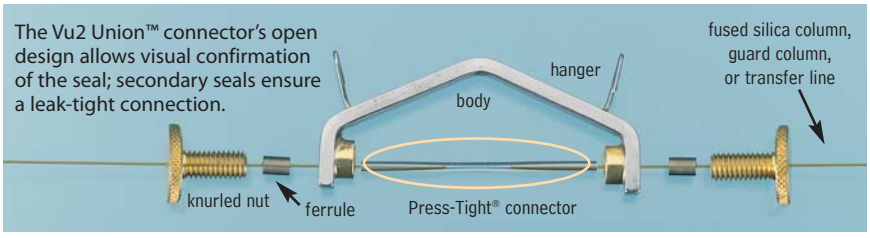
How does a Vu2 Union™ connector work?

A Press-Tight® union in the Vu2 Union™ connector joins the fused silica ends together; the ferrule and knurled nut at each end of the connector hold the tubing in place via a secondary seal between the ferrule and the Press-Tight® union. Each knurled nut applies independent pressure to each ferrule, to make a leak-tight seal with the column end. These ultra-strong connections will not unexpectedly disconnect under temperature changes, vibrations, or other stresses normally encountered in GC analyses. The open design allows visual confirmation of the seal between the column and the Press-Tight® union, to ensure confidence in the connection. Hang the connector from the column cage, to minimize stress on the connections.

Who will benefit from using Vu2 Union™ connectors?

Any analyst using guard columns, transfer lines, or restrictor tubing, performing a dual-column analysis with columns connected in series, or seeking to repair a broken column will find Vu2 Union™ connectors the simple, reliable, easy-to-use solution to their connection needs.

Secure, reliable column-to-column connections!



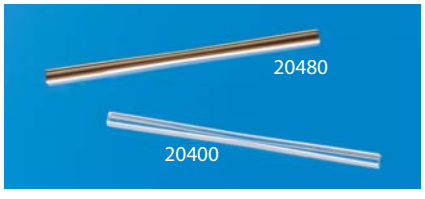
NOTE: This product is not recommended for GC column-to-MS connections—use the Vacuum Vu-Union (page 217).

Kits include: Vu2 Union™ body, 2 knurled nuts, 2 Press-Tight® unions, and 4 ferrules

Description	Ferrules Fit Column ID	qty.	cat.#	price
Vu2 Union Connector Kit	0.10/0.15mm	kit	22220	
Vu2 Union Connector Kit	0.18/0.28mm	kit	21105	
Vu2 Union Connector Kit	0.32mm	kit	21106	
Vu2 Union Connector Kit	0.45/0.53mm	kit	21107	
Knurled nut		2-pk.	21108	

Universal Press-Tight® Connectors

Description	5-pk./price	25-pk./price	100-pk./price
Universal Press-Tight Connectors	20400	20401	20402
Deactivated, Universal Press-Tight Connectors	20429	20430	
Siltek Treated Universal Press-Tight Connectors	20480	20449	



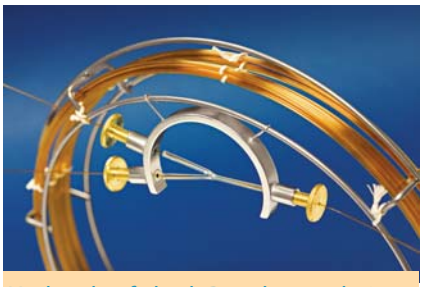
Graphite Ferrules for Vu2 Union™ Connectors

- High-purity, high-density graphite.
- Stable to 450°C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.



Ferrule ID	Fits Column ID	Graphite 2-pk./price	Graphite 10-pk./price
0.3mm	0.10/0.15mm	22221	22222
0.4mm	0.18/0.28mm	20280	20281
0.5mm	0.32mm	20282	20283
0.8mm	0.45/0.53mm	20284	20285

restek
innovation!



Updated to fit both Restek cage designs.



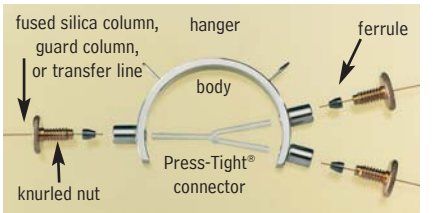
Patent pending.

SeCure™ "Y" Connector Kits

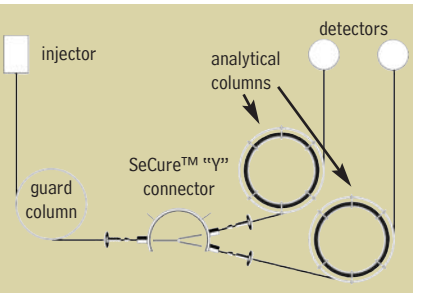
- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and $^{1}/_{16}$" graphite ferrules.
- Reliable seal integrity, will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- New format will fit both Restek cage designs.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400°C.

The SeCure™ "Y" Connector's open design allows visual confirmation of the seal.



Dual-column confirmational analysis with a single injection—one of the SeCure™ "Y" connector's many uses.

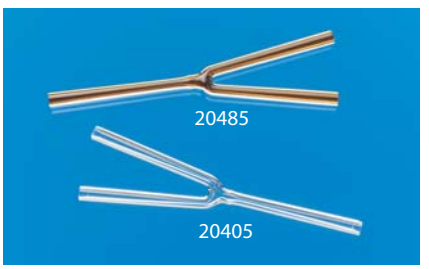


Kits include: SeCure™ "Y" connector body, 3 knurled nuts, "Y" Universal Press-Tight® union, 3 ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#	price
SeCure "Y" Connector Kit	0.18/0.25/0.28mm	kit	20276	
SeCure "Y" Connector Kit	0.32mm	kit	20277	
SeCure "Y" Connector Kit	0.45/0.53mm	kit	20278	
Knurled nut		3-pk.	20279	

Secure, reliable column-to-column connections!

Universal "Y" Press-Tight® Connectors



- Split sample flow onto two columns.
- Split a single column flow to two detectors—perform confirmation analysis with a single injection.
- Deactivated Press-Tight® connectors assure better recovery of polar and nonpolar compounds.
- Siltek® treated connectors are ideal for organochlorine pesticides analysis.
- Fit column ODs from 0.33–0.74mm (Restek 0.1mm–0.53mm ID).

Description	ea. /price	3-pk. /price
Universal "Y" Press-Tight Connector	20405	20406
Deactivated Universal "Y" Press-Tight Connector	20405-261	20406-261
Siltek Treated Universal "Y" Press-Tight Connector	20485	20486

Graphite Ferrules for SeCure™ "Y" Connectors



- Preconditioned to minimize out-gassing.
- High-purity, high-density graphite.
- Stable to 450°C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 10-pk. /price	Graphite 50-pk. /price
0.4mm	0.18/0.25/0.28mm	20200	20227
0.5mm	0.32mm	20201	20228
0.8mm	0.45/0.53mm	20202	20224


20427

Vacuum Vu-Union® Connector for GC/MS Applications

- Connects analytical column to MS transfer line.
- Use under vacuum conditions.
- Use only with Vu-Union® Vespel®/graphite ferrules (order ferrules separately).
- Includes metal housing body, one deactivated tapered glass insert, and Vu-Union® Helping Hand.
- Fits column ODs from 0.33–0.74mm (Restek 0.1mm–0.53mm ID).

A specifically designed Vu-Union® glass insert permits more torque to be applied to the ferrules without fear of cracking the insert. The hex end nuts enable you to use wrenches to tighten the end fittings.

Vu-Union® Helping Hand

The Helping Hand is designed to hold in place the metal housing of the Vacuum Vu-Union® connector. This allows you to easily assemble the columns in the glass insert and tighten the nuts. The Helping Hand is included with the Vacuum Vu-Union® connector.



Description	qty.	cat.#	price
Vacuum Vu-Union Connector (with the Helping Hand)	ea.	20427	
Replacement Inserts	3-pk.	20428	


20422

Vu-Union® Vespel®/Graphite Ferrules

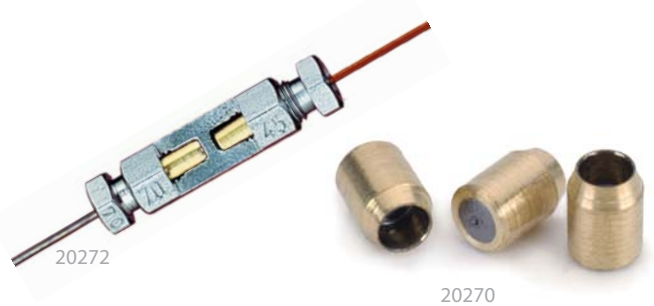
- Use with Vacuum Vu-Union® connectors.
- 60% Vespel®/40% graphite.
- 400°C maximum operating temperature.

Ferrule ID	Fits Column	qty.	cat.#	price
0.3mm	< 0.22mm ID/< 0.4mm OD	10-pk.	20423	
0.4mm	0.25mm ID/0.4mm OD	10-pk.	20420	
0.5mm	0.32mm ID/0.5mm OD	10-pk.	20421	
0.8mm	0.45/0.53mm ID/0.8mm OD	10-pk.	20422	

tech tip

Coupling GC Columns

An MXT™ connector is a good alternative to a glass connector when coupling GC columns. This connector is constructed from stainless steel and will not break; it uses ferrules for sealing. The design ensures low dead volume, and Siltek® treatment ensures the MXT™ connector is inert—both features help minimize peak tailing. MXT™ connectors can be used to connect metal-to-metal, metal-to-fused silica, or fused silica-to-fused silica tubing. When connecting metal tubing, use $^{1}/_{32}$-inch stainless steel ferrules; for fused silica tubing, use Valcon polyimide adaptor ferrules (see page 218).


20272

20270

Gerstel GRAPHPACK® 3D/2 Connectors & Ferrules

GRAPHPACK® technology provides a complete system that quickly and reliably makes a leak-tight, low-dead-volume connection. The central component is a metal-jacketed graphite ferrule—the ideal seal for GC applications.

Description		qty.	cat.#	price
GRAPHPACK 3D/2 Connector* (0.25mm to 0.32mm ID)		ea.	20272	
GRAPHPACK 3D/2 Connector* (0.45mm to 0.7mm ID)		ea.	20273	
Ferrule ID	**Fits Column ID**	**qty.**	**cat.#**	**price**
0.4mm	0.25mm	10-pk.	20271	
0.5mm	0.32mm	10-pk.	20270	
0.8mm	0.45/0.53mm	10-pk.	20274	

*Use only with GRAPHPACK 3D/2 ferrules.



20146

Ferrule Removal Kit

The tapered tools in this kit have teeth designed to grip and remove fused silica adaptor ferrules that have become stuck in the fitting detail. Each kit has two tools: one for removing $^{1}/_{32}$-inch adaptor ferrules and one for removing $^{1}/_{16}$-inch adaptor ferrules.

Description	Valco #	qty.	cat.#	price
Ferrule Removal Kit	FRK1	kit	20146	


20388

$^{1}/_{4}$-Inch–$^{3}/_{16}$-Inch Open-End Wrenches

High-quality miniature wrenches to use with MXT™ low-dead-volume connectors.

Description	qty.	cat.#	price
$^{1}/_{4}$"–$^{3}/_{16}$" Open-End Wrenches	2-piece set	20388	

MXT™-Union Connector Kits for Fused Silica Columns

- Low-dead-volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 360°C.
- Available in union and "Y" configurations.
- Can also be used for fused silica to metal connections.

These MXT™ connectors can be used with fused silica tubing, because of a Valcon polyimide 1/32-inch one-piece fused silica adaptor. This unique graphite-reinforced composite allows a capillary column to slide into the adaptor and be locked in place simply by loosening and tightening the fitting.

MXT™-Union Connector Kits for Fused Silica Columns

Each kit contains the MXT™ union, two 1/32-inch nuts and two one-piece fused silica adaptors.



Description	qty.	cat.#	price
For 0.25mm ID Fused Silica Columns	kit	21386	
For 0.32mm ID Fused Silica Columns	kit	21385	
For 0.53mm ID Fused Silica Columns	kit	21384	

MXT™ "Y"-Union Connector Kits for Fused Silica Columns

Each kit contains the MXT™ union, three 1/32-inch nuts and three one-piece fused silica adaptors.



Description	qty.	cat.#	price
For 0.25mm ID Fused Silica Columns	kit	21389	
For 0.32mm ID Fused Silica Columns	kit	21388	
For 0.53mm ID Fused Silica Columns	kit	21387	



Adaptor Ferrules



20389

Valco™ Connectors—One-Piece Valcon Polyimide Adaptor Ferrule for Fused Silica

Fused silica adaptor ferrules are Valcon polyimide, a unique graphite-reinforced composite, specially prepared to maximize mechanical stability at temperatures to 350°C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

1/32-Inch Adaptor Ferrule (Valcon Polyimide)

Tubing OD	Tubing ID	Valco #	qty.	cat.#	price
0.25 ≤ 0.40mm	0.25mm	FS.4-5	5-pk.	20137	
0.40 ≤ 0.50mm	0.32mm	FS.5-5	5-pk.	20140	
0.50 ≤ 0.80mm	0.53mm	ZF.5V-5	5-pk.	20141	
1/32" Replacement Nut			5-pk.	20389	

MXT™ Low-Dead-Volume Connector Kits for Metal Columns

These low-dead-volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns. They can be used at temperatures up to 430°C without degrading the deactivated layer. Purchase the appropriate ferrules for connecting 0.28, 0.32 or 0.53mm ID tubing.

MXT™ Low-Dead-Volume Connector Kits for Metal Columns

- Connect a guard column/transfer line to an MXT® stainless steel column.
- Low thermal mass tracks rapid oven temperature programming.
- Stainless steel ferrules and nuts.
- Available in "Y" and union configurations.
- Siltek® treatment ensures ultimate inertness.

Each kit contains the MXT™ union, two 1/32-inch ferrules and nuts.



Description	qty.	cat.#	price
For 0.28mm ID MXT Columns NEW!	kit	20397	
For 0.32mm ID MXT Columns	kit	20536	
For 0.53mm ID MXT Columns	kit	20394	

MXT™ Low-Dead-Volume "Y" Connector Kits for Metal Columns

- Connect two MXT® columns to one inlet or one MXT® column to two detectors.

Each kit contains the MXT™ union, three 1/32-inch ferrules and nuts.



Description	qty.	cat.#	price
For 0.28mm ID MXT Columns NEW!	kit	20396	
For 0.32mm ID MXT Columns	kit	20537	
For 0.53mm ID MXT Columns	kit	20395	

1/32-Inch Stainless Steel Replacement Ferrules for MXT™ Connectors



Ferrule ID	Fits Column ID	qty.	cat.#	price
0.59mm NEW!	0.28mm	10-pk.	20398	
0.53mm	0.32mm	10-pk.	20535	
0.79mm	0.53mm	10-pk.	20399	



20147

Zero-Dead-Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. 300 series stainless steel. For 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#	price
Internal Union	0.15mm	ZU1XC	ea.	20147	
Internal Union	0.25mm	ZU1C	ea.	20148	
Internal Union	0.75mm	ZU1	ea.	20149	
Internal Union	1/16"	ZU1T	ea.	20150	


20151

Zero-Dead-Volume Valco® Internal Reducing Union

Connect two sizes of tubing, using zero-dead-volume fittings on each end. For 1/8" to 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#	price
Internal Reducing Union	0.25mm	ZRU21C	ea.	20151	
Internal Reducing Union	0.75mm	ZRU21	ea.	20152	
Internal Reducing Union	1/16"	ZRU21T	ea.	20153	



20154

Zero-Dead-Volume Valco® Internal Tee

Connect three lines. 300 series stainless steel; stainless steel ferrules included. For 1/16" OD tubing.

Description	Union Bore	Valco #	qty.	cat.#	price
Internal Tee	0.25mm	ZT1C	ea.	20154	
Internal Tee	0.75mm	ZT1	ea.	20155	



20156

Zero-Dead-Volume Valco® Internal Cross

Connect four lines. 300 series stainless steel; stainless steel ferrules included. For 1/16" OD tubing.

Description	Union Bore	Valco #	qty.	cat.#	price
Internal Cross	0.25mm	ZX1C	ea.	20156	
Internal Cross	0.75mm	ZX1	ea.	20157	


20159


20158

Male Pipe to Valco® Internal Adapter

Makes a minimum volume connection from a female pipe fitting on a pressure gauge or regulator to a Valco® zero-dead-volume fitting. 300 series stainless steel; stainless steel ferrules included.

Description	Fitting Size	Bore	Valco #	qty.	cat.#	price
1/8" NPT Male Internal Adapter	1/16" ZDV	1.0mm	PZA21	ea.	20158	
1/4" NPT Male Internal Adapter	1/16" ZDV	1.0mm	PZA41	ea.	20159	


20286


20287

Nuts & Ferrules for Valco® Connectors

Description	Valco #	qty.	cat.#	price
1/16" Stainless Steel Ferrules	ZF1-10	10-pk.	20286	
1/16" Stainless Steel Nuts	ZN1-10	10-pk.	20287	



1/16-Inch Valco® Adaptor Ferrules

			Valcon Polyimide			Polyimide		
Tubing OD	Tubing ID	Valco #	qty.	cat.#	price	qty.	cat.#	price
0.25–0.4mm	0.1-0.25mm	FS1.4-5	5-pk.	20142		2-pk.	21015	
0.4–0.5mm	0.32mm	FS1.5-5	5-pk.	20143		2-pk.	21016	
0.5–0.8mm	0.53mm	FS1.8-5	5-pk.	20144		—	—	—
0.8mm (1/32")	—	FS1.9-5	5-pk.	20145		—	—	—

also available



Treated Fittings!

See pages 237-241 for our Siltek®/Sulfinert® treated and Silcosteel®-CR treated fittings, as well as many more brass and stainless steel fittings from Swagelok® and Parker.







GC ACCESSORIES
GAS PURIFICATION ESSENTIALS

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Tubing & Fitting Tools 248-249





Top: Deb Weaver, Shipping Technician
Bottom: Joe Eckley, Supplier Quality Technician

What's **NEW?** look for this circle

Restek provides the following total gas system solution:

- Restek gas purifiers provide cost-effective gas purity assurance.
- Restek stainless steel and copper tubing, precleaned and ready to use.
- Swagelok® and Parker A-Lok® tube fittings consistently deliver high-quality performance.
- Extensive line of hand tools to make your work easier and faster, including Restek's Electronic Leak Detector.
- Gas generators for an uninterupted supply of gas.
- Gas regulators for optimum line pressure control of all your chromatography gases.

Restek's Technical Service Team, 800-356-1688 or 814-353-1300, ext. 4, or your Restek representative, can answer your questions and provide system-design advice. From the gas source to your point of use, we offer the products and services that ensure the purity of your gas.



Why do I need to use traps and where should I install them?

Carrier gas must contain less than 1ppm of oxygen, water vapor, or any other trace contaminant, to prevent column degradation, shortened column lifetime, and increased stationary phase bleed. Contaminants cause ghost peaks to appear during temperature programming and degrade the validity of analytical data. The expense of using high-purity gases in combination with carrier gas purifiers will be offset by longer column lifetime and less instrument maintenance.

Moisture Removal

Moisture in carrier gas lines will prematurely degrade oxygen and hydrocarbon traps and increase detector noise (particularly with ECDs). As a precaution, we highly recommend installing a moisture trap before the hydrocarbon and oxygen traps on all carrier gas lines. Our favorite trap is the Super-Clean Ultra-High Capacity Moisture Filter (cat.# 22028, pg. 225).

Hydrocarbon Removal

Use a hydrocarbon trap if your gas has a potential source of hydrocarbon contaminants (e.g., an oil pump in an air compressor) or if you suspect you are observing carrier gas ghost peaks. Install the hydrocarbon trap after the moisture trap, to prevent moisture from degrading the hydrocarbon-trapping ability of the activated carbon in the hydrocarbon trap. We recommend the Super-Clean Ultra-High Capacity Hydrocarbon Filter (cat.# 22030, pg. 225).

Oxygen Removal

Oxygen is a column killer and can enter the system at any connection which is leaking. It is present even in ultra high purity gases, as minute leaks at fittings allow oxygen to influx against the concentration gradient. There are many choices for oxygen removal—the Super-Clean Ultra-High Capacity Oxygen Filter (cat.# 22029, pg. 225) is popular with Restek chemists. Because oxygen can enter a gas line at any fitting, the oxygen trap should be the last connection before the gas line enters the chromatograph.

Leak Checking

To prevent column degradation, increase column lifetime, and decrease stationary phase bleed, carrier gas should always contain <1ppm oxygen. This can be monitored by continually leak checking all gas system connections using Restek's Electronic Leak Detector (cat.# 22839, page 222).

for **more** info

Questions about which carrier gas purifier to use?

Call 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative to discuss your application with our technical service chemists.

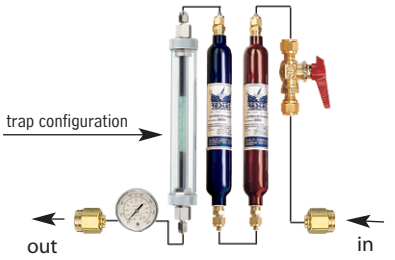


Dimensions:
12" x 14" x 3"
(30.5 x 35.6 x 7.6 cm)

Restek Gas Management System

Restek has put together a convenient unit providing gas purification all in one step. Complete with an indicating trap, your gas purification issues are handled in one central location.

- Removes moisture, hydrocarbons, and oxygen from carrier gas, extending column lifetime.
- Produces high-purity carrier gas for most applications.
- Includes one each: moisture, hydrocarbon, and indicating oxygen trap.
- Replacing traps is safe and easy.
- Maximum flow: 1 liter/minute.



did you **know**?

The Restek Gas Management System removes water vapor (to 10ppb), hydrocarbons (to 0.1ppm), and oxygen (to less than 0.1ppm) with three traps housed in one unit.

Description	qty.	cat.#	price
Restek Gas Management System (includes fittings for 1/8" and 1/4" gas line)	ea.	21999	
Replacement Traps	**qty.**	**cat.#**	**price**
High-Capacity Moisture Trap, 1/8" Nickel-Plated Brass Fittings	ea.	21997	
Capillary-Grade Hydrocarbon Trap, 1/8" Nickel-Plated Brass Fittings	ea.	21991	
Indicating Oxygen Trap, 1/8" Nickel-Plated Brass Fittings	ea.	22010	

NEW!



22839

Restek Electronic Leak Detector

Why have a small leak turn into a costly repair? Protect your data and analytical column by using a Restek Leak Detector.

Backed by a 1-year warranty, the new Restek Leak Detector sets an industry standard for performance and affordability in hand-held leak detectors.

Leak Detector Facts

Detectable gases:	helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
Warranty:	one year
Certifications:	CE, Japan
Compliance:	WEEE, RoHS

Limits of Detection

These gases can be detected with the Restek Electronic Leak Detector at the following leak rates.

Gas	Minimum Detectable Leak Rate (atm cc/sec.)	Indicating LED Light Color
Helium	1.0×10^{-5}	Red
Hydrogen*	1.0×10^{-5}	Red
Nitrogen	1.4×10^{-3}	Yellow
Argon	1.0×10^{-4}	Yellow
Carbon Dioxide	1.0×10^{-4}	Yellow



22658

Description	qty.	cat.#	price
Leak Detector with Universal Charger Set (US, UK, European, Australian)	ea.	22839	
Soft-Side Carry/Storage Case	ea.	22657	
Small Probe Adaptor	ea.	22658	

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. The Restek Electronic Leak Detector may be used for determining trace amounts of hydrogen in a GC environment only.

tech tip

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.



Dimensions: 9¼" x 2" (23.5 x 5.1 cm)



22081

High-Capacity Indicating Oxygen Trap

- Indicator changes from dark blue to black as oxygen & water are trapped.
- Lasts longer than three smaller traps.
- Use with all carrier gases.
- Ambient operating temperature, 100psi (689kPa) operating pressure.
- Built-in frit traps microparticles.
- Outlet gas purity:
  O_2 < 0.1ppm when inlet does not exceed 15ppm.
  H_2O < 0.5ppm when inlet does not exceed 10ppm.
- Maximum operating pressure: 150psi (1,034kPa).
- Maximum flow: 16.5L/min.

Description	qty.	cat.#	price
High-Capacity Indicating Oxygen Trap, ⅛" Compression Tube Brass Fittings	ea.	20624	
High-Capacity Indicating Oxygen Trap, ¼" Compression Tube Brass Fittings	ea.	20623	
Replacement Cartridge (fits ¼" or ⅛" housing)	ea.	20625	
Replacement O-Rings (5 small O-rings and 5 large O-rings)	kit	22081	



Dimensions: 10" x 1¼" (25.4 x 3.2 cm)

Indicating Oxygen Trap

- Indicator changes from light green to grey as oxygen is trapped.
- Heavy-walled glass body prevents oxygen & water infusion.
- Prepurged for fast stabilization.
- 100psi (689kPa) maximum operating pressure.
- Reduces oxygen to 0.1ppm.

Description	qty.	cat.#	price
Indicating Oxygen Trap, ⅛" Nickel-Plated Brass Fittings	ea.	22010	
Indicating Oxygen Trap, ¼" Nickel-Plated Brass Fittings	ea.	22011	



Dimensions: 11" x 1½" (27.9 x 3.8 cm)

High-Capacity Oxygen Trap

- Removes up to 600mg of oxygen or 2g of water.
- Long life—typically purifies more than five 200ft³ cylinders.
- Reduces oxygen to 15ppb.
- Maximum operating pressure: 250psi (1,724kPa).
- Flow: 3L/min. @ 32psi (221kPa).

Description	qty.	cat.#	price
High-Capacity Oxygen Trap, ⅛" Nickel-Plated Brass Fittings	ea.	20601	
High-Capacity Oxygen Trap, ¼" Nickel-Plated Brass Fittings	ea.	20600	

Rechargeable Molecular Sieve S-Trap

- Traps water vapor; increases column and oxygen trap lifetime.
- Reduces baseline noise from sensitive detectors such as ECDs and mass spectrometers.
- Activated and ready to use.
- Reduces water to less than 1ppm.
- Fits in GC oven for easy thermal recharging.
- Maximum flow: 1L/min.



Dimensions: 6¾" x 5⅝" (17.1 x 14.3 cm)

Description	qty.	cat.#	price
Rechargeable Molecular Sieve S-Trap, ⅛" Brass Fittings	ea.	20686	
Rechargeable Molecular Sieve S-Trap, ¼" Brass Fittings	ea.	20685	



Dimensions: 11" x 1½" (27.9 x 3.8 cm)

High-Capacity Moisture Trap

- Purged with ultra-high-purity helium; ready to use.
- Reduces water to less than 15ppb.
- Maximum operating pressure: 250psi (1,724kPa).
- Maximum flow: 1.25L/min.

Description	qty.	cat.#	price
High-Capacity Moisture Trap, ⅛" Nickel-Plated Brass Fittings	ea.	21997	
High-Capacity Moisture Trap, ¼" Nickel-Plated Brass Fittings	ea.	20638	



Dimensions: 13" x 2" (33 x 5.1 cm)

Indicating Moisture Trap

- Reduces water to less than 10ppb; indicator changes from blue to pink at 5% relative humidity.
- Prepurged for fast stabilization.
- Reduces noise from high-sensitivity detectors.
- Heavy-walled glass body prevents oxygen & water infusion.
- 40µm frit prevents microparticulate damage to needle valves and flow controllers.
- Maximum operating pressure: 100psi (689kPa).

Description	qty.	cat.#	price
Indicating Moisture Trap, ⅛" Nickel-Plated Brass Fittings	ea.	22014	
Indicating Moisture Trap, ¼" Nickel-Plated Brass Fittings	ea.	22015	

Gas Traps



Dimensions: 11" x 1½" (27.9 x 3.8 cm)

Capillary-Grade Hydrocarbon Trap

- Packed with an extremely high surface area, baked coconut shell-based activated carbon.
- Purged with ultra-high purity helium.
- Reduces organics to 0.1ppm (assuming 100ppm input).
- Maximum operating pressure: 250psi (1,724kPa).

Description	qty.	cat.#	price
Capillary-Grade Hydrocarbon Trap, ⅛" Nickel-Plated Brass Fittings	ea.	21991	
Capillary-Grade Hydrocarbon Trap, ¼" Nickel-Plated Brass Fittings	ea.	21992	



Dimensions: 9¼" x 2¼" (23.5 x 5.7 cm)

Refillable Hydrocarbon Trap

- Removes trace impurities from carrier gas.
- Reduces organics to 0.1ppm (assuming 100ppm input).
- 60µm frit prevents gas contamination by purifier particles.
- Good for purge & trap systems.
- Refillable and rechargeable.
- Maximum operating pressure: 125psig (862kPa).
- Maximum flow: 5L/min.

Description	qty.	cat.#	price
Refillable Hydrocarbon Trap, ⅛" Nickel-Plated Brass Fittings	ea.	22012	
Refillable Hydrocarbon Trap, ¼" Nickel-Plated Brass Fittings	ea.	22013	
Carbon Refill (two recharges)	pint	20626	

Hydrocarbon S-Trap

- Removes hydrocarbons and other contaminants.
- Reduces organics to 0.1ppm (assuming 100ppm input).
- Each individually activated to ensure maximum efficiency.
- Fits in GC oven for easy thermal recharging.
- Maximum operating pressure: 60psi (414kPa).



Dimensions: 6¾" x 5⅝" (17.1 x 14.3 cm)

Description	qty.	cat.#	price
Hydrocarbon S-Trap, ⅛" Brass Fittings	ea.	22016	



Dimensions: 6" x 1¾" (15.2 x 4.4 cm)

Indicating Hydrocarbon Trap for Air Compressors

- Pass compressed air from an oil-filled air compressor through this trap, to remove oil vapors and mist.
- Indicator changes from pale pink to deep pink.

Description	qty.	cat.#	price
Indicating Hydrocarbon Trap for Air Compressors, ⅛" Brass Fittings	ea.	20637	
Indicating Hydrocarbon Trap for Air Compressors, ¼" Brass Fittings	ea.	20636	



Dimensions: 6" x 1" (15.2 x 2.5 cm)

High-Capacity Split Vent Trap

- Reduces the release of hazardous materials from the capillary split vent into the lab.
- Lasts approximately one month or 1,500 injections.
- Includes connecting lines and mounting kit.

Description	qty.	cat.#	price
High-Capacity Split Vent Trap, ⅛" Fittings	ea.	20698	
High-Capacity Split Vent Trap, ⅛" Fittings	5-pk.	20699	



Dimensions: 6" x 1" (15.2 x 2.5 cm)

ECD Vent Trap

- Reduces the release of hazardous materials from the ECD vent into the lab.
- Includes connecting lines and mounting kit.

Description	qty.	cat.#	price
ECD Vent Trap, ⅛" Fittings	ea.	22017	

tech tip

Carrier Gas Purity

Carrier gas should contain less than 1ppm of oxygen, moisture, or other trace contaminants, to prevent column degradation, increase column lifetime, and decrease stationary phase bleed.

The expense of using high-purity gases in combination with carrier gas line purifiers will be offset by longer column lifetime and less GC maintenance.

Restek Super-Clean Gas Filters

- High-purity output ensures 99.9999% pure gas (at max. flow of 2L/min.).
- "Quick connect" fittings for easy, leak-tight cartridge changes.
- Glass inside to prevent diffusion; polycarbonate housing outside for safety.
- All traps measure $10^{5}/_{8}$" x $1^{3}/_{4}$" (27 x 4.4 cm).
- Each base plate unit measures 4" x 4" x $1^{7}/_{8}$" (10.2 x 10.2 x 4.8 cm).



Table I Each Super-Clean gas filter provides high-purity outlet gas.

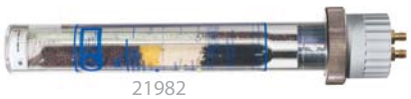
Type of Filter	Outlet Gas Quality (%)	Maximum Pressure/ Maximum Flow Rates	Use for:	Indicator Color Change	Capacity H_2O (g)	Capacity O_2 (mL)	Capacity Hydrocarbons (g)	Estimated Lifetime (years)
Moisture cat.# 22028	>99.9999	11 bar 159psi/ 7 L/min.	Inert carrier gas Air Hydrogen	Yellow/orange to clear	7.2	—	—	>2
Oxygen cat.# 22029	>99.9999	11 bar 159psi/ 7 L/min.	Inert carrier gas	Green to grey	NA	1,000	—	>2
Hydrocarbons cat.# 22030	>99.9999	11 bar 159psi/ 7L/min.	Inert carrier gas Air Hydrogen	No indicator	NA	—	12[3]	>2
Fuel Gas[1] cat.# 22022	>99.9999	11 bar 159psi/ 7L/min.	Inert carrier gas Air Hydrogen	Yellow/orange to clear	3.5	—	24[3]	>1.5
Triple[2] cat.# 22020	>99.9999	11 bar 159psi/ 7L/min.	Inert carrier gas	Yellow/orange to clear Green to grey	1.8	500	4[3]	>1
Helium Specific[2] cat.# 21982	>99.9999	11 bar 159psi/ 7L/min.	Helium	Yellow/orange to clear Green to grey	1.8	500	—	>1

[1]Removes hydrocarbons, moisture.
[2]Removes hydrocarbons, moisture, oxygen.
[3]As *n*-butane.

did you know?

All Restek Super-Clean gas filter cartridges (except hydrocarbon filter cat.# 22030) feature easy-to-read indicators. The indicator code is shown on every trap so there is no confusion about when to replace it.


22020


21982


22025

Restek Super-Clean Gas Filter Kits and Replacements

Description	qty.	cat.#	price
Carrier Gas Cleaning Kit (includes mounting base plate, $^{1}/_{8}$" inlet/outlet fittings, and oxygen/moisture/hydrocarbon Triple Gas Filter)	kit	22019	
Fuel Gas Purification Kit (includes mounting base plate, $^{1}/_{8}$" inlet/outlet fittings, and hydrocarbon/moisture Fuel Gas Filter)	kit	22021	enquire
Ultra-High Capacity Hydrocarbon Filter	ea.	22030	
Ultra-High Capacity Moisture Filter	ea.	22028	
Ultra-High Capacity Oxygen Filter	ea.	22029	
Replacement Triple Gas Filter (removes oxygen, moisture and hydrocarbons)	ea.	22020	
Replacement Fuel Gas Filter (removes moisture and hydrocarbons)	ea.	22022	
Helium-Specific Carrier Gas Cleaning Kit (includes mounting base plate, $^{1}/_{8}$" inlet/outlet fittings, and oxygen/moisture/hydrocarbon Helium-Specific Filter)	kit	21983	
Replacement Helium-Specific Gas Filter (removes oxygen, moisture and hydrocarbons)	ea.	21982	
Gas Filter Bundle Kit (includes one Triple Gas Filter, cat.#22020 and two Fuel Gas Filters, cat.# 22022)	kit	22031	

tech tip

Oxygen and Moisture Traps

Restek highly recommends oxygen and moisture traps for make-up gas when operating sensitive detectors such as electron capture detectors (ECD). The hydrogen reaction gas for sensitive electrolytic conductivity detectors (ELCD) also requires a hydrocarbon trap, to remove trace impurities.

Super-Clean Gas Filters



22026



22025



22027

Restek Filter Base Plates

- Standard base plate fittings are 1/8". To adapt to 1/4", order 1/8" to 1/4" tube-end unions.
- Base plates fit all Super-Clean gas filters listed on previous page.

		Brass			Stainless Steel	
Description	qty.	cat.#	price	qty.	cat.#	price
Single-Position Filter Base Plate	ea.	22025		ea.	22344	
2-Position Filter Base Plate	ea.	22026		ea.	22345	
3-Position Filter Base Plate	ea.	22027		ea.	22346	

Wall Mounting Bracket

- Base plates can be mounted by using screws and the mounting holes on the base plate, or by using this optional wall mounting bracket.



Description	qty.	cat.#	price
Wall Mounting Bracket for Super-Clean Base Plates	ea.	21984	

Replacement O-Rings for Cartridge Base Plates

- Pack includes 10 large O-rings and 10 small O-rings.



Description	qty.	cat.#	price
Replacement O-Rings for Cartridge Base Plates	20-pk.	22023	

1/8-Inch to 1/4-Inch Tube-End Unions

- To adapt 1/8" Super-Clean base plate fittings to 1/4", use 1/8" to 1/4" tube-end unions.



21833

		Brass			Stainless Steel	
Description	qty.	cat.#	price	qty.	cat.#	price
1/8" to 1/4" Tube-End Unions	5-pk.	21833		2-pk.	21933	

Restek Super-Clean Gas Trapping System for LC/MS

A Super-Clean quick-change cartridge system efficiently removes hydrocarbons from nitrogen!

- Changing filters is quick and easy.
- Up to 20L of hydrocarbon-free nitrogen per minute.
- Filters connected in parallel to handle high flows of LC/MS.



20L of purified nitrogen per minute!

Super-Clean Gas Filters provide high-purity outlet gas

Type of filter:	Hydrocarbon (charcoal)
Max. Flow:	20L/min.
Outlet Gas Quality %:	99.9999%
Maximum Pressure:	11 bar/159psi
Estimated Lifetime:	3 to 6 months

Super-Clean Gas Trapping System for LC/MS

Description	qty.	cat.#	price
Super-Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062	
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061	

also **available**

Looking for a nitrogen generator for your LC/MS?
Restek offers a full line of Parker LC/MS generators.
See **page 233**.





Catch the Buzz

Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Restek Click-On Inline Super-Clean Purification Gas Traps

- High-purity output ensures 99.9999% pure gas.
- Click-On fittings for easy, leak-tight cartridge changes; brass or stainless steel, 1/4" or 1/8".
- Helium-Specific Triple Gas Trap is ideal for GC/MS—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Triple Gas Trap is ideal for purifying carrier gas—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Fuel Gas Trap is ideal for purifying flame ionization detector (FID) fuel gases, removing both moisture and hydrocarbons.

See next page for more Click-On Inline Super-Clean products.

Click-On adaptor connectors allow cartridges to be exchanged without introducing oxygen, moisture, and hydrocarbons. Spring-loaded check valves seal when a filter is removed and open only when a new filter has been locked in place.

Filter Type	Gas Quality at Outlet	Maximum Pressure	Maximum Flow (L/min.)	Use For	H_2O (g)	Capacity O_2 (mL)	Hydrocarbons (g) (*n*-butane)	Estimated Lifetime (years)
Moisture cat.#22467	>99.9999	11 bar 160psi	25	Inert carrier gas, helium, air, H_2	15	NA	NA	>3
Oxygen cat.#22468	>99.9999	11 bar 160psi	25	Inert carrier gas	NA	2,000	NA	>3
Hydrocarbon cat.#22466	>99.9999	11 bar 160psi	25	Inert carrier gas, helium, air, H_2	NA	NA	24	>3
Fuel Gas[1] cat.#22465	>99.9999	11 bar 160psi	25	Inert carrier gas, helium, air, H_2	7	NA	12	>2
Triple[2] cat.#22464	>99.9999	11 bar 160psi	25	Inert carrier gas	4	1,000	8	>2

[1]Removes hydrocarbons, moisture.
[2]Removes hydrocarbons, moisture, oxygen.

Click-On Traps measure: 8 1/2" x 1 1/4" (21.6 x 3.2cm)



NOTE: Super-Clean Gas Filters are recommended for purifying noncorrosive gases with low concentrations of contaminants. The maximum concentration of oxygen in the incoming gas stream for oxygen purifiers is 0.5%.

did you **know**?

Trap replacement depends on the quality of the incoming gas. Use the double connector and install an indicating cartridge after a trap to indicate when the trap should be replaced.

Restek Click-On Inline Super-Clean Gas Traps and Connector Kits

Description	qty.	cat.#	price
Carrier Gas Purification Kit, 1/8" Stainless Steel Includes (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22456	
Carrier Gas Purification Kit, 1/8" Brass Includes (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22457	
Carrier Gas Purification Kit, 1/4" Stainless Steel Includes (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22458	
Carrier Gas Purification Kit, 1/4" Brass Includes (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22459	
Fuel Gas Purification Kit, 1/8" Stainless Steel Includes (4) 1/8" SS connectors and (2) hydrocarbon/moisture traps	kit	22460	
Fuel Gas Purification Kit, 1/8" Brass Includes (4) 1/8" brass connectors and (2) hydrocarbon/moisture traps	kit	22461	
Fuel Gas Purification Kit, 1/4" Stainless Steel Includes (4) 1/4" SS connectors and (2) hydrocarbon/moisture traps	kit	22462	
Fuel Gas Purification Kit, 1/4" Brass Includes (4) 1/4" brass connectors and (2) hydrocarbon/moisture traps	kit	22463	





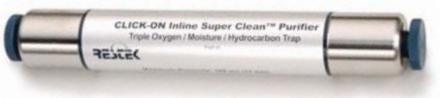
Click-On Inline Super-Clean Indicator

- Oxygen: Green to Grey
- Moisture: Beige to Clear

Description	qty.	cat.#	price
Click-On Inline Super-Clean Indicator (oxygen, moisture)	ea.	22474	

tech tip

Install an indicator after the Click-On inline gas filter so there is no confusion about when to replace the traps.



Click-On Inline Super-Clean Replacement Gas Traps

Description	qty.	cat.#	price
Click-On Super-Clean Replacement Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22464	
Click-On Super-Clean Replacement Fuel Gas Trap (removes moisture and hydrocarbons)	ea.	22465	

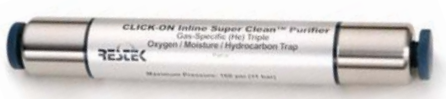


Click-On Inline Super-Clean Ultra-High Capacity Gas Traps

Description	qty.	cat.#	price
Ultra-High Capacity Hydrocarbon Trap	ea.	22466	
Ultra-High Capacity Moisture Trap	ea.	22467	
Ultra-High Capacity Oxygen Trap	ea.	22468	

did you know?

Helium-Specific Click-On Inline Super-Clean Gas Trap and Kits are designed specifically for purification of helium in GC/MS systems.



Helium-Specific Click-On Inline Super-Clean Gas Trap and Connector Kits

Description	qty.	cat.#	price
Kits			
Helium-Specific Carrier Gas Cleaning Kit, 1/8" Stainless Steel Includes (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22469	
Helium-Specific Carrier Gas Cleaning Kit, 1/8" Brass Includes (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22470	
Helium-Specific Carrier Gas Cleaning Kit, 1/4" Stainless Steel Includes (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22471	
Helium-Specific Carrier Gas Cleaning Kit, 1/4" Brass Includes (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22472	
Replacement Trap			
Helium-Specific Replacement Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22473	



Each connector is 2 3/8" (6cm) in length.

Click-On Inline Super-Clean Connectors

- Click-On connectors allow you to change traps quickly, without introducing oxygen into your system.

Description	qty.	cat.#	price
1/8" Brass Click-On Inline Super-Clean Connectors	2-pk.	22475	
1/8" Stainless Steel Click-On Inline Super-Clean Connectors	2-pk.	22476	
1/4" Brass Click-On Inline Super-Clean Connectors	2-pk.	22477	
1/4" Stainless Steel Click-On Inline Super-Clean Connectors	2-pk.	22478	



Each double connector is 3" (8cm) in length.

Click-On Inline Super-Clean Double Connector

- Connects any Click-On trap to a Click-On indicator.

Description	qty.	cat.#	price
Click-On Inline Super-Clean Double Connector, Stainless Steel	ea.	22479	





Accessories for Inline Super-Clean Gas Traps and Connectors

Description	qty.	cat.#	price
Wall-Mounting Clamps for Click-On Inline Super-Clean Gas Traps	4-pk.	22480	
Replacement O-Rings for Click-On Inline Super-Clean Connectors (includes 10 large and 10 small)	20-pk.	22481	

VICI® Mat/Sen® Gas-Specific Purifier Modules

- Replace separate oxygen, moisture, and hydrocarbon traps with one multiple-bed purifier, specific for purifying helium, hydrogen, nitrogen, or air.
- Reduce gas impurities from ppm to low ppb levels.
- Decrease baseline noise and increase GC/MS sensitivity.
- Prepurged with the specified gas, to shorten downtime.



Dimensions: 21" x 1½" (53.3 x 3.8 cm)

Performance for these purifiers is optimized by incorporating a multiple-bed format that progressively lowers concentrations of contaminants at each successive bed. VICI® Mat/Sen® purifiers are guaranteed to produce gases that are purer than 99.9999%, when supplied with gas of 99.995% purity, and are prepurged with the specified gas to speed conditioning. Purifier capacity is approximately four tanks of gas at 99.995% (50ppm) purity, and correspondingly longer for purer gases.

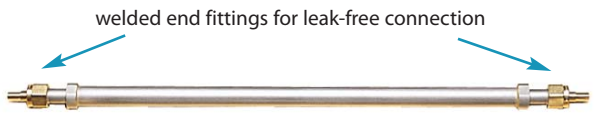
Please Note: We recommend using an indicating oxygen trap (e.g., cat.# 22029, pg. 225) downstream from a VICI® Mat/Sen® purifier to continually ensure gas purity and indicate absolute change-out time.

Specifications:

Length	21" (52.3cm)
Diameter	1.5" (3.8cm)
Maximum Inlet Pressure	1,000psi (6895kPa)
Maximum Recommended Flow	500mL/min.
Pressure Drop from 120psi (827 kPa) inlet at at 0-500mL/min.:	<0.20psi (1.4kPa)
End Fittings	compression, 1/8" or 1/4", stainless steel
Shipping Weight	3.04 lb. (1,300 g)

Gas-Specific Purifier Module	Compression Tube Fittings 1/4-inch qty.	cat.#	price	1/8-inch qty.	cat.#	price
Helium Purifier Module	ea.	22600		ea.	22601	
Hydrogen Purifier Module	ea.	22602		ea.	22603	
Nitrogen Purifier Module*	ea.	22604		ea.	22605	
Air Purifier Module	ea.	22606		ea.	22607	

*Warning: Do not use with nitrogen containing more than 500ppm of oxygen. If the oxygen level in the stream exceeds 500ppm, use an air purifier.



Dimensions: 13" x 1/2" (33 x 1.3 cm)

Thermal Gas High Capacity Purifier Replacement Getter Tube

Each replacement getter tube has 12L oxygen and 35L water vapor capacity at a minimum flow rate of 1 liter/minute and removes oxygen, water, carbon monoxide, carbon dioxide, hydrocarbons (except methane) to ppb levels; pure enough for MS. Typically requires replacement once per year.

Replacement Getter Tubes	qty.	cat.#	price
1/8" Fittings (Similar to Supelco part# 2-2396)	ea.	21661	
1/4" Fittings (Similar to Supelco part# 2-2398)	ea.	21660	

Replacement getter tubes must be used with a Thermal Gas Purifier housing unit.

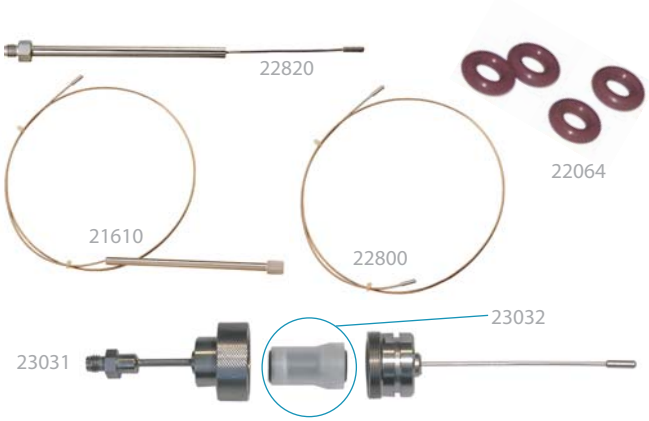
Change tube when gas pressure drops.

Gas Pressure Gauge Kit

- Use an in-line pressure gauge to indicate when a Thermal Gas Purifier getter tube should be replaced.
- Includes 1/8" tee and 0–100 psi (0-689kPa) gauge.



Description	qty.	cat.#	price
In-line Gas Pressure Gauge Kit for Thermal Gas Purifiers	kit	21657	



Replacement Chemical Traps for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent part #	qty.	cat.#	price
Replacement Split Vent Trap for Agilent 6890/6850 GCs	G1544-80550	ea.	22820	
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610	
Split Vent Line for Agilent GCs (32-inch) (Includes all installation hardware.)	19251-80525 G1544-20620	2-pk.	22800	
O-rings for Agilent Trap Fittings	5180-4181	25-pk.	22064	
Optional Split Vent Trap Assembly for Agilent 6890/6850 GCs	G1544-60610	kit	23031	
Replacement Traps (2) and O-rings (4)	G1544-80530	kit	23032	

tech tip

Eliminate ghost peaks—change your chemical trap often!

Parker Balston® PEM Hydrogen Generators



- Proton Exchange Membrane (PEM) cell eliminates the need for liquid electrolytes.
- Reliably generate 99.9995% pure hydrogen—for better chromatography.
- Eliminates high-pressure cylinders—greater convenience and improved lab safety.
- Compact unit, requiring only one square foot of bench space.
- Quick and easy to service and maintain; unique display lighting changes color for easy status checks and water level indication.
- Comes with a set of universal power adapters for US, European, and Asian plug types.

Fuel-grade high purity hydrogen generators are safer alternatives to high-pressure gas cylinders. The new Proton Exchange Membrane (PEM) cell eliminates the use of liquid electrolytes with hydrogen generators. Deionized water is all that is required to generate hydrogen for weeks of continuous operation. With an output capacity of up to 510cc/minute, one generator can supply 99.9995% pure hydrogen for up to several FIDs. Based on cylinder gas savings alone, a hydrogen generator pays for itself in one or two years.



Produced and supported by an ISO 9001 registered organization, Parker Balston® hydrogen generators are the first built to meet the toughest laboratory standards in the world: CSA, UL, cUL, and CE Mark. A great safety feature is the built-in sensing circuit, which shuts the generator down if a hydrogen leak is detected.

Specifications

Purity:	99.9995% pure hydrogen
Delivery Pressure:	10-100psig ± 1psig (69-689kPa ± 7kPa)
Outlet Port:	1/8" compression
Electrical Requirements:	100-230VAC/50-60Hz
Physical Dimensions:	17.12"h x 13.46"w x 17.95"d (43.48 x 34.19 x 45.6cm)
Shipping Weight:	40 lbs. (18kg) dry

free literature

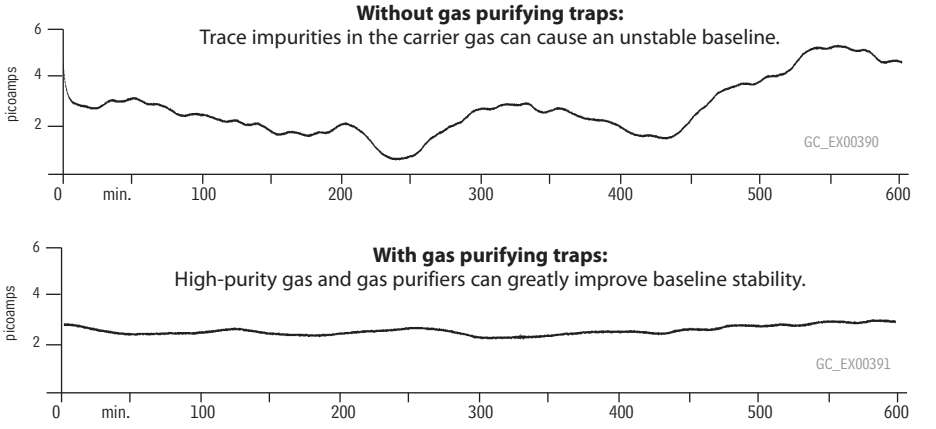
Parker Balston® Hydrogen Generators

Download your free copy from **www.restek.com**.

Fast Facts
lit. cat.# 580053A

Description	Capacity	qty.	cat.#	price
Hydrogen Generator H2PEM-100	100cc/min.	ea.	23065	enquire
Hydrogen Generator H2PEM-165	165cc/min.	ea.	23066	enquire
Hydrogen Generator H2PEM-260	260cc/min.	ea.	23067	enquire
Hydrogen Generator H2PEM-510	510cc/min.	ea.	23068	enquire
Replacement and Maintenance Components for Hydrogen Generators (for all models listed above)				
Replacement Desiccant Cartridge for H2PEM Generators		ea.	23069	enquire
6-Month Maintenance Kit for H2PEM Generators (Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters)		kit	23070	enquire
24-Month Maintenance Kit for H2PEM Generators (Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters, 1 water level sensor, 1 water pump, and 1 desiccant cartridge)		kit	23071	enquire

The combination of high-purity gas and gas purifying traps can save analytical time in the long run.

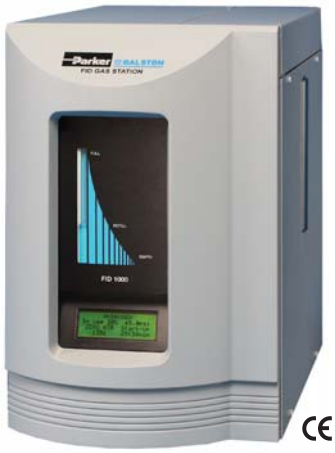


tech tip

Using purifying gas traps in combination with a gas generator can improve chromatography tremendously and improve column lifetime.

Parker Balston® Model FID-1000 and FID-2500 Gas Stations

- Single unit produces UHP zero air from house compressed air and 99.9995% pure hydrogen from deionized water.
- Ideal for supplying up to 5-6 FIDs.
- Eliminates inconvenient and dangerous gas cylinders.
- Silent operation, minimal operator attention required.



Parker Balston® Gas Stations provide both UHP grade hydrogen gas and zero grade air for flame ionization detectors. The system is specifically designed to supply gas to FIDs and to support flame thermionic and flame photometric detectors. The units produce zero air by purifying compressed air to a total hydrocarbon concentration of 0.1ppm or less (measured as methane).

The hydrogen generators produce hydrogen gas from deionized water, using the principle of electrolytic dissociation of water and hydrogen proton conduction through a proton exchange membrane cell.

Parker Filtration

Produce zero air and pure hydrogen from one unit!

Specifications

Hydrogen Purity:	99.9995%	Power:	120VAC/amp, 60Hz, 400 watts
Zero Air Purity:	FID-1000:	Hydrogen Outlet Pressure:	60 psig (414kPa)
	< 0.1ppm total hydrocarbons as methane	Zero Air Outlet Pressure:	40-125 psig* (276-862kPa)
	FID-2500:	Inlet Connection:	1/4" NPT (female)
	< 0.05ppm total hydrocarbons as methane	Outlet:	1/8" compression
Max. Hydrogen Flow Rate:	FID-1000: 90cc/min.	Dimensions:	16.5"h x 10.5"w x 17"d
	FID-2500: 250cc/min.		(42cm x 27cm x 43cm)
Max. Zero Air Flow Rate:	FID-1000: 1000cc/min.	Weight:	53 lbs. (24kg)
	FID-2500: 2500cc/min.		

*Zero air inlet requires minimum of 40psig (276kPa) compressed air pressure.



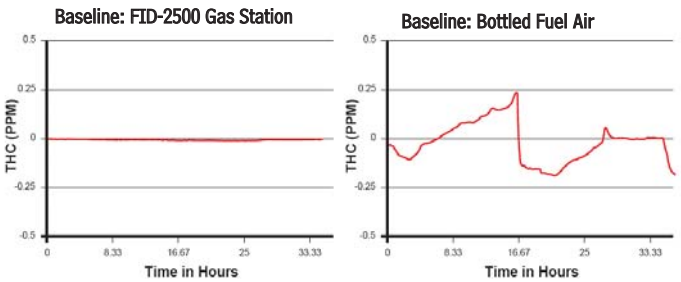
free literature

FID Gas Stations

Download your free copy from **www.restek.com**.

Fast Facts
lit. cat.# 580051

Compare baselines produced by a Parker Balston® FID Gas Station and bottled fuel air. The baseline produced by the Parker Balston® Generator is flat, with no fluctuations or peaks; the chromatogram from the bottled air fuel supply has many peaks ranging from 0.25 ppm to -0.25 ppm total hydrocarbons.



Description	qty.	cat. #	price
Model FID-1000 Gas Station (ideal for 1-2 FIDs)	ea.	20177	enquire
Model FID-2500 Gas Station (ideal for 5-6 FIDs)	ea.	24913	enquire
Replacement Components for FID Gas Stations			
Resin Bed Cartridge for Hydrogen Generators in FID-1000 and FID-2500 Gas Stations	ea.	24914	enquire
Replacement Desiccant Cartridge	ea.	21671	enquire
FID Gas Station Maintenance Kit (Includes 1 desiccant cartridge, 1 resin bed cartridge, 1 filter cartridge)	ea.	24915	enquire

ordering **note**

For **international orders**, please add the appropriate power cord suffix from the table below.

International Power Cord Sets

Just add the proper suffix to the catalog number for the gas generator you are ordering.

Location	qty.	cat.# suffix	price
United Kingdom (230VAC, 50/50Hz)	ea.	-550	N/C
European (230VAC, 50/60Hz)	ea.	-551	N/C
IEC Connector Only (230VAC, 50/60Hz)	ea.	-552	N/C
Japanese (200VAC, 50/60Hz)	ea.	-556	N/C
Japanese for Zero Air (100VAC, 50/60Hz)	ea.	-553	enquire
Japanese for Hydrogen (100VAC, 50/60Hz)	ea.	-554	enquire
Japanese for Nitrogen (100VAC, 50/60Hz)	ea.	-555	enquire

Select the power cord you need.

Parker Balston® Zero Air Generators

- Turn in-house compressed air into ultra-pure air (<0.1ppm total hydrocarbons).
- Remove hydrocarbons to less than 0.1ppm by catalytic oxidation.
- Operate at 40 to 125psi (276-862kPa).
- Typical payback is less than one year, based on cylinder costs.
- Install easily and take up little bench space.
- Maintenance kits include a one year supply of prefilters and final filter.



Model	Number of FIDs*
75-83NA	Up to 3
HPZA-3500	Up to 11
HPZA-7000	Up to 23
HPZA-18000	Up to 60
HPZA-30000	Up to 100

*based on a 300 cc/min. fuel air rate

Specifications

Maximum Zero Air Flow Rate:	75-83NA	1 lpm
	HPZA-3500	3.5 lpm
	HPZA-7000	7 lpm
	HPZA-18000	18 lpm
	HPZA-30000	30 lpm
Outlet Hydrocarbon Concentration (as methane):	75-83NA	< 0.1 ppm
	HPZA-30000	< 0.1 ppm
	Other Models	< .05 ppm
Minimum/Maximum Inlet Air Pressure:	40 psig/125 psig (276/862kPa)	
Maximum Inlet Hydrocarbon Concentration (as methane):	100 ppm	
Pressure Drop at Maximum Flow Rate:	4 psi (28kPa) differential	
Maximum Inlet Air Temperature:	78°F (25°C)	
Inlet/Outlet Ports:	1/4" NPT (female)	
Start-up Time to Specified Hydrocarbon Concentration:	45 minutes	
Electrical Requirements:	75-83NA	120 VAC/60 Hz, 0.5 amps
	Other Models	120 VAC/60 Hz, 3.5 amps
Dimensions:	75-83NA	12"h x 10"w x 3"d (30cm x 25cm x 8cm)
	Other Models	16"h x 11"w x 13"d (42cm x 27cm x 34cm)
Shipping Weight:	75-83NA	7 lbs. (3 kg)
	Other Models	41 lbs. (19 kg)

Zero Air Generator	Capacity	qty.	cat. #	price
Zero Air Generator Model 75-83NA	1000cc/min.	ea.	20684	enquire
Zero Air Generator Model 75-83NA with United Kingdom Power Cord	1000cc/min.	ea.	20684-550	enquire
Zero Air Generator Model HPZA-3500	3500cc/min.	ea.	20680	enquire
Zero Air Generator Model HPZA-3500 with European Power Cord	3500cc/min.	ea.	20680-551	enquire
Zero Air Generator Model HPZA-7000	7000cc/min.	ea.	20681	enquire
Zero Air Generator Model HPZA-18000	18,000cc/min.	ea.	20682	enquire
Zero Air Generator Model HPZA-30000	30,000cc/min.	ea.	20683	enquire
Maintenance Kits (includes a one-year supply of prefilters and final filter)		**qty.**	**cat. #**	price
Maintenance Kit for Model 75-83NA		kit	21646	enquire
Maintenance Kit for Models HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000		kit	21647	enquire
Replacement Catalyst Towers	**Capacity**	**qty.**	**cat. #**	price
Replacement Catalyst Tower for Model 75-83NA	1000cc/min.	ea.	22005	enquire
Replacement Catalyst Tower for Model HPZA-3500	3500cc/min.	ea.	22004	enquire
Replacement Catalyst Tower for Model HPZA-7000	7000cc/min.	ea.	22006	enquire
Replacement Catalyst Tower for Model HPZA-18000	18,000cc/min.	ea.	22007	enquire
Replacement Catalyst Tower for Model HPZA-30000	30,000cc/min.	ea.	22008	enquire

ordering note

For **international orders**, please add the appropriate power cord suffix from the table below.



free literature

Zero Air Generators

Download your free copy from **www.restek.com**.

Fast Facts
lit. cat.# 580050

International Power Cord Sets

Just add the proper suffix to the catalog number for the gas generator you are ordering.

Location	qty.	cat.# suffix	price
United Kingdom (230VAC, 50/50Hz)	ea.	-550	N/C
European (230VAC, 50/60Hz)	ea.	-551	N/C
IEC Connector Only (230VAC, 50/60Hz)	ea.	-552	N/C
Japanese (200VAC, 50/60Hz)	ea.	-556	N/C
Japanese for Zero Air (100VAC, 50/60Hz)	ea.	-553	enquire
Japanese for Hydrogen (100VAC, 50/60Hz)	ea.	-554	enquire
Japanese for Nitrogen (100VAC, 50/60Hz)	ea.	-555	enquire

Parker Balston® Nitrogen Gas Generators

- Turn compressed air into ultra-pure nitrogen (up to 99.9995%).
- Flows from 1 to 75+ Lpm.
- Require only a compressed air source and 110 volt AC power.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.
- N2-14 and N2-14A can be used for LC/MS.



20677

Specifications

	Model HPN2-1100 or UHPN2-1100	Model HPN2-2000	Model N2-14 or N2-14A
Maximum Nitrogen Flow Rate:	See Flow Table	2 lpm	78scfh** at 95% purity
Nitrogen Purity:	99.9999%	99.99%	95.0%–99.5%
Maximum Nitrogen Outlet Pressure:	See Flow Table	90 psig	
CO Concentration:	< 1.0 ppm	NA	
CO_2 Concentration:	< 1 ppm	< 1 ppm	
O_2 Concentration:	< 1 ppm	< 100 ppm	
H_2O Concentration:	≤ 2 ppm	≤ 2 ppm	
Hydrocarbon Concentration[1]:	< 0.1 ppm	NA	
Argon Concentration[2]:	0.9%	0.9%	
Atmospheric Dewpoint:			-58°F (-50°C)
Suspended Liquids:			None
Particles > 0.01μm:			None
Oxygen Analyzer:			Included with Model 75-720NA
Commercially Sterile:			Yes
Minimum/Maximum Inlet Pressure:	60 psig/125 psig (414/862kPa)	75 psig/120 psig (517/827kPa)	60 psig/145 psig (414/1,000kPa)
Maximum Pressure Drop (99% N_2 Purity, 125 psig):			10 psig (69kPa)
Recommended Inlet Temperature:	≤ 78°F (25°C)	≤ 78°F (25°C)	≤ 68°F (25°C) (Max.)
Ambient Operating Temperature:	60°F–100°F (16°C–38°C)	40°F–100°F (4°C–38°C)	110°F (43°C) (Max.)
Maximum Air Consumption:	42 lpm (1.5 scfm)*	42 lpm (1.5 scfm)*	
Inlet Connection:	1/4" NPT (female)	1/4" NPT (female)	1/4" NPT
Outlet Connection:	1/4" compression	1/8" NPT compression	1/8" NPT
Electrical Requirements[3]:	120 VAC/60 Hz	120 VAC/60 Hz	N2-14: None N2-14A: 120 VAC/60 Hz/25 Watts
Dimensions:	35"h x 12"w x 16"d (89cm x 30cm x 41cm)	35"h x 12"w x 16"d (89cm x 30cm x 41cm)	50"h x 16"w x 16"d (127cm x 41cm x 41cm)
Shipping Weight:	115 lbs. (52 kg)	115 lbs. (52 kg)	N2-14: 75 lbs. (34 kg) N2-14A: 80 lbs. (36 kg)

[1]Models HPN2-1100 and HPN2-2000 do not remove hydrocarbons.
[2]Purity specification for nitrogen does not include argon concentration.
[3]Power consumption is:
Model HPN2-1100 = 25 Watts
Model UHPN2-1100 = 700 Watts
Model HPN2-2000 = 25 Watts

Flow Table for Models HPN2-2000, HPN2-1100, and UHPN2-1100

Inlet Air Pressure	Maximum Outlet Flow (cc/min.)	Maximum
	Models HPN2-1100 and UHPN2-1100	Outlet Pressure
125 psig (862kPa)	1100	85 psig (586kPa)
110 psig (758kPa)	1000	75 psig (517kPa)
100 psig (689kPa)	900	65 psig (448kPa)
90 psig (621kPa)	800	60 psig (414kPa)
80 psig (552kPa)	700	50 psig (345kPa)
70 psig (483kPa)	600	45 psig (310kPa)
60 psig (414kPa)	500	35 psig (241kPa)
	Model HPN2-2000	
75-120 psig (517-827kPa)	2000	90 psig (621kPa)



free literature

Nitrogen Generators

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Fast Facts
lit. cat.# 580052

Parker Balston® Nitrogen Generators for LC/MS or General Purposes

Nitrogen Generators for LC/MS or General Purpose	qty.	cat.#	price
Nitrogen Generator N2-14 (general purpose) 78 scfh** max. flow at 95% purity	ea.	20677	enquire
Nitrogen Generator N2-14 with European Power Cord	ea.	20677-551	enquire
Nitrogen Generator N2-14A (general purpose w/oxygen analyzer) 78 scfh** max. flow at 95% purity	ea.	21652	enquire
Nitrogen Generators	**qty.**	**cat.#**	price
Nitrogen Generator HPN2-2000 (high purity—99.99%) 2.0 lpm max. flow	ea.	21654	enquire
Nitrogen Generator HPN2-1100 (ultra-high purity—99.9995%) 1.1 lpm max. flow	ea.	21653	enquire
Nitrogen Generator UHPN2-1100 (ultra-high purity—99.9995%); [HC<0.1ppm] 1.1 lpm max. flow	ea.	20697	enquire
Maintenance Kits	**qty.**	**cat.#**	price
Maintenance Kit for Models N2-14, N2-14A, 75-72, 75-720NA	kit	21648	enquire
Maintenance Kit for Models HPN2-1100, HPN2-2000, 76-96, 76-92	kit	21649	enquire
Maintenance Kit for Models UHPN2-1100, 76-94	kit	21655	enquire

*Standard cubic feet per minute.
**Standard cubic feet per hour.

ordering **note**

For **international orders**, please add the appropriate power cord suffix from the table on the previous page.

Overview of Restek's Ultra-High Purity (UHP) Gas Regulators

- Regulators feature metal-to-metal seals throughout for long-term leak-tightness.
- Metal diaphragm outlet valve ensures gas purity.
- Each regulator is helium leak-test-certifiable to $1x10^{-8}$scc/sec.
- Temperature range: -40°C to 60°C

Ultra-High Purity (UHP) Brass Body Gas Regulators

UHP brass regulators are the best choice when using ultra-high purity carrier gas for sensitive GC applications using MS, PID, or ECD detection methods. They feature reduced internal dead-volume, relative to stainless steel bodies. The metal valve diaphragm ensures leak-free shut-off. Oxidation-resistant chrome plating maintains a like-new appearance.



Dual-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Most stable outlet pressure control.
- Secondary pressure regulation not needed.
- Most widely used regulator.
- Less internal volume than stainless steel gas regulators.

Inlet gauge: 0 to 4,000psig (0-27,579kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#	price
CGA 580 (N_2 He, Ar)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	21667	
CGA 350 (H_2, P_5)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	21668	
CGA 590 (Air)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	21669	



Single-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Inlet gauge: 0 to 4,000psig (0-27,579kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#	price
CGA 580 (N_2, He, Ar)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20646	
CGA 350 (H_2, P_5)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20647	
CGA 590 (Air)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20648	



Ultra-High Purity Chrome-Plated Brass Line Gas Regulator

- Oxidation-resistant, chrome-plated.
- Use where you need to reduce the line pressure by 20psig (138kPa) or more.
- Same purity protection as high-pressure cylinder regulators.

Inlet connections: 1/4" FPT
Outlet assembly: 1/4" FPT port

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#	price
1/4" female NPT ports*	0-50psig (0-345kPa)	30" - 0 to 100psig (0-689kPa)	ea.	21666	
1/4" female NPT ports*	0-100psig (0-689kPa)	30" - 0 to 200psig (0-1379kPa)	ea.	22452	

*Order appropriate male connector, pipe-to-tube fittings.

Swagelok® Male Connector, Pipe-to-Tube Fittings



23134



23179

Fitting Type	Size (inches)	Similar to Swagelok	Brass qty.	Brass cat.#	Brass price	Stainless Steel qty.	Stainless Steel cat.#	Stainless Steel price
Male Connector	1/4" to 1/4" NPT	400-1-4	10-pk.	23134		2-pk.	23184	
Male Connector	1/8" to 1/4" NPT	200-1-4	10-pk.	23136		2-pk.	23186	
Tube End Reducer	1/4" tube to 1/8"	200-R-4	5-pk.	23129		2-pk.	23179	

Ultra-High Purity (UHP) Stainless Steel Body Gas Regulators

UHP stainless steel regulators are the standard for ultra-high-purity and corrosion-resistant pressure regulation. They are more easily purged of atmospheric components, compared to brass gas regulators, making them ideal for the most demanding applications. Stainless steel is especially useful in atmospheres of dry corrosive gases such as hydrogen.

Dual-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Most stable outlet pressure control.
- Secondary pressure regulation not needed.

Inlet gauge: 0 to 4,000psig (0-27,579kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting



Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#	price
CGA 580 (N_2, He, Ar)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20662	
CGA 350 (H_2, P_5)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20663	
CGA 590 (Air)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20664	

Single-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Use when there is secondary pressure requirement downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Inlet gauge: 0 to 4,000psig (0-27,579kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting



Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#	price
CGA 580 (N_2, He, Ar)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20665	
CGA 350 (H_2, P_5)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20666	
CGA 590 (Air)	0 to 100psig (0-689kPa)	30" – 0 to 200psig (0-1379kPa)	ea.	20667	

Flexible Stainless Steel Hoses



Description	qty.	cat. #	price
Flexible Stainless Steel Hose, 36", 1/4" Female NPT Fittings	ea.	21339	
Flexible Stainless Steel Hose, 18", 1/4" Female NPT Fittings	ea.	21340	
Flexible Stainless Steel Hose, 36", with Stainless Steel CGA 580	ea.	21344	

Flammable Gas Flash Arrestor—Factory Mutual Approved*

- Gas flow shuts off in the event of a flashback.
- Flame extinguished—flame front prevented from reaching the gas supply.
- No gas flow restriction under normal operating conditions.



Description	qty.	cat.#	price
Flammable Gas Flash Arrestor, Brass Body	ea.	21334	

*Approved for brass body servicing hydrogen, acetylene, propane, or natural gas only.

CGA Fittings

CGA-specified nuts and nipples with internal frit, 1/4-inch NPT nickel-plated brass.



Description	qty.	cat.#	price
CGA 580 Fitting, (N_2, He, Ar)	ea.	21336	
CGA 350 Fitting, (H_2, P_5)	ea.	21337	
CGA 590 Fitting, (Air)	ea.	21338	

ordering **note**

International Fittings

All gas regulators are available with the following BS (British Standard) and DIN (German Industrial Standards Organization) connections. Please contact your local Restek representative for more information.

BS 341 #01	BS 341 #08	BS 341 #15	DIN 477 #06	DIN 477 #10	DIN 477 #14
BS 341 #02	BS 341 #10	DIN 477 #01	DIN 477 #07	DIN 477 #11	DIN 477 #15
BS 341 #03	BS 341 #13	DIN 477 #03	DIN 477 #08	DIN 477 #12	
BS 341 #04	BS 341 #14	DIN 477 #05	DIN 477 #09	DIN 477 #13	

Critical Purity Automatic Switchover System for Noncorrosive Gases


20668580

High-purity automatic switchover systems provide a continuous supply of high purity gas to the laboratory, process, or instrument, to allow you to replace a depleted gas source without interruption in the gas supply. Continuous gas supply is achieved by setting the two regulators at slightly different pressures and discharging one side of the system at a time. These models include flexible, all-stainless-steel pigtails with armor casing. The CGA connection on each pigtail has a check valve in the gland to prevent contamination and minimize purging requirements.

Switching pressure:	200psig/170psig (1379/1172kPa)
Inlet connections:	flexible SS pigtails (36")
Line regulator:	0 to 100psig (0-689kPa)

Brass Automatic Switchover System with Line Regulator	qty.	cat.#	price
CGA 580 (N_2, He, Ar)	ea.	20668580	
CGA 350 (H_2, P_5)	ea.	20668350	
CGA 590 (Air)	ea.	20668590	
Stainless Steel Automatic Switchover System with Line Regulator	**qty.**	**cat.#**	**price**
CGA 580 (N_2, He, Ar)	ea.	21593580	

Protocol Station


21347

The protocol station is designed for convenient wall mounting of high-purity gas regulators. Wall mounting provides ease of use, prevents gas regulator damage, and improves safety. Either chrome-plated brass or 316 stainless steel option is complete with a 3-foot, flexible, all-stainless-steel pigtail with armor casing. The CGA connection on the pigtail has an integral check valve in the gland to prevent contamination during cylinder changeout.

Chrome-Plated Brass Protocol Station*	qty.	cat.#	price
CGA 580 (N_2, He, Ar)	ea.	21347	
CGA 350 (H_2, P_5)	ea.	21348	
CGA 590 (Air)	ea.	21349	
Stainless Steel Protocol Station*	**qty.**	**cat.#**	**price**
CGA 580 (N_2, He, Ar)	ea.	21327	

*Pressure regulator not included. Order separately.


21321

Cylinder Valve Wrench

This specially-designed wrench enables easy opening of cylinder valves that are fitted with a hand wheel. It is also suitable for removing difficult cylinder caps.

Description	qty.	cat.#	price
Cylinder Valve Wrench	ea.	21321	


21322

Universal Cylinder Wrench

Use this versatile wrench for tightening gauges and gas regulator CGA fittings to cylinder outlets and pipe thread connections.

Description	qty.	cat.#	price
Universal Cylinder Wrench	ea.	21322	


20635

Backpressure Gas Regulator

Capillary GC inlet systems have backpressure regulators to maintain a constant upstream pressure and rapidly respond to catastrophic leaks. The 0–60psig (0-414kPa) operating range is sufficient to operate a 105m, 0.25mm ID column at its optimum flow rate.

Description	qty.	cat.#	price
Backpressure Gas Regulator	ea.	20635	

MINICYL Regulator


20610

This compact general purpose regulator has many laboratory applications including air-drying glassware, sparging or evaporating solutions, and controlling pneumatic valves. It is constructed of lightweight aluminum with an elastomer diaphragm. Includes a 0–60psig (0-414kPa) gauge and either $^1/_8$- or $^1/_4$-inch tube fittings.

Description	qty.	cat.#	price
MINICYL Regulator, $^1/_8$" Fittings	ea.	20610	
MINICYL Regulator, $^1/_4$" Fittings	ea.	20611	


21333


NEW!
23400
23401
23402

Cylinder Holders, Wall Mounted

Prevent serious injuries! These holders are designed to prevent free-standing gas cylinders from tipping over and injuring personnel. The cast aluminum holder can be secured to a wall or the side of a work bench. Each mount will secure a cylinder 4-15 inches in diameter.

Description	qty.	cat.#	price
Single Cylinder Holder, Wall Mounted	ea.	21333	
Double Cylinder Holder, Wall Mounted	ea.	23400	
Triple Cylinder Holder, Wall Mounted	ea.	23401	
Four Cylinder Holder, Wall Mounted	ea.	23402	

Swagelok® Brass & Stainless Steel Fitting Kits

Save more than 40% by purchasing a new Restek Swagelok® Fittings Kit, compared to prices for the individual parts!

NEW!

- Includes the most common assortment of 1/8" and 1/4" brass or stainless steel fittings.
- Parts list makes reordering easy.
- Parts come in sturdy tool box for easy and convenient storage.



40% savings



Swagelok Brass Fitting Kit Includes:

Swagelok #	Description, qty included in kit
B-202-1	1/8" brass nut (20)
B-402-1	1/4" brass nut (20)
B-203-1	1/8" brass front ferrule (20)
B-403-1	1/4" brass front ferrule (20)
B-204-1	1/8" brass back ferrule (20)
B-404-1	1/4" brass back ferrule (20)
B-200-C	1/8" brass cap (6)
B-400-C	1/4" brass cap (6)
B-200-P	1/8" brass plug (6)
B-400-P	1/4" brass plug (6)
B-200-6	1/8" brass union (2)
B-400-6	1/4" brass union (2)
B-400-6-2	1/4" to 1/8" brass reducing union (2)
B-200-3	1/8" brass tee (2)
B-400-3	1/4" brass tee (2)
B-400-R-2	1/8" to 1/4" brass tube end reducer (2)
B-200-R-4	1/4" to 1/8" brass tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#	price
Swagelok Brass Fitting Kit	kit	23141	

Swagelok Stainless Steel Fitting Kit Includes:

Swagelok #	Description, qty included in kit
SS-202-1	1/8" SS nut (20)
SS-402-1	1/4" SS nut (20)
SS-203-1	1/8" SS front ferrule (20)
SS-403-1	1/4" SS front ferrule (20)
SS-204-1	1/8" SS back ferrule (20)
SS-404-1	1/4" SS back ferrule (20)
SS-200-C	1/8" SS cap (6)
SS-400-C	1/4" SS cap (6)
SS-200-P	1/8" SS plug (6)
SS-400-P	1/4" SS plug (6)
SS-200-6	1/8" SS union (2)
SS-400-6	1/4" SS union (2)
SS-400-6-2	1/4" to 1/8" SS reducing union (2)
SS-200-3	1/8" SS tee (2)
SS-400-3	1/4" SS tee (2)
SS-400-R-2	1/8" to 1/4" SS tube end reducer (2)
SS-200-R-4	1/4" to 1/8" SS tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#	price
Swagelok Stainless Steel Fitting Kit	kit	23197	



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NEW!

Swagelok® Fittings

Restek is pleased to offer one of the premier lines of fittings available for chromatographers in the market today. We can supply the entire line of Swagelok® fittings. If you don't see the exact product you're looking for, please call us for a quote.


nut


front ferrule


back ferrule


nut & ferrule set


plug


union

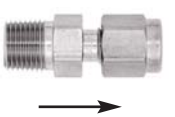

reducing union

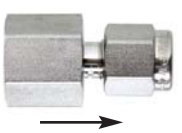

tee


cross


tube end reducer


port connector


male connector


female connector


male quick coupling


female quick coupling

Fitting Type	Size	Swagelok #	Brass qty.	Brass cat.#	Brass price	316 Grade Stainless Steel qty.	316 Grade Stainless Steel cat.#	316 Grade Stainless Steel price
Nut	1/16"	102-1	20-pk.	23100		5-pk.	23150	
	1/8"	202-1	40-pk.	23101		10-pk.	23151	
	1/4"	402-1	40-pk.	23102		10-pk.	23152	
Front Ferrule	1/16"	103-1	20-pk.	23103		10-pk.	23153	
	1/8"	203-1	40-pk.	23104		20-pk.	23154	
	1/4"	403-1	40-pk.	23105		20-pk.	23155	
Back Ferrule	1/16"	104-1	20-pk.	23106		10-pk.	23156	
	1/8"	204-1	40-pk.	23107		20-pk.	23157	
	1/4"	404-1	40-pk.	23108		20-pk.	23158	
Nut & Ferrule Set	1/16"	—	10-pk.	23109		2-pk.	23159	
	1/8"	—	20-pk.	23110		5-pk.	23160	
	1/4"	—	20-pk.	23111		5-pk.	23161	
Plug	1/16"	100-P	5-pk.	23112		2-pk.	23162	
	1/8"	200-P	10-pk.	23113		4-pk.	23163	
	1/4"	400-P	10-pk.	23114		4-pk.	23164	
Union	1/16"	100-6	3-pk.	23115		ea.	23165	
	1/8"	200-6	5-pk.	23116		2-pk.	23166	
	1/4"	400-6	5-pk.	23117		2-pk.	23167	
Reducing Union	1/8" to 1/16"	200-6-1	5-pk.	23118		ea.	23168	
	1/4" to 1/16"	400-6-1	5-pk.	23119		2-pk.	23169	
	1/4" to 1/8"	400-6-2	5-pk.	23120		2-pk.	23170	
Tee	1/16"	100-3	2-pk.	23121		ea.	23171	
	1/8"	200-3	2-pk.	23122		ea.	23172	
	1/4"	400-3	2-pk.	23123		ea.	23173	
Cross	1/8"	200-4	2-pk.	23124		ea.	23174	
	1/4"	400-4	2-pk.	23125		ea.	23175	
Tube End Reducer	1/8" to 1/16"	100-R-2	5-pk.	23126		2-pk.	23176	
	1/4" to 1/16"	100-R-4	5-pk.	23127		2-pk.	23177	
	1/8" to 1/4"	400-R-2	5-pk.	23128		2-pk.	23178	
	1/4" to 1/8"	200-R-4	5-pk.	23129		2-pk.	23179	
Port Connector	1/8"	201-PC	5-pk.	23130		2-pk.	23180	
	1/4"	401-PC	10-pk.	23131		2-pk.	23181	
	1/8" to 1/4"	401-PC-2	5-pk.	23132		2-pk.	23182	
Male Connector	1/8" to 1/8" NPT	200-1-2	10-pk.	23133		2-pk.	23183	
	1/4" to 1/4" NPT	400-1-4	10-pk.	23134		2-pk.	23184	
	1/16" to 1/8" NPT	100-1-2	5-pk.	23135		2-pk.	23185	
	1/8" to 1/4" NPT	200-1-4	10-pk.	23136		2-pk.	23186	
	1/4" to 1/8" NPT	400-1-2	10-pk.	23137		2-pk.	23187	
Female Connector	1/8" to 1/8" NPT	200-7-2	5-pk.	23138		2-pk.	23188	
	1/4" to 1/4" NPT	400-7-4	5-pk.	23139		2-pk.	23189	
	1/4" to 1/8" NPT	400-7-2	5-pk.	23140		2-pk.	23190	
Male & Female Quick Couplings	1/8" male*	QC4D-200	—	—	—	ea.	23191	
	1/8" male	QC4S-200	—	—	—	ea.	23192	
	1/8" female*	QC4B-200	—	—	—	ea.	23193	
	1/4" male*	QC4D-400	—	—	—	ea.	23194	
	1/4" male	QC4S-400	—	—	—	ea.	23195	
	1/4" female*	QC4B-400	—	—	—	ea.	23196	

*Includes self-sealing shut-off valve.

also **available**

Restek also carries specialized tools for Swagelok® fittings.
See **page 249**.

Siltek®/Sulfinert® and Silcosteel®-CR Treated Swagelok® Fittings

- Full line of treated 1/16", 1/8", and 1/4" fittings.
- Silcosteel®-CR treatment enhances corrosion resistance by 10x, or more.
- Custom treatment available for any Swagelok® fitting, or other system parts not listed here (call for details).
- Description of custom Restek coatings listed below.

			Siltek/Sulfinert Treated			Silcosteel-CR Treated		
Fitting Type	Size	Swagelok #	qty.	cat.#	price	qty.	cat.#	price
Union	1/16"	SS-100-6	ea.	22540		ea.	22575	
	1/8"	SS-200-6	ea.	22541		ea.	22576	
	1/4"	SS-400-6	ea.	22542		ea.	22577	
	3/8"	SS-600-6	ea.	22909		ea.	22904	
Tee	1/16"	SS-100-3	ea.	22543		ea.	22578	
	1/8"	SS-200-3	ea.	22544		ea.	22579	
	1/4"	SS-400-3	ea.	22545		ea.	22580	
	3/8"	SS-600-3	ea.	22910		ea.	22905	
Reducing Union	1/8" to 1/16"	SS-200-6-1	ea.	22546		ea.	22581	
	1/4" to 1/16"	SS-400-6-1	ea.	22547		ea.	22582	
	1/4" to 1/8"	SS-400-6-2	ea.	22548		ea.	22583	
	3/8" to 1/4"	SS-600-6-4	ea.	22911		ea.	22906	
Elbow	1/8"	SS-200-9	ea.	22549		ea.	22584	
	1/4"	SS-400-9	ea.	22550		ea.	22585	
Plug	1/8"	SS-200-P	ea.	22573		ea.	22620	
	1/4"	SS-400-P	ea.	22574		ea.	22597	
Cross	1/8"	SS-200-4	ea.	22551		ea.	22586	
	1/4"	SS-400-4	ea.	22552		ea.	22587	
Tube End Reducer	1/8" tube to 1/16"	SS-100-R-2	ea.	22553		ea.	22588	
	1/4" tube to 1/16"	SS-100-R-4	ea.	22554		ea.	22589	
	1/8" tube to 1/4"	SS-400-R-2	ea.	22555		ea.	22590	
	1/4" tube to 1/8"	SS-200-R-4	ea.	22556		ea.	22591	
Port Connector	1/8"	SS-201-PC	ea.	22557		ea.	22592	
	1/4"	SS-401-PC	ea.	22558		ea.	22593	
	1/8" tube to 1/4"	SS-401-PC-2	ea.	22559		ea.	22594	
Male Connector	1/8" to 1/8" NPT	SS-200-1-2	ea.	22561		ea.	22595	
	1/4" to 1/4" NPT	SS-400-1-4	ea.	22562		ea.	22596	
	1/16" to 1/8" NPT	SS-100-1-2	ea.	22563		ea.	22610	
	1/8" to 1/4" NPT	SS-200-1-4	ea.	22564		ea.	22611	
	1/4" to 1/8" NPT	SS-400-1-2	ea.	22565		ea.	22612	
	3/8" to 3/8" NPT	SS-600-1-6	ea.	22912		ea.	22907	
Female Connector	1/8" to 1/8" NPT	SS-200-7-2	ea.	22566		ea.	22613	
	1/4" to 1/4" NPT	SS-400-7-4	ea.	22567		ea.	22614	
	1/4" to 1/8" NPT	SS-400-7-2	ea.	22568		ea.	22615	
	1/8" to 1/4" NPT	SS-200-7-4	ea.	22569		ea.	22616	
Bulkhead Union	1/8"	SS-200-61	ea.	22570		ea.	22617	
	1/4"	SS-400-61	ea.	22571		ea.	22618	


union


tee


reducing union


elbow


plug


cross


tube end reducer


port connector


male connector


female connector


bulkhead union

Custom Restek Coatings

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

For more information on our custom coatings, see page 242.


nut


front ferrule


back ferrule


nut & ferrule set


plug


union


reducing union


tee


cross


tube end reducer


port connector


male connector


female connector


male & female quick couplings

Parker Fittings

Parker's (A-Lok) two-piece ferrules and NPT fittings are ideal for installing new equipment, modifying existing instrumentation, or replacing worn connections. Restek offers both brass and stainless steel fittings. If there is a particular Parker fitting that you are looking for and it is not listed here, please contact us to inquire about availability.

			Brass			316 Grade Stainless Steel		
Fitting Type	**Size**	**Parker #**	**qty.**	**cat.#**	price	**qty.**	**cat.#**	price
Nut	1/16"	1 Nu 1	20-pk.	21800		5-pk.	21900	
	1/8"	2 Nu 2	40-pk.	21801		10-pk.	21901	
	1/4"	4 Nu 4	40-pk.	21802		10-pk.	21902	
Front Ferrule	1/16"	1 FF 1	20-pk.	21803		10-pk.	21903	
	1/8"	2 FF 2	40-pk.	21804		20-pk.	21904	
	1/4"	4 FF 4	40-pk.	21805		20-pk.	21905	
Back Ferrule	1/16"	1 BF 1	20-pk.	21806		10-pk.	21906	
	1/8"	2 BF 2	40-pk.	21807		20-pk.	21907	
	1/4"	4 BF 4	40-pk.	21808		20-pk.	21908	
Nut & Ferrule Set	1/16"	—	10-pk.	21809		2-pk.	21909	
	1/8"	—	20-pk.	21810		5-pk.	21910	
	1/4"	—	20-pk.	21811		5-pk.	21911	
Plug	1/16"	1 BLP 1	5-pk.	21815		2-pk.	21915	
	1/8"	2 BLP 2	10-pk.	21816		4-pk.	21916	
	1/4"	4 BLP 4	10-pk.	21817		4-pk.	21917	
Union	1/16"	1 SC 1	3-pk.	21818		ea.	21918	
	1/8"	2 SC 2	5-pk.	21819		2-pk.	21919	
	1/4"	4 SC 4	5-pk.	21820		2-pk.	21920	
Reducing Union	1/8" to 1/16"	2 RU 1	5-pk.	21823		ea.	21923	
	1/4" to 1/16"	4 RU 1	5-pk.	21824		2-pk.	21924	
	1/4" to 1/8"	4 RU 2	5-pk.	21825		2-pk.	21925	
Tee	1/16"	1 ET 1	2-pk.	21826		ea.	21926	
	1/8"	2 ET 2	2-pk.	21827		ea.	21927	
	1/4"	4 ET 4	2-pk.	21828		ea.	21928	
Cross	1/8"	2 ECR 2	2-pk.	21829		ea.	21929	
	1/4"	4 ECR 4	2-pk.	21830		ea.	21930	
Tube End Reducer	1/8" tube to 1/16"	2 TUR 1	5-pk.	21831		2-pk.	21931	
	1/4" tube to 1/16"	4 TUR 1	5-pk.	21832		2-pk.	21932	
	1/8" tube to 1/4"	2 TUR 4	5-pk.	21833		2-pk.	21933	
	1/4" tube to 1/8"	4 TUR 2	5-pk.	21834		2-pk.	21934	
Port Connector	1/8"	2 PC 2	5-pk.	21835		2-pk.	21935	
	1/4"	4 PC 4	10-pk.	21836		2-pk.	21936	
	1/8" tube to 1/4"	2 PC 4	5-pk.	21837		2-pk.	21937	
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	10-pk.	21841		2-pk.	21941	
	1/4" to 1/4" NPT	4 MSC 4N	10-pk.	21842		2-pk.	21942	
	1/16" to 1/8" NPT	1 MSC 2N	5-pk.	21843		2-pk.	21943	
	1/8" to 1/4" NPT	2 MSC 4N	10-pk.	21844		2-pk.	21944	
	1/4" to 1/8" NPT	4 MSC 2N	10-pk.	21845		2-pk.	21945	
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	5-pk.	21846		2-pk.	21946	
	1/4" to 1/4" NPT	4 FSC 4N	5-pk.	21847		2-pk.	21947	
	1/4" to 1/8" NPT	4 FSC 2N	5-pk.	21848		2-pk.	21948	
Male & Female Quick Couplings	1/8" male*	2A-Q4VN	—	—	—	ea.	21957	
	1/8" male	2A-Q4P	—	—	—	ea.	21958	
	1/8" female*	2A-Q4CN	—	—	—	ea.	21959	
	1/4" male*	4A-Q4VN	—	—	—	ea.	21960	
	1/4" male	4A-Q4P	—	—	—	ea.	21961	
	1/4" female*	4A-Q4CN	—	—	—	ea.	21962	

*Includes self-sealing shut-off valve.

Siltek®/Sulfinert® Treated and Silcosteel®-CR Treated Parker Fittings

A broad line of 1/16", 1/8" and 1/4" fittings are available with Siltek®/Sulfinert® or Silcosteel®-CR treatment. Because of expanding applications for these coatings, we have received many requests for a broader product offering. If you do not see everything you need, contact us for information on custom coating services.

			Siltek/Sulfinert Treated			Silcosteel-CR Treated		
Fitting Type	Size	Parker #	qty.	cat.#	price	qty.	cat.#	price
Union	1/16"	1 SC 1	ea.	22520		ea.	22863	
	1/8"	2 SC 2	ea.	22521		ea.	22864	
	1/4"	4 SC 4	ea.	22522		ea.	22865	
Tee	1/16"	1 ET 1	ea.	22526		ea.	22866	
	1/8"	2 ET 2	ea.	22527		ea.	22867	
	1/4"	4 ET 4	ea.	22528		ea.	22868	
Reducing Union	1/8" to 1/16"	2 RU 1	ea.	22523		ea.	22869	
	1/4" to 1/16"	4 RU 1	ea.	22524		ea.	22870	
	1/4" to 1/8"	4 RU 2	ea.	22525		ea.	22871	
Elbow	1/16"	1 EE 1	—	—	—	ea.	22874	
	1/8"	1 EE 2	ea.	22530		ea.	22875	
	1/4"	1 EE 4	ea.	22531		ea.	22876	
Plug	1/16"	1 BLP 1	ea.	21539		ea.	22877	
	1/8"	2 BLP 2	ea.	21540		ea.	22878	
	1/4"	4 BLP 4	ea.	21541		ea.	22879	
Cross	1/8"	2 ECR 2	ea.	21542		ea.	22872	
	1/4"	4 ECR 4	ea.	21543		ea.	22873	
Tube End Reducer	1/8" tube to 1/16"	2 TUR 1	ea.	21544		ea.	22880	
	1/4" tube to 1/16"	4 TUR 1	ea.	21545		ea.	22881	
	1/8" tube to 1/4"	2 TUR 4	ea.	21546		ea.	22882	
	1/4" tube to 1/8"	4 TUR 2	ea.	21547		ea.	22883	
Port Connector	1/8"	2 PC 2	ea.	21548		ea.	22884	
	1/4"	4 PC 4	ea.	21549		ea.	22885	
	1/8" tube to 1/4"	2 PC 4	ea.	21550		ea.	22886	
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	ea.	21551		ea.	22887	
	1/4" to 1/4" NPT	4 MSC 4N	ea.	21552		ea.	22888	
	1/16" to 1/8" NPT	1 MSC 2N	ea.	21553		ea.	22889	
	1/8" to 1/4" NPT	2 MSC 4N	ea.	21554		ea.	22890	
	1/4" to 1/8" NPT	4 MSC 2N	ea.	21555		ea.	22891	
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	ea.	21556		ea.	22892	
	1/4" to 1/4" NPT	4 FSC 4N	ea.	21557		ea.	22893	
	1/4" to 1/8" NPT	4 FSC 2N	ea.	21558		ea.	22894	
	1/8" to 1/4" NPT	2 FSC 4N	ea.	21559		ea.	22895	
Plug Valve, 2-Way	1/8"	2A PR4 VT SS	ea.	21586		—	—	—
	1/4"	4A PR4 VT SS	ea.	21587		—	—	—
Ball Valve, 2-Way	1/8"	2A B2LJ2 SSP	ea.	21588		—	—	—
	1/4"	4A B2LJ2 SSP	ea.	21589		—	—	—

Please note: Nuts and ferrules are not treated unless requested (custom parts). Nuts and ferrules normally are not in contact with sample pathway, and thus do not require coating.


union

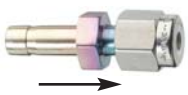

tee


reducing union

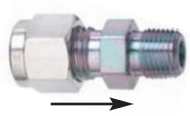

elbow

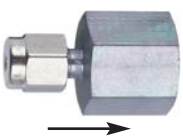

plug


cross


tube end reducer


port connector


male connector


female connector


plug valve, 2-way


ball valve, 2-way

Siltek®/Sulfinert® Treated Treated Valco® Fittings

		Siltek/Sulfinert Treated		
Fitting Type	Size	qty.	cat.#	price
Valco Zero Dead Volume Tee	1/16"	ea.	22534	
	1/8"	ea.	22535	
Valco Zero Dead Volume Union	1/16"	ea.	22532	
	1/8"	ea.	22533	


zero dead volume tee


zero dead volume union

Tubing and Available Coatings

Restek sets the standard in tubing for analytical and process applications. Complete your system with precleaned or treated tubing and treated fittings and valves for an inert, corrosion-resistant pathway.

Available tubing coatings include:

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing or stack gas sampling.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.

Frequently Asked Questions

1. Can treated tubing be bent?
Treated tubing can be bent into curves with a bend radius greater than 1 inch for $^{1}/_{16}$-inch OD tubing, 2 inches for $^{1}/_{8}$-inch OD tubing, or 4 inches for $^{1}/_{4}$-inch OD tubing. The treatment layer will remain intact as long as the tubing isn't stretched dramatically. If tight bends are necessary, use a treated elbow union or bend untreated tubing and send it to Restek for custom treatment.

2. Can compression fittings be used without crushing the treatment layer?
Yes. The layer is thin and permeates the surface. It compresses with minimal damage.

3. Is welding possible after Restek treatment?
Yes. The coating does not interfere with the welding of two coated components. The coating is lost at the weld and in the heat affected zones approximately 2 to 5mm on either side of the weld.

4. Is any additional chemical deactivation necessary?
A Sulfinert® or Silcosteel® layer leaves few exposed active sites, so there usually is no need for additional treatment. Chemical deactivation is useful in chromatographic applications in which water will be vaporized on the Silcosteel® treated surface, but is not necessary for Sulfinert® treated surfaces. Parts used in high-temperature applications (>400°C) cannot be chemically deactivated.

5. What are the temperature constraints of Restek surface treatments?
On stainless steel, a Silcosteel® layer is stable to 600°C. Parts treated with a secondary polymeric layer are limited to temperatures of 400°C in inert atmospheres and 250°C when oxygen is present, the temperature maximums for the polymer. Temperatures above 600°C can be used under certain conditions—please contact us for information.

6. Why use Sulfinert® or Silcosteel® treatment instead of Teflon® coating?
Three reasons: 1) Sulfinert® and Silcosteel® layers are nonpolymeric, so they do not exhibit the problems associated with gas permeability. 2) Teflon® coating often flakes off the surface, while the Sulfinert® or Silcosteel® layer is tightly integrated into the substrate lattice. 3) Teflon® coating is limited to 280°C, while Silcosteel® treated stainless steel tubing and fittings can be used to 600°C.

7. Why use Siltek®/Sulfinert® treated tubing for transfer lines?
Siltek®/Sulfinert® treated stainless steel tubing offers all of the advantages of glass or fused silica tubing for the transfer of active compounds (e.g., sulfurs), but is far more durable and flexible.

8. Is treated tubing similar to glass-lined tubing (GLT)?
No. Sulfinert® or Silcosteel® treated tubing is flexible and can be bent without heating. Also, the Sulfinert® or Silcosteel® layer is highly inert, unlike impure glass.

9. How can I clean the surface of a treated part after use?
Most often, a mild organic solvent (methylene chloride, methanol, hexane) or water is sufficient. Mild sonication may assist and accelerate the process. Do not use caustic, abrasive, or high pH (pH>8) cleaners, as they will damage or dissolve the layer. Steam cleaning in the presence of oxygen or air could create surface activity, and also should be avoided.

10. What materials should I avoid using with Silcosteel® treated parts?
The Silcosteel® coating is silicon-based and is prone to attack by hydrofluoric acid or by basic compounds. The surface should not be exposed to media with pH>8.

11. Siltek® and Sulfinert®: What's the Difference?
Siltek® is the name for our patented deposition process. When we developed the Siltek® process, the application that showed the greatest benefit, among many we investigated, was the storage and transfer of low ppb level active sulfur compounds, such as hydrogen sulfide and mercaptans. Because there was (and continues to be) demand for a reliable surface treatment for this application, we use the name Sulfinert® to describe Siltek® treated products created specifically for this purpose.

Instrument-Grade Welded and Drawn 304 Grade Stainless Steel Tubing

Clean tubing is critical to ensure the delivery of pure gas to your instrument. Restek's stainless steel tubing is specially cleaned for inertness by using the procedure for processing our Silcosteel® and Siltek®-treated products, because scrupulously clean parts are a prerequisite for a quality coating. This ensures you are getting a quality tubing for your chromatography system.

Tubing Dimensions		Length (per-foot pricing on 26 feet or more) 25 Feet		26–100 Feet		>100 Feet*	
ID (in.)	OD (in.)	cat.#	price	cat.#	price	cat.#	price
0.01"	1/16"	21500		21501	/ft.	21502	/ft.
0.02"	1/16"	21503		21504	/ft.	21505	/ft.
0.03"	1/16"	21506		21507	/ft.	21508	/ft.
0.04"	1/16"	21509		21510	/ft.	21511	/ft.
0.085"	1/8"	21512		21513	/ft.	21514	/ft.
0.21"	1/4"	21515		21516	/ft.	21517	/ft.

*The availability of long lengths (continuous lengths up to 500 feet) is subject to inventory constraints. Please inquire before ordering.



ordering **note**

Required length in meters x 3.2808 = length in feet.

An extra charge is applied for cutting and/or straightening stainless steel and/or copper tubing, calculated from the total number of pieces produced for each line item:

# of Pieces	Added Charge
5 to 15	enquire
16 to 30	enquire
31 to 75	enquire
76 to 99	enquire
100 to 200	enquire

Precleaned Copper Tubing

- Adheres to ASTM B-280.
- Precleaned and ready to use.
- Use for plumbing GC systems.

ID	OD	Wall	qty.	cat.#	price
0.065"	1/8"	0.030"	50 ft.	21590	
0.190"	1/4"	0.030"	50 ft.	21592	

tech tip

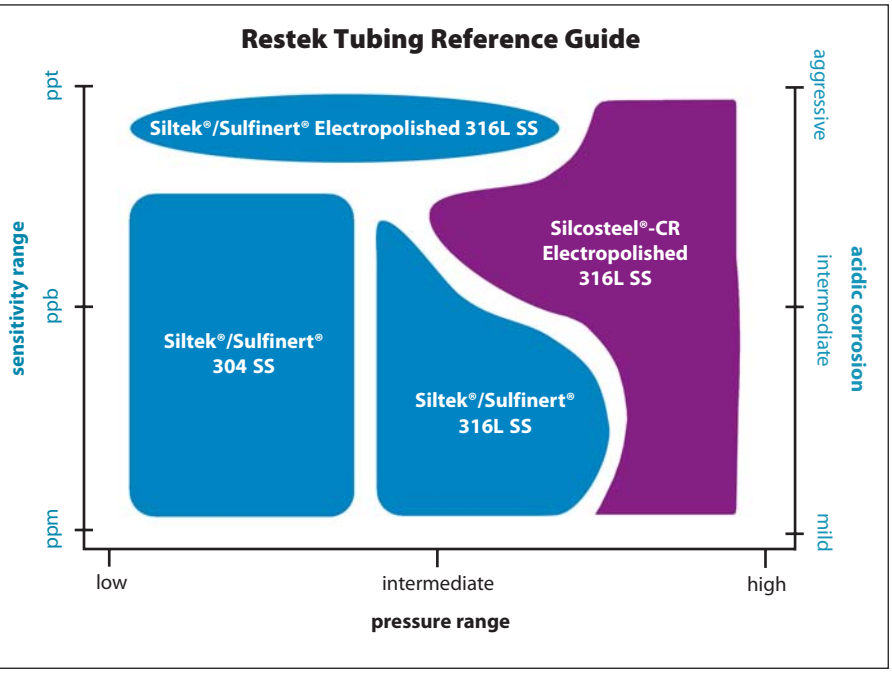
Plumbing a GC

It is essential to use clean chromatographic-grade tubing to plumb a GC. Standard-grade tubing contains residual hydrocarbon contaminants from the drawing process. These contaminants migrate into the carrier gas stream, elevating background noise and causing down time.

frequently **asked** question

Which treated tubing should I use?

This chart will help you determine the tubing best suited to your application with respect to pressure, sensitivity of your analysis, and acidic environment exposure. For more frequently asked questions on treated tubing, see previous page.



did you **know**?

A smoother internal surface is less adsorptive.



Top: electropolished finish, surface roughness average number: 10-15.

Bottom: conventional finish, surface roughness average number: approx. 23-27.

An extra charge is applied for cutting Siltek®/Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item:

# of Pieces	Added Charge
5 to 15	enquire
16 to 30	enquire
31 to 75	enquire
76 to 99	enquire
100 to 200	enquire

Minimum Bend Radius for Coated Tubing

OD	Min. Bend Radius
≤1/16"	1" (2.5cm)
1/8"	2" (5.1cm)
1/4"	4" (10.2cm)
3/8"	6" (15.2cm)

did you **know**?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000ft.

ordering **note**

Required length in meters x 3.2808 = length in feet.

Treated Seamless Electropolished 316L Grade Stainless Steel Tubing

Our highest performing tubing. Recommended for:
- demanding/corrosive environments.
- high temperatures.
- ultimate inertness.

Siltek®/Sulfinert® Treated Coiled Electropolished 316L Grade Stainless Steel Tubing

Price-per-foot

OD	ID	Wall Thickness	cat.#	5-24 ft.	25-99 ft.	100-299 ft.	>300 ft.
1/8" (3.18mm)	0.085" (2.16mm)	0.020"	22538	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22539	/ft.	/ft.	/ft.	/ft.

Silcosteel®-CR Treated Coiled Electropolished 316L Grade Stainless Steel Tubing

Price-per-foot

OD	ID	Wall Thickness	cat.#	5-24 ft.	25-99 ft.	100-299 ft.	>300 ft.
1/8" (3.18mm)	0.085" (2.16mm)	0.020"	22536	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22537	/ft.	/ft.	/ft.	/ft.

1/8" OD: 5 ft. to 100 ft. in one continuous coil; 1/4" OD: 5 ft. to 300 ft. in one continuous coil. Longer lengths will be more than one coil.

Treated Welded/Drawn 304 Grade Stainless Steel Tubing

Our most popular grade of tubing. Recommended for:
- chromatography applications.
- gas delivery systems.
- lower pressures.
- inert applications.

Siltek®/Sulfinert® Treated Coiled 304 Grade Stainless Steel Tubing

Price-per-foot

OD	ID	Wall Thickness	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
0.022" (0.56mm)	0.011" (0.28mm)		22500	/ft.	/ft.	/ft.	/ft.
0.029" (0.74mm)	0.021" (0.53mm)		22501	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.010" (0.25mm)		22502	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.020" (0.51mm)		22503	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.030" (0.76mm)		22504	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.040" (1.02mm)		22505	/ft.	/ft.	/ft.	/ft.
1/8" (3.18mm)	0.085" (2.16mm)	0.020"	22506	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.210" (5.33mm)	0.020"	22507	/ft.	/ft.	/ft.	/ft.

Treated Seamless 316L Grade Stainless Steel Tubing

High durability tubing. Recommended for:
- inert applications.
- high temperatures.
- high pressures.
- corrosive environments.

Siltek®/Sulfinert® Treated Coiled 316L Grade Stainless Steel Tubing

Price-per-foot

OD	ID	Wall Thickness	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
1/8" (3.18mm)	0.055" (1.40mm)	0.035"	22508	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22509	/ft.	/ft.	/ft.	/ft.
3/8" (9.52mm)	0.277" (7.04mm)	0.049"	22914	/ft.	/ft.	/ft.	/ft.

Silcosteel®-CR Treated Coiled 316L Grade Stainless Steel Tubing

Price-per-foot

OD	ID	Wall Thickness	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
1/8" (3.18mm)	0.055" (1.40mm)	0.035"	22896	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22897	/ft.	/ft.	/ft.	/ft.
3/8" (9.52mm)	0.277" (7.04mm)	0.049"	22915	/ft.	/ft.	/ft.	/ft.

Treated Hydroguard™ Deactivated Stainless Steel Tubing

Hydroguard™ deactivation creates a high-density surface that is not readily attacked by aggressive hydrolysis. Recommended for:

- plumbing purge and trap systems.
- headspace systems.

Silcosteel® Treated Hydroguard™ Deactivated 304 Grade Stainless Steel Tubing

				Price-per-foot			
OD	ID	Wall Thickness	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
1/16" (1.59mm)	0.010" (0.25mm)		22497	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.020" (0.51mm)		22496	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.030" (0.76mm)		22495	/ft.	/ft.	/ft.	/ft.
1/16" (1.59mm)	0.040" (1.02mm)		22494	/ft.	/ft.	/ft.	/ft.
1/8" (3.18mm)	0.085" (2.16mm)	0.020"	22493	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.210" (5.33mm)	0.020"	22492	/ft.	/ft.	/ft.	/ft.

Silcosteel® Treated Hydroguard™ Deactivated Seamless 316L Grade Stainless Steel Tubing

				Price-per-foot			
OD	ID	Wall Thickness	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
1/8" (3.18mm)	0.055" (1.40mm)	0.035"	22491	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22490	/ft.	/ft.	/ft.	/ft.

Silcosteel® Treated Hydroguard™ Deactivated Electropolished 316L Grade Stainless Steel Tubing

				Price-per-foot			
OD	ID	Wall Thickness	cat.#	5-24 ft.	25-99 ft.	100-299 ft.	>300 ft.
1/8" (3.18mm)	0.085" (2.16mm)	0.020"	22489	/ft.	/ft.	/ft.	/ft.
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	22488	/ft.	/ft.	/ft.	/ft.

Treated Straight, 6-Foot Length Stainless Steel Tubing

Silcosteel®-CR Treated Straight Seamless 316L Grade Stainless Steel Tubing

- Individual 6-foot pieces.

In response to customer requests, we offer 6-foot straight lengths of 1/8-, 1/4, and 3/8-inch Silcosteel®-CR treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

6 foot Length (± 1/2")

OD	ID	Wall Thickness	qty.	cat.#	price
1/8" (3.18mm)	0.055" (1.40mm)	0.035"	ea.	22898	
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	ea.	22899	
3/8" (9.52mm)	0.277" (7.04mm)	0.049"	ea.	22900	

Siltek®/Sulfinert® Treated Straight Seamless 316L Grade Stainless Steel Tubing

- Individual 6-foot pieces.

In response to customer requests, we offer 6-foot straight lengths of 1/8-, 1/4, and 3/8-inch Siltek®/Sulfinert® treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

6 foot Length (± 1/2")

OD	ID	Wall Thickness	qty.	cat.#	price
1/8" (3.18mm)	0.055" (1.40mm)	0.035"	ea.	22901	
1/4" (6.35mm)	0.180" (4.57mm)	0.035"	ea.	22902	
3/8" (9.52mm)	0.277" (7.04mm)	0.049"	ea.	22903	

recommended for **purge & trap**



An extra charge is applied for cutting Siltek®/Sulfinert®, or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item:

# of Pieces	Added Charge
5 to 15	enquire
16 to 30	enquire
31 to 75	enquire
76 to 99	enquire
100 to 200	enquire

ordering **note**

Required length in meters x 3.2808 = length in feet.

did you **know**?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000ft.

Gas Valves, Leak Detector



Toggle valve—instant on/off control



Ball valve—leak-free bidirectional sealing



Plug valve—leak-free at wide temperature swings

Parker Balston® Shut-Off Gas Valves

Toggle gas valves are ideal for applications in which instant on/off gas control is necessary. They are rated to 200psig at 21°C and have a maximum operating temperature of 148°C.

Ball valves have a floating ball to assist sealing and to reduce operating torque, and dual seats to provide leak-tight bidirectional sealing. They are rated to 1,500psig at 21°C and have a maximum operating temperature of 177°C.

Plug valves work well in any application requiring throttling or on/off operations. Parker plug valves remain leak-free even when subjected to wide temperature swings. They are rated to 3,000psig at 21°C and have a maximum operating temperature of 205°C.

	1/8" Brass		1/4" Brass		1/8" Stainless Steel		1/4" Stainless Steel	
Valve Type	cat.#	ea.	cat.#	ea.	cat.#	ea.	cat.#	ea.
Toggle	22188		22189		22190		22191	
Ball	22192		22193		22194		22195	
Plug	22196		22197		22198		22199	



22209

Optional knob for accurate control of low flow

Parker Balston® Precision Metering Gas Valves

Parker valve stem threads do not contact the fluid stream, making these metering valves ideal for high-purity applications. The O-ring seal and stem threads are coated with a low vapor pressure, silicone lubricant for optimum performance.



22200

	1/8" Nickel-Plated Brass		1/4" Nickel-Plated Brass		1/8" Stainless Steel		1/4" Stainless Steel	
Valve Type	cat.#	ea.	cat.#	ea.	cat.#	ea.	cat.#	ea.
Metering, straight	22200		22201		22204		22205	

Vernier Knob for Metering Valve: cat.# 22209 (ea.)

Restek Electronic Leak Detector



22839

Why have a small leak turn into a costly repair? Protect your data and analytical column by using a Restek Leak Detector.

Features & Benefits include:

- Optimized sample flow path.
- New ergonomic, hand-held design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Longer lasting battery, up to 6 hours of continuous use.
- Automatic shut-off.
- A convenient carrying and storage case.
- Easy to clean probe assembly.
- A universal charger set (US, European, UK, and Australian plugs included).

Backed by a 1-year warranty, the new Restek Leak Detector sets an industry standard for performance and affordability in hand-held leak detectors.

Leak Detector Facts

Detectable gases:	helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
Warranty:	one year
Certifications:	CE, Japan
Compliance:	WEEE, RoHS

Verify hard-to-reach leaks using the small probe adaptor.



22658

For more details on Restek's Leak Detector, see page 137.

Description	qty.	cat.#	price
Leak Detector with Universal Charger Set (US, UK, European, Australian)	ea.	22839	
Soft-Side Carry/Storage Case	ea.	22657	
Small Probe Adaptor	ea.	22658	

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. The Restek Electronic Leak Detector may be used for determining trace amounts of hydrogen in a GC environment only.

tech tip

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.


21325

GC Installation Kit

This kit contains the tubing and fittings needed to add an additional GC to your lab bench. Kit includes: tubing cutter, one 1/8-inch x 1/4-inch reamer, one 7/16-inch wrench, one 1/2-inch wrench, four 1/8-inch brass tees, ten 1/8-inch brass nuts, ten brass front and back ferrules, and 50 feet (15.2 meters) of our instrument-grade cleaned 1/8-inch copper tubing.

Description	qty.	cat.#	price
GC Installation Kit	kit	21325	


23004

54-Piece Tool Kit

Set comes with screwdrivers, pliers, wrenches, sockets, scissors, clamps, and more. Durable, zippered, notebook-style carrying case for easy transport.

Description	qty.	cat.#	price
Tool Kit	kit	23004	

Plier Set

Includes 6-inch nose/side cutter, 6-inch wire cutter, and 6-inch adjusting pliers.



Description	qty.	cat.#	price
Plier Set	set	23033	


22999

Metric 9 Piece Ball-Point Hex Key Set

Includes 9 metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10mm.

Description	qty.	cat.#	price
Metric 9 Piece Ball-Point Hex Key Set	set	22999	


22998

12 Piece Ball-Point Hex Key Set

Includes 12 hex keys (Allen wrenches): .050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#	price
12 Piece Ball-Point Hex Key Set	set	22998	

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.



Description	qty.	cat.#	price
Torx Screwdriver Set	set	23034	



23002

5-in-1 Magnetic Screwdriver

Magnetic power tip holds bits and screws securely.

Description	qty.	cat.#	price
5-in-1 Magnetic Screwdriver	set	23002	


23001

Wrench Set

Includes 4-inch, 6-inch, and 8-inch adjustable wrenches.

Description	qty.	cat.#	price
Wrench Set	set	23001	



20192

1/16-Inch Tubing Cutter

- Produces square, smooth cuts in 1/16-inch tubing.
- Eliminates tubing distortion.
- Replaceable cutting wheel.

Description	qty.	cat.#	price
1/16" Tubing Cutter	ea.	20192	
Replacement Cutting Wheels	3-pk.	20185	



Ridgid® Tubing Cutter

- Excellent for cutting 1/8- or 1/4-inch metal tubing.
- Compact size is ideal for tight spaces.
- Replaceable cutting wheel.

Description	qty.	cat.#	price
Ridgid Tubing Cutter for 1/8" or 1/4" metal tubing	ea.	23011	
Replacement Cutting Wheels	2-pk.	23012	



22621

Ridgid® Heavy-Duty Tubing Cutter

- Specifically designed to cut 3/16-1 1/8" stainless steel tubing.
- Large knob and 6 individual bearings for more control with less turning.
- Convenient fold-away reamer.

Description	qty.	cat.#	price
Ridgid Heavy-Duty Tubing Cutter	ea.	22621	



20193

1/16-Inch Tubing Cutting Pliers

- Ideal for cutting 1/16-inch tubing.
- Cuts quickly, reducing distortion.
- Cuts clean, eliminating need for deburring.

Description	qty.	cat.#	price
1/16" Tubing Cutting Pliers	ea.	20193	



23029

8" x 6 1/4" x 4 1/4"
(20.3 x 15.9 x 10.8 cm)
Weight: 11 lbs. (5.0 kg)

SSI TC-20 Tube Cutting Machine

- Cuts 1/16", 1/8", or 1/4" tubing with inside diameter as small as 0.008".
- Electrically operated bench-top model.
- Handy dressing tool on the swing arm removes burrs and reams tubing.
- Voltage selectable 110–120/220–240 volts, 50–60Hz.*

Description	qty.	cat.#	price
SSI Tubing Cutter Machine	ea.	23029	
SSI Replacement Cutting Wheels	3-pk.	23030	

*Unit shipped set for 110–120 operating voltage. Switch to 220–240 volts by using alternate fuse and power cord (included).



20188

Tubing Burring & Reaming Tool

Removes burrs and reams tubing.

Description	qty.	cat.#	price
1/16" Tubing Dressing Tool	ea.	20188	
Replacement Insert for 1/16" Tubing Dressing Tool	ea.	20189	
1/8" Tubing Dressing Tool	ea.	20190	
Replacement Insert for 1/8" Tubing Dressing Tool	ea.	20191	



20134

Tubing Reamer

- Removes burrs from stainless steel tubing.
- For 1/4- or 1/8-inch tubing.
- Nonslip safety design.

Description	qty.	cat.#	price
Tubing Reamer	ea.	20134	


23009

Tubing Bender

- Bends 1/8-inch, 3/16-inch, or 1/4-inch tubing.
- Assists in making accurate left-hand, right-hand, or offset bends.

Description	qty.	cat.#	price
Tubing Bender	ea.	23009	


22626

Heavy-Duty Tube Bender

- Allows precise bending of 1/4" tubing.
- Patented swivel handle can be repositioned easily, allowing easy fabrication of bends up to 180°.
- Does not score or flatten tubing.
- Calibrated to show angle of bend.

Description	qty.	cat.#	price
Heavy-Duty Tube Bender	ea.	22626	

ResTape Teflon® Tape

- For threaded connections in a wide range of plumbing materials.
- Each roll is 1/2" x 260".
- Maximum temperature: 260°C.



Description	Uses	qty.	cat.#	price
ResTape Green PTFE	oxygen service*	ea.	22485	
ResTape Yellow PTFE	general gas service**	ea.	22486	
ResTape Grey PTFE	stainless steel fittings***	ea.	22487	

*Compatible with gaseous or liquid oxygen, and with many other gases and liquids.
**Compatible with a broad range of gases and liquids.
***Anti-galling. Also compatible with many other metals and polymers.


22625

Strap Wrench

- Securely grip large, hard to turn items.
- Safely grip sample cylinders without damage when installing valves.
- Large capacity: 8" diameter cylinder.

Description	qty.	cat.#	price
Strap Wrench	ea.	22625	


22627

Flexible Inspection Light

- Inspect inside surfaces of sample cylinders or other chambers.
- 14" reach.
- 100,000-hour LED life.

Description	qty.	cat.#	price
Flexible Inspection Light	ea.	22627	


22622

Swaging Tool

- Preswage compression fittings for easy installation.
- Ideal for installations in tight areas.
- For Swagelok® fittings only.

Description	qty.	cat.#	price
Swaging Tool	ea.	22622	


22623

Tee Wrench

- Hold 1/4" or 6mm tee or cross fittings secure in multiple orientations during installation.
- Fits easily in tool box, pouch, or belt.
- Cushioned vinyl grip with generous gripping area.
- For Swagelok® fittings only.

Description	qty.	cat.#	price
Tee Wrench	ea.	22623	


22624

Gap Inspection Gauge

- Confirm that fittings are sufficiently tightened.
- For use with 1/4", 3/8", 1/2" Swagelok® fittings.
- For Swagelok® fittings in new installations only.

Description	qty.	cat.#	price
Gap Inspection Gauge	ea.	22624	



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VIALS & SYRINGES
VIALS

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Top: Marcia Fulton, Assembly Technician
Bottom: Stephanie Sunner, International Customer Service

What's **NEW?** look for this circle

Siltek Coated Vials

For a highly inert surface, we recommend Siltek® deactivation for your vials:

- Maximizes inertness, minimizes sample breakdown—ideal for difficult matrices and reactive compounds.
- Inert over a wide sample pH range.
- Low bleed.
- Thermally stable.
- Any glass vial can be coated.



Our patented Siltek® deactivation process produces a highly inert glass surface that features high temperature stability, extreme durability, and low bleed. Try Siltek® deactivated vials for better recovery of sample analytes.

For Siltek® vials, add the corresponding suffix number to the vial catalog number.

Qty.	Siltek Deactivation		
100-pk.	-222	enquire	addl. cost
1000-pk.	-223	enquire	addl. cost

Septum Selection Guide

Materials	Compatibility	Incompatibility	Resealability	Max. Temp.
Red Rubber (synthetic)	acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	90°C
PTFE/ Natural Rubber	PTFE: resistance until punctured Rubber: acetone, ACN, alcohols, diethylamine, DMF, DMSO, phenol	aromatics, carbon disulfide, chlorinated solvents, hydrocarbon solvents	very good	90°C
PTFE/Silicone PTFE/Silicone/PTFE	PTFE: resistance until punctured Silicone: acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	205°C
Polyethylene	Good resistance to solvents and weak acids or bases. Unreactive with most chemicals, but some solvents cause softening or swelling.	hydrocarbon solvents	one-time use	175°C
Gray Chlorobutyl	acids or bases, water solutions, buffer solutions, oxygenated solvents, vegetable oils	aliphatic or aromatic hydrocarbons, halogenated solvents, mineral oils, strong acids	very good	100°C

Abbreviations: ACN - acetonitrile, DMF - dimethylformamide, DMSO - dimethylsulfoxide, THF - tetrahydrofuran

instrument **reference**

For 2.0mL, 11mm Crimp-Top Vials

The following instruments are compatible with 2.0mL, 11mm crimp-top vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
A.I.M.	CPS -100, 200
A.I.	42 vial tray
Agilent	1042, 1050, 1080, 1082, 1084, 1090, 1100, 5890, 6850, 6890, 7670A, 7671A, 7672, 7673A/B, 7683, 7890, 8042
Alcott	738
Alltech	570, 580 (standard tray)
Altex	
AMS	42
Antek	736 Unisampler, 738
ASC	
Carlo Erba/ Fisons	42 vial tray AS 800
Carnegie	CMA-250/200
Chrompack	CP 9000 GC Series
CTC	CTC A105S
Dani	ALS 39.80, 86.80
Delsi	
Dynatech	42 vial tray
Fisons	42 vial tray, AS800
GBC	
Gerstel	

Manufacturer	Instrument/Model #
Gilson	231 XL, 232 XL, 233 XL, Asted XL, Aspec XL
Gynkotek	Gina, others
Hitachi	AS-2000, AS-6000
IBM	
ICI	other than LC 1600
Infochroma	
Jasco	851-AS, AS-950
Kipp	
Kontron	360
LDC	Marathon, Promis, other than 713
L.E.A.P. Technologies	CTC A200S, CTC A105S
Magnus Scientific	
PerkinElmer	Autosystem GC, AI-1, Integral 4000, ISS 100, ISS 200, LC 600 42 vial tray, 420/B, 4900
Pharmacia LKB	2157-010
Precision Sampling	GC111, GC 311, LC 241-60
Phillips	LC-XP, 4247, 4710
Polymer-Labs	GPC 110/210
Pye	LCXP
S.G.E.	M280D

Manufacturer	Instrument/Model #
Sedere	
Shimadzu	SIL-10A, 10Ai, 10AxL
Siemens	AS 32, AS 200
Spark Holland	SPH 125, Marathon, Promis, Triathlon, Midas
Spectra-Physics	8875, 8880
Talbot	
Thermo Scientific	TRACE GC 2000, AS2000
TosoHaas	TSK-6080, AS-8010, AS-8020
Tosca 1	
Tracor	770, 771, 772
TSP	8875, 8880, AS 100/1000, AS 300/3000
Unicam	4710, LC-XP, 4247
United Technologies	
Varian/Rainin	Dynamax AI-IA, AI-200, Dynamax AI-3
Varian	8100/8200, 9100/9090/9095, Marathon
Waters	Alliance 2690

Vial Size Quick Reference Chart

All vials pictured are actual size, with description, Restek catalog number, and page number for quick reference.

WISP Vials

4.0mL Screw-Thread Step Vial



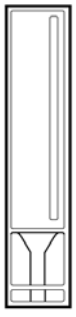
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4.0mL Clear Crimp-Top



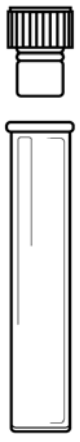
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700µL Limited Volume



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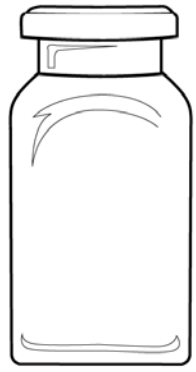
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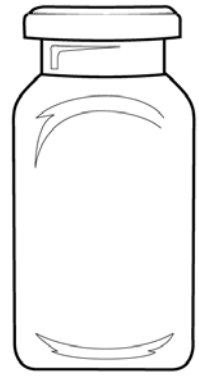
Headspace Vials

10mL Clear Flat Bottom



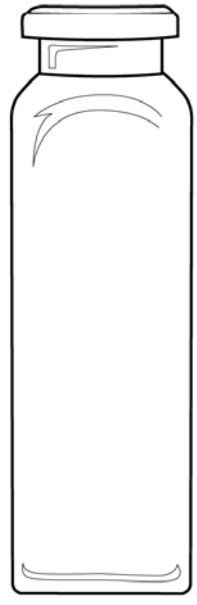
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10mL Clear Rounded Bottom



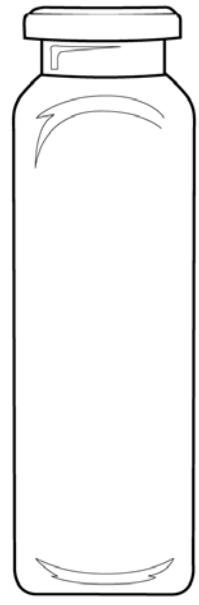
21164,
21165
Page 263

20mL Clear Flat Bottom



24685,
24686
Page 263

20mL Clear Rounded Bottom



21162,
21163
Page 263

Vial Size Quick Reference Chart

All vials pictured are actual size, with description, Restek catalog number, and page number for quick reference.

Limited Volume Inserts

250µL Big Mouth Insert



24516, 21779
Pages 256, 261

250µL Glass Flat Bottom



24510
Page 260

350µL Glass Flat Bottom Inserts



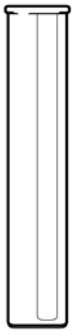
21780, 24517
Pages 256, 261

w/ID Ring



24692, 24693
Pages 256, 261

500µL Glass WISP Flat Bottom



21787, 21788
Page 262

100µL Glass or Polypropylene w/ Polypropylene Bottom Spring



24508, 21775
24512
Page 260

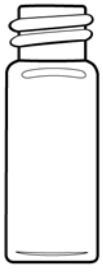
250µL Glass or Polypropylene w/ Bottom Spring



21776, 21777
Pages 256, 261, 262
24518
Page 256

8mm Screw-Thread Vials

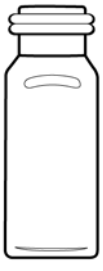
2.0mL Clear or Amber w/ White Graduated Marking Spot



24619, 24620, 24621, 24622
Page 259

9mm Short-Cap Vials

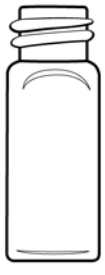
2.0mL Clear or Amber w/White Graduated Marking Spot



21154*, 21155*
*w/out white graduated marking spot
21140, 21141
21142, 21143
Page 258

10mm Screw-Thread Vials

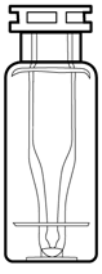
2.0mL Big Mouth Step Clear or Amber



24626, 24627, 24628, 24629
Page 260

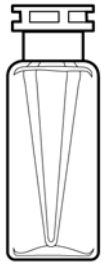
11mm Crimp-Top Vials

Limited Volume 100µL Glass Insert, Clear Plastic Vial



24653
Page 256

Limited Volume 100µL Polypropylene



24651, 24652
Page 256

2.0mL Snap Seal Style Clear or Amber Glass



21152, 21153, 24383, 24384, 24385, 24386
Page 256



24385



24383


21724

also **available**

See **page 266** for crimpers and decappers.



24673


21776



24518A


24692


24651

2.0mL Crimp-Top Vials, 12 x 32mm, 11mm

White graduated marking spots are a standard feature unless otherwise noted.

2.0mL Crimp-Top Vials, 12 x 32mm, 11mm

Description	100-pk.	1000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24383	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24385	24386
2.0mL Clear Glass Vial without Graduated Marking Spot	21152	21153

2.0mL, 11mm Aluminum Crimp Seals with Septa

Description	100-pk.	500-pk.	1000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21174	—	21175
Blue Seal, PTFE/Red Rubber Septa	24351	—	24352
Green Seal, PTFE/Red Rubber Septa	24353	—	24354
Red Seal, PTFE/Red Rubber Septa	24355	—	24356
Yellow Seal, PTFE/Red Rubber Septa	24357	—	24358
Mixed Colors, PTFE/Rubber Septa	—	21724	—
Silver Seal, PTFE/Silicone Septa	24359	—	24360
Blue Seal, PTFE/Silicone Septa	24361	—	24362
Green Seal, PTFE/Silicone Septa	24363	—	24364
Red Seal, PTFE/Silicone Septa	24365	—	24366
Yellow Seal, PTFE/Silicone Septa	24367	—	24368
Mixed Colors, PTFE/Silicone Septa	—	21725	—
Silver Seal, PTFE/Silicone/PTFE Septa	24369	—	24370

2.0mL Crimp Vial Convenience Kits: Vials, Caps, & Septa

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk.	1000-pk.
2.0mL Clear Vial, deactivated, PTFE/Natural Rubber Silver Seal	24671	24672
2.0mL Amber Vial, deactivated, PTFE/Natural Rubber Silver Seal	24673	24674
2.0mL Clear Vial, untreated, PTFE/Natural Rubber Silver Seal	21196	21197
2.0mL Amber Vial, untreated, PTFE/Natural Rubber Silver Seal	21198	21199
2.0mL Clear Vial, untreated, PTFE/Silicone Silver Seal	24646	24647
2.0mL Amber Vial, untreated, PTFE/Silicone Silver Seal	24648	24649

Inserts for 2.0mL Crimp-Top & Short-Cap, Screw-Thread Vials

Description	100-pk.	1000-pk.
50µL Glass, Big Mouth w/Bottom Spring	24513	21782
250µL Glass, Big Mouth Insert w/Bottom Spring	21776	21777
250µL Glass, Big Mouth Insert w/Glass Flange (Step Design)*	24516	21779
350µL Glass, Flat Bottom Insert	21780	24517
350µL Glass, Flat Bottom Insert w/ID Ring	24692	24693
250µL Polypropylene, Big Mouth, Bottom Spring	24518	—
250µL Polypropylene, Big Mouth, Bottom Spring w/Graduated Markings	24518A	—
250µL Polypropylene, Big Mouth, Top Flange	24519	—
250µL Polypropylene, Big Mouth, No Spring	24520	—

NEW!

*Not to be used with 9mm screw-thread vials.

2.0mL Crimp-Top Vial with 100µL Insert

- Plastic vial.
- Choice of glass or polypropylene insert.

Description	100-pk.	1000-pk.
100µL Polypropylene	24651	24652
100µL Glass Insert/Clear Plastic Vial	24653	—

2.0mL, 11mm Poly Crimp Seal Caps: Snap-on or Crimp

The patented Poly Crimp Seal is versatile, working as either a snap-on or crimp-top cap. Simply use a standard crimping tool to secure the Poly Crimp Seal onto any crimp-top vial. It's that easy! The Poly Crimp Seal offers the following benefits:

- Works on any crimp style vial.
- Crimps smoothly and easily—no more sharp edges from an aluminum crimp cap.
- Easily decaps using standard decapping tools.
- Eliminates inconsistent sealing that results from improper crimping.
- Unique design holds the septum firmly in place.
- Provides better seal than snap caps.*
- Meets CONEG standards. The Poly Crimp Seal is free of heavy metals and is easily disposed of or incinerated.







Description	100-pk.	400-pk.	1000-pk.
Clear Seal, PTFE/Red Rubber Liner	24433	—	24434
Clear Seal, PTFE/Silicone Liner	24443	—	24444
Blue Seal, PTFE/Silicone Liner	24445	—	24446
Clear Seal, PTFE/Silicone/PTFE Liner	24453	—	24454
Blue Seal, PTFE/Silicone/PTFE Liner	24455	—	24456
Mixed Color Seals, PTFE/Silicone/PTFE Liner	— —	21728	— —

*Based on continual use for 3–4 days.

tech tip

Compatibility concerns?
Refer to the Septum Selection Guide on **page 253**.

2.0mL, 11mm GC Snap-Top Cap with Septum

- Snaps on any crimp-style vial.
- Clear polypropylene cap provides a tighter seal than standard Snap-Top Cap.
- Good for pressurized injection systems.
- Save money! Use this snap cap when you don't need to crimp.

Description	100-pk.	1000-pk.
Polypropylene Cap, 10mil PTFE Liner	21729	21730
Polypropylene Cap, PTFE/Natural Rubber Septum	21731	21732
Polypropylene Cap, PTFE/Silicone Septum	21733	21734


21731

Certified Autosampler Vial Kits

National Scientific's certified vial kits provide the extra assurance that time after time the vial that you use upholds the rigorous manufacturing standards of National Scientific. These certified vial kits include your choice of vials and closures, conveniently packaged in benchtop storage compartments.

NEW!

- Certificates enclosed with each kit.
- Vials of clear or amber borosilicate glass, with ID marking spots.
- Closures with pre-inserted septa.
- Each kit sealed for integrity purposes.

Certification Parameters Include:

Vial Dimensions:	height, diameter, bottom thickness, neck length, thread profile, and annealing
Cap/Septum:	diameter, height, thread integrity, center flash, septa insertion, sealing/resealing test, residue by headspace GC, and extractables
Chemical Test:	
HPLC Test:	nonvolatile residue
GC Test:	volatile residue



22788


22792

Certified Vials, 2.0mL Screw-Thread Vials

Description	100-pk.
Assembled 2mL Clear Vial w/Marking Spot and Bonded PTFE/Silicone Slit Septa	22789
Assembled 2mL Amber Vial w/Marking Spot and Bonded PTFE/Silicone Slit Septa	22788
Unassembled 2mL Clear Vial w/Marking Spot and Bonded PTFE/Silicone Septa	22792
Unassembled 2mL Clear High Recovery Vial w/Marking Spot and Bonded PTFE/Silicone Slit Septa	22793
Unassembled 2mL Amber Vial w/Marking Spot and Bonded PTFE/Silicone Septa	22790
Unassembled 2mL Amber High Recovery Vial w/Marking Spot and Bonded PTFE/Silicone Slit Septa	22791

Agilent Compatible!



21140

Ideal for Agilent 7673 & other autosamplers that process 12 x 32mm crimp-top vials.



also **available**

Limited volume inserts are available on **page 256**.

2.0mL, 9mm Short-Cap, Screw-Thread Vials, 12 x 32mm

Are you tired of dealing with crimp-top vials, but worried about using screw-thread vials with your autosampler? If you want the performance of a crimp-top vial with the convenience of a screw-thread vial, these vials are the answer for you.

- Fit all 2.0mL, 12 x 32mm, crimp-top vial based autosamplers.
- Shorter screw cap allows the robotic autosampler to function properly.
- Wider opening prevents syringe problems.
- Dimensions are effectively identical to the crimp-top vial.
- Variety of colors and liner material.

2.0mL, 9mm Short-Cap, Screw-Thread Vials (vial only)

Description	100-pk.	1000-pk.
2.0mL Clear Vial, w/White Graduated Marking Spot	21140	21141
2.0mL Amber Vial, w/White Graduated Marking Spot	21142	21143
2.0mL Clear Vial, without Graduated Marking Spot	21154	21155

2.0mL, 9mm Short-Cap, Screw-Vial Closures (preassembled)

Description	100-pk.		500-pk.		1000-pk.	
Blue Cap, PTFE/Red Rubber Liner	24473		—	—	24474	
Mixed Colors, PTFE/Red Rubber Liner	—	—	24668		—	—
Blue Cap, PTFE/Silicone Liner	24485		—	—	24486	
Green Cap, PTFE/Silicone Liner	24487		—	—	24488	
Yellow Cap, PTFE/Silicone Liner	24493		—	—	24494	
Mixed Colors, PTFE/Silicone Liner	—	—	24669		—	—
Blue Cap, PTFE/Silicone/PTFE Liner	24497		—	—	24498	
Black Cap, PTFE/Silicone/PTFE Liner	24495		—	—	24496	
Natural Cap, PTFE/Silicone/PTFE Liner	24501		—	—	24502	
Red Cap, PTFE/Silicone/PTFE Liner	24503		—	—	24504	
Yellow Cap, PTFE/Silicone/PTFE Liner	24505		—	—	24506	
Mixed Colors, PTFE/Silicone/PTFE Liner	—	—	24670		—	—

instrument **reference**

For 2.0mL, 9mm Short-Cap, Screw-Thread Vials

The following instruments are compatible with 2.0mL, 9mm short-cap, screw-thread vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
Carlo Erba / Fisons	AS 800
Dani	ALS 39.80, 86.80
Dynatech	42 vial tray, LC2000
Gilson	231 XL, 232 XL, 233 XL, Aspec XL
Agilent	1042, 1050, 1080, 1082, 1084, 1090, 1100, 5890, 6890, 7670A, 7671A, 7672, 7673A/B, 7683, 7890, 8042
Hitachi	AS-2000, AS-6000
LDC	Marathon, Promis

Manufacturer	Instrument/Model #
L.E.A.P. Technologies	CTC A200S
PerkinElmer	AI-1, ISS 100, ISS 200, LC 600 42 vial tray
Shimadzu	SIL-10A, 10Ai, 10AxL
Spark Holland	SPH 125, Marathon, Promis
Spectra-Physics	8875, 8880
Thermo Scientific	TRACE GC 2000, AS2000
Varian	8100/8200, Marathon
Waters	Alliance 2690

NEW!



2.0mL Sample Vial Racks

- Racks feature alphanumeric indexing for easier vial identification.
- Racks can be stacked for efficient storage.
- Fits most 2.0mL, 12 x 32mm vials (vials sold separately).

Description	Capacity	qty.	cat.#	price	qty.	cat.#	price
Polypropylene Storage Rack for 12 x 32mm Vials	50 vials, 5 x 10	ea.	22856		5-pk.	22857	

2.0mL Screw-Thread Vials, 12 x 32mm, 8mm/425 Thread

- Fit all 2.0mL, 12 x 32mm, screw-thread 8mm/425 vial-based autosamplers.
- Vaporization is minimized over shorter vials.



2.0mL, 8mm Screw-Thread Vials (vial only)

Description	100-pk.	1000-pk.
2.0mL Clear Vial, White Graduated Marking Spot	24619	24620
2.0mL Amber Vial, White Graduated Marking Spot	24621	24622

2.0mL, 8mm Caps and Septa (preassembled)

Description	100-pk.	1000-pk.
8/425 Black Cap w/Red PTFE/Silicone Septa, 0.065"	21149	21720
8/425 Black Top Hat PTFE/Silicone Septa	21721	21722

Polypropylene Caps & Septa for 2.0mL, 8mm Screw-Thread Vials

Description	100-pk.	1000-pk.
Black, Open-Hole Cap	21176	21177
8mm x 0.045" Red PTFE/Silicone	21178	21179
8mm x 0.065" Red PTFE/White Silicone	21795	21147

2.0mL Convenience Kits: Vials w/Preassembled Caps and Septa Packed Separately

- Black polypropylene open-hole caps and 8mm red PTFE/silicone septa, 0.065".
- Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk.	1000-pk.
2.0mL Clear Vial, Silcote CL7-Deactivated	24638	24639
2.0mL Amber Vial, Silcote CL7-Deactivated	24640	24641
2.0mL Clear Vial, untreated	21192	21193
2.0mL Amber Vial, untreated	21194	21195

2.0mL Preassembled Vial Kits: Screw-Thread, Unmarked Vials, Septa, and Caps

Caps attached to vials.

Description	100-pk.	1000-pk.
Clear Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24630	24631
Amber Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24632	24633
Clear Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24634	24635
Amber Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24636	24637

*Best fit for Shimadzu.
**Best fit for Varian.

instrument **reference**

For 2.0mL, 8mm Screw-Thread Vials

The following instruments are compatible with 2.0mL, 8mm screw-thread vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
A.I.M.	CPS-100, 200
Alcott	738
Alltech	570
ASC	
Beckman	501, 502, 507
Carlo Erba/Fisons	AS 800, 8000
Dani	ALS 39.80, 86.80
Dynatech	42 vial tray
Gilson	231XL, 232XL, 233XL, Asted XL, Aspec XL
Gynkoteck	Gina, others
Hitachi	S6551, L-7200, L-7250
IBM	
ICI	All except LC1600
Infochroma	
Jasco	851-AS, AS-950, LC800 & 900 series
Kipp	
Kontron	360, 460
LDC	All except 713
L.E.A.P. Technologies	CTC A200S
Magnus Scientific	

Manufacturer	Instrument/Model #
PerkinElmer	Autosystem GC, 420/B, 4900
Pharmacia LKB	2157-010
Precision Sampling	GC111, GC 311, LC241-60
Phillips	LC-XP, 4247, 4710
S.G.E.	M280D
Sedere	
Shimadzu	AOC-8B/9, SIL-6A, AOC14/1400, AOC-17, SIL-6B, -9A, -8A, SIL-10A, 10Ai, 10AxL
Spark Holland	Marathon, Promis, Tiathalon, Midas
Spectra-Physics	8875, 8880
Talbot	
TOA	ICA5450
TosoHaas	TSK-6080, AS-8010, AS-8020
TSP	8875, 8880, AS100/1000, AS300/3000
Unicam	4700LC, LC-XP, 4247
United Technologies	
Varian/Rainin	Dynamax AI-3AI-IA, AI-2W
Varian	8100/8200, 8035, 8000 Series, Marathon, 8055, 8085, 9100/9090/9095, 3800 GC
Waters	Alliance 2690

Screw-Thread Vials



Inserts for 2.0mL, 8mm Screw-Thread Vials

Description	100-pk.		1000-pk.	
100µL Glass w/Polypropylene Bottom Spring	24508		21775	
250µL Glass, Flat Bottom	—	—	24510	
250µL Glass, Flat Bottom w/ID Ring	—	—	24691	
100µL Polypropylene, No Spring	24511		—	—
100µL Polypropylene, Bottom Spring	24512		—	—



2.0mL, 8mm Screw-Thread Vials with 100µL Insert

- Plastic vials.
- Choice of glass or polypropylene insert.

Description	100-pk.	1000-pk.	
100µL Polypropylene	24623	24624	
100µL Glass Insert/Clear Plastic Vial*	24625	—	—

*Amber glass insert/clear plastic vial available on request (1,000-packs only).



2.0mL Big Mouth Step Design Screw-Thread Vials, 12 x 32mm, 10mm/425 Thread

- 40% larger opening than other vials.
- Step profile automatically centers glass flange limited volume inserts.
- Preassembled caps with septa, with or without vials.
- Designed for Waters Alliance® autosamplers.

The Big Mouth Step Vial System has a larger ID than conventional vials and incorporates a neck finish that is uniquely designed to allow the insert to be precisely aligned in the center of the vial. This precise alignment provides maximum sample withdrawal and eliminates any chance of missed injections.

2.0mL Big Mouth Step Screw-Thread Vials (vial only)

Description	100-pk.	1000-pk.
2.0mL Clear Step Vial, White Graduated Marking Spot	24626	24627
2.0mL Amber Step Vial, White Graduated Marking Spot	24628	24629



2.0mL Caps and Septa for Big Mouth Step Vials

Description	1000-pk.
Caps w/Septa, Pre-Assembled, Red PTFE/White Silicone, 0.060"	24677
Septa Only, Red PTFE/White Silicone, 0.060"	21148
Cap w/Septa, Pre-Assembled, PTFE/Silicone/PTFE, 0.040"	21723

also **available**

See **page 261** for preassembled vial kits and limited volume inserts.

tech tip

Compatibility concerns?
Refer to the Septum Selection Guide on **page 253**.

instrument **reference**

For 2.0mL, 10mm Screw-Thread Vials

The following instruments are compatible with 2.0mL, 10mm screw-thread vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
Alcott	738
Alltech	570
Altex	
ASC	
Beckman	501, 502, 507
L.E.A.P. Technologies	CTC A200S
Shimadzu	SIL-10A, 10Ai, 10AxL
Varian	8100/8200
Waters	Alliance 2690

Preassembled Vial Kits and Limited Volume Inserts for 2.0mL Big Mouth Step Design Screw-Thread Vials, 12 x 32mm, 10mm/425 Thread

2.0mL Big Mouth Step Vial Kits w/Black Caps (preassembled)

Caps attached to vials.

Description	100-pk.	1000-pk.
2.0mL Clear Vial, PTFE/Silicone/Red PTFE Septa, 0.040"	24675	24676
2.0mL Clear Vial, Red PTFE/Silicone Septa, 0.065"	24642	24643
2.0mL Amber Vial, Red PTFE/Silicone Septa, 0.065"	24644	24645

2.0mL Big Mouth Step Inserts

Description	100-pk.	1000-pk.
250µL Glass, Big Mouth Insert w/Bottom Spring	21776	21777
350µL Glass, Flat Bottom Insert	21780	24517
350µL Glass, Flat Bottom Insert w/ID Ring	24692	24693
250µL Glass, Big Mouth Insert w/Glass Flange (Step Design)*	24516	21779

Polypropylene inserts available on request (1,000-packs only).
*Not to be used with 9mm screw-thread vials.



WISP Vials

4.0mL WISP 48 Crimp-Top 13mm Vials, 15 x 45mm, Snap Seal

4.0mL WISP 48 Crimp-Top Vial (vial only)

Description	100-pk.	1000-pk.
4.0mL Clear Vial, White Graduated Marking Spot	24658	24659



Aluminum Seals w/Septa for 4.0mL WISP Crimp-Top Vials

Description	100-pk.	1000-pk.
Silver, PTFE/Natural Rubber	21753	21754
Silver, PTFE/Silicone	21755	21756

13mm Crimper and Decapper

Good for WISP-type vials.

Description	qty.	cat.#	price
13mm Crimper	ea.	21739	
13mm Decapper	ea.	21740	



instrument **reference**

For 4.0mL WISP 48 Style Vials

The following instruments are compatible with 4.0mL WISP 48 style vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
Bruker	LC 51
Hitachi	L-7200, L7250
Phillips	LC-XP
Shimadzu	AOC-14/1400, AOC-17, SIL-2AS

Manufacturer	Instrument/Model #
TosoHaas	TSK-6080, AS-8010, AS-8020
Unicam	LC-XP
Waters	48-pos. M700, 710, 717+

also **available**

For other crimpers/decappers, see **page 266**.



24654

4.0mL WISP 48 Screw-Thread Step Vials (15 x 45mm, 13/425)

4.0mL WISP 48 Screw-Thread Step Vials (vials only)

Description	100-pk.	1000-pk.
4.0mL Clear Step Vial, White Grad. Marking Spot	24654	24655
4.0mL Amber Step Vial, White Grad. Marking Spot	24656	24657

4.0mL WISP 48 Caps and Septa

Description	100-pk.	1000-pk.
Top Hat, PTFE/Silicone Septa	21745	21746
Pre-Assembled, Red PTFE/Silicone, 0.065"	21743	21744
Caps, Black, Polypropylene, Open-Hole	21741	21742
Septa, Red PTFE/Silicone, 0.040"	21751	21752
Septa, Red PTFE/Silicone, 0.060"	21749	21750

4.0mL WISP Inserts

Description	100-pk.	1000-pk.
500µL, Glass, WISP, Flat Bottom**	21787	21788

Polypropylene inserts available on request (1,000-packs only).
**Also fit 4.0mL Snap Seal Vials (page 261).


24664 24662 24678

1.0mL WISP 96 Style Shell Vials, 8 x 40mm

Available in 3 styles.

1.0mL WISP 96 Style, 8 x 40mm Shell Vials

Description	200-pk.	1000-pk.
1.0mL Clear Vial	24662	24663
1.0mL Amber Vial	24664	24665
1.0mL Polypropylene Vial	24678	24679
700µL Limited Volume Polypropylene Vial	24680	24681


21776

Limited Volume Inserts for Shell Vials

Description	100-pk.	1000-pk.
250µL Glass, Big Mouth Insert w/Bottom Spring	21776	21777

did you **know**?

Restek can provide services to coat chromatography vials and make them inert to most organics. Our Siltek® coating can create a highly inert surface for your testing purposes. See **page 253** for more details.

instrument **reference**

For 1.0mL WISP 96 Style Vials

The following instruments are compatible with 1.0mL WISP 96 style vials. For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
Hitachi	L-7200
Waters	96-position M-700, 710, 717+

Crimp-Top and Screw-Top Headspace Vials

- 6, 10, 20, and 27mL vials available with 20mm crimp-seal finish.
- 10 and 20mL screw-top vials available with 18mm screw-thread finish.
- Compatible with Gerstel and CTC/Leap Technologies headspace samplers when used with magnetic closures.



Screw-Top Headspace Vials (18mm)

Description	Dimensions	qty.	cat.#	price
20mL Screw-Top Vial	22 x 75mm	125-pk.	22794	
10mL Screw-Top Vial	22 x 45mm	125-pk.	22795	

Magnetic Screw-Thread Caps

Description	qty.	cat.#	price
18mm Magnetic Screw-Thread Cap w/PTFE/Silicone	125-pk.	22796	
18mm Magnetic Screw-Thread Cap w/PTFE/Silicone for SPME	125-pk.	22797	
18mm Magnetic Screw-Thread Cap w/Pre-slit PTFE/Silicone for SPME	125-pk.	22798	
18mm Magnetic Screw-Thread Cap w/PTFE/Blue Chlorobutyl	125-pk.	22799	


18mm magnetic screw-thread caps

Headspace Crimp Vials (20mm)

Description	Dimensions	100-pk.	1000-pk.
a) 6mL Clear Vial	22 x 38mm	21166	21167
b) 10mL Clear Vial, Flat Bottom	23 x 48mm	24683	24684
c) 10mL Clear Vial, Rounded Bottom	23 x 48mm	21164	21165
d) 20mL Clear Vial, Flat Bottom	23 x 75mm	24685	24686
e) 20mL Clear Vial, Rounded Bottom	23 x 75mm	21162	21163
f) 27mL Clear Vial	30 x 60mm	21160	21161

a) - f) vial to instrument compatibility are designated in instrument reference chart below.


21166

Aluminum Seals w/Septa (20mm, preassembled)

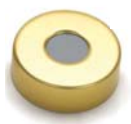
Description	100-pk.	1000-pk.
Silver Seal w/PTFE/Gray Butyl Rubber	21761	21762
Silver Seal w/PTFE/Silicone	21763	21764
Pressure Release Silver Seal w/PTFE/Gray Butyl Rubber Septum	21765	21766
Pressure Release Silver Seal w/PTFE/Silicone Septum	21767	21768
20mm Magnetic Crimp Cap w/Teflon/Silicone Septum (tan/white) with 8mm Hole	22831	22832
20mm Magnetic Crimp Cap w/Teflon/Silicone Septum (tan/white) with 5mm Hole	22833	22834
20mm Magnetic Crimp Cap w/PTFE/Butyl Septum with 8mm Hole	22835	22836

5mm hole is compatible with the following systems: Carlo Erba HS500/HS800, CTC 500, Fisons HS500/HS800 and Varian/Chrompack 9020/25. 8mm hole is compatible with the Combi Pal.

tech tip

Compatibility concerns?
Refer to the Septum Selection Guide on **page 253**.


21761


22835

instrument reference

For Headspace Vials

The following instruments are compatible with the headspace vials listed above (as letter designated above). For further information or questions, please contact your Restek sales representative or technical service.

Manufacturer	Instrument/Model #
a) Carlo Erba	HS 500, HS 800
Agilent	Headspace
PerkinElmer	ISS 200
b) A.I.	Headspace
Carlo Erba	HS500, HS 800
Cueni	Headspace
Dani	HSS 39.50, HSS 86.50
Agilent	Headspace

Manufacturer	Instrument/Model #
c) A.I.	Headspace
Cueni	Headspace
Dani	HSS 39.50, HSS 86.50
L.E.A.P. Technologies	HS 500
PerkinElmer	Autosystem GC, F40, F45, HS 6, Integral 4000, HS 40
Tekmar	7000, 7000/7050
Varian	Genesis

Manufacturer	Instrument/Model #
d) A.I.	Headspace
Carlo Erba	HS 500, HS 800
CTC	Headspace
Cueni	Headspace
Dani	HSS 39.50, HSS 86.50, SPT 37.50
Agilent	Headspace
e) A.I.	Headspace
Cueni	Headspace

Manufacturer	Instrument/Model #
e) Dani	HSS 39.50, HSS 86.50, SPT 37.50
L.E.A.P. Technologies	HS 500
PerkinElmer	Autosystem GC, F40, F45, HS 6, Integral 4000, HS 40
Tekmar	7000, 7000/7050
Varian	Genesis
f) Shimadzu	HSS-2B


22701

2.0mL Versa Vials, Glass, 12 x 32mm

- Increased neck length for accommodating fluctuations in robotic arm settings.
- Eliminate cracked necks, breakage and dangerous sharp edges, using soft Versa Vial PTFE/silicone plugs.
- Largest target area available, ideal for sampling and pipet use.
- Vials available with or without graduated marking spots.
- Patent pending.

Description	100-pk.	1000-pk.
2.0mL Clear Glass Vial	22701	22702
2.0mL Clear Glass Vial w/Graduated Marking Spot	22703	22704
2.0mL Amber Glass Vial	22697	22698


22705

1.5mL Versa Vials, Polypropylene, 12 x 32mm

Description	100-pk.	1000-pk.
1.5mL Polypropylene Vial	22705	22706


22707

Versa Vial Inserts

Description	100-pk.	1000-pk.
250µL Glass Insert w/Glass Flange	22707	— —
250µL Polypropylene w/Flange	22709	22710
250µL Glass Flat Bottom Insert	22711	22712


22715

Versa Vial Plugs

Description	100-pk.	1000-pk.
12mm, Green Polyethylene Plug	22713	22714
12mm, Grey Chlorobutyl/Siciconized Plug	22715	22716
12mm, White PTFE/Silicone Plug	22717	22718
12mm, White PTFE/Silicone Plug w/Slit*	22719	22720

*Eliminates needle damage to plug.


21798 26122

Pre-Cleaned Volatile Organic Analyte (VOA) Sampling Vials

- Container, liner and closure cleaned and assembled.
- Clear or amber.
- Open top caps.
- Teflon® faced 0.125" silicone septa.
- Each case lot numbered.

Description	Screw-Thread Size	qty.	cat.#	price
20mL Clear Pre-Cleaned VOA Vials	24mm-400	72-pk.	21798	
20mL Amber Pre-Cleaned VOA Vials	24mm-400	72-pk.	21799	
40mL Clear Pre-Cleaned VOA Vials	24mm-400	72-pk.	21796	
40mL Amber Pre-Cleaned VOA Vials	24mm-400	72-pk.	21797	
60mL Collection Vials, Clear Glass, for ASE 200	24mm-400	72-pk.	26121	
60mL Collection Vials, Amber Glass, for ASE 200	24mm-400	72-pk.	26122	
Replacement Septa for 20, 40 & 60mL Vials and 250mL Bottles (24mm Teflon-lined 0.125" silicone septa)		100-pk.	24694	

2.0mL Sample Vial Racks

NEW!

- Racks feature alphanumeric indexing for easier vial identification.
- Racks can be stacked for efficient storage.
- Fits most 2.0mL, 12 x 32mm vials (vials sold separately).

Description	Capacity	qty.	cat.#	price	qty.	cat.#	price
Polypropylene Storage Rack for 12 x 32mm Vials	50 vials, 5 x 10	ea.	22856		5-pk.	22857	



Snap Rack Storage Unit

The Snap Rack sample vial rack is an innovation that allows you to keep your vials and caps together. Constructed of tough polypropylene, the Snap Rack holds 50 12 x 32mm size vials. The Snap Rack is stackable too! Simply "snap" one rack on top of another. Double rack capacity by snapping a rack across another rack.

Description	Capacity	qty.	cat.#	price
50 Position Snap Rack for 12 x 32mm Vials	50	ea.	24521	



Snap Rack vial racks are stackable for maximum storage of vials and caps!

Accuform® Micro-Vials with Screw Threads

- Two sizes available.
- Tapered for high recovery of contents.
- Work with Mininert® sampling valves.

Description	Screw Thread Size	qty.	cat.#	price
1.0mL Micro-Vial, Accuform Borosilicate Glass, Screw Thread, Graduated, Open Top Closure (attached)	13mm–425	12-pk.	21050	
3.0mL Micro-Vial, Accuform Borosilicate Glass, Screw Thread, Graduated, Open Top Closure (attached)	20mm–400	12-pk.	21051	



21050 21051

Mininert® Precision Sampling Valves for Vials

Mininert® valves are very convenient for repetitive sampling and limit content exposure to the silicon septum. Models are available for screw-cap and crimp-top vials. The crimp-top valve for 20mm ID glassware slides into the neck of the vial. Turn the threaded flange to secure a tight fit.

Description	Thread Size	qty.	cat.#	price
13mm Mininert Screw Cap	13mm–425	12-pk.	24900	
15mm Mininert Screw Cap	15mm–425	12-pk.	24901	
18mm Mininert Screw Cap	18mm–400	12-pk.	24902	
20mm Mininert Screw Cap	20mm–400	12-pk.	24903	
24mm Mininert Screw Cap	24mm–400	12-pk.	24904	
20mm Mininert Crimp Top	—	12-pk.	24905	
Replacement Septa	—	50-pk.	24906	
Septum Insertion Tool	—	ea.	24907	



24903 24900



24905



Universal plug set for battery charger included in all kits.

Electronic Rechargeable Crimpers and Decappers

- Easy to use; comfortable grip.
- Hundreds of operations from one charge.
- Adjustable crimping force.
- New battery allows for faster charge cycle.
- All kits include a universal plug set for the battery charger.
- For 11mm and 20mm caps.

The redesigned electronic crimpers and decappers have a 4.8 volt battery installed. The battery allows for quick, powerful operation and a faster charge cycle, minimizing down-time. Charging the battery takes thirty minutes to two hours. The universal plug set includes U.S., European, UK, and Australian plug clips. Each kit includes a tool, a 4.8v battery, which allows for a faster charge cycle, and a universal plug set for the battery charger.

Capping

Easily crimp caps on standard crimp vials.



Decapping has never been easier!

one. . .



two. . .



three!



Description	qty.	cat.#	price
11mm Electronic Crimper	kit	22338	
11mm Electronic Decapper	kit	22340	
20mm Electronic Crimper	kit	22339	
20mm Electronic Decapper	kit	22341	
Replacement Battery for Electronic Crimpers and Decappers	ea.	22342	

Safer than removing caps with pliers, knives or screwdriver blades!



Decapper



Crimper

Manual Crimpers and Decappers

Each crimper is adjustable for optimized aluminum cap sealing performance and is comfortable enough for prolonged use. If you need to save, transfer, or dispose of your samples, our decapper allows you to remove a crimp-top cap safely and easily.

Description	qty.	cat.#	price
8mm Crimper	ea.	21735	
8mm Decapper	ea.	21736	
11mm Crimper	ea.	21170	
11mm Decapper	ea.	21171	
13mm Crimper	ea.	21739	
13mm Decapper	ea.	21740	
20mm Crimper	ea.	21737	
20mm Decapper	ea.	21738	







The Claw and The Claw Holder Kit



- Easily removes hot liners from injection ports.
- 4mL vials (not included) can be changed out and disposed of when dirty.

Never again will you have to burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4mL vial situated in the Claw holder until ready for reuse.

Description	qty.	cat. #	price
The Claw	ea.	26261	
The Claw Holder Kit (includes The Claw and holder)	kit	26262	
4.0mL Clear Vial, White Graduated Marking Spot	100-pk.	24658	



Injector Mounting Posts and Parking Post for Agilent 7673 & 7683 Autosamplers

- Performance equivalent to original manufacturer's parts.
- For Agilent 7673 & 7683 series autosamplers.

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 5890 GCs	18597-60805	ea.	21236	
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 6890 GCs	07673-21140	ea.	21237	
Injector Mounting Post for Agilent 7683 Series Autosamplers for use with 6850/6890 GCs	G2613-20500	ea.	21172	
Parking Post for Agilent 7673/7683 Series Autosamplers for use with 5890/6890/7890 GCs	05890-61525	ea.	22343	

Turret Tray Assembly for Agilent 5890/6890 GC



- Holds sample, waste and solvent vials.

Description	Similar to Agilent part #	qty.	cat.#	price
Turret Tray Assembly for Agilent 5890/6890 GC	07673-60605	ea.	22855	

Carriage Motor for Agilent 7673A & 7673B Autosamplers



- Meets original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Carriage Motor for Agilent 7673A and 7673B	07673-60890	ea.	22693	

Autosampler Plunger Carrier Belt for Agilent 7673A & 7673B Autosamplers



- All parts meet or exceed original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Autosampler Plunger Carrier Belt for Agilent 7673A and 7673B	07673-61275	ea.	22695	

Injector Turret Motor for Agilent 7673A & 7673B Injectors



- Meets original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#	price
Injector Turret Motor for Agilent 7673A & 7673B Injectors	07673-60810	ea.	22337	

VIALS & SYRINGES
SYRINGES

Syringe Basics 269
Autosampler Syringes 270-277
Microliter Syringes 278-279
Micro-Volume Syringes 280
Gas-Tight Syringes 281-284
Precision Sampling Syringes 284
Air Monitoring Syringes 284
HPLC Syringes 285-289
Plastic Syringes 289





Top: Sabah Dabby, Bryan Wolcott, Tina Welch
Bottom: Jesse Weaver, Receiving

What's **NEW?** look for this circle

Syringe Basics

Needle Gauge Chart

Gauge	Nominal OD		Nominal ID	
26s	0.019 in.	0.47mm	0.0050 in.	0.13mm
26	0.018 in.	0.46mm	0.0102 in.	0.26mm
25	0.021 in.	0.51mm	0.0102 in.	0.26mm
23s	0.025 in.	0.64mm	0.0060 in.	0.15mm
23	0.025 in.	0.64mm	0.0132 in.	0.34mm
22s	0.028 in.	0.72mm	0.0060 in.	0.15mm
22	0.028 in.	0.72mm	0.0162 in.	0.41mm

s (after gauge) = smaller ID with thicker walls

Needle Point Style

Restek offers several different point styles on syringe and needle products. Choose one based on your application.



Point Style 2, BV: beveled needle tip. Recommended for optimum septum penetration and prevention of septum coring.



Point Style 3, LC: square/blunt needle tip. For use with HPLC injection valves and for sample pipetting.



Point Style 5: conical needle with side hole. Liquid samples are filled and dispensed through the side hole.



Point Style H: domed needle tip with side hole. Liquid samples are filled and dispensed through the side hole. The solid tip minimizes septum damage.



Point Style Agilent/Cone: special conical style needle point used exclusively on syringes for autosamplers.

did you **know**?

Syringes and needles manufactured by Hamilton Company and SGE are intended for scientific research and laboratory use only and are not intended for human *in vivo* use.

also **available**

We can supply many additional sizes. Call us if you don't see exactly what you need.

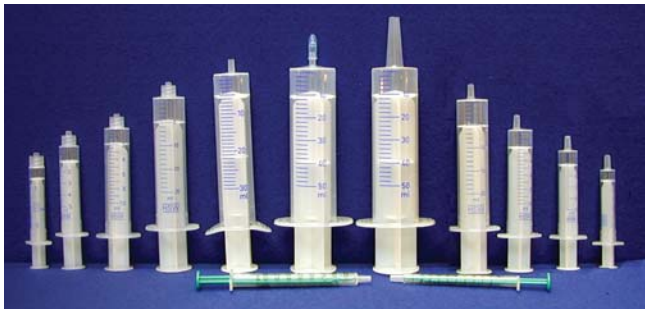
Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

NORM-JECT® Syringes

NORM-JECT® syringes are latex-free, contain no rubber, no silicone oil, styrene or DEHP and are DNA-free. These syringes are the choice for any situation needing an inert, nonreactive syringe. Because of their composition, they are indicated for chromatography and many other laboratory procedures. They are more chemically resistant than rubber-tipped syringes and are manufactured from only laboratory grade polypropylene and polyethylene. These unique plastic syringes have a positive safety stop to prevent accidental spills. NORM-JECT® syringes are individually sterile strip packed.



Description	qty.	cat.#	price
1mL Tuberculin[1]	100-pk.	22766	
3mL Luer Slip Centric Tip	100-pk.	22767	
5mL Luer Slip Centric Tip[2]	100-pk.	22768	
10mL Luer Slip Eccentric Tip[2]	100-pk.	22769	
20mL Luer Slip Eccentric Tip[2]	100-pk.	22770	
30mL Luer Slip Eccentric Tip	50-pk.	22771	
50mL Luer Slip Eccentric Tip[2]	30-pk.	22772	
3mL Luer Lock Tip	100-pk.	22773	
5mL Luer Lock Tip[2]	100-pk.	22774	
10mL Luer Lock Tip[2]	100-pk.	22775	
20mL Luer Lock Tip[2]	100-pk.	22776	
30mL Luer Lock Tip	50-pk.	22777	
50mL Luer Lock Tip[2]	30-pk.	22778	





Great for use with Restek syringe filters! See **page 363**.

[1]Dose saver design with low dead space plug on the piston to minimize waste.
[2]The 5mL has graduations to 6mL, 10mL has graduations to 12mL, 20mL has graduations to 24mL and 50mL has graduations to 60mL.

Autosampler Syringes for Agilent GCs



Hamilton 10µL, Autosampler Cemented Needle for Agilent 7673, 7683, 6850 Autosamplers
20167



SGE Removable Needle for Agilent 7673, 7683, 6850 Autosamplers
24793

Standard Microliter Syringes for Agilent 7673, 7683, and 6850 Autosamplers

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
0.5µL	ASRN	23s	1.71"	Agilent	7000.5	86276	ea.	24895	
0.5µL	ASRN	26s	1.71"	Agilent	7000.5	86274	ea.	21221	
5µL	ASRN	23s	1.71"	Agilent	75	87957	ea.	20172	
5µL	ASN	23s	1.71"	Agilent	75	87987	ea.	20168	
5µL	ASN	23s	1.71"	Agilent	75	87990	6-pk.	20170	
5µL	ASN	26s	1.71"	Agilent	75	87988	ea.	24592	
5µL	ASN	26s	1.71"	Agilent	75	87989	6-pk.	21230	
5µL	ASRN	23s–26s	1.71"	Agilent	75	87959	ea.	21223	
5µL	ASN	23s–26s	1.71"	Agilent	75	87993	ea.	24593	
5µL	ASN	23s–26s	1.71"	Agilent	75	87994	6-pk.	24594	
10µL	ASRN	23s	1.71"	Agilent	701	80357	ea.	20171	
10µL	ASN	23s	1.71"	Agilent	701	80387	ea.	20167	
10µL	ASN	23s	1.71"	Agilent	701	80390	6-pk.	20169	
10µL	ASRN	26s	1.71"	Agilent	701	80358	ea.	24597	
10µL	ASN	26s	1.71"	Agilent	701	80388	ea.	24595	
10µL	ASN	26s	1.71"	Agilent	701	80389	6-pk.	24599	
10µL	ASRN	23s–26s	1.71"	Agilent	701	80359	ea.	24598	
10µL	ASN	23s–26s	1.71"	Agilent	701	80393	ea.	24596	
10µL	ASN	23s–26s	1.71"	Agilent	701	80391	6-pk.	24600	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
0.5µL	R	23	42mm	Cone	0.5BR-HP-0.63	000410	ea.	24791	
0.5µL	R	26	42mm	Cone	0.5BR-HP-0.47	000400	ea.	24790	
5µL	R	23	42mm	Cone	5R-HP-0.63	001815	ea.	24793	
5µL	F	23	42mm	Cone	5F-HP-0.63	001810	ea.	24781	
5µL	F	23	42mm	Cone	SK-5F-HP-0.63	001814	6-pk.	24783	
5µL	F	26	42mm	Cone	5F-HP-0.47	001800	ea.	24780	
5µL	F	26	42mm	Cone	SK-5F-HP-0.47	001804	6-pk.	24782	
5µL	R	23–26s	42mm	Cone	5R-HP-0.63/0.47	001825	ea.	21211	
5µL	F	23–26s	42mm	Cone	5F-HP-0.63/0.47	001821	ea.	21210	
5µL	F	23-26s	42mm	Cone	SK-5F-HP-0.63/0.47	001822	6-pk.	21214	
10µL	R	23	42mm	Cone	10R-HP-0.63	002815	ea.	24795	
10µL	F	23	42mm	Cone	10F-HP-0.63	002810	ea.	24785	
10µL	F	23	42mm	Cone	SK-10F-HP-0.63	002814	6-pk.	24787	
10µL	R	26	42mm	Cone	10R-HP-0.47	002805	ea.	24794	
10µL	F	26	42mm	Cone	10F-HP-0.47	002800	ea.	24784	
10µL	F	26	42mm	Cone	SK-10F-HP-0.47	002804	6-pk.	24786	
10µL	R	23–26s	42mm	Cone	10R-HP-0.63/0.47	002825	ea.	21213	
10µL	F	23–26s	42mm	Cone	10F-HP-0.63/0.47	002821	ea.	21212	
10µL	F	23–26s	42mm	Cone	SK-10F-HP-0.63/0.47	002822	6-pk.	21215	

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



also **available**

Looking for Restek Genuine Replacement Parts for Agilent Instruments?
See **pages 146-172**.

Gas-Tight Teflon®-Tipped Syringes for Agilent 7673, 7683, and 6850 Autosamplers



Hamilton 10µL Gas-Tight Syringe
24894

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
5µL	ASN	23s	1.71"	Agilent	175	80074	ea.	24893	
10µL	ASN	23s	1.71"	Agilent	1701	80080	ea.	24894	
10µL	ASRN	23s	1.71"	Agilent	1701	80087	ea.	21224	
10µL	ASRN	26s	1.71"	Agilent	1701	80088	ea.	21228	
10µL	ASRN	23s–26s	1.71"	Agilent	1701	80089	ea.	21229	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	F	23	42mm	Cone	10F-HP-GT-0.63	002812	ea.	24789	
10µL	R	23	42mm	Cone	10R-HP-GT-0.63	002818	ea.	24797	
10µL	R	23–26	42mm	Cone	10R-HP-GT-0.63/0.47	002829	ea.	21220	

Large Volume Syringes for Agilent 7673, 7683, and 6850 Autosamplers

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
25µL	R	23	42mm	Cone	25R-HP-0.63	003665	ea.	24798	
50µL	R	23	42mm	Cone	50R-HP-0.63	004665	ea.	24799	
100µL	R	23	42mm	Cone	100R-HP-0.63	005665	ea.	24800	
250µL	R	23	42mm	Cone	250R-HP-0.63	006665	ea.	24801	

also **available**

Looking for an Agilent Syringe Cross-Reference?
See **page 272**.

Replacement Needles for Agilent 7673, 7683, and 6850 Autosampler Syringes

Needles for Hamilton Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#	price
5–10µL	23s	1.71"	Agilent	7786-01	6-pk.	20164	
5–10µL	26s	1.71"	Agilent	7786-02	6-pk.	20165	
5–10µL	23s–26s	1.71"	Agilent	7785-01	6-pk.	20166	



Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
0.5µL	23	42mm	Cone	033715	ea.	24821	
0.5µL	26	42mm	Cone	033708	ea.	24820	
5µL	23	42mm	Cone	036720	2-pk.	24823	
10µL	23	42mm	Cone	037717	2-pk.	24825	
10µL	26	42mm	Cone	037715	2-pk.	24824	
25–250µL	23	42mm	Cone	038717	2-pk.	24826	



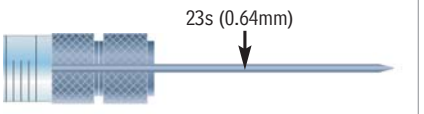
Replacement Teflon®-Tipped Plunger Assembly for Agilent 7673, 7683, and 6850 Autosampler Syringes

SGE

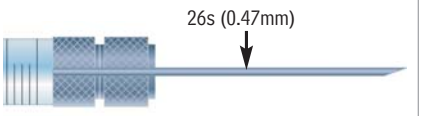
Syringe Volume	Needle Term.	SGE cat.#	qty.	Restek cat.#	price
10µL	F	031808	2-pk.	21218	
10µL	R	031809	2-pk.	21284	

Needle Gauge for Agilent 7673, 7683, 6850 Syringes

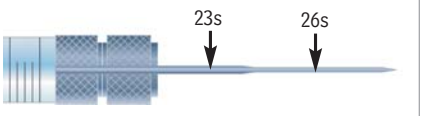
Single Gauge Needle (23s)
- The most popular gauge for Agilent 7673.
- Best for Merlin Microseal septum and standard septum-equipped GCs.
- Packed column injection ports.
- Split/splitless injection ports.



Single Gauge Needle (26s)
- On-column injection ports.
- Split/splitless injection ports.



23s-26s—Dual Gauge (tapered)
- Durability of a 23s gauge needle.
- Ability of a 26s gauge needle to perform split/splitless and on-column injections.



cross-reference

For Agilent Syringes

Listed below are some Hamilton and SGE syringes, cross-referenced to Agilent part numbers for your convenience. For further information or questions, contact your Restek sales representative or technical service.

Similar to Agilent Part #	Restek Part #	Description	Page
5181-1267	21212, 24596	10µL Standard Syringe, Fixed Needle, 23-26 Gauge	270
5181-1273	21210, 24593	5µL Standard Syringe, Fixed Needle, 23-26 Gauge	270
5181-3319	20166	Needle for 10µL Standard Syringe, 23-26 Gauge	271
5181-3321	21213, 24598	10µL Standard Syringe, Removable Needle, 23-26 Gauge	270
5181-3356	21218	Replacement Teflon-Tipped Plunger for 10µL Fixed Needle Syringe	272
5181-3358	24919	Teflon-Tipped Plunger for 10µL Standard Syringe, Removable Needle	282
5181-3360	21215, 24600	10µL Standard Syringe, Fixed Needle, 23-26 Gauge (6-pk.)	270
5181-3365	21218	Teflon-Tipped Plunger for 10µL Standard Syringe, Fixed Needle	272
5181-8809	24894, 24789	10µL Gas-tight Syringe, Fixed Needle, 23 Gauge	271
5181-8811	20164, 24825	Needle for 10µL Gas-tight Syringe, 23 Gauge	271
5181-8813	21224, 24797	10µL Gas-tight Syringe, Removable Needle, 23 Gauge	271
5182-0830	24821	Needle for 0.5µL Standard Syringe, 23 Gauge	271
5182-0832	20166	Needle for 5-10µL Autosampler Syringe, 23-26 Gauge	271
5182-0834	20172, 24793	5µL Standard Syringe, Removable Needle, 23 Gauge	270
5182-0835	21223, 21211	5µL Standard Syringe, Removable Needle, 23-26 Gauge	270
5182-0875	20170, 24783	5µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	270
9301-0713	20167, 24785	10µL Standard Syringe, Fixed Needle, 23 Gauge	270
9301-0714	24595, 24784	10µL Standard Syringe, Fixed Needle, 26 Gauge	270
9301-0725	20169, 24787	10µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	270
9301-0891	24592, 24780	5µL Standard Syringe, Fixed Needle, 26 Gauge	270
9301-0892	20168, 24781	5µL Standard Syringe, Fixed Needle, 23 Gauge	270

Autosampler Syringes for PerkinElmer Autosystem and Clarus 500 GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are developed to withstand multiple and rapid injections through a septum.

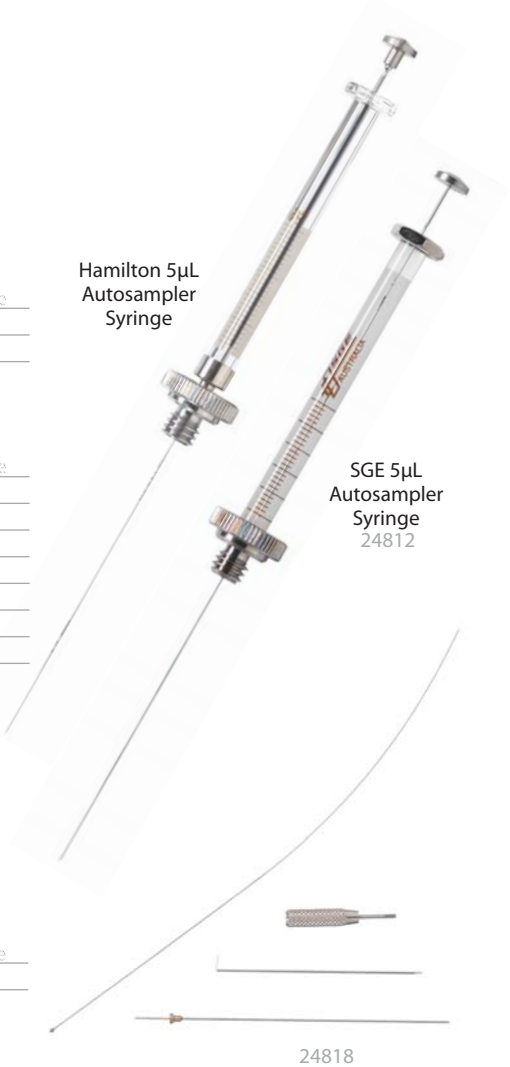
Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#	price
5µL	ASN	23	2.756"	3	75ASN/PE	88035	ea.	24953	
5µL	ASN	26	2.756"	3	75ASN/PE	88040	ea.	24952	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#	price
0.5µL	R	23	70mm	Cone	0.5BR-PE-0.63	000478	ea.	24811	
0.5µL	R	26	70mm	Cone	0.5BR-PE-0.47	000475	ea.	24810	
5µL	F	23	70mm	Cone	5F-PE-0.63	001954	ea.	24813	
5µL*	F	23	70mm	Cone	5F-PE-GT-0.63	001957	ea.	24815	
5µL	F	26	70mm	Cone	5F-PE-0.47	001953	ea.	24812	
5µL*	F	26	70mm	Cone	5F-PE-GT-0.47	001955	ea.	24814	
50µL	F	23	70mm	Cone	50F-PE-0.63	004670	ea.	24816	

*Gas-tight.



Replacement Needle and Plunger Kit for PerkinElmer Autosampler Syringes

SGE Needle and Plunger Kit

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
0.5µL	23	70mm	Cone	033765	kit	24818	

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

also **available**

Looking for Restek Genuine Replacement Parts for PerkinElmer Instruments?
See **pages 182-185.**

Autosampler Syringes for Varian GCs



Hamilton 10µL
Autosampler Syringe
24956



SGE 10µL
Autosampler Syringe
24851

Autosampler Syringes for Varian 8000 Series GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are developed to withstand multiple and rapid injections through a septum.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
Varian 8100/8200 Syringes									
10µL	RN	26s	1.99"	5	701 Varian	202880	ea.	24956	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
Varian 8000 Syringes									
10µL	R	25	50mm	Dome	10R-VA80-II	002926	ea.	24850	
Varian 8035, 8100, & 8200 Syringes									
10µL*	F	25	53mm	S/Hole	10F-VA8X-11	002923	ea.	24851	
10µL*	R	25	53mm	S/Hole	10R-VA8X-II	002924	ea.	24852	
100µL	R	25	53mm	S/Hole	100R-VA8X	005921	ea.	24853	
Varian CP 8400, CP8410 Syringes									
10µL	F	26	50mm	Cone	10F-C/F-5/0.47C	002980	ea.	24922	
10µL	F	26	50mm	Bevel	10F-VA8400-5/0.47	002950	ea.	21202	

*Gas-tight syringe.



also **available**

Looking for Restek Genuine Replacement Parts for Varian Instruments?
See **pages 173-177**.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



24857

Replacement Needles for Varian 8000 Series Autosampler Syringes

Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
10µL	23	53mm	S/Hole	037779	2-pk.	24857	
10µL*	25	53mm	S/Hole	037780	ea.	24858	
10µL**	25	53mm	S/Hole	037777	ea.	24854	
10µL	25	53mm	2	037776	2-pk.	24855	

*straight needle shaft, 0.20mm ID needle, for use with viscous samples
**tapered needle shaft, 0.12mm ID needle

Autosampler Syringes for Shimadzu GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are developed to withstand multiple and rapid injections through a septum.

Hamilton Syringes for Shimadzu AOC 9 GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
5µL	RN	26s	2"/51mm	2	75RN	87930	ea.	24617	
5µL	N	26s	2"/51mm	2	75N	87900	ea.	24938	
10µL	RN	26s	2"/51mm	2	701RN	80330	ea.	24530	

SGE Syringes for Shimadzu AOC 14, 17, 20, and 20i GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
0.5µL	R	23	42mm	Cone	0.5BR-S-0.63	000445	ea.	24841	
0.5µL	R	26	42mm	Cone	0.5BR-S-0.47	000440	ea.	24840	
5µL	F	23	42mm	Cone	5F-S-0.63	001988	ea.	24843	
5µL	F	26	42mm	Cone	5F-S-0.47	001987	ea.	24842	
10µL	R	23	42mm	Cone	10R-S-0.63	002898	ea.	24845	
10µL*	R	23	42mm	Cone	10R-S-GT-0.63	002902	ea.	24846	
10µL	R	26	42mm	Cone	10R-S-0.47	002897	ea.	24844	
250µL*	F	23	42mm	Cone	250F-S-GT-0.63	006682	ea.	24847	

*Gas-tight syringe.



Hamilton 10µL Autosampler Syringe

SGE 5µL Autosampler Syringe
24843

Replacement Needles for Shimadzu Autosampler Syringes

Needles for SGE Syringes

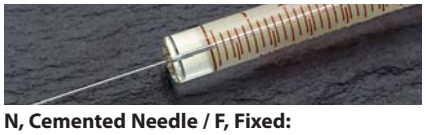
Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
0.5µL	23	42mm	Cone	033745	ea.	24747	
0.5µL	26	42mm	Cone	033738	ea.	24746	
10µL	23	42mm	Cone	037747	2-pk.	24749	
10µL	26	42mm	Cone	037745	2-pk.	24748	



24749

Syringe Termination Types

From cemented to removable needles and from Teflon® luer-lock to special syringe fittings, syringe barrel terminations create the interface between a syringe and its mating connection. For your reference, we describe the most common Hamilton/SGE terminations below.



N, Cemented Needle / F, Fixed:
Needle cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Not autoclavable.



KH, Knurled Hub / R, Removable:
Used on 7000 Series Hamilton syringes, exclusively. Knurled hub enables 6,000 psig maximum injection pressures and the attachment of a spacer for repeatable-depth injections. Autoclavable when disassembled.



RN, Removable Needle / R, Removable:
Needle seats precisely to the zero graduation mark of the syringe. Allows the use of different specification needles on the same syringe barrel. Autoclavable when disassembled.



TLL, Teflon® Luer-Lock / LL, Luer Lock / LT, Luer Tip:
Male luer taper with nickel-plated brass hub accepts and locks into place luer hub needles and connectors. Autoclavable when disassembled.



also **available**
Looking for Restek Genuine Replacement Parts for Shimadzu Instruments?
See **pages 178-181**.

Autosampler Syringes for Thermo Scientific GCs



Autosampler Syringes for Thermo Scientific GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are developed to withstand multiple and rapid injections through a septum.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	N	26s	3.15"	AS	701SN	80318	ea.	24962	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	F	26	80mm	Cone	10F-C/F-8/0.47C	002992	ea.	24924	
10µL	R	26	80mm	Cone	10R-C/F-8/0-0.47C	002993	ea.	24934	

Replacement Needles for Thermo Scientific Autosampler Syringes



Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
0.5µL	26	50mm	Cone	033770	ea.	24927	
10µL	26	80mm	Cone	031535	3-pk.	24935	



also **available**

Looking for Restek Genuine Replacement Parts for Thermo Scientific Instruments?
See **pages 186-191**.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

instrument **reference**

Autosampler Syringes for Thermo Scientific GCs

Autosampler syringes for TriPlus, AS3000, AS2000, AS200/800 GCs. The following autosamplers are compatible with the respective SGE and Hamilton syringes. For further information or questions, contact your Restek sales representative or technical service.

SGE Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24928	277
•	•			24926	277
•	•	•	•	24923	277
•	•	•	•	24932	277
•		•		24924	276
•	•	•	•	24934	276
•	•	•	•	24922	277
•	•	•		24930	277

Replacement Needles for SGE Syringes for Thermo Scientific GCs

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24929	277
•	•			24927	276
•	•	•	•	24933	277
•	•	•		24931	277
•	•	•	•	24935	276

Hamilton Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
			•	24962	276

Autosampler Syringes for CTC/LEAP GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are developed to withstand multiple and rapid injections through a septum.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#	price
1.2µL	N	26	2"/51mm	AS	7701.2N	203185	ea.	22755	
5µL	N	26s	2"/51mm	AS	75N	203189	ea.	22756	
10µL	N	23s	2"/51mm	AS	701N	203361	ea.	22757	
10µL	N	23s-26s	2"/51mm	AS	701N	203362	ea.	22758	
10µL	N	23s	2"/51mm	2	701N	203363	ea.	22759	
10µL	N	26s	2"/51mm	2	701N Slim Line	203072	ea.	22760	
10µL	N	26s	2"/51mm	AS	701N	203205	ea.	22761	
10µL	N	26s	2"/51mm	2	701N	203269	6-pk.	22762	
25µL*	N	26s	2"/51mm	AS	1702N	203043	ea.	22763	
25µL*	N	26s	2"/51mm	AS	1702N Slim Line**	203074	ea.	22764	
100µL*	N	26s	2"/51mm	AS	1710N Slim Line**	203076	ea.	22765	

*Gas-tight syringe.
**Barrel OD = 6.7mm; all other 25µL and 100µL syringes have a 7.9mm barrel OD.

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#	price
0.5µL	R	23	50mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928	
0.5µL	R	26	50mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926	
5µL	F	23	50mm	Cone	5F-C/F-5/0.63	001981	ea.	24921	
5µL	F	26	50mm	Cone	5F-C/F-5/0.47	001982	ea.	24920	
10µL	F	23	50mm	Cone	10F-C/F-0.63	002981	ea.	24923	
10µL	R	23	50mm	Cone	10R-C/F-0.63	002984	ea.	24932	
10µL	F	26	50mm	Cone	10F-C/F-5/0.47C	002980	ea.	24922	
10µL	F	26	50mm	Cone	SK10F-C/F-5/0.47C	002986	6-pk.	24925	
10µL	R	26	50mm	Cone	10R-C/F-5/0-0.47C	002982	ea.	24930	
10µL*	F	23	50mm	Cone	10F-C/T-GT-5/0.63C	002987	ea.	22749	
25µL	F	26	50mm	Cone	25F-C/T-5/0.47C	003980	ea.	22750	
25µL*	F	23	50mm	Cone	25F-C/T-GT-5/0.63C	003987	ea.	22751	
100µL*	F	23	50mm	Cone	100F-C/T-GT-5/0.63C	005335	ea.	22753	
100µL*	R	26	50mm	Cone	100R-C/T-GT-5/0.47C	005333	ea.	22754	

*Gas-tight syringe.



Hamilton 10µL Autosampler Syringe

SGE 10µL Autosampler Syringe

also available

Replacement plunger assemblies for these syringes are available on request.

Replacement Needles for CTC/LEAP Autosampler Syringes



24933

Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
0.5µL	23	50mm	Cone	033772	ea.	24929	
10µL	23	50mm	Cone	037787	2-pk.	24933	
10µL	26	50mm	Cone	037785	2-pk.	24931	

Microliter Syringes





Hamilton 700 Series Manual Microliter Syringes

Manual Microliter Syringes

- Economical.
- Available with cemented needles (N/F) or removable needles (RN/R).
- Each syringe plunger and barrel assembly is manufactured as one working unit; components are not interchangeable or individually replaceable.

Hamilton 700 Series Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
5µL	N	26s	2"/51mm	2	75N	87900	ea.	24938	
5µL	RN	26s	2"/51mm	2	75RN	87930	ea.	24617	
10µL	N	26s	2"/51mm	2	701N	80300	ea.	20174	
10µL	N	26s	2"/51mm	2	701N	80366	6-pk.	20175	
10µL	RN	26s	2"/51mm	2	701RN	80330	ea.	24530	
25µL	N	22s	2"/51mm	2	702N	80400	ea.	24531	
10µL	N	26s	2"/51mm	5	701NPT5	80339	ea.	24967	
25µL*	RN	22s	2"/51mm	2	702RN	80430	ea.	24532	
50µL	N	22s	2"/51mm	2	705N	80500	ea.	24533	
50µL*	RN	22s	2"/51mm	2	705RN	80530	ea.	24534	
100µL	N	22s	2"/51mm	2	710N	80600	ea.	24535	
100µL*	RN	22s	2"/51mm	2	710RN	80630	ea.	24536	
250µL	N	22s	2"/51mm	2	725N	80700	ea.	24537	
250µL*	RN	22s	2"/51mm	2	725RN	80730	ea.	24538	
500µL	N	22	2"/51mm	2	750N	80800	ea.	24539	
500µL*	RN	22	2"/51mm	2	750RN	80830	ea.	24540	





SGE Standard Manual Microliter Syringes

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
5µL	F	26	50mm	2	5F**	001000	ea.	24700	
5µL*	R	26	50mm	2	5R**	001050	ea.	24701	
10µL	F	26	50mm	2	10F**	002000	ea.	24702	
10µL	F	26	50mm	2	SK-10F**	002030	6-pk.	24715	
10µL*	R	26	50mm	2	10R**	002050	ea.	24703	
10µL*	R	26	50mm	2	SK-10R**	002080	6-pk.	24716	
25µL	F	25	50mm	2	25F	003000	ea.	24704	
25µL*	R	25	50mm	2	25R	003050	ea.	24705	
50µL	F	25	50mm	2	50F	004000	ea.	24706	
50µL*	R	25	50mm	2	50R	004050	ea.	24707	
100µL	F	25	50mm	2	100F	005000	ea.	24708	
100µL*	R	25	50mm	2	100R	005050	ea.	24709	
250µL	F	25	50mm	2	250F	006000	ea.	24710	
250µL*	R	25	50mm	2	250R	006050	ea.	24711	
500µL	F	25	50mm	2	500F	007000	ea.	24712	
500µL*	R	25	50mm	2	500R	007050	ea.	24713	

*For replacement RN/R needles, see page 282.
**With plunger protection.



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SuperfleX Flexible Plunger Microliter Syringes

- The SuperfleX syringe features a super-elastic plunger that returns to its original shape if twisted or bent.

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
5µL	F	26	50mm	2	5FX	001100	ea.	24720	
5µL	R	26	50mm	2	5RX	001150	ea.	24721	
10µL	F	26	50mm	2	10FX	002100	ea.	24722	
10µL	F	26	50mm	2	SK-10FX	002130	6-pk.	24718	
10µL	R	26	50mm	2	10RX	002150	ea.	24723	
10µL*	R	26	50mm	2	SK-10RX	002180	6-pk.	24719	



SGE SuperfleX Syringe

Reinforced Plunger Microliter Syringes

- Reinforcing extends the life of fragile, small diameter plungers.
- Economical because of longer life—even in rugged applications.
- Hand-lapped plunger ensures a perfect seal with the barrel.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
5µL	N	26s	2"/51mm	2	95	87920	ea.	24541	
5µL*	RN	26s	2"/51mm	2	95	87925	ea.	24542	
10µL	N	26s	2"/51mm	2	901	80360	ea.	24543	
10µL*	RN	26s	2"/51mm	2	901	80370	ea.	24544	



Hamilton 900 Series Microliter Syringe

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
5µL	F	26	50mm	2	5F-GP	001400	ea.	24769	
5µL*	R	26	50mm	2	5R-GP	001450	ea.	24766	
10µL	F	26	50mm	2	10F-GP	002400	ea.	24767	
10µL*	R	26	50mm	2	10R-GP	002450	ea.	24768	



SGE Guided Plunger Syringe

*For replacement RN/R needles, see page 282.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Micro-Volume Syringes



Hamilton 7001 Series Micro-Volume Syringe



SGE Micro-Volume Plunger-in-Needle Syringe

Micro-Volume, Positive Displacement Syringes

- Sample is contained in the needle with full plunger displacement, ensuring no dead volume.
- High precision and accuracy down to 0.1µL.
- Seal between the plunger and the needle can be tightened for high-pressure injection.
- Replaceable needle/plunger kits and barrels (available on request).

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
0.5µL	KH	25	2.75"/70mm	2	7000.5	86259	ea.	24545	
0.5µL	KH	25	2.75"/70mm	3	7000.5	86250	ea.	24546	
1.0µL	KH	22s	2.75"/70mm	2	7101	86211	ea.	24549	
1.0µL	KH	25s	2.75"/70mm	2	7001	80135	ea.	24547	
1.0µL	KH	25s	2.75"/70mm	3	7001	80100	ea.	24548	
2.0µL	KH	25	2.75"/70mm	2	7002	88411	ea.	24551	
5.0µL	KH	24	2.75"/70mm	2	7105	88011	ea.	24555	
5.0µL	KH	24	2.75"/70mm	3	7105	88000	ea.	24556	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
0.5µL	R	23	70mm	2	0.5BR-7BV	000311	ea.	24771	
0.5µL	R	23	70mm	Cone	0.5BR-7	000310	ea.	24772	
0.5µL	R	26	70mm	Cone	0.5BR-OC-7/0.47*	000376	ea.	24770	
1.0µL	R	23	70mm	2	1BR-7BV	000506	ea.	24775	
1.0µL	R	23	70mm	Cone	1BR-7	000505	ea.	24774	
1.0µL	R	23	50mm	Cone	1BR-5	000500	ea.	24773	
1.0µL	R	26	70mm	Cone	1BR-7/0.47*	000570	ea.	24776	
5.0µL	R	23	70mm	2	5BR-7BV	000803	ea.	24779	
5.0µL	R	23	70mm	Cone	5BR-7	000802	ea.	24778	
5.0µL	R	23	50mm	Cone	5BR-5	000800	ea.	24777	

*70mm needle length, 0.47mm OD, on-column syringe.

SGE Replacement Plunger-in-Needle Kits

- Kits are supplied with both a plunger and a needle.
- Plunger and needle must be replaced together.

Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	For Syringe cat.#	qty.	Restek cat.#	price
0.5µL	23	70mm	2	NP0.5B-7BV	033060	24771	kit	24831	
0.5µL	23	70mm	Cone	NP0.5B-7C	033057	24772	kit	24830	
0.5µL	26	70mm	Cone	NP0.5B-OC-7	033630	24770	kit	24832	
1.0µL	23	70mm	2	NP1B-7BV	034060	24775	kit	24835	
1.0µL	23	70mm	Cone	NP1B-7C	034057	24774	kit	24834	
1.0µL	23	50mm	Cone	NP1B-5C	034055	24773	kit	24833	
1.0µL	26	70mm	Cone	NP1B-OC-7/0.47	034610	24776	kit	24836	
5.0µL	23	70mm	2	NP5B-7BV	035058	24779	kit	24839	
5.0µL	23	70mm	Cone	NP5B-7C	035057	24778	kit	24838	
5.0µL	23	50mm	Cone	NP5B-5C	035055	24777	kit	24837	

tech tip

Reinserting Teflon®-tipped Plungers

After disassembling and cleaning a syringe with a Teflon®-tipped plunger, wet the Teflon® plunger tip prior to reinserting it into the barrel. Always avoid touching the plunger—any abrasions, scratches or oil from fingers could interfere with proper plunger operation.

Teflon® Tip, Gas-Tight Syringes

- Suitable for gases or liquids, for maximum inertness.
- High accuracy of dispensed volumes.
- Interchangeable barrels, plungers, and tips extend performance and increase cost-effectiveness.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	N	26s	2"/51mm	2	1701	80000	ea.	24557	
10µL	RN	26s	2"/51mm	2	1701	80030	ea.	24558	
25µL	N	22s	2"/51mm	2	1702	80200	ea.	24559	
25µL	RN	22s	2"/51mm	2	1702	80230	ea.	24560	
50µL	N	22s	2"/51mm	2	1705	80900	ea.	24561	
50µL	RN	22s	2"/51mm	2	1705	80930	ea.	24562	
100µL	N	22s	2"/51mm	2	1710	81000	ea.	24563	
100µL	RN	22s	2"/51mm	2	1710	81030	ea.	24564	
250µL	N	22s	2"/51mm	2	1725	81100	ea.	24567	
250µL	RN	22s	2"/51mm	2	1725	81130	ea.	24568	
500µL	LTN	22	2"/51mm	2	1750	81217	ea.	24571	
500µL	RN	22	2"/51mm	2	1750	81230	ea.	24572	
1mL	LTN	22	2"/51mm	2	1001	81317	ea.	24575	
1mL	RN	22	2"/51mm	2	1001	81330	ea.	24576	
1mL	TLL	*	—	w/out slots	1001	81320	ea.	24578	
2.5mL	TLL	*	—	w/out slots	1002	81420	ea.	24584	
2.5mL	RN	22	2"/51mm	2	1002	81430	ea.	24582	
2.5mL	N	22	2"/51mm	2	1002	81417	ea.	24581	
5mL	TLL	*	—	w/out slots	1005	81520	ea.	20178	
10mL	TLL	*	—	w/out slots	1010	81620	ea.	20179	
25mL	TLL	*	—	w/out slots	1025	82520	ea.	24591	
50mL	TLL	*	—	w/out slots	1050	85020	ea.	24717	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	F	26	50mm	2	10F-GT	002200	ea.	24725	
10µL	R	26	50mm	2	10R-GT	002250	ea.	24726	
25µL	F	25	50mm	2	25F-GT	003200	ea.	24727	
25µL	R	25	50mm	2	25R-GT	003250	ea.	24728	
50µL	F	25	50mm	2	50F-GT	004200	ea.	24729	
50µL	R	25	50mm	2	50R-GT	004250	ea.	24730	
100µL	F	25	50mm	2	100F-GT	005200	ea.	24734	
100µL	R	25	50mm	2	100R-GT	005250	ea.	24735	
100µL	LL	*	—	—	100F-LL-GT	005230	ea.	24737	
250µL	F	25	50mm	2	250F-GT	006200	ea.	24738	
250µL	R	25	50mm	2	250R-GT	006250	ea.	24739	
250µL	LL	*	—	—	250F-LL-GT	006230	ea.	24741	
500µL	F	25	50mm	2	500F-GT	007200	ea.	24742	
500µL	R	25	50mm	2	500R-GT	007250	ea.	24743	
1mL	R	23	50mm	2	1MR-GT	008100	ea.	24750	
1mL	LL	*	—	—	1MDF-LL-GT	008025	ea.	24752	
2.5mL	LL	*	—	—	2.5MDF-LL-GT	008425	ea.	24755	
5mL	LL	*	—	—	5MDR-LL-GT	008760	ea.	24757	
10mL	LL	*	—	—	10MDR-LL-GT	008960	ea.	24759	
25mL	LL	*	—	—	25MDR-LL-GT	009462	ea.	24760	
50mL	LL	*	—	—	50MR-LL-GT	009660	ea.	24761	
100mL	LL	*	—	—	100MR-LL-GT	009760	ea.	24762	

*Needles sold separately. See page 282.



SGE Gas-Tight Syringe

Hamilton 1700/1000 Series Gas-Tight Syringe

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



Teflon® Tip, Gas-Tight Syringe Replacement Needles for Removable Needle Syringes

Materials: stainless steel needle, nickel-plated brass hub

Needles for Hamilton Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#	price
5–100µL	26s	2"	2	7758-02	6-pk.	24939	
5–100µL	22s	2"	2	7758-03	6-pk.	24940	
250µl–10mL	22	2"	2	7779-01	6-pk.	24942	
250µl–10mL	26s	2"	2	7779-02	6-pk.	24943	
250µl–10mL	22s	2"	2	7779-03	6-pk.	24944	



Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
5µL	26	50mm	2	036110	5-pk.	24802	
10µL	23	50mm	2	037111	5-pk.	24804	
10µL	26	50mm	2	037110	5-pk.	24803	
25–500µL	23	50mm	2	038111	5-pk.	24806	
25–500µL	25	50mm	2	038110	5-pk.	24805	
1—2.5mL	23	50mm	2	039110	5-pk.	24807	



Replacement Teflon®-Tipped Plunger Assembly

Hamilton

Syringe Volume	Needle Term.	Hamilton cat.#	qty.	Restek cat.#	price
10µL	N, RN, LT/LTN	13205	ea.	24919	



Gas-Tight Syringe Replacement Needles for Luer-Lock Syringes

Needles for Hamilton Syringes

Hub Material	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#	price
metal	26s	2"/51mm	2	90053	6-pk.	20133	
metal	25s	1.97"	3	90049*	6-pk.	24605	
metal	22s	2"/51mm	2	90051	6-pk.	24606	
Kel-F (Teflon tip)	26s	2"/51mm	2	90153	6-pk.	24607	
Kel-F (Teflon tip)	25s	1.97"	3	90149*	6-pk.	24608	
Kel-F (Teflon tip)	22s	2"/51mm	2	90151	6-pk.	24609	

*For Waters U6K injection valve.



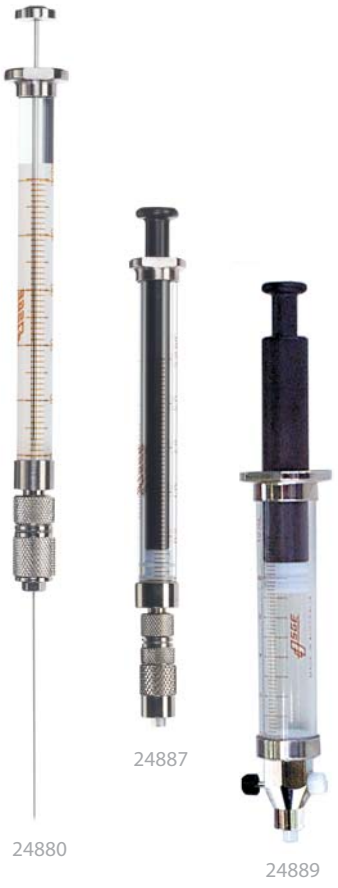
Needles for SGE Syringes

Hub Material	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
metal	23	50mm	2	039802	5-pk.	24763	
metal	22	2"/51mm	3	039895**	2-pk.	24765	
metal	18	50mm	2	039842	5-pk.	24764	

**For Rheodyne/Valco valves.

SGE Gas-Tight Syringes with Shut-off Valves

- Ideal for sample storage and transportation.
- Push-pull shut-off valve.



Syringe Fitted with Removable Needle and Valve

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
50µL	50R-V-GT	004279	ea.	24880	
100µL	100R-V-GT	005279	ea.	24881	
250µL	250R-V-GT	006279	ea.	24882	
500µL	500R-V-GT	007279	ea.	24883	
1mL	1MDR-V-GT	008110	ea.	24884	
2.5mL	2.5MDR-V-GT	008510	ea.	24885	

Syringe Fitted with Luer-Lock Valve*

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
1mL	1MR-VLL-GT	008160	ea.	24886	
2.5mL	2.5MDR-VLL-GT	008560	ea.	24887	
5mL	5MDR-VLLMA-GT	008770	ea.	24888	
10mL	10MDR-VLLMA-GT	008970	ea.	24889	
25mL	25MDR-VLLMA-GT	009472	ea.	24890	
50mL	50MR-VLLMA-GT	009670	ea.	24891	
100mL	100MR-VLLMA-GT	009770	ea.	24892	

*Order needles separately.

Replacement Needles for SGE Gas-Tight Syringes with Shut-off Valves



Model V Syringe Valve: fits any SGE removable needle syringe, 25µL-2.5mL

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
25µL–2.5mL	23	50mm	Cone	V	031905	ea.	24898	

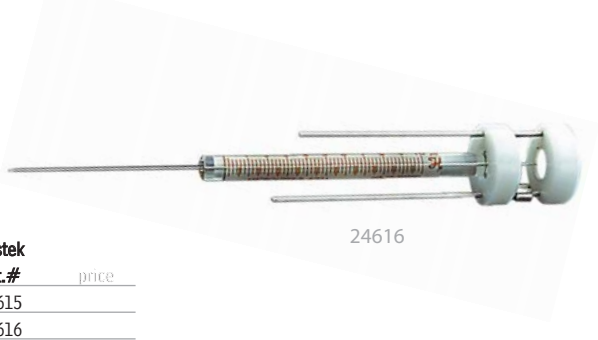
Luer-Lock Needles

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
1mL–100mL	23	50mm	2	NLL-5/23	039802	5-pk.	24763	
1mL–100mL	18	50mm	2	NLL-5/18	039842	5-pk.	24764	
1mL–100mL	22	2"/51mm	3	NLL-LC	039895**	2-pk.	24765	

**Fits Rheodyne & Valco injection valves

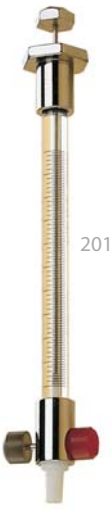
Economical Hamilton Syringe Guide***

- Prevents syringe plunger from bending.
- Adjustable stop prevents plunger damage.
- Easily installed.



Syringe Volume	Used with Syringe Series	Hamilton cat.#	qty.	Restek cat.#	price
25–500µL	700/1700/1000	14906	ea.	24615	
5–10µL	700/1700/1000	14806	ea.	24616	

***Syringe not included.


20162


21208

A-2 Luer Gas-Tight Syringes*

- For use with VOA-CYL 4 standards.
- Push-style on-off button valve.

Use to withdraw a gas sample from a high-pressure cylinder through a high-purity VOC single-stage regulator after attaching the appropriate adaptor to the regulator. Use with luer syringe needles listed.

Description	qty.	cat.#	price
100µL Luer Syringe	ea.	20162	
500µL Luer Syringe	ea.	20163	
Luer Syringe Needles (26s gauge)	6-pk.	20133	

*Restek's A-2 syringes have a luer tip.

Heavy Duty Purge & Trap Syringe (Dynatech Precision Sampling)

- Heavy-duty glass barrel with metal front and rear flanges.
- Teflon® luer-lock tip.
- Can fill and empty sparge tubes.
- Sample-Lok valve accepts standard luer-lock needles.
- Suitable for purge & trap applications.

	2mL		5mL		10mL	
Syringe	cat.#	price	cat.#	price	cat.#	price
without Sample-Lok	21205		21206		21209	
with Sample-Lok	—	—	21208		21207	



Luer-Lock Valve Adaptors

Description	SGE cat. #	qty.	Restek cat.#	price
Luer-Lock Valve Adaptors	200010	2-pk.	21283	

also **available**

Restek carries purge & trap vessels.
See **page 199** for more information.


21276


21279

21278

Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer-lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a sub-sample. The plunger stem is detachable, making sample storage easy.

Jumbo Syringe

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
500mL	500MAR-LL-GT	009910	ea.	21275	
1000mL	1000MAR-LL-GT	009920	ea.	21276	
2000mL	20000MAR-LL-GT	009930	ea.	21277	

Syringe O-Rings

Syringe Volume	SGE cat.#	qty.	Restek cat.#	price
500mL	032527	ea.	21278	
1000mL	032532	ea.	21279	

Syringes for Waters U6K Valves

- Reinforced plungers.
- Removable needles.
- Replaceable plunger/barrel assemblies.
- Barrel stop prevents plunger blowout.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	RN	25s	1.97"	3	801	84815	ea.	21255	
25µL	RN	25s	1.97"	3	802	84816	ea.	21256	
50µL	RN	25s	1.97"	3	805	84817	ea.	21257	
100µL	RN	25s	1.97"	3	810	84818	ea.	21258	
250µL	RN	25s	1.97"	3	825	84819	ea.	21259	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
25µL	R	25	50mm	3	25R-WLC-RA8	003375	ea.	24873	
50µL	R	25	50mm	3	50R-WLC-RA8	004375	ea.	24874	
100µL	R	25	50mm	3	100R-WLC-RA8	005375	ea.	24875	
250µL	R	25	50mm	3	250R-WLC-RA8	006375	ea.	24876	
500µL	R	25	50mm	3	500R-WLC-RA8	007375	ea.	24877	



Hamilton 50µL Syringe for Waters U6K Valves
21257



SGE 50µL Syringe for Waters U6K Valves
24874

Replacement Needles for Syringes for Waters U6K Valves

Needles for Hamilton Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#	price
10-100µL	25s	1.97"	3	8647-01	6-pk.	21270	
250µL-10mL	25s	1.97"	3	8648-01	6-pk.	21271	



Technical Service

Do you have a technical question? Restek's Technical Service group has answers!

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

Outside the U.S.

Contact your Restek representative.



Tim Herring,Technical Service



Hamilton 10µL Gas-Tight Syringe for Rheodyne® and Valco® Valves
21260



SGE 50µL Gas-Tight Syringe for Rheodyne® and Valco® Valves
24868

Gas-Tight Syringes for Rheodyne® & Valco® Valves

- Teflon®-tipped plungers.
- Removable needles.
- Replaceable syringe barrels, plungers, and plunger tips.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	RN	26s	2"/51mm	3	1701	80065	ea.	21260	
25µL	RN	22s	2"/51mm	3	1702	80265	ea.	21261	
50µL	RN	22s	2"/51mm	3	1705	80965	ea.	21262	
100µL	RN	22s	2"/51mm	3	1710	81065	ea.	21263	
250µL	RN	22s	2"/51mm	3	1725	81165	ea.	21264	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	R	22	2"	3	10R-GT-LC	002313	ea.	24866	
25µL	R	22	2"	3	25R-GT-LC	003312	ea.	24867	
50µL	R	22	2"	3	50R-GT-LC	004312	ea.	24868	
100µL	R	22	2"	3	100R-GT-LC	005312	ea.	24869	
250µL	R	22	2"	3	250R-GT-LC	006312	ea.	24870	
500µL	R	22	2"	3	500R-GT-LC	007312	ea.	24871	



Replacement Needles for Gas-Tight Syringes for Rheodyne® & Valco® Valves

Needles for Hamilton Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#	price
5–100µL	22s	2"	3	7770-01	6-pk.	24941	
250µL–10mL	22	2"	3	7780-04	6-pk.	24945	

Needles for SGE Syringes

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#	price
10µL	22	2"	3	037250	5-pk.	24808	
25–500µL	22	2"	3	038250	5-pk.	24809	



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Economical Microliter Liquid-Type Syringes for Rheodyne® & Valco® Valves

- Cemented/fixed needles.
- Plungers and barrels are not interchangeable or replaceable.

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	N	22s	2"	3	701	80365	ea.	21250	
25µL	N	22s	2"	3	702	80465	ea.	21251	
50µL	N	22s	2"	3	705	80565	ea.	21252	
100µL	N	22s	2"	3	710	80665	ea.	21253	
250µL	N	22s	2"	3	725	80765	ea.	21254	

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	F	22	2"	3	10F-LC	002301	ea.	24860	
25µL	F	22	2"	3	25F-LC	003300	ea.	24861	
50µL	F	22	2"	3	50F-LC	004300	ea.	24862	
100µL	F	22	2"	3	100F-LC	005300	ea.	24863	
250µL	F	22	2"	3	250F-LC	006300	ea.	24864	
500µL	F	22	2"	3	500F-LC	007300	ea.	24865	



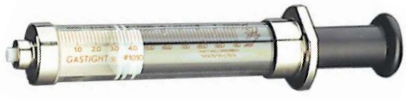
Hamilton 50µL Microliter Syringe for Rheodyne® and Valco® Valves
21252



SGE 50µL Microliter Syringe for Rheodyne® and Valco® Valves
24860

Priming Syringes for Waters 6000, 6000A, 501, 510, 590, 610 and 610E HPLC Pumps

- Designed for maximum safety with metal flange and luer-lock (LL) hub.
- Teflon®-tipped plunger.



21265

Hamilton Syringe

Volume	Needle Term.	Hamilton Model	Hamilton cat.#	Pressure Tested to	qty.	Restek cat.#	price
10mL	TLL	1010W	81610	700 psig	ea.	21265	

SGE Syringe

Volume	Needle Term.	SGE Model	SGE cat.#	Pressure Tested to	qty.	Restek cat.#	price
10mL	LL	10MDR-LL-GT	008960	100 psig	ea.	24759	

also **available**

We can supply many additional sizes. Call us if you don't see exactly what you need.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



22290



22292

Syringes for Agilent 1090 & 1100 LC Autosamplers

1/4-32 UNEF Thread

SGE Syringes

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
25µL	25D-HP1090-GT	003670	ea.	22290	

Syringe for Hitachi LC Autosamplers

M10 X1 Thread

SGE Syringe

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
500µL	500C-HITACH1	007660	ea.	22292	

Syringes for PerkinElmer LC Autosamplers

1/4-28 UNF Thread



22297

SGE Syringes

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
100µL	100D-CX-GT	005990	ea.	22296	
250µL	250D-CX-GT	006995	ea.	22297	
500µL	500D-CX-GT	007995	ea.	22298	
1mL	1MD-C-GT	008185	ea.	22299	



22294



24529

Syringes for Waters WISP LC Autosamplers

1/4-28 UNF Thread

SGE Syringes

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#	price
25µL	25D-WISP	003990	ea.	22293	
250µL	250D-WISP	006690	ea.	22294	

Hamilton Syringes

- Teflon® PTFE-tipped plungers

Volume	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
250µL	1725	80024	ea.	24529	

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) Teflon® Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Syringes for CTC/LEAP LC Autosamplers

Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#	price
10µL	N	22s	2"/51mm	3	701N	203073	ea.	22743	
25µL	N	22s	2"/51mm	3	1702N	203075	ea.	22744	
100µL	N	22s	2"/51mm	3	1710N Slim Line*	203077	ea.	22745	
100µL	N	22	2"/51mm	3	1710N	203235	ea.	22746	
250µL	N	22	2"/51mm	3	1725N	203079	ea.	22747	
500µL	N	22	2"/51mm	3	1750N	203349	ea.	22748	

*Barrel OD = 6.7mm; all other 25µL and 100µL syringes have a 7.9mm barrel OD.

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#	price
10µL	F	22s	2"/51mm	LC	10F-CTC-LC	002710	ea.	22737	
100µL*	R	22s	2"/51mm	LC	100R-C/T-GT-LC	005330	ea.	22741	
500µL*	F	22s	2"/51mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742	

*Gas-tight syringe.


22746

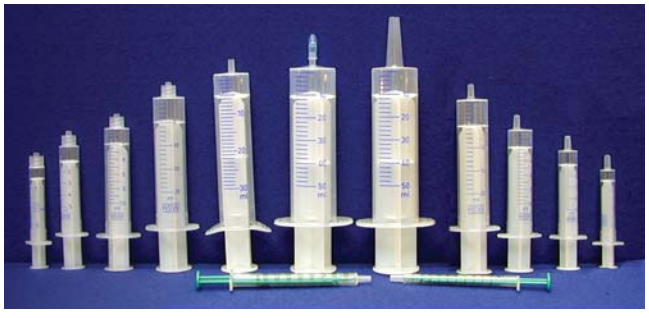

22741

also **available**

Replacement plunger assemblies for these syringes are available on request.

NORM-JECT® Syringes

NORM-JECT® syringes are latex-free, contain no rubber, no silicone oil, styrene or DEHP and are DNA-free. These syringes are the choice for any situation needing an inert, nonreactive syringe. Because of their composition, they are indicated for chromatography and many other laboratory procedures. They are more chemically resistant than rubber-tipped syringes and are manufactured from only laboratory grade polypropylene and polyethylene. These unique plastic syringes have a positive safety stop to prevent accidental spills. NORM-JECT® syringes are individually sterile strip packed.



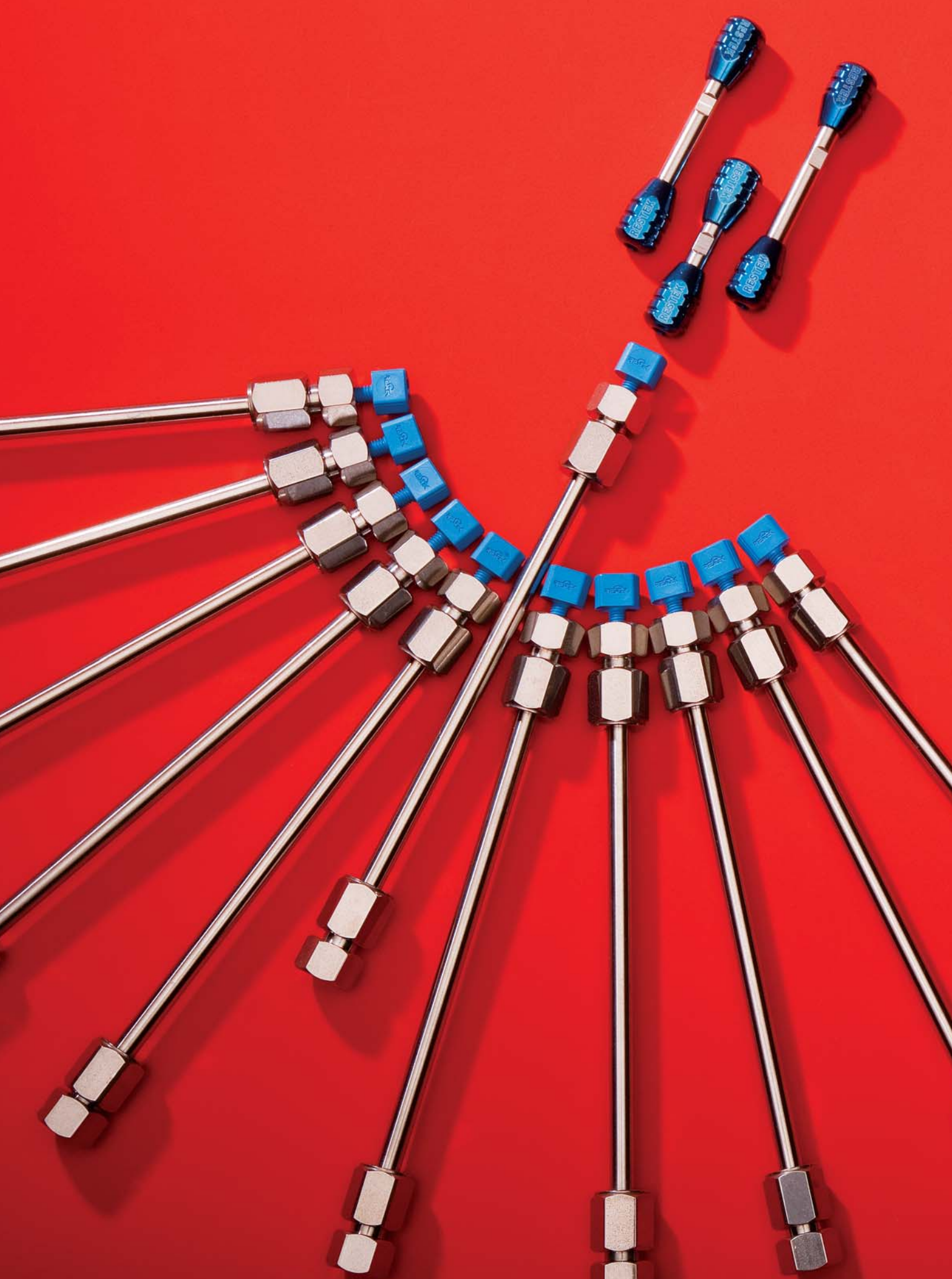
Description	qty.	cat.#	price
1mL Tuberculin[1]	100-pk.	22766	
3mL Luer Slip Centric Tip	100-pk.	22767	
5mL Luer Slip Centric Tip[2]	100-pk.	22768	
10mL Luer Slip Eccentric Tip[2]	100-pk.	22769	
20mL Luer Slip Eccentric Tip[2]	100-pk.	22770	
30mL Luer Slip Eccentric Tip	50-pk.	22771	
50mL Luer Slip Eccentric Tip[2]	30-pk.	22772	
3mL Luer Lock Tip	100-pk.	22773	
5mL Luer Lock Tip[2]	100-pk.	22774	
10mL Luer Lock Tip[2]	100-pk.	22775	
20mL Luer Lock Tip[2]	100-pk.	22776	
30mL Luer Lock Tip	50-pk.	22777	
50mL Luer Lock Tip[2]	30-pk.	22778	





Great for use with Restek syringe filters! See **page 363**.

[1]Dose saver design with low dead space plug on the piston to minimize waste.
[2]The 5mL has graduations to 6mL, 10mL has graduations to 12mL, 20mL has graduations to 24mL and 50mL has graduations to 60mL.



HPLC Columns

HPLC Column Selection 292-297
UHPLC Columns 298-299
Capillary LC Columns 300
Pinnacle DB Columns 301-305
Pinnacle II Columns 306-309
Allure Columns 310-313
Ultra Columns 314-320
Viva Wide Pore Columns 321-323
Fast LC Cartridge Columns 323
Prep Columns 324-325
Bulk Packing Materials 326
Trident Guard Systems 327-329

HPLC Accessories 330-353
HPLC Column Test Mixes 486-487
Reference Books .....www.restek.com

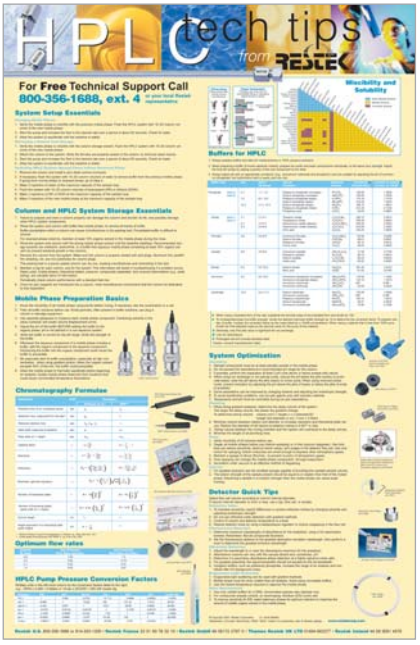
HPLC Applications 488-533



ordering **note**

For assistance in selecting an HPLC column, please contact Restek Technical Service at 814-353-1300 or 800-356-1688 (ext. 4) or support@restek.com.

free literature



HPLC Tech Tips Wall Chart

Almost everything you need to remember about HPLC, condensed into 3 feet by 2 feet: mobile phase basics, buffers (types, pKa values, pH ranges, formula masses, more), miscibility and solubility chart (invaluable!), system setup and optimization, detector tips, pressure conversion factors, most-used chromatographic equations, and column storage essentials.

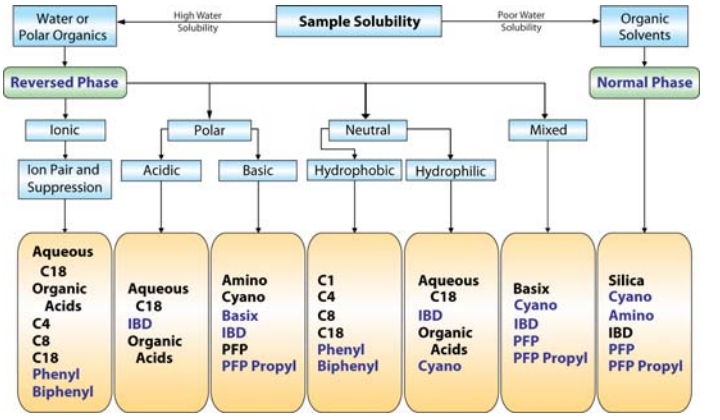
Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

lit. cat.# 59894A

Selecting an HPLC Column

Choosing the best column for your application requires consideration of stationary phase chemistry, retention capacity, particle size, and column dimensions. Identifying the best stationary phase for your separation is the most critical step of column selection, and your decision should be based on sample solubility and the chemical differences among the compounds of interest. Figure 1 is a handy tool for stationary phase selection.

Figure 1 Stationary phase selection.



Reversed phase columns (e.g. alkyl, phenyl, cyano) work well for water-soluble hydrophobic compounds. Some stationary phases incorporate both polar and nonpolar functionality and can be used in either reversed phase or normal phase modes (e.g. Ultra IBD, Allure® Basix, and Allure® PFP Propyl). While straight chain alkyl stationary phases (e.g. C18) are historically the most commonly used, many newer phases provide better separations. Alkyl phases are best suited for analyzing neutral compounds with a high ratio of carbon:heteroatoms where the major distinction among analytes is their hydrophobicity. However, for analyzing compounds that are highly polar, aromatic, or halogenated, nonalkyl stationary phases often provide significantly better selectivity (Figure 2).

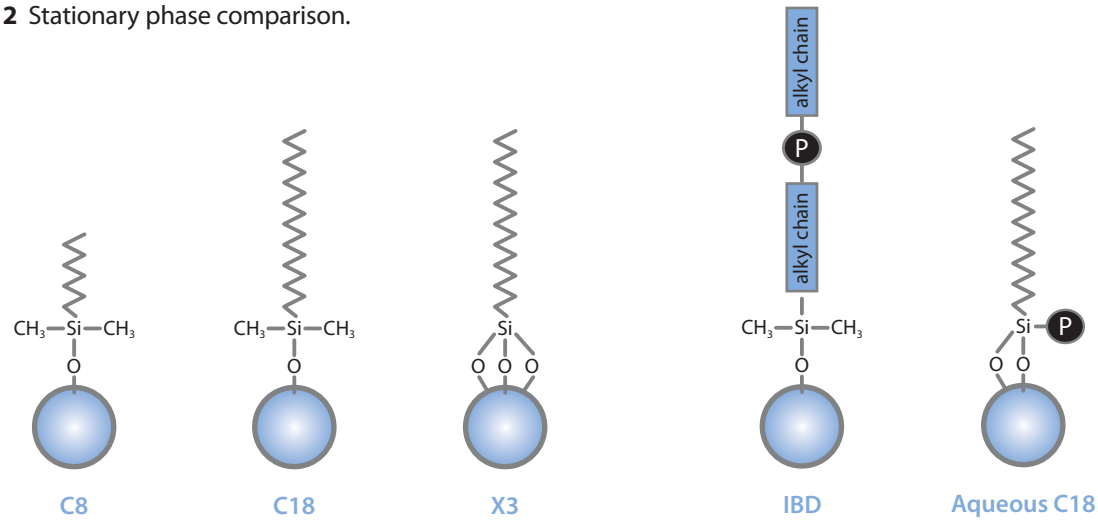
Retention capacity is another important consideration and is influenced by surface area and carbon load (% carbon in the packing material). Allure® columns were designed for maximum retention using a high density of ligands bonded to a large surface area silica. Ultra, Pinnacle® II and Pinnacle® DB columns have the same high ligand density, but are more moderately retentive due to their lower surface areas. Surface area is inversely proportional to pore size; thus, larger pore sizes result in less retention. However, wide pore (e.g. 300Å) packings, such as Viva, are ideal when analyzing larger molecules, as a larger pore size is necessary to allow the analytes to 'fit' into the pores.

Particle size and column dimensions also influence column choice. In selecting a particle size, the primary consideration is efficiency (plates/meter) versus column pressure. A 3µm column will have approximately 50% more efficiency than a 5µm column, if all other conditions are constant for both columns. As particle size is further decreased (e.g. <2µm), theoretically, efficiencies will increase proportionally, based on the Van Deemter equation (and the usable flow rate range is much wider). Please note that column backpressure also increases as particle size decreases. Column dimensions include internal diameter and length, where the most commonly used internal diameter (ID) for HPLC columns is 4.6mm. In theory, resolution and pressure should be independent of column ID as long as flow rate is adjusted to maintain the same mobile phase linear velocity (flow rate is proportional to column cross-sectional area). Table I shows the approximate optimum flow rates for four column IDs.

Table I Approximate optimum flow rates for various analytical column IDs.

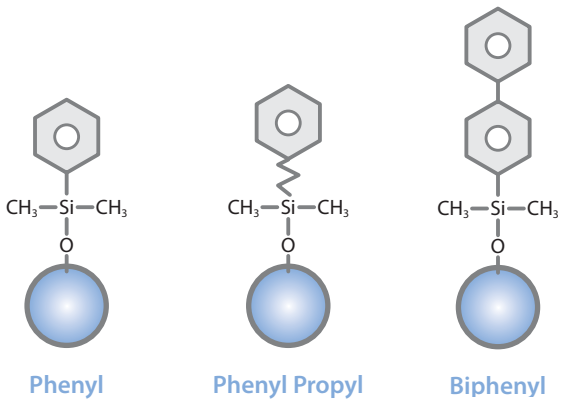
	5µm Particles	3µm Particles
ID (mm)	Optimum Flow Rate (mL/min.)	Optimum Flow Rate (mL/min.)
4.6	1.00	1.5
3.2	0.50	0.73
2.1	0.20	0.31
1.0	0.05	0.07

Figure 2 Stationary phase comparison.

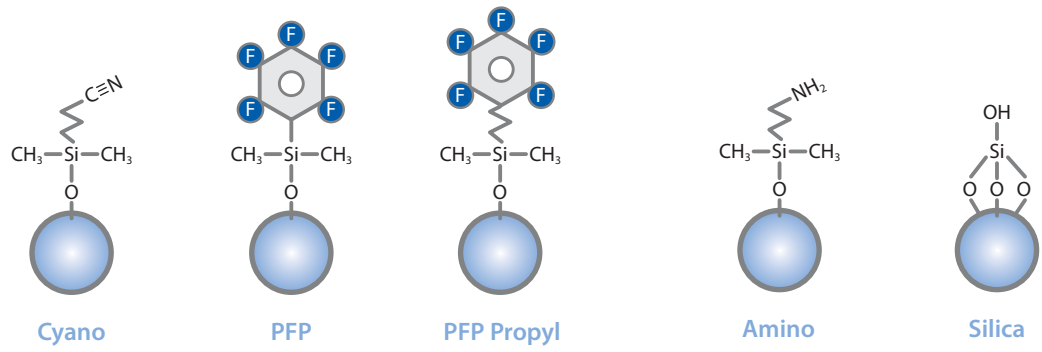


Alkyl phases (e.g. C18)
Alkyl-based stationary phases, such as C18, are best suited for analyzing hydrophobic molecules with a high carbon:heteroatom ratio.

Modified Alkyl Phases
An alkyl-based stationary phase with either an embedded polar group or a polar side chain has significantly greater interaction with polar compounds than a traditional alkyl phase.



Phenyl & Biphenyl phases
Phenyl stationary phases interact with compounds containing aromatic groups or unsaturated bonds through π-π interactions. The biphenyl stationary phase has even greater interaction due to the higher concentration of aromatic rings.



Cyano & Fluorinated phases
Fluorinated phases, such as the pentafluorophenyl propyl (PFP propyl), and cyano-based phases interact strongly with basic, nitrogen-containing and halogenated analytes.

Amino and Silica Phases
Amino and silica phases are traditionally used for the normal phase separation of polar analytes.

Physical Characteristics



Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications
Pinnacle DB C18	Y	140	11	Hydrophobic C18 phase suitable for analyses of a wide range of compounds, from acidic through slightly basic.
Pinnacle DB Aqueous C18	—	140	6	Ideal for applications that require highly aqueous mobile phases, such as organic acids and water-soluble vitamins.
Pinnacle DB C8	Y	140	6	Applications similar to Pinnacle DB C18, but with less hydrophobic retention. Less retention can be useful for shortening analysis time, if resolution is adequate.
Pinnacle DB PFP Propyl	Y	140	6	Exhibits excellent peak shapes for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.
Pinnacle DB Biphenyl	Y	140	8	Excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.
Pinnacle DB Cyano	Y	140	4	Suitable for a wide range of compounds, from acidic through slightly basic. Also useful for confirmation of analyses on a C18 or C8 column. Can be used in normal phase or reversed phase mode of separation.
Pinnacle DB Phenyl	Y	140	5.3	Suitable for polar aromatic compounds, fatty acids, purines and pyrimidines.
Pinnacle DB Silica	—	140	—	Normal phase mode of separation.
Pinnacle DB IBD	Y	140	—	A polar group assists in deactivating surface silanols and contributes to unique separation selectivities for acids, bases, zwitterions, and other polar compounds.
Pinnacle DB PAH	Y	140	—	Ideal for polycyclic aromatic hydrocarbons.
Pinnacle DB X3 C18	Y	140	—	Fast analysis.
Pinnacle II C18	Y	110	13	Superior general purpose C18 for nonbasic analytes.
Pinnacle II PAH	Y	110	—	Maximum resolution of polycyclic aromatic hydrocarbons.
Pinnacle II C8	Y	110	7	Superior general purpose C8 for nonbasic analytes.
Pinnacle II Cyano	Y	110	4	Superior general purpose cyano for weakly-basic analytes. Used in either normal or reversed phase analyses.
Pinnacle II Phenyl	Y	110	6	Superior general purpose phenyl for neutral analytes.
Pinnacle II Amino	N	110	2	Excellent general purpose amino phase. Excellent choice for mono- and di-saccharide analysis.
Pinnacle II Biphenyl	Y	110	—	Multiple aromatic ring structures; excellent for explosives.
Pinnacle II Silica	—	110	—	Ideal for polar analytes.
Allure C18	Y	60	27	Ideal for MS and light-scattering detection of neutral to slightly polar solutes. Separates basic compounds, showing good deactivation; excellent for explosives or steroids.
Allure Aqueous C18	N	60	—	Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds. Excellent for water-soluble vitamins and organic acids. More retention than Ultra Aqueous columns.
Allure AK	Y	60	—	Ideal for the analysis of aldehydes and ketones as DNPH derivatives.
Allure Basix	Y	60	12	Ideal for LC/MS of basic solutes. Excellent for basic pharmaceuticals or other amine-containing compounds.
Allure PFP Propyl	Y	60	17	Ideal for MS, ELSD, or NPD detection of nucleosides, nucleotides, purines, pyrimidines, or halogenated compounds.
Allure Organic Acids	N	60	—	Excellent resolution of challenging organic acids.
Allure Biphenyl	Y	60	23	Multiple ring structure; excellent for aromatic and unsaturated compounds. Increased retention over traditional phenyl phases.
Allure Silica	—	60	—	Most retentive phase for normal phase separation.
Ultra C18	Y	100	20	Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids.
Ultra Aqueous C18	N	100	15	Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds. Excellent for water-soluble vitamins and organic acids.
Ultra IBD	N	100	12	A polar group assists in deactivating surface silanols and contributes to unique separation selectivities for acids, bases, zwitterions, and other polar compounds.
Ultra C8	Y	100	12	Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention.
Ultra C4	Y	100	9	Ideal for peptides and small proteins.
Ultra C1	—	100	5	Alternative selectivity to Ultra C18 or C8 columns, especially for polar analytes. Shortest chain alkyl phase available for reversed phase separations.

pH ranges and temperature limits: see product listings on pages listed here.
Column lifetime will be shorter when operating at pH and/or temperature extremes.



Chromatographic Properties	Similar Phases	USP Code	Page #
Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding.	Hypersil BDS C18, Zorbax Eclipse XDB-C18, Spherisorb ODS	L1	301
Highly selective phase for polar analytes. Compatible with highly aqueous (up to 100%) mobile phases. Silica manufactured by Restek.	Aquasil C18, AQUA C18, Hypersil Gold AQ, YMC ODS-Aq	L1	304
Highly base-deactivated spherical silica manufactured by Restek. Monomeric C8 bonding. Similar to Pinnacle DB C18, but the shorter alkyl chain provides less hydrophobic retention.	Hypersil BDS C8, Spherisorb C8	L7	301
Highly base-deactivated spherical silica manufactured by Restek. Unique pentafluorophenyl phase with a propyl spacer.	Discovery HS F5	L43	303
Highly base-deactivated spherical silica manufactured by Restek. Unique reversed phase material that displays both increased retention and selectivity for aromatic and/or unsaturated compounds when compared to conventional alkyl and phenyl phases.	unique **column**	L11	303
Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding.	Hypersil BDS Cyano, Spherisorb Cyano, Zorbax Eclipse XDB-CN	L10	302
Highly base-deactivated spherical silica manufactured by Restek. Phenyl bonding.	Hypersil BDS Phenyl, Spherisorb Phenyl Zorbax Eclipse XDB-Phenyl	L11	302
Highly base-deactivated spherical silica manufactured by Restek.	—	L3	304
One of a group of intrinsically base-deactivated (IBD) phases, with a polar group within, or intrinsic to, the alkyl bonded phase. Provides unique selectivity and high level of base deactivation while reducing or eliminating the need for mobile phase additives.	unique **column**	—	305
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons.	unique **column**	—	305
A dense trifunctionally bonded C18 alkyl phase for reversed phase separations.	T3	—	305
Intermediate carbon load and surface area, suitable for a wide range of neutral to acidic compounds. Silica manufactured by Restek.	Hypersil ODS	L1	306
Proprietary stationary phase; resolves 16 PAHs in US EPA Method 610. Silica manufactured by Restek.	unique **column**	—	306
Provides shorter retention times for hydrophobic compounds than C18. Silica manufactured by Restek.	Hypersil C8	L7	307
More rugged than bare silica for normal phase analyses. Silica manufactured by Restek.	Hypersil CPS	L10	307
Offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Silica manufactured by Restek.	Hypersil Phenyl	L11	308
Silica manufactured by Restek.	Hypersil APS 2 Amino, Spherisorb Amino	L8	308
Silica manufactured by Restek. Unique biphenyl phase.	unique **column**	L11	309
Superior value phase for normal phase separation of polar analytes. Lower retention than Ultra C18. Silica manufactured by Restek.	Hypersil Silica	L3	309
Most retentive phase for hydrophobic and slightly polar analytes. Mobile phase containing higher percentage of organic modifier contributes to higher sensitivity in ESI-based LC/MS.	Ultracarb C18, BetaMax Neutral, Discovery C18	L1	310
Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases.	unique **column**	L1	311
Highly retentive, highly selective phase, developed specifically for the analysis of aldehydes and ketones as DNPH derivatives.	unique **column**	—	313
Highly retentive phase for analytes containing amino functionality.	BetaMax Base, Maxsil CN	L10	310
A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. Excellent for beta-blockers, halogenated compounds, nucleosides, nucleotides, pyridines, pyrimidines, tricyclic antidepressants.	Discovery HS F5	L43	311
Single 30cm column performs equally to two C18 columns in series. (AOAC Method 986.13)	unique **column**	—	312
High purity, highly retentive phase for aromatic and unsaturated compounds.	unique **column**	L11	312
High purity, highly retentive phase for normal phase separation of polar analytes. Very high surface area.	Maxsil Si	L3	313
A very retentive, high-purity phase that exhibits excellent peak shape for a wide range of compounds. Recommended as a general purpose reversed phase column.	Discovery C18, Symmetry C18, Hypersil Gold C18, Luna C18, Zorbax C18, Kromasil C18, LiChrospher RP-18, Inertsil ODS-2, Develosil C18	L1	314
Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases.	AQUA C18, Aquasil C18, Hypersil Gold AQ, YMC ODS-Aq	L1	315
One of a group of intrinsically base-deactivated (IBD) phases, with a polar group within, or intrinsic to, the alkyl bonded phase. Provides unique selectivity and high level of base deactivation while reducing or eliminating the need for mobile phase additives.	SymmetryShield, Discovery ABZ & ABZ+, Prism	—	315
Very retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds.	Luna C8, Symmetry C8, Hypersil Gold C8	L7	314
Exceptionally stable C4 packing, with high bonding coverage and silanol base-deactivation. Exhibits shorter retention than C18 or C8 phases.	Supelcosil Butyl (C4), Delta-Pak C4	L26	316
Exceptionally stable C1 packing resists hydrolysis, even under acidic mobile phase conditions. Least retentive reversed phase hydrocarbon packing.	Spherisorb C1	L13	316

Continued on next page. . .



Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications
Ultra Cyano	Y	100	8	Excellent for basic pharmaceuticals, steroids (normal or reversed phase conditions), or other basic compounds.
Ultra Phenyl	Y	100	10	Ideal for fatty acids, polycyclic aromatic hydrocarbons, purines and pyrimidines, and polar aromatics.
Ultra Amino	N	100	2	Superior general purpose amino phase. Ideal for carbohydrates.
Ultra PFP	Y	100	7	Ideal for taxol and precursors, or halogenated compounds, amines, esters, or ketones.
Ultra Silica	—	100	—	Ideal for normal phase applications.
Ultra Carbamate	—	100	—	Rapid analysis of carbamates.
Ultra Quat	—	100	—	Proprietary phase for the analysis of paraquat and diquat and other quaternary amines.
Viva C18	Y	300	9	Proteins and other higher molecular weight compounds.
Viva C8	Y	300	5	Proteins and other higher molecular weight compounds. Less retentive than C18 phase.
Viva C4	Y	300	3.5	Proteins and other higher molecular weight compounds. Less retentive than C18 and C8 phases.
Viva Biphenyl	Y	300	6.7	Exhibits excellent peak shape for a wide range of compounds; ideal for large molecule and biomolecule assays.
Viva PFP Propyl	Y	300	5	Exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.
Viva Silica	—	300	—	Normal phase applications for highly retained high molecular weight compounds.

pH ranges and temperature limits: see product listings on pages listed here.
Column lifetime will be shorter when operating at pH and/or temperature extremes.

US Pharmacopeia Cross Reference

L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 1.7 to 10µm in diameter, or a monolithic rod. *Pinnacle DB C18 (p. 301), Pinnacle DB Aqueous C18 (p. 304), Pinnacle II C18 (p. 306), Allure C18 (p. 310), Allure Aqueous C18 (p. 311), Ultra C18 (p. 314), Ultra Aqueous C18 (p. 315), Viva C18 (p. 321)*
L3	Porous silica particles, 5 to 10µm in diameter. *Pinnacle DB Silica (p. 304), Pinnacle II Silica (p. 309), Allure Silica (p. 313), Ultra Silica (p. 319), Viva Silica (p. 323)*
L7	Octylsilane chemically bonded to totally porous silica particles, 1.7 to 10µm in diameter. *Pinnacle DB C8 (p. 301), Pinnacle II C8 (p. 307), Ultra C8 (p. 314), Viva C8 (p. 321)*
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10µm in diameter. *Pinnacle II Amino (p. 308), Ultra Amino (p. 318)*
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10µm in diameter. *Pinnacle DB Cyano (p. 302), Pinnacle II Cyano (p. 307), Allure Basix (p. 310), Ultra Cyano (p. 317)*
L11	Phenyl groups chemically bonded to porous silica particles, 1.7 to 10µm in diameter. *Pinnacle DB Phenyl (p. 302), Pinnacle DB Biphenyl (p. 303), Pinnacle II Phenyl (p. 308), Pinnacle II Biphenyl (p. 309), Allure Biphenyl (p. 312), Ultra Phenyl (p. 317), Viva Biphenyl (p. 322)*
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter. *Ultra C1 (p. 316)*
L26	Butyl silane chemically bonded to totally porous silica particles, 3 to 10µm in diameter. *Ultra C4 (p.316), Viva C4 (p.322)*
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10µm in diameter. *Pinnacle DB PFP Propyl (p. 303), Allure PFP Propyl (p. 311), Ultra PFP (p. 318), Viva PFP Propyl (p. 322)*

Chromatographic Properties	Similar Phases	USP Code	Page #
High-purity cyano phase with reduced silanol activity. Often a better choice than C18 for basic pharmaceuticals. Cyano is the most stable bonded phase for normal phase mode.	Platinum CN, Develosil Cyano, Luna CN, Hypersil Gold CN	L10	317
High-purity, highly retentive, base-deactivated phase with alternate selectivity to hydrocarbon phases, especially for aromatic analytes.	Platinum Phenyl, Supelcosil Phenyl, Betasil Phenyl	L11	317
Recommended for normal phase analyses of mono- and disaccharides and other similar compounds. Can also serve as a weak anion exchanger, with aqueous buffers.	Platinum Amino, Develosil NH2	L8	318
A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogens or other basic analytes.	Fluophase PFP, Fluosep-RP Phenyl, Curosil PFP	L43	318
High purity, high surface area.	—	L3	319
Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase.	unique **column**	—	319
High purity silica.	unique **column**	—	320
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	BioBasic 18, Symmetry 300 C18, Jupiter 300 C18, Zorbax 300 OSB C18, Synchropak C18, 208 TP C18	L1	321
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	BioBasic 8, Zorbax 300 OSB C8, Synchropak C8, 208 TP C8	L7	321
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	BioBasic 4, Symmetry 300 C4, Jupiter 300 C4, Synchropak C4, 208 TP C4	L26	322
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	unique **column**	L11	322
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	unique **column**	L43	322
Silica manufactured by Restek. Greatest large-pore surface ratio in the market.	—	L3	323



free literature

HPLC Column Selection Guide

A useful chart to keep with your workbooks, or post on a wall. Quickly scan important characteristics of Restek HPLC columns. Includes brief, practical guidelines for choosing stationary phase, particle size, pore diameter, and column dimensions. Also includes USP designations for each phase and lists similar phases from other suppliers.

Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

lit. cat.# 59454D

tech tip

Managing High Backpressure

High backpressure is one of the most common problems encountered in HPLC analyses. Normal column back-pressure is observed after a new column has been installed and equilibrated with mobile phase. Unfortunately, this pressure often will increase as the column is used because particles collect on the column inlet frit. These particles can be sample impurities, mobile phase contaminants, or materials from the injector or autosampler rotor seal.

In addition to increasing backpressure, particles on the frit can cause split peaks, peak tailing, and, eventually, over-pressure shut-down. In some circumstances, these problems can be corrected by back-flushing the column. However, in many cases the result is an unusable column.

To minimize backpressure problems, all samples and mobile phase solvents must be filtered before use, and rotor seals should be changed on a routine basis. Along with these preventive measures, it is advisable to use precolumn filters such as the Trident guard column protection system. Particles build up on the inexpensive, replaceable frit in the filter, instead of on the permanent frit at the column inlet.



Restek's popular Pinnacle® DB HPLC columns are available in a <2µm particle size. Ruggedness and reproducibility are guaranteed, as we control every step in the process, from base silica to bonded phase to final packed column. The silica particles are classified and selected to give an exceptionally tight distribution around 1.9µm, while eliminating <1µm particles that can contribute to a poorly packed bed. Highly base-deactivated Pinnacle® DB stationary phases are an excellent choice when analyzing a wide range of compounds, from acidic to basic. To optimize your ultra high pressure HPLC methods, reach for Restek small particle HPLC columns!

1.9µm Pinnacle® DB UHPLC Columns

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek.

Length	2.1mm ID cat.#	price
Pinnacle DB C18 1.9µm Columns		
30mm	9414232	
50mm	9414252	
100mm	9414212	
Pinnacle DB Silica 1.9µm Columns		
30mm	9410232	
50mm	9410252	
100mm	9410212	
Pinnacle DB PFP Propyl 1.9µm Columns		
30mm	9419232	
50mm	9419252	
100mm	9419212	
Pinnacle DB Biphenyl 1.9µm Columns		
30mm	9409232	
50mm	9409252	
100mm	9409212	
Pinnacle DB Aqueous C18 1.9µm Columns		
30mm	9418232	
50mm	9418252	
100mm	9418212	
NEW! **Pinnacle DB IBD 1.9µm Columns**		
30mm	9425232	
50mm	9425252	
100mm	9425212	
Pinnacle DB Cyano 1.9µm Columns		
30mm	9416232	
50mm	9416252	
100mm	9416212	
NEW! **Pinnacle DB C8 1.9µm Columns**		
30mm	9413232	
50mm	9413252	
100mm	9413212	
NEW! **Pinnacle DB PAH 1.9µm Columns**		
30mm	9470232	
50mm	9470252	
100mm	9470212	
NEW! **Pinnacle DB X3 C18 1.9µm Columns**		
30mm	9424232	
50mm	9424252	
100mm	9424212	



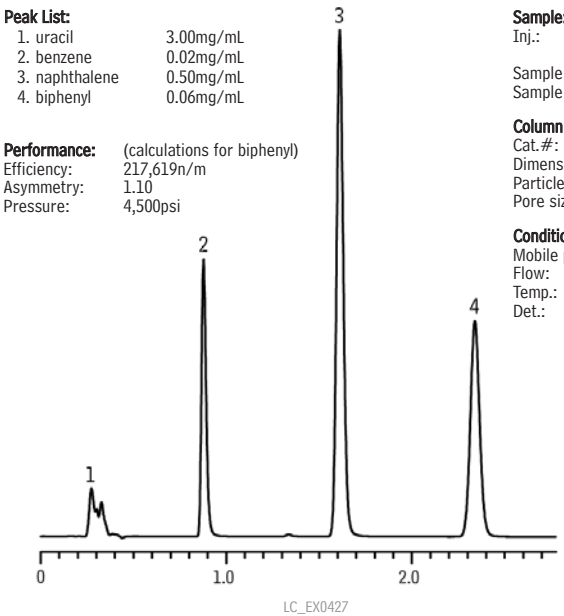
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literature

Optimize Selectivity & Efficiency in UHPLC Separations

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Applications Note
lit. cat.# 580202

Figure 1 Excellent peak symmetry and efficiency on a 1.9µm Pinnacle® DB C18 column, using a reversed phase test mix.



Peak List:

1. uracil	3.00mg/mL
2. benzene	0.02mg/mL
3. naphthalene	0.50mg/mL
4. biphenyl	0.06mg/mL

Performance: (calculations for biphenyl)

Efficiency:	217,619n/m
Asymmetry:	1.10
Pressure:	4,500psi

Sample:

Inj.:	2µL HPLC Reversed Phase Test Mix #1 (cat.# 35005)
Sample diluent:	water:methanol (25:75)
Sample temp.:	ambient

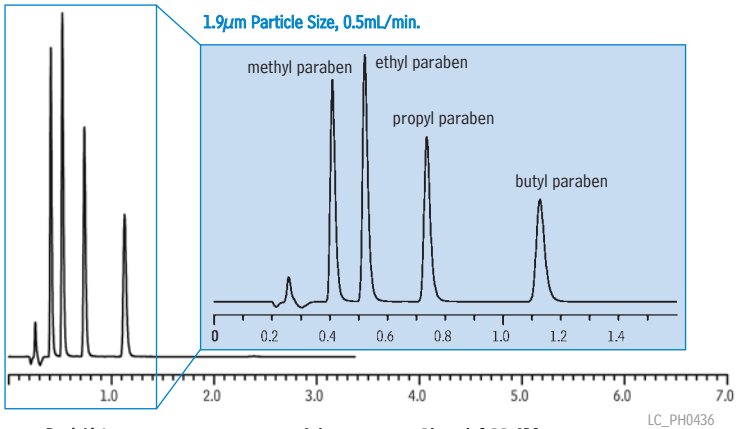
Column: **Pinnacle® DB C18**

Cat.#:	9414252
Dimensions:	50mm x 2.1mm
Particle size:	1.9µm
Pore size:	140Å

Conditions:

Mobile phase:	water:acetonitrile (45:55)
Flow:	0.4mL/min.
Temp.:	25°C
Det.:	UV @ 254nm

Figure 2 Parabens on a 1.9µm Pinnacle® DB C18 column.



Peak List:

1. methyl paraben
2. ethyl paraben
3. propyl paraben
4. butyl paraben

Column: **Pinnacle® DB C18**

Cat.#:	9414252
Dimensions:	50mm x 2.1mm
Particle size:	1.9µm
Pore size:	140Å

Sample:

Inj.:	2µL
Conc.:	~ 100µg/mL each component
Sample diluent:	mobile phase

Conditions:

Mobile phase:	0.1% acetic acid: acetonitrile (50:50) isocratic
Flow:	0.5mL/min.
Temp.:	ambient
Det.:	UV @ 254nm



Anthony Hahn, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com





- High quality, Restek manufactured packing materials.
- Superior packing technology ensures rugged, reproducible columns.
- Wide range of phases and dimensions available—please inquire.

ordering **note**

Looking for another stationary phase or capillary dimension?

Please contact Restek Technical Service at 814-353-1300 or 800-356-1688 (ext. 4) or support@restek.com to inquire.

Restek Capillary HPLC Columns

Physical Characteristics:

Allure® Basix:
particle size: 3µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Allure® PFP Propyl:
particle size: 3µm, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Ultra C18:
particle size: 3µm, spherical
pore size: 100Å
carbon load: 20%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Allure® Biphenyl:
particle size: 3µm, spherical
pore size: 60Å
carbon load: 23%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Ultra Aqueous C18:
particle size: 3µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Viva C18:
particle size: 3µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Available in a wide variety of stationary phases for acidic to basic compounds. Columns are suitable for small molecules using Allure® and Ultra phases and large biomolecules using Viva C18.

Length	0.3mm ID cat.#	price
Allure Basix 3µm Capillary Columns		
50mm	916135B	
150mm	916136B	
Allure Biphenyl 3µm Capillary Columns		
50mm	916635B	
150mm	916636B	
Allure PFP Propyl 3µm Capillary Columns		
50mm	916935B	
150mm	916936B	
Ultra Aqueous C18 3µm Capillary Columns		
50mm	917835B	
150mm	917836B	
Ultra C18 3µm Capillary Columns		
50mm	917435B	
150mm	917436B	
Viva C18 3µm Capillary Columns		
50mm	951435B	
150mm	951436B	



"We focus on developing cutting-edge LC column chemistries with exacting standards and total process control. Our goal is to help customers increase productivity by providing exceptional columns and accessories, matched to their specific analytical needs."

Restek's HPLC Group
pictured: Shane Stevens, Larry Peters, Terry Cressman, Randy Romesberg, Steve Kozel, Bruce Albright, Vernon Bartlett, Frank Dorman (not pictured: Mike Kochakian)

Pinnacle® DB Columns: 1.9, 3, or 5µm particle sizes; 140Å pore size

Prepared using a highly base-deactivated silica support; ideal for analyses of basic compounds, or bases mixed with acids/neutrals. Silica manufactured at Restek, for total control of quality and reproducibility.

Pinnacle® DB C18 Columns (USP L1)

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 11%
endcap: yes
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding. Hydrophobic C18 phase suitable for analyses of a wide range of compounds, from acidic through slightly basic. Replaces Hypersil® BDS C18 and Pinnacle® ODS Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9414232					
50mm			9414252					
100mm			9414212					
3µm Columns								
30mm	9414331		9414332		9414333		9414335	
50mm	9414351		9414352		9414353		9414355	
100mm	9414311		9414312		9414313		9414315	
5µm Columns								
30mm	9414531		9414532		9414533		9414535	
50mm	9414551		9414552		9414553		9414555	
100mm	9414511		9414512		9414513		9414515	
150mm	9414561		9414562		9414563		9414565	
200mm	9414521		9414522		9414523		9414525	
250mm	9414571		9414572		9414573		9414575	

.....Page #
Parabens 511
Vanilla Bean Extract 515
Xanthines 532

looking for more **chromatograms?**

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Pinnacle® DB C8 Columns (USP L7)

Restek manufactured silica

Physical Characteristics:

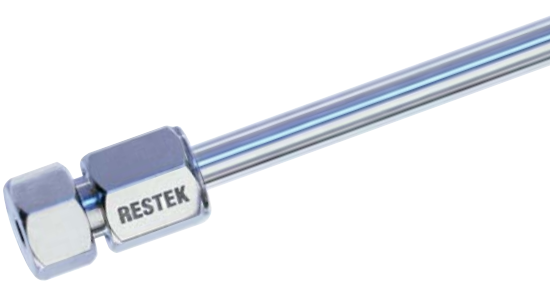
particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Monomeric C8 bonding. Similar to Pinnacle® DB C18, but the shorter alkyl chain provides less hydrophobic retention. Less retention can be useful for shortening analysis time, if resolution is adequate. Replaces Hypersil® BDS C8 and Pinnacle® C8 Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9413232					
50mm			9413252					
100mm			9413212					
3µm Columns								
30mm	9413331		9413332		9413333		9413335	
50mm	9413351		9413352		9413353		9413355	
100mm	9413311		9413312		9413313		9413315	
5µm Columns								
30mm	9413531		9413532		9413533		9413535	
50mm	9413551		9413552		9413553		9413555	
100mm	9413511		9413512		9413513		9413515	
150mm	9413561		9413562		9413563		9413565	
200mm	9413521		9413522		9413523		9413525	
250mm	9413571		9413572		9413573		9413575	

NEW! 1.9µm Pinnacle® DB columns. See pages 298-299 for more information.





Pinnacle® DB Cyano Columns (USP L10)

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm or 5µm, spherical
pore size: 140Å
carbon load: 4%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding. Suitable for analyses of a wide range of compounds, from acidic through slightly basic. Also useful for confirmation of analyses on a C18 or C8 column. Can be used in normal phase or reversed phase mode of separation. Replaces Hypersil® BDS Cyano and Pinnacle® Cyano Amine.



also **available**

Prep Columns
See page 325.

Bulk Packing Materials
See page 326.

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
1.9µm Columns								
30mm			9416232					
50mm			9416252					
100mm			9416212					
5µm Columns								
30mm	9416531		9416532		9416533		9416535	
50mm	9416551		9416552		9416553		9416555	
100mm	9416511		9416512		9416513		9416515	
150mm	9416561		9416562		9416563		9416565	
200mm	9416521		9416522		9416523		9416525	
250mm	9416571		9416572		9416573		9416575	

Pinnacle® DB Phenyl Columns (USP L11)

Restek manufactured silica

Physical Characteristics:

particle range: 5µm, spherical
pore size: 140Å
carbon load: 5.3%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Pinnacle® DB Phenyl columns offer alternate selectivity to straight chain hydrocarbon phases, especially for aromatic analytes. Replaces Hypersil® BDS Phenyl and Pinnacle® Phenyl Amine.



Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
5µm Columns								
30mm	9415531		9415532		9415533		9415535	
50mm	9415551		9415552		9415553		9415555	
100mm	9415511		9415512		9415513		9415515	
150mm	9415561		9415562		9415563		9415565	
200mm	9415521		9415522		9415523		9415525	
250mm	9415571		9415572		9415573		9415575	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Pinnacle® DB PFP Propyl Columns (USP L43)

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Pinnacle® DB PFP Propyl, a unique pentafluorophenyl phase with a propyl spacer, uses a highly base-deactivated spherical silica manufactured by Restek. This highly base-deactivated packing exhibits excellent peak shapes for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9419232					
50mm			9419252					
100mm			9419212					
3µm Columns								
30mm	9419331		9419332		9419333		9419335	
50mm	9419351		9419352		9419353		9419355	
100mm	9419311		9419312		9419313		9419315	
150mm	9419361		9419362		9419363		9419365	
5µm Columns								
30mm	9419531		9419532		9419533		9419535	
50mm	9419551		9419552		9419553		9419555	
100mm	9419511		9419512		9419513		9419515	
150mm	9419561		9419562		9419563		9419565	
200mm	9419521		9419522		9419523		9419525	
250mm	9419571		9419572		9419573		9419575	

.....Page #
Benzodiazepines 497

for **more** info

See **pages 298-299** for more information on our 1.9µm Pinnacle® DB columns.

Pinnacle® DB Biphenyl Columns (USP L11)

Restek manufactured silica

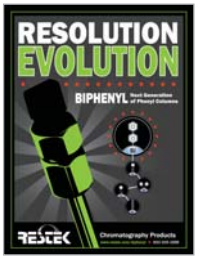
Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 8%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Pinnacle® DB Biphenyl is a unique reversed phase material that displays both increased retention and selectivity for aromatic and/or unsaturated compounds when compared to conventional alkyl and phenyl phases. Highly base-deactivated spherical silica manufactured by Restek. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9409232					
50mm			9409252					
100mm			9409212					
3µm Columns								
30mm	9409331		9409332		9409333		9409335	
50mm	9409351		9409352		9409353		9409355	
100mm	9409311		9409312		9409313		9409315	
150mm	9409361		9409362		9409363		9409365	
5µm Columns								
30mm	9409531		9409532		9409533		9409535	
50mm	9409551		9409552		9409553		9409555	
100mm	9409511		9409512		9409513		9409515	
150mm	9409561		9409562		9409563		9409565	
200mm	9409521		9409522		9409523		9409525	
250mm	9409571		9409572		9409573		9409575	



free literature

Resolution Evolution: Biphenyl-Next Generation of Phenyl Columns

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Flyer
lit. cat.# GNFL1096

.....Page #
Antibiotics 525
Steroids 530



Pinnacle® DB Aqueous C18 Columns (USP L1)

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly selective phase for polar analytes. Compatible with highly aqueous (up to 100%) mobile phases. Silica manufactured by Restek.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9418232					
50mm			9418252					
100mm			9418212					
3µm Columns								
30mm	9418331		9418332		9418333		9418335	
50mm	9418351		9418352		9418353		9418355	
100mm	9418311		9418312		9418313		9418315	
150mm	9418361		9418362		9418363		9418365	
5µm Columns								
30mm	9418531		9418532		9418533		9418535	
50mm	9418551		9418552		9418553		9418555	
100mm	9418511		9418512		9418513		9418515	
150mm	9418561		9418562		9418563		9418565	
200mm	9418521		9418522		9418523		9418525	
250mm	9418571		9418572		9418573		9418575	

Pinnacle® DB Silica Columns (USP L3)

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: none
endcap: no
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Useful for normal phase separations. Replaces Hypersil® BDS and Pinnacle® Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9410232					
50mm			9410252					
100mm			9410212					
3µm Columns								
30mm	9410331		9410332		9410333		9410335	
50mm	9410351		9410352		9410353		9410355	
100mm	9410311		9410312		9410313		9410315	
150mm	9410361		9410362		9410363		9410365	
5µm Columns								
30mm	9410531		9410532		9410533		9410535	
50mm	9410551		9410552		9410553		9410555	
100mm	9410511		9410512		9410513		9410515	
150mm	9410561		9410562		9410563		9410565	
200mm	9410521		9410522		9410523		9410525	
250mm	9410571		9410572		9410573		9410575	

for **more** info

See **pages 298-299** for more information on our 1.9µm Pinnacle® DB columns.

also **available**

HPLC Syringes

See pages 285-289.



ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.

Pinnacle® DB X3 C18 UHPLC Columns

Restek manufactured silica

NEW!

- Higher stability in acidic and highly aqueous conditions.
- Improved peak shape for basic compounds.
- Greater retention of hydrophilic compounds.

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A dense trifunctionally bonded C18 alkyl phase for reversed phase separations.



	2.1mm ID	
Length	cat.#	price
1.9µm Columns		
30mm	9424232	
50mm	9424252	
100mm	9424212	

Pinnacle® DB PAH UHPLC Columns

Restek manufactured silica

NEW!

- Complete resolution of EPA 610 PAHs in less than 4 minutes.
- Greatly reduces run times, increasing sample throughput.

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons.

	2.1mm ID	
Length	cat.#	price
1.9µm Columns		
30mm	9470232	
50mm	9470252	
100mm	9470212	

.....Page #
Polycyclic Aromatic Hydrocarbons 508, 509

Pinnacle® DB IBD UHPLC Columns

Restek manufactured silica

NEW!

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and a high level of base deactivation, while reducing or eliminating the need for mobile phase additives.

	2.1mm ID	
Length	cat.#	price
1.9µm Columns		
30mm	9425232	
50mm	9425252	
100mm	9425212	



Pinnacle® II Columns: 3µm or 5µm particles; 110Å pore size

Silica manufactured at Restek, for total control of quality and reproducibility. Excellent replacement for the original Hypersil® material. Physical and chromatographic properties similar to our original Pinnacle® materials, but with greater lot-to-lot uniformity.

Pinnacle® II C18 Columns (USP L1)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 13%
endcap: fully endcapped
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Excellent choice as a general purpose C18 column. Intermediate carbon loading and surface area, suitable for a wide range of acidic to neutral hydrophobic compounds. Replaces Hypersil® ODS and Pinnacle® C18.

Page #
Allicin 510
Capsaicinoids 513
Morphine Sulfate 520
Phenolic Antioxidants 510, 513

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.0mm ID cat.#	price	4.6mm ID cat.#	price
3µm Columns										
30mm	9214331		9214332		9214333		—	—	9214335	
50mm	9214351		9214352		9214353		—	—	9214355	
100mm	9214311		9214312		9214313		—	—	9214315	
5µm Columns										
30mm	9214531		9214532		9214533		—	—	9214535	
50mm	9214551		9214552		9214553		—	—	9214555	
100mm	9214511		9214512		9214513		9214514		9214515	
150mm	9214561		9214562		9214563		9214564		9214565	
200mm	9214521		9214522		9214523		—	—	9214525	
250mm	9214571		9214572		9214573		—	—	9214575	

Pinnacle® II PAH Columns

Restek manufactured silica

Physical Characteristics:

particle size: 4µm, spherical
pore size: 110Å
endcap: fully endcapped
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Developed specifically for challenging analyses of polycyclic aromatic hydrocarbons. The Pinnacle® II PAH stationary phase incorporates a proprietary C18 bonding that enables unique shape selectivity to resolve to baseline all 16 PAHs listed in US EPA Method 610. Every lot of Pinnacle® II PAH bonded phase material is tested to ensure baseline resolution of the Method 610 PAHs, using a simple water/acetonitrile mobile phase gradient. Further, because we make Pinnacle® II PAH columns using our own silica, we have greater control over quality and reproducibility. Replaces Pinnacle® PAH columns.

If you are analyzing PAHs, Pinnacle® II PAH columns are the reliable, cost-effective columns you need.

Page #
PAHs 508



Length	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
4µm Columns						
50mm	9219452		9219453		9219455	
100mm	9219412		9219413		9219415	
150mm	9219462		9219463		9219465	
200mm	9219422		9219423		9219425	
250mm	9219472		9219473		9219475	

Pinnacle® II C8 Columns (USP L7)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Reliable performance and symmetrical peaks for neutral to acidic compounds. Provides shorter retention times for hydrophobic compounds, compared to C18 phases. Replaces Hypersil® C8 and Pinnacle® C8.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9213331		9213332		9213333		—	—	9213335	
50mm	9213351		9213352		9213353		—	—	9213355	
100mm	9213311		9213312		9213313		—	—	9213315	
5µm Columns										
30mm	9213531		9213532		9213533		—	—	9213535	
50mm	9213551		9213552		9213553		—	—	9213555	
100mm	9213511		9213512		9213513		9213514		9213515	
150mm	9213561		9213562		9213563		9213564		9213565	
200mm	9213521		9213522		9213523		—	—	9213525	
250mm	9213571		9213572		9213573		—	—	9213575	

Page #
Parabens 511

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Pinnacle® II Cyano Columns (USP L10)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 4%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Can be used in either reversed phase or normal phase mode. More rugged than bare silica for normal phase applications. Replaces Hypersil® Cyano and Pinnacle® CN.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9216331		9216332		9216333		9216335	
50mm	9216351		9216352		9216353		9216355	
100mm	9216311		9216312		9216313		9216315	
5µm Columns								
30mm	9216531		9216532		9216533		9216535	
50mm	9216551		9216552		9216553		9216555	
100mm	9216511		9216512		9216513		9216515	
150mm	9216561		9216562		9216563		9216565	
200mm	9216521		9216522		9216523		9216525	
250mm	9216571		9216572		9216573		9216575	

Page #
Corticosteroids 528
Piperine 513

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.





also **available**

Prep Columns
See page 325.

Bulk Packing Materials
See page 326.



Pinnacle® II Phenyl Columns (USP L11)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 6%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

The Pinnacle® II Phenyl phase offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Replaces Hypersil® Phenyl and Pinnacle® Phenyl.

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
3µm Columns								
30mm	9215331		9215332		9215333		9215335	
50mm	9215351		9215352		9215353		9215355	
100mm	9215311		9215312		9215313		9215315	
5µm Columns								
30mm	9215531		9215532		9215533		9215535	
50mm	9215551		9215552		9215553		9215555	
100mm	9215511		9215512		9215513		9215515	
150mm	9215561		9215562		9215563		9215565	
200mm	9215521		9215522		9215523		9215525	
250mm	9215571		9215572		9215573		9215575	

Page #
Parabens 511
Sorbic & Benzoic Acids 513

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Pinnacle® II Amino Columns (USP L8)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 2%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

HPLC analysis using an amino-based stationary phase is the most popular technique for routine analyses of simple sugars, using isocratic elution (e.g., acetonitrile:water, 75:25) and a refractive index detector (RID) or an evaporative light scattering detector (ELSD). The Pinnacle® II Amino column is ideal for mono- and disaccharide analyses. Replaces Hypersil® Amino and Pinnacle® Amino.

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
3µm Columns								
30mm	9217331		9217332		9217333		9217335	
50mm	9217351		9217352		9217353		9217355	
100mm	9217311		9217312		9217313		9217315	
5µm Columns								
30mm	9217531		9217532		9217533		9217535	
50mm	9217551		9217552		9217553		9217555	
100mm	9217511		9217512		9217513		9217515	
150mm	9217561		9217562		9217563		9217565	
200mm	9217521		9217522		9217523		9217525	
250mm	9217571		9217572		9217573		9217575	

Page #
Lactulose Concentrate 532
Maple Syrup 515
Sugars 515

also **available**

HPLC Syringes
See pages 285-289



ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.

Pinnacle® II Biphenyl Columns (USP L11)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 110Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

The Pinnacle® II Biphenyl phase offers alternate selectivity to straight-chain hydrocarbon phases, and enhanced selectivity and retention for unsaturated compounds, compared to traditional phenyl phases. An excellent confirmation column for explosive compounds, as in EPA method 8330.

	4.6mm ID	
Length	cat.#	price
5µm Column		
150mm	9209565	
250mm	9209575	

Page #
Explosives 501

Explosives by US EPA Method 8330B on a Pinnacle® II Biphenyl column.

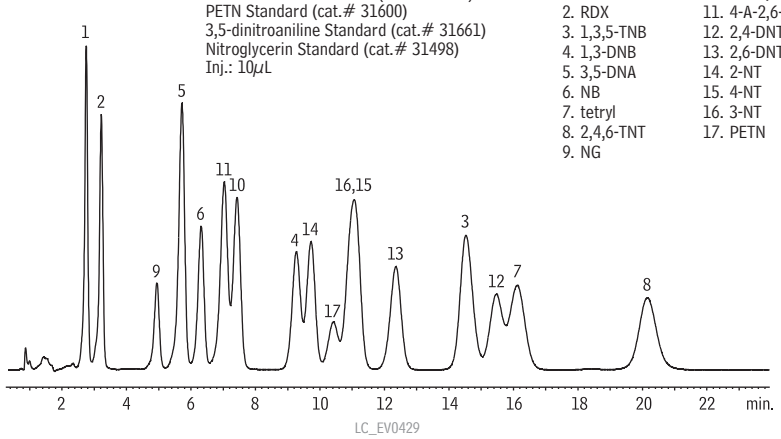
Column: Pinnacle® II Biphenyl
Cat.#: 9209565-700
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Sample: 50µg/mL each compound diluted in acetonitrile
8330 Calibration Mix #1 (cat.# 31450)
8330 Calibration Mix #2 (cat.# 31451)
PETN Standard (cat.# 31600)
3,5-dinitroaniline Standard (cat.# 31661)
Nitroglycerin Standard (cat.# 31498)
Inj.: 10µL

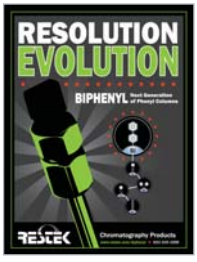
Conditions:
Mobile phase: water:methanol (45:55 v/v)
Flow: 1.2mL/min.
Temp.: 30°C
Det.: UV detection @ 210nm

Peak List

1. HMX
2. RDX
3. 1,3,5-TNB
4. 1,3-DNB
5. 3,5-DNA
6. NB
7. tetryl
8. 2,4,6-TNT
9. NG
10. 2-A-4,6-DNT
11. 4-A-2,6-DNT
12. 2,4-DNT
13. 2,6-DNT
14. 2-NT
15. 4-NT
16. 3-NT
17. PETN



LC_EV0429



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Pinnacle® II Silica Columns (USP L3)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: none
endcap: no
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Good general purpose packing for normal phase separations. Moderate surface area. Replaces Hypersil® and Pinnacle® Silica.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9210331		9210332		9210333		9210335	
50mm	9210351		9210352		9210353		9210355	
100mm	9210311		9210312		9210313		9210315	
5µm Columns								
30mm	9210531		9210532		9210533		9210535	
50mm	9210551		9210552		9210553		9210555	
100mm	9210511		9210512		9210513		9210515	
150mm	9210561		9210562		9210563		9210565	
200mm	9210521		9210522		9210523		9210525	
250mm	9210571		9210572		9210573		9210575	

Page #
Hydrocodone Bitartrate 520
Tocopherols 510



Allure® Columns: 5µm particles; 60Å pore size

Small pore size in a high-purity, Type B silica provides a large surface area. High carbon loads, highly retentive. An excellent choice for light scattering (ELSD) and MS detectors, in which more organic solvent in the mobile phase gives better sensitivity.

Allure® C18 Columns (USP L1)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 27%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Most retentive of our alkyl stationary phases due to large surface area of the base silica and high-density bondings. Provides excellent peak shapes for a wide range of compounds.

Page #
Antibiotics 526
Herbicides 504
Pesticides 506

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
5µm Columns								
30mm	9164531		9164532		9164533		9164535	
50mm	9164551		9164552		9164553		9164555	
100mm	9164511		9164512		9164513		9164515	
150mm	9164561		9164562		9164563		9164565	
200mm	9164521		9164522		9164523		9164525	
250mm	9164571		9164572		9164573		9164575	

Allure® Basix Columns (USP L10)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly retentive propyl cyano phase. Excellent choice for basic compounds and for analytes containing amine group functionality.

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Acetaminophen, Narcotic Analgesics 519
Albuterol 528
Antiarrhythmics 521, 522
Antibiotics 526
Antidepressants 527
Herbicides 503
Ibuprofen & Pseudoephedrine 533
Sedatives 532
Steroids 530

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
5µm Columns								
30mm	9161531		9161532		9161533		9161535	
50mm	9161551		9161552		9161553		9161555	
100mm	9161511		9161512		9161513		9161515	
150mm	9161561		9161562		9161563		9161565	
200mm	9161521		9161522		9161523		9161525	
250mm	9161571		9161572		9161573		9161575	

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Allure® PFP Propyl Columns (USP L43)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, halogenated compounds, β-blockers, and tricyclic antidepressants.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9169531		9169532		9169533		9169535	
50mm	9169551		9169552		9169553		9169555	
100mm	9169511		9169512		9169513		9169515	
150mm	9169561		9169562		9169563		9169565	
200mm	9169521		9169522		9169523		9169525	
250mm	9169571		9169572		9169573		9169575	

Page #
Antibiotics 524
Benzodiazepines 498
Catecholamines 494
Cocaine, Ecgonine Methyl Ester 497
Nucleic Acid Bases 493
Opiates 496
System Suitability Mix 499

Allure® Aqueous C18 Columns (USP L1)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 5µm spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly retentive and selective phase for separating polar analytes, including polar acidic compounds. Compatible with highly aqueous (up to 100%) mobile phases. Highly base deactivated. An excellent choice when analyzing a wide range of compounds, as in LC/MS screening methods.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9168531		9168532		9168533		9168535	
50mm	9168551		9168552		9168553		9168555	
100mm	9168511		9168512		9168513		9168515	
150mm	9168561		9168562		9168563		9168565	
200mm	9168521		9168522		9168523		9168525	
250mm	9168571		9168572		9168573		9168575	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.





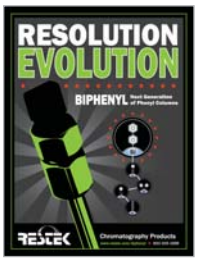
also **available**

Prep Columns
See page 324.

Bulk Packing Materials
See page 326.



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Antibiotics 526
Cannabinoids 496
Corticosteroids 529
NSAIDs 531
Steroids 529



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Allure® Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 23%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly retentive and selective for aromatic and unsaturated compounds. Increased retention and selectivity, compared to phenyl phases. Excellent selectivity for steroids, tetracyclines, explosives, and other unsaturated compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9166531		9166532		9166533		9166535	
50mm	9166551		9166552		9166553		9166555	
100mm	9166511		9166512		9166513		9166515	
150mm	9166561		9166562		9166563		9166565	
200mm	9166521		9166522		9166523		9166525	
250mm	9166571		9166572		9166573		9166575	

Allure® Organic Acids Columns

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Allure® Organic Acids columns provide enhanced retention and selectivity for polar organic acids, allowing the separation to be performed on a single 30cm column. An Allure® Organic Acids column effectively resolves key organic acids such as tartaric and quinic acids, using the chromatographic conditions specified in AOAC method 986.13. Retention is stable and reproducible, even with the 100% aqueous mobile phase specified in the AOAC method.

	3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price
5µm Column				
150mm	9165563		9165565	
250mm			9165575	
300mm			9165585	

Note: Other dimensions available on request.

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Carboxylic Acids 514
Fruit Juice Acids 514, 515

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Allure® Silica Columns (USP L3)

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly retentive phase for normal phase separations. Very high surface area, Type B silica packing.



Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
5µm Columns								
30mm	9160531		9160532		9160533		9160535	
50mm	9160551		9160552		9160553		9160555	
100mm	9160511		9160512		9160513		9160515	
150mm	9160561		9160562		9160563		9160565	
200mm	9160521		9160522		9160523		9160525	
250mm	9160571		9160572		9160573		9160575	

Allure® AK Columns

Physical Characteristics:

particle size: 5µm
pore size: 60Å
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

This highly retentive, highly selective phase, unique to Restek, was developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. Allure® AK is a reversed phase HPLC material that has the unique ability to separate all thirteen carbonyl compounds specified in California Air Resources Board (CARB) Method # 1004, using a simple acetonitrile/water gradient, in less than 15 minutes. Other columns require long analysis times or the use of tetrahydrofuran.

Length	3.2mm ID cat.#	price	4.6mm ID cat.#	price
5µm Columns with Trident Integral Inlet Fittings				
200mm	9159523-700		9159525-700	

Page #
Carbonyls 500

Carbonyls by CARB Method 1004 on an Allure® AK column.

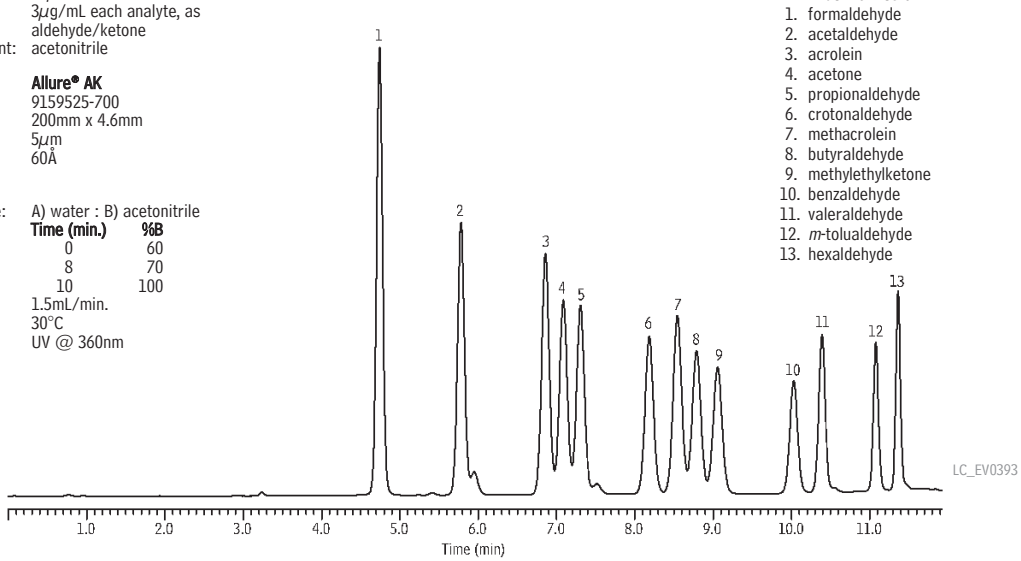
Sample:
Inj.: 10µL
Conc.: 3µg/mL each analyte, as aldehyde/ketone
Sample diluent: acetonitrile

Column: **Allure® AK**
Cat.#: 9159525-700
Dimensions: 200mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: A) water : B) acetonitrile

Time (min.)	%B
0	60
8	70
10	100

Flow: 1.5mL/min.
Temp.: 30°C
Det.: UV @ 360nm



Peak DNPH derivatives of:	Ret. Time (min.)
1. formaldehyde	4.74
2. acetaldehyde	5.78
3. acrolein	6.86
4. acetone	7.09
5. propionaldehyde	7.31
6. crotonaldehyde	8.19
7. methacrolein	8.55
8. butyraldehyde	8.79
9. methylethylketone	9.06
10. benzaldehyde	10.03
11. valeraldehyde	10.39
12. *m*-tolualdehyde	11.08
13. hexaldehyde	11.36



Ultra Columns: 3µm or 5µm particles; 100Å pore size

Our broadest selection of stationary phases, including unique phases. High density bondings, for maximum retention. High-purity, Type B silica gives excellent peak shapes for a wide range of compounds.

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Acetaminophen, Narcotic Analgesics 519
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Beclomethasone 523
Corticosteroids 529
Explosives 501
Herbicides 502
Hydrocodone Bitartrate, Acetaminophen 533
Nitrofuran Metabolites 517
Vitamins (Fat Soluble) 512

Ultra C18 Columns (USP L1)
Excellent for a wide range of analyses

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 20%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A retentive, high-purity packing that exhibits excellent peak shape for a wide range of compounds. Excellent general-purpose reversed phase column.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9174331		9174332		9174333		—	—	9174335	
50mm	9174351		9174352		9174353		—	—	9174355	
100mm	9174311		9174312		9174313		—	—	9174315	
5µm Columns										
30mm	9174531		9174532		9174533		—	—	9174535	
50mm	9174551		9174552		9174553		—	—	9174555	
100mm	9174511		9174512		9174513		9174514		9174515	
150mm	9174561		9174562		9174563		9174564		9174565	
200mm	9174521		9174522		9174523		—	—	9174525	
250mm	9174571		9174572		9174573		—	—	9174575	

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Oxycodone 520
Vanillin & Ethyl Vanillin 516

Ultra C8 Columns (USP L7)
Excellent for a wide range of analyses

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds. Less retention for neutral, hydrophobic compounds, compared to the Ultra C18 column.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9103331		9103332		9103333		—	—	9103335	
50mm	9103351		9103352		9103353		—	—	9103355	
100mm	9103311		9103312		9103313		—	—	9103315	
5µm Columns										
30mm	9103531		9103532		9103533		—	—	9103535	
50mm	9103551		9103552		9103553		—	—	9103555	
100mm	9103511		9103512		9103513		9103514		9103515	
150mm	9103561		9103562		9103563		9103564		9103565	
200mm	9103521		9103522		9103523		—	—	9103525	
250mm	9103571		9103572		9103573		—	—	9103575	





Ultra Aqueous C18 Columns (USP L1)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly retentive and selective for reversed phase separations of polar analytes. Highly base-deactivated. Compatible with highly aqueous (up to 100%) mobile phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9178331		9178332		9178333		9178335	
50mm	9178351		9178352		9178353		9178355	
100mm	9178311		9178312		9178313		9178315	
5µm Columns								
30mm	9178531		9178532		9178533		9178535	
50mm	9178551		9178552		9178553		9178555	
100mm	9178511		9178512		9178513		9178515	
150mm	9178561		9178562		9178563		9178565	
200mm	9178521		9178522		9178523		9178525	
250mm	9178571		9178572		9178573		9178575	

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Herbicides 502, 503
Phenethyl Glucosinolate 510
Sudan Dyes 516

Ultra IBD Columns
Specialized Columns for Mixed Polar and Nonpolar Compounds

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and a high level of base deactivation, while reducing or eliminating the need for mobile phase additives.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9175331		9175332		9175333		9175335	
50mm	9175351		9175352		9175353		9175355	
100mm	9175311		9175312		9175313		9175315	
5µm Columns								
30mm	9175531		9175532		9175533		9175535	
50mm	9175551		9175552		9175553		9175555	
100mm	9175511		9175512		9175513		9175515	
150mm	9175561		9175562		9175563		9175565	
200mm	9175521		9175522		9175523		9175525	
250mm	9175571		9175572		9175573		9175575	

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ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Ultra C4 Columns (USP L26)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 9%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Exceptionally stable C4 packing, with high bonding coverage and base deactivation. Less retention than C18 or C8 phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9102331		9102332		9102333		9102335	
50mm	9102351		9102352		9102353		9102355	
100mm	9102311		9102312		9102313		9102315	
5µm Columns								
30mm	9102531		9102532		9102533		9102535	
50mm	9102551		9102552		9102553		9102555	
100mm	9102511		9102512		9102513		9102515	
150mm	9102561		9102562		9102563		9102565	
200mm	9102521		9102522		9102523		9102525	
250mm	9102571		9102572		9102573		9102575	

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Ultra C1 Columns (USP L13)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 5%
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Exceptionally stable C1 phase. Least retentive reversed phase hydrocarbon packing.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9101331		9101332		9101333		9101335	
50mm	9101351		9101352		9101353		9101355	
100mm	9101311		9101312		9101313		9101315	
5µm Columns								
30mm	9101531		9101532		9101533		9101535	
50mm	9101551		9101552		9101553		9101555	
100mm	9101511		9101512		9101513		9101515	
150mm	9101561		9101562		9101563		9101565	
200mm	9101521		9101522		9101523		9101525	
250mm	9101571		9101572		9101573		9101575	



also **available**

Prep Columns
See page 324.

Bulk Packing Materials
See page 326.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Ultra Cyano Columns (USP L10)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 8%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

High-purity cyano phase with few silanol sites. Often a better choice than C18 phases for basic pharmaceuticals, especially regarding peak shape and selectivity. Cyano phases are more rugged than bare silica for normal phase analyses because they are less sensitive to small amounts of water in the mobile phase.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9106331		9106332		9106333		9106335	
50mm	9106351		9106352		9106353		9106355	
100mm	9106311		9106312		9106313		9106315	
5µm Columns								
30mm	9106531		9106532		9106533		9106535	
50mm	9106551		9106552		9106553		9106555	
100mm	9106511		9106512		9106513		9106515	
150mm	9106561		9106562		9106563		9106565	
200mm	9106521		9106522		9106523		9106525	
250mm	9106571		9106572		9106573		9106575	

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Antiarrhythmics 520

Ultra Phenyl Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 10%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

High-purity, highly retentive, base-deactivated phase with alternative selectivity to straight chain hydrocarbon phases, especially for aromatic analytes.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9105331		9105332		9105333		9105335	
50mm	9105351		9105352		9105353		9105355	
100mm	9105311		9105312		9105313		9105315	
5µm Columns								
30mm	9105531		9105532		9105533		9105535	
50mm	9105551		9105552		9105553		9105555	
100mm	9105511		9105512		9105513		9105515	
150mm	9105561		9105562		9105563		9105565	
200mm	9105521		9105522		9105523		9105525	
250mm	9105571		9105572		9105573		9105575	

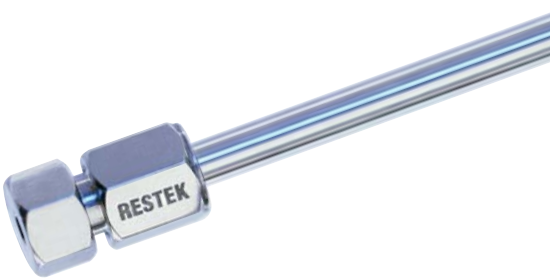
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Guaifenesin, Codeine 533

also **available**

HPLC Syringes

See pages 285-289.





looking for **chromatograms?**
Visit www.restek.com.

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Ultra Amino Columns (USP L8)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 2%
encap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Recommended for normal phase analyses of mono- and disaccharides, or similar compounds.

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
3µm Columns								
30mm	9107331		9107332		9107333		9107335	
50mm	9107351		9107352		9107353		9107355	
100mm	9107311		9107312		9107313		9107315	
5µm Columns								
30mm	9107531		9107532		9107533		9107535	
50mm	9107551		9107552		9107553		9107555	
100mm	9107511		9107512		9107513		9107515	
150mm	9107561		9107562		9107563		9107565	
200mm	9107521		9107522		9107523		9107525	
250mm	9107571		9107572		9107573		9107575	

Ultra PFP Columns (USP L43) Unique Selectivity

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A pentafluorophenyl phase. Unique selectivity for compounds containing organohalogens or other basic functional groups.

Length	1.0mm ID cat.#	price	2.1mm ID cat.#	price	3.2mm ID cat.#	price	4.6mm ID cat.#	price
3µm Columns								
30mm	9176331		9176332		9176333		9176335	
50mm	9176351		9176352		9176353		9176355	
100mm	9176311		9176312		9176313		9176315	
5µm Columns								
30mm	9176531		9176532		9176533		9176535	
50mm	9176551		9176552		9176553		9176555	
100mm	9176511		9176512		9176513		9176515	
150mm	9176561		9176562		9176563		9176565	
200mm	9176521		9176522		9176523		9176525	
250mm	9176571		9176572		9176573		9176575	



ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Ultra Silica Columns (USP L3)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: none
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

High surface area, Type B silica packing.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9100331		9100332		9100333		9100335	
50mm	9100351		9100352		9100353		9100355	
100mm	9100311		9100312		9100313		9100315	
5µm Columns								
30mm	9100531		9100532		9100533		9100535	
50mm	9100551		9100552		9100553		9100555	
100mm	9100511		9100512		9100513		9100515	
150mm	9100561		9100562		9100563		9100565	
200mm	9100521		9100522		9100523		9100525	
250mm	9100571		9100572		9100573		9100575	

Ultra Carbamate Columns

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Restek chemists developed the Ultra Carbamate column specifically for carbamates analysis. The unique packing separates 10 target carbamates in just over 10 minutes. The column is compatible with fluorescence or LC/MS detection.* An Ultra Carbamate column can process as many as 3 to 4 samples per hour, versus less than 2 samples per hour on a general-purpose C18 column. In addition to increased sample throughput, this much faster analysis will significantly reduce solvent usage—and the costs of disposing of solvent waste.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
50mm	9177351		9177352		9177353		9177354		9177355	
100mm	9177311		9177312		9177313		—	—	9177315	
5µm Columns										
250mm	—	—	—	—	—	—	—	—	9177575	

*For post-column derivatization/fluorescence detection applications for a 4.6mm ID column the total system dead volume, including the post-column reactor, must be less than 650µL. For standard post-column reactor systems, we recommend a 250mm x 4.6mm, 5µm column. Contact Restek technical service or your Restek representative for more information.

restek **exclusive**!

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Pesticides (Carbamates) 507

restek **innovation**!

Faster analyses and reduced solvent use!
An Ultra Carbamate column can process as many as 3 to 4 samples per hour, versus less than 2 samples per hour on a general-purpose C18 column.



also **available**

We also have syringe filters!
See **page 363.**



restek **exclusive**!

Page #
Paraquat, Diquat 505

Ultra Quat Columns

Physical Characteristics:

particle size: 5µm, spherical
pore size: 100Å
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A retentive, high-purity, base deactivated reversed phase packing. Ideal for the analysis of paraquat and diquat or other quaternary amines when used with Ultra Quat Reagent Solution mobile phase additive (cat.# 32441).

Length	4.6mm ID cat.#	price
5µm Column		
150mm	9181565	



free literature

Simple, Sensitive HPLC/UV Analysis for Paraquat and Diquat

Download your free copy from **www.restek.com**.

Applications Note
lit. cat.# 580006

restek **innovation**!

An Ultra Quat column and Ultra Quat Reagent Solution eliminate the need for ion pairing reagents in paraquat/diquat analysis.

Ultra Quat Reagent Solution

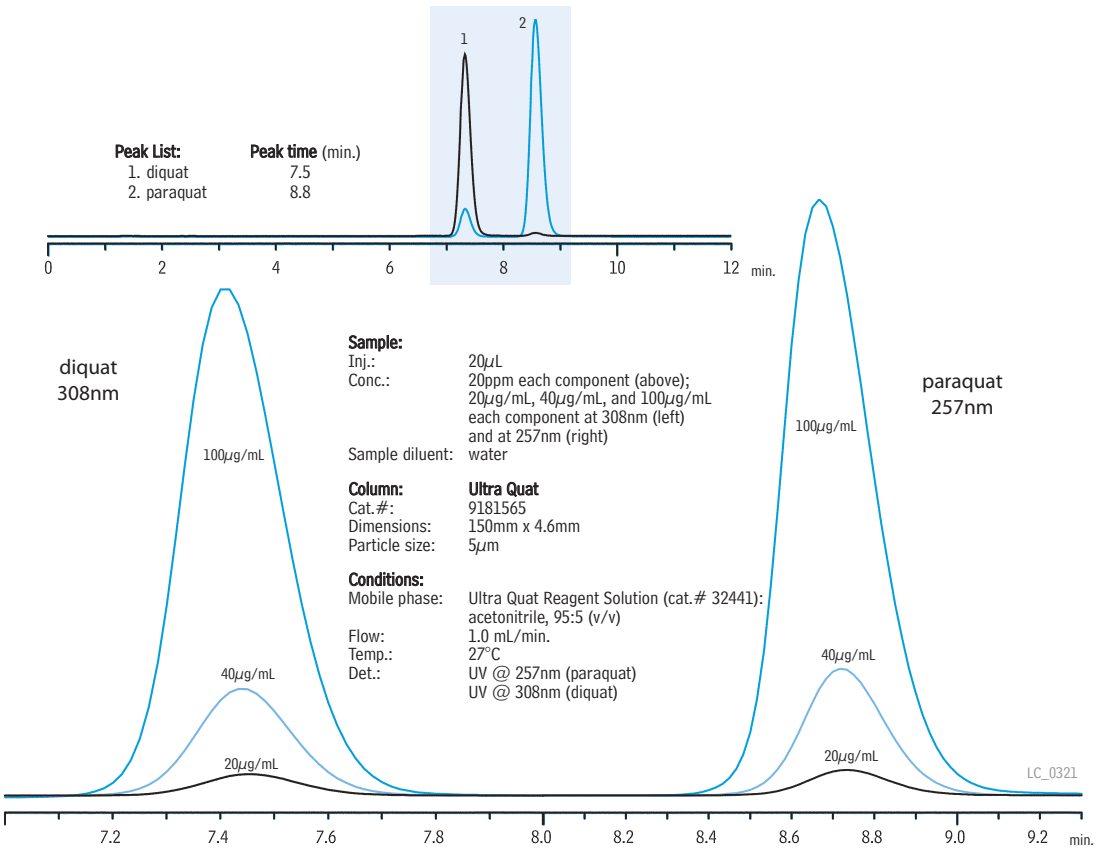
Use with Ultra Quat HPLC column. Dilute to 1 liter water, per instructions.

In water, 20mL/bottle
cat. # 32441 (ea.)

Paraquat & Diquat Calibration Mix

diquat dibromide paraquat dichloride
1,000µg/mL each in water, 1mL/ampul
cat. # 32437 (ea.)

Consistent resolution, retention times, and peak symmetry for paraquat and diquat on an Ultra Quat column.





Viva Wide Pore HPLC Columns: 3µm or 5µm particles; 300Å pore size

- Excellent for separating peptides or proteins.
- Rugged, spherical particles, with 300Å pore size.
- High proportion of pore/surface area available to large molecules.

Viva columns are based on a wide pore material we designed for optimal large molecule separations. In developing Viva silica, we found that although many commercial wide-pore silicas meet the standard 300Å mean pore size, most have very broad distributions about this mean, with a significant portion of their pore volume falling below 150Å. This means a large portion of the surface area is unavailable to larger molecules. Viva columns have a narrow distribution about the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

Viva C18 Columns (USP L1)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Excellent general-purpose column for analyzing large molecules and biomolecules.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9514331		9514332		9514333		9514335	
50mm	9514351		9514352		9514353		9514355	
100mm	9514311		9514312		9514313		9514315	
150mm	9514361		9514362		9514363		9514365	
5µm Columns								
30mm	9514531		9514532		9514533		9514535	
50mm	9514551		9514552		9514553		9514555	
100mm	9514511		9514512		9514513		9514515	
150mm	9514561		9514562		9514563		9514565	
200mm	9514521		9514522		9514523		9514525	
250mm	9514571		9514572		9514573		9514575	

Viva C8 Columns (USP L7)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Less retention in reversed phase assays than Viva C18.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9513531		9513532		9513533		9513535	
50mm	9513551		9513552		9513553		9513555	
100mm	9513511		9513512		9513513		9513515	
150mm	9513561		9513562		9513563		9513565	
200mm	9513521		9513522		9513523		9513525	
250mm	9513571		9513572		9513573		9513575	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.

restek **innovation**!

Viva silica has a narrow distribution about the mean pore size, permitting a larger portion of the silica surface to play a role in the separation of large molecules and biomolecules.

Page #
Oxytocin 495
Peptides 494
Proteins 495

ordering **note**

Other column dimensions and phases are available. Please call for a quote.

also **available**

3µm particles are available for all Viva phases—please inquire.



Viva C4 Columns (USP L26)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 3.5%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Less retention in reversed phase assays than Viva C18 or Viva C8.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9512531		9512532		9512533		9512535	
50mm	9512551		9512552		9512553		9512555	
100mm	9512511		9512512		9512513		9512515	
150mm	9512561		9512562		9512563		9512565	
200mm	9512521		9512522		9512523		9512525	
250mm	9512571		9512572		9512573		9512575	



free literature

Viva Wide Pore HPLC Columns

Download your free copy from **www.restek.com**.

Flyer
lit. cat.# 59939

also **available**

3µm particles are available for all Viva phases—please inquire.

Viva Biphenyl Columns (USP L11)

restek **exclusive**!

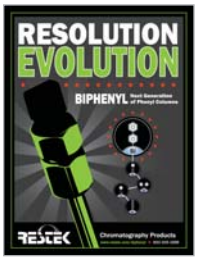
Physical Characteristics:

particle size: 5µm
pore size: 300Å
carbon load: 6.7%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds; ideal for large molecule and biomolecule assays. Highly retentive and selective phase for aromatic and unsaturated compounds, with increased retention, relative to phenyl phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9516531		9516532		9516533		9516535	
50mm	9516551		9516552		9516553		9516555	
100mm	9516511		9516512		9516513		9516515	
150mm	9516561		9516562		9516563		9516565	
200mm	9516521		9516522		9516523		9516525	
250mm	9516571		9516572		9516573		9516575	



free literature

Resolution Evolution: Biphenyl-Next Generation of Phenyl Columns

Download your free copy from **www.restek.com**.

Flyer
lit. cat.# GNFL1096

Viva PFP Propyl Columns (USP L43)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9519531		9519532		9519533		9519535	
50mm	9519551		9519552		9519553		9519555	
100mm	9519511		9519512		9519513		9519515	
150mm	9519561		9519562		9519563		9519565	
200mm	9519521		9519522		9519523		9519525	
250mm	9519571		9519572		9519573		9519575	

also **available**

HPLC Syringes
See pages 285-289.



Viva Silica Columns (USP L3)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds in normal phase separations.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9510531		9510532		9510533		9510535	
50mm	9510551		9510552		9510553		9510555	
100mm	9510511		9510512		9510513		9510515	
150mm	9510561		9510562		9510563		9510565	
200mm	9510521		9510522		9510523		9510525	
250mm	9510571		9510572		9510573		9510575	



also **available**

Prep Columns
See page 325.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (cat.#25026 or 25062), see page 327.
For guard cartridges for these columns, see page 329.



Fast LC Method Development Kits

Fast, efficient separations in an economical cartridge format. The design allows rapid substitution of one cartridge for another. The holder is available with either standard fittings or with a universal PEEK™ tip fitting. The universal fitting gives the user the option of threading the column directly into the detector inlet, reducing system dwell volume. The cartridges are 30mm long, with either 2.1mm or 4.0mm ID. The 2.1mm and 4.0mm ID cartridges have the same outside diameter, so the holder will accept either.

Each kit includes four 3µm Fast LC Cartridges: Ultra C18 (USP L1), Ultra Aqueous C18 (USP L1), Ultra Cyano (USP L10), Ultra PFP (USP L43), and a Fast LC cartridge holder.

Fast LC Development Kits

Description	qty.	cat.#	price
Fast LC Development Kit, four 30mm x 2.1mm columns	kit	25296	
Fast LC Development Kit, four 30mm x 4.0mm columns	kit	25297	

3µm Fast LC Cartridges

Description	Length	2.1mm ID	4.0mm ID	price
Ultra C18 Fast LC Cartridge	30mm	91743320	91743340	
Ultra Aqueous C18 Fast LC Cartridge	30mm	91783320	91783340	
Ultra Cyano Fast LC Cartridge	30mm	91063320	91063340	
Ultra PFP Fast LC Cartridge	30mm	91763320	91763340	

Fast LC Cartridge Holders

Description	qty.	cat.#	price
Fast LC Cartridge Holder with PEEK Tip	ea.	25298	
Fast LC Cartridge Holder with Standard Fittings	ea.	25299	



also **available**

Additional column kits and Fast LC cartridges are available. Please call for more information.

HPLC Prep Columns

- Easy scale-up from Restek analytical columns.
- Popular bonded phases.

Restek makes it easy to scale up your separations. We offer a wide range of semi-preparative and preparative-scale columns packed with many of our popular Ultra, Allure®, Pinnacle® DB, Pinnacle® II, and Viva bonded phases on a 5µm spherical silica. Other stationary phases and particle sizes are available—if you need a phase on 7µm, 10µm or 15µm particles, please call.



ordering **note**

We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).

The relative mass capacity when comparing phases by surface area is: **Allure**>**Ultra**>**Pinnacle II**>**Pinnacle DB**>**Viva**

NEW!

Prep columns now available in even more phases.

Allure® HPLC Prep Columns

Small pore size in a high-purity, Type B silica provides a large surface area. High carbon loads, highly retentive.

Dimensions Length x ID	Allure C18 cat.#	Allure Basix cat.#	Allure Biphenyl cat.#	Allure PFP Propyl cat.#	Allure Silica cat.#	price
50 x 10mm	9164557	9161557	9166557	9169557	9160557	enquire
50 x 21.2mm	9164558	9161558	9166558	9169558	9160558	enquire
50 x 30mm	9164559	9161559	9166559	9169559	9160559	enquire
50 x 50mm	9164550	9161550	9166550	9169550	9160550	enquire
100 x 10mm	9164517	9161517	9166517	9169517	9160517	enquire
100 x 21.2mm	9164518	9161518	9166518	9169518	9160518	enquire
100 x 30mm	9164519	9161519	9166519	9169519	9160519	enquire
100 x 50mm	9164510	9161510	9166510	9169510	9160510	enquire
150 x 10mm	9164567	9161567	9166567	9169567	9160567	enquire
150 x 21.2mm	9164568	9161568	9166568	9169568	9160568	enquire
150 x 30mm	9164569	9161569	9166569	9169569	9160569	enquire
150 x 50mm	9164560	9161560	9166560	9169560	9160560	enquire
250 x 10mm	9164577	9161577	9166577	9169577	9160577	enquire
250 x 21.2mm	9164578	9161578	9166578	9169578	9160578	enquire
250 x 30mm	9164579	9161579	9166579	9169579	9160579	enquire
250 x 50mm	9164570	9161570	9166570	9169570	9160570	enquire

Ultra HPLC Prep Columns

Our broadest selection of stationary phases, including unique phases. High density bondings, for maximum retention. High-purity, Type B silica gives excellent peak shapes for a wide range of compounds.

Dimensions Length x ID	Ultra C18 cat.#	Ultra Aqueous C18 cat.#	Ultra C8 cat.#	Ultra IBD cat.#	Ultra Cyano cat.#	Ultra Phenyl cat.#	Ultra PFP cat.#	Ultra Silica cat.#	price
50 x 10mm	9174557	9178557	9103557	9175557	9106557	9105557	9176557	9100557	enquire
50 x 21.2mm	9174558	9178558	9103558	9175558	9106558	9105558	9176558	9100558	enquire
50 x 30mm	9174559	9178559	9103559	9175559	9106559	9105559	9176559	9100559	enquire
50 x 50mm	9174550	9178550	9103550	9175550	9106550	9105550	9176550	9100550	enquire
100 x 10mm	9174517	9178517	9103517	9175517	9106517	9105517	9176517	9100517	enquire
100 x 21.2mm	9174518	9178518	9103518	9175518	9106518	9105518	9176518	9100518	enquire
100 x 30mm	9174519	9178519	9103519	9175519	9106519	9105519	9176519	9100519	enquire
100 x 50mm	9174510	9178510	9103510	9175510	9106510	9105510	9176510	9100510	enquire
150 x 10mm	9174567	9178567	9103567	9175567	9106567	9105567	9176567	9100567	enquire
150 x 21.2mm	9174568	9178568	9103568	9175568	9106568	9105568	9176568	9100568	enquire
150 x 30mm	9174569	9178569	9103569	9175569	9106569	9105569	9176569	9100569	enquire
150 x 50mm	9174560	9178560	9103560	9175560	9106560	9105560	9176560	9100560	enquire
250 x 10mm	9174577	9178577	9103577	9175577	9106577	9105577	9176577	9100577	enquire
250 x 21.2mm	9174578	9178578	9103578	9175578	9106578	9105578	9176578	9100578	enquire
250 x 30mm	9174579	9178579	9103579	9175579	9106579	9105579	9176579	9100579	enquire
250 x 50mm	9174570	9178570	9103570	9175570	9106570	9105570	9176570	9100570	enquire

Pinnacle® II HPLC Prep Columns

Silica manufactured at Restek, for total control of quality and reproducibility. Excellent replacement for the original Hypersil® material.

Dimensions Length x ID	Pinnacle II C18 cat.#	Pinnacle II C8 cat.#	Pinnacle II Cyano cat.#	Pinnacle II Silica cat.#	price
50 x 10mm	9214557	9213557	9216557	9210557	
50 x 21.2mm	9214558	9213558	9216558	9210558	enquire
50 x 30mm	9214559	9213559	9216559	9210559	enquire
50 x 50mm	9214550	9213550	9216550	9210550	enquire
100 x 10mm	9214517	9213517	9216517	9210517	
100 x 21.2mm	9214518	9213518	9216518	9210518	enquire
100 x 30mm	9214519	9213519	9216519	9210519	enquire
100 x 50mm	9214510	9213510	9216510	9210510	enquire
150 x 10mm	9214567	9213567	9216567	9210567	
150 x 21.2mm	9214568	9213568	9216568	9210568	enquire
150 x 30mm	9214569	9213569	9216569	9210569	enquire
150 x 50mm	9214560	9213560	9216560	9210560	enquire
250 x 10mm	9214577	9213577	9216577	9210577	enquire
250 x 21.2mm	9214578	9213578	9216578	9210578	enquire
250 x 30mm	9214579	9213579	9216579	9210579	enquire
250 x 50mm	9214570	9213570	9216570	9210570	enquire

Pinnacle II not recommended for basic analytes.



Pinnacle® DB HPLC Prep Columns

Prepared using a highly base-deactivated silica support; ideal for analyses of basic compounds, or bases mixed with acids/neutrals. Silica manufactured at Restek, for total control of quality and reproducibility.

Dimensions Length x ID	Pinnacle DB C18 cat.#	Pinnacle DB Aqueous C18 cat.#	Pinnacle DB C8 cat.#	Pinnacle DB Biphenyl cat.#	Pinnacle DB Cyano cat.#	Pinnacle DB IBD cat.#	Pinnacle DB PFP Propyl cat.#	Pinnacle DB Silica cat.#	price
50 x 10mm	9414557	9418557	9413557	9409557	9416557	9425557	9419557	9410557	
50 x 21.2mm	9414558	9418558	9413558	9409558	9416558	9425558	9419558	9410558	enquire
50 x 30mm	9414559	9418559	9413559	9409559	9416559	9425559	9419559	9410559	enquire
50 x 50mm	9414550	9418550	9413550	9409550	9416550	9425550	9419550	9410550	enquire
100 x 10mm	9414517	9418517	9413517	9409517	9416517	9425517	9419517	9410517	enquire
100 x 21.2mm	9414518	9418518	9413518	9409518	9416518	9425518	9419518	9410518	enquire
100 x 30mm	9414519	9418519	9413519	9409519	9416519	9425519	9419519	9410519	enquire
100 x 50mm	9414510	9418510	9413510	9409510	9416510	9425510	9419510	9410510	enquire
150 x 10mm	9414567	9418567	9413567	9409567	9416567	9425567	9419567	9410567	enquire
150 x 21.2mm	9414568	9418568	9413568	9409568	9416568	9425568	9419568	9410568	enquire
150 x 30mm	9414569	9418569	9413569	9409569	9416569	9425569	9419569	9410569	enquire
150 x 50mm	9414560	9418560	9413560	9409560	9416560	9425560	9419560	9410560	enquire
250 x 10mm	9414577	9418577	9413577	9409577	9416577	9425577	9419577	9410577	enquire
250 x 21.2mm	9414578	9418578	9413578	9409578	9416578	9425578	9419578	9410578	enquire
250 x 30mm	9414579	9418579	9413579	9409579	9416579	9425579	9419579	9410579	enquire
250 x 50mm	9414570	9418570	9413570	9409570	9416570	9425570	9419570	9410570	enquire

ordering note

We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).

Viva HPLC Prep Columns

Viva columns are based on a wide pore material we designed for optimal large molecule separations. Viva columns have a narrow distribution about the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

Dimensions Length x ID	Viva C18 cat.#	Viva C8 cat.#	Viva C4 cat.#	price
50 x 10mm	9514557	9513557	9512557	enquire
50 x 21.2mm	9514558	9513558	9512558	enquire
50 x 30mm	9514559	9513559	9512559	enquire
50 x 50mm	9514550	9513550	9512550	enquire
100 x 10mm	9514517	9513517	9512517	enquire
100 x 21.2mm	9514518	9513518	9512518	enquire
100 x 30mm	9514519	9513519	9512519	enquire
100 x 50mm	9514510	9513510	9512510	enquire
150 x 10mm	9514567	9513567	9512567	enquire
150 x 21.2mm	9514568	9513568	9512568	enquire
150 x 30mm	9514569	9513569	9512569	enquire
150 x 50mm	9514560	9513560	9512560	enquire
250 x 10mm	9514577	9513577	9512577	enquire
250 x 21.2mm	9514578	9513578	9512578	enquire
250 x 30mm	9514579	9513579	9512579	enquire
250 x 50mm	9514570	9513570	9512570	enquire

NEW!



also **available**

Other stationary phases and particle sizes are available; please inquire.

Bulk Packing Materials

Use our bulk packing materials to pack your own columns!
Restek is among the small group of column manufacturers capable of producing their own high purity silica. We offer our Pinnacle® II and Pinnacle® DB silica and bonded phases in bulk. Pinnacle® II is an excellent replacement for Hypersil® silica. Pinnacle® DB is a highly base-deactivated material for analyses of basic compounds and an excellent alternative to Hypersil® BDS silica. Bonded phases from our Ultra, Allure®, and Viva lines also are available in bulk.

Our extensive QC program ensures the high quality and reproducibility of these silicas. Each lot of material is tested for mean particle size and distribution, pore diameter, surface area, and total metals analysis. You can be confident that you are getting consistent, high-quality product.

Use these materials for easy scale up to preparative scale chromatography, or for packing your own columns.

Bulk Packing Materials

Description	min. qty.	cat.#	5-99 grams		100-499 grams		500-999 grams	≥1000 grams
3µm Pinnacle II Bulk Packing Materials								
Pinnacle II C8 Bulk Packing	5g	92133	/g	/g	/g	/g		
Pinnacle II C18 Bulk Packing	5g	92143	/g	/g	/g	/g		
Pinnacle II Cyano Bulk Packing	5g	92163	/g	/g	/g	/g		
Pinnacle II Phenyl Bulk Packing	5g	92153	/g	/g	/g	/g		
5µm Pinnacle II Bulk Packing Materials								
Pinnacle II Amino Bulk Packing	5g	92175	/g	/g	/g	/g		
Pinnacle II C8 Bulk Packing	5g	92135	/g	/g	/g	/g		
Pinnacle II C18 Bulk Packing	5g	92145	/g	/g	/g	/g		
Pinnacle II Cyano Bulk Packing	5g	92165	/g	/g	/g	/g		
Pinnacle II Phenyl Bulk Packing	5g	92155	/g	/g	/g	/g		
5µm Pinnacle DB Bulk Packing Materials								
Pinnacle DB C18 Bulk Packing	5g	94145	/g	/g	/g	/g		
Pinnacle DB C8 Bulk Packing	5g	94135	/g	/g	/g	/g		
Pinnacle DB Cyano Bulk Packing	5g	94165	/g	/g	/g	/g		

Description	qty.	cat.#	1-9 bottles		10-49 bottles		50-99 bottles	≥100 bottles
5µm Ultra Bulk Packing Materials								
Ultra C1 Bulk Packing	10g/btl.	91015	/btl.	/btl.	/btl.	/btl.		
Ultra C4 Bulk Packing	10g/btl.	91025	/btl.	/btl.	/btl.	/btl.		
Ultra C8 Bulk Packing	10g/btl.	91035	/btl.	/btl.	/btl.	/btl.		
Ultra C18 Bulk Packing	10g/btl.	91745	/btl.	/btl.	/btl.	/btl.		
Ultra Amino Bulk Packing	10g/btl.	91075	/btl.	/btl.	/btl.	/btl.		
Ultra Cyano Bulk Packing	10g/btl.	91065	/btl.	/btl.	/btl.	/btl.		
Ultra Phenyl Bulk Packing	10g/btl.	91055	/btl.	/btl.	/btl.	/btl.		

Silica Bulk Materials

Description	min. qty.	cat.#	5-99 grams		100-499 grams		500-999 grams	≥1000 grams
Silica Bulk Materials								
Pinnacle II Silica Bulk Packing, 3µm	5g	92103	/g	/g	/g	/g		
Pinnacle II Silica Bulk Packing, 5µm	5g	92105	/g	/g	/g	/g		
Pinnacle DB Silica Bulk Packing, 5µm	5g	94105	/g	/g	/g	/g		

	qty.	cat.#	1-9 bottles		10-49 bottles		50-99 bottles	≥100 bottles
Ultra Silica Bulk Packing, 5µm	10g/btl.	91005	/btl.	/btl.	/btl.	/btl.		

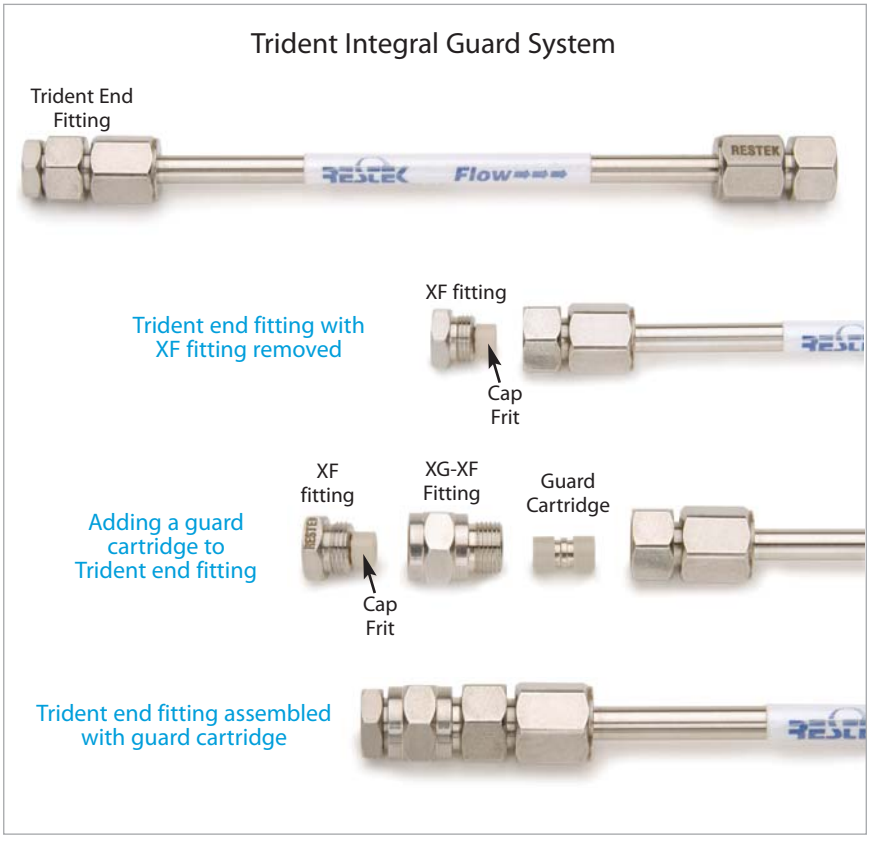
Restek's Exclusive Trident Integral System

- Convenient and economical leak-free guard cartridge system, extremely easy to install.
- Versatile configuration protects against all levels of contamination.
- Integral design eliminates troublesome tubing connections.

The system's foundation consists of the analytical column configured with our exclusive Trident end fitting and XF fitting. This configuration contains the standard internal frit as well as a replaceable cap frit, which easily can be changed without disturbing the packed bed. Changing the external frit can reverse the effects of accumulated particles, such as high backpressure or peak distortion. To obtain this basic configuration, simply order any Restek HPLC column, and add the suffix -700 to the catalog number for the column. (Nominal additional charge.)

For maximum protection against contaminants and particulate matter, the system can be configured with an integral guard cartridge holder (XG-XF), a guard cartridge, and a replaceable external frit. To obtain this configuration, simply order any Restek HPLC column, add the suffix -700 to the catalog number for the column, and order the appropriate XG-XF male fitting (cat.# 25026 or 25062, below) and Trident guard cartridges (page 329).

Description	qty.	cat.#	price
XG-XF Fitting for 10mm Guard Cartridge	ea.	25026	
XG-XF Fitting for 20mm Guard Cartridge	ea.	25062	
Replacement XF Filter Fitting	ea.	25024	
Replacement Cap Frits: 4mm, 2.0µm	5-pk.	25022	
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm, 2.0µm	5-pk.	25057	
Replacement Cap Frits: 2mm, 0.5µm NEW!	5-pk.	25990	





Shannon Rishell, Customer Service

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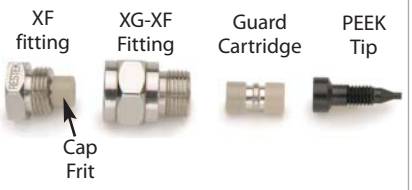
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Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com



Trident Direct 10mm guard cartridge holder with filter

Components



Assembled



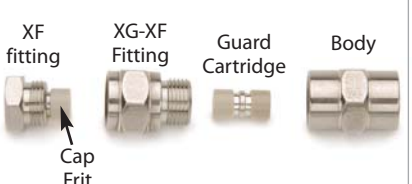
Installed onto column





Trident In-Line 10mm guard cartridge holder with filter

Components



Assembled



Installed onto column



Trident Direct Guard Cartridge System

Easy to Use, Low Dead Volume—The Ultimate Combination of Convenience and Column Protection

Unlike "one size fits all" guard systems, the Trident Direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection and guard cartridges in four dimensions, with a variety of bonded phases to match your analytical column. The economical, leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability. The foundation of the Trident Direct system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters-style end fittings.* The system is available in configurations to match different protection level needs: in-line filter, in-line filter with holder for 10mm guard cartridge, and in-line filter with holder for 20mm guard cartridge. The guard cartridges are available in 2.1 and 4.0mm ID and are interchangeable within the appropriate length holder.



25082
Protection against particulate matter.



25084
Protection against particulate matter and moderate protection against irreversibly adsorbed compounds.



25086
Protection against particulate matter and maximum protection against irreversibly adsorbed compounds.

Description	qty.	cat.#	price
High-pressure filter	ea.	25082	
10mm guard cartridge holder without filter	ea.	25083	
10mm guard cartridge holder with filter	ea.	25084	
20mm guard cartridge holder without filter	ea.	25085	
20mm guard cartridge holder with filter	ea.	25086	
Connection tip for Waters-style end fittings	ea.	25088	
PEEK tip standard fittings	ea.	25087	
Replacement Cap Frits: 4mm, 2.0µm	5-pk.	25022	
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm, 2.0µm	5-pk.	25057	
Replacement Cap Frits: 2mm, 0.5µm	5-pk.	25990	

*The standard PEEK tip in Trident Direct systems is compatible with Parker, Upchurch Scientific, Valco, and other CPI-style fittings. To use Trident Direct systems with Waters-style end fittings, replace the tip with cat.# 25088.

Trident HPLC In-Line Guard Cartridge Holders

A Trident in-line guard cartridge holder can be used with almost any HPLC column by connecting it with a short piece of $^{1}/_{16}$" tubing, appropriate nuts and ferrules, or finger-tight fittings. The system can be used with Restek columns, or with columns from other manufacturers. Holders are available for either 10mm or 20mm guard cartridges. Either size can be purchased with or without a prefilter, which provides added protection against the particles that can shorten the lifetime of the guard cartridge.



25021



25040



25061



25060

Description	qty.	cat.#	price
Holder for 10mm guard cartridge	ea.	25021	
Holder with filter for 10mm guard cartridge	ea.	25040	
Holder for 20mm guard cartridge	ea.	25061	
Holder with filter for 20mm guard cartridge	ea.	25060	
Replacement Cap Frits: 4mm, 2.0µm*	5-pk.	25022	
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm, 2.0µm*	5-pk.	25057	
Replacement Cap Frits: 2mm, 0.5µm	5-pk.	25990	

*Standard porosity.

Trident HPLC Guard Cartridges

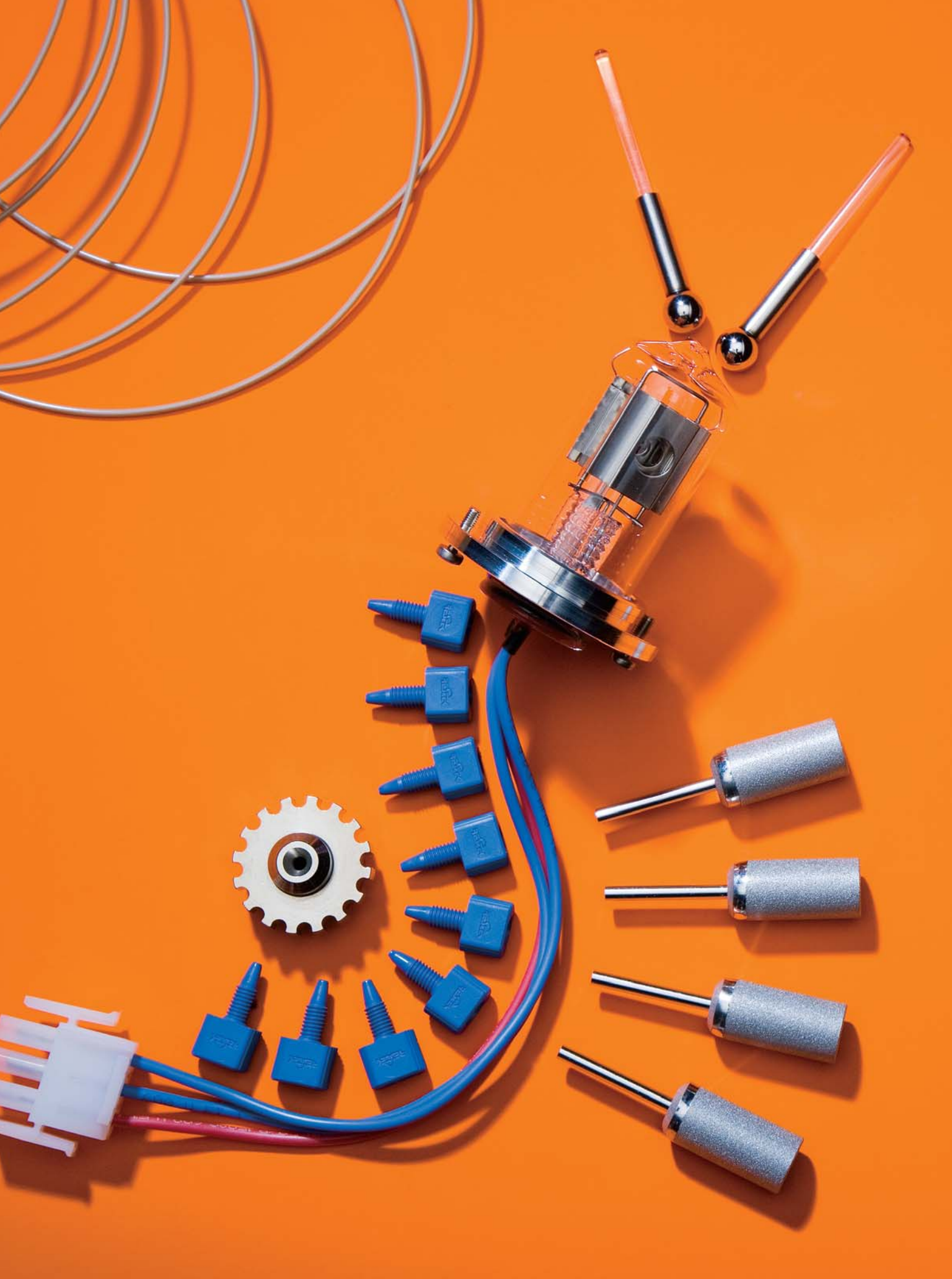
Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure AK	—	915950210	—	—	
Allure Basix	916150212	916150210	916150222	916150220	
Allure C18	916450212	916450210	916450222	916450220	
Allure PFP Propyl	916950212	916950210	916950222	916950220	
Allure Silica	916050212	916050210	916050222	916050220	
Allure Organic Acids	916550212	916550210	916550222	916550220	
Allure Aqueous C18	916850212	916850210	916850222	916850220	
Allure Biphenyl	916650212	916650210	916650222	916650220	
Pinnacle II Amino	921750212	921750210	921750222	921750220	
Pinnacle II C8	921350212	921350210	921350222	921350220	
Pinnacle II C18	921450212	921450210	921450222	921450220	
Pinnacle II Cyano	921650212	921650210	921650222	921650220	
Pinnacle II PAH	921950212	921950210	921950222	921950220	
Pinnacle II Phenyl	921550212	921550210	921550222	921550220	
Pinnacle II Biphenyl	—	920950210	—	920950220	
Pinnacle II Silica	921050212	921050210	921050222	921050220	
Pinnacle DB C8	941350212	941350210	941350222	941350220	
Pinnacle DB C18	941450212	941450210	941450222	941450220	
Pinnacle DB Aqueous C18	941850212	941850210	941850222	941850220	
Pinnacle DB Biphenyl	940950212	940950210	940950222	940950220	
Pinnacle DB PFP Propyl	941950212	941950210	941950222	941950220	
Pinnacle DB Cyano	941650212	941650210	941650222	941650220	
Pinnacle DB Phenyl	941550212	941550210	941550222	941550220	
Pinnacle DB Silica	941050212	941050210	941050222	941050220	
Ultra Amino	910750212	910750210	910750222	910750220	
Ultra Aqueous C18	917850212	917850210	917850222	917850220	
Ultra C1	910150212	910150210	910150222	910150220	
Ultra C4	910250212	910250210	910250222	910250220	
Ultra C8	910350212	910350210	910350222	910350220	
Ultra C18	917450212	917450210	917450222	917450220	
Ultra Carbamate	917750212	917750210	917750222	917750220	
Ultra Cyano	910650212	910650210	910650222	910650220	
Ultra IBD	917550212	917550210	917550222	917550220	
Ultra PFP	917650212	917650210	917650222	917650220	
Ultra Phenyl	910550212	910550210	910550222	910550220	
Ultra Silica	910050212	910050210	910050222	910050220	
Ultra Quat	918150212	918150210	918150222	918150220	
Viva C18	951450212	951450210	951450222	951450220	
Viva C8	951350212	951350210	951350222	951350220	
Viva C4	951250212	951250210	951250222	951250220	
Viva PFP Propyl	951950212	951950210	951950222	951950220	
Viva Biphenyl	951650212	951650210	951650222	951650220	
Viva Silica	951050212	951050210	951050222	951050220	



10 & 20mm Guard Cartridges



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25259


25276


22482


25265


25262

Restek Replacement Parts for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#	price
Preventive Maintenance Kit (Includes: rotor seal, needle seat, needle assembly, seat cap)	1050	01078-68721	kit	25259	
Autosampler Preventive Maintenance Kit (Includes: rotor seal, needle assembly, needle seat)	1100	G1313-68709	kit	25271	
Pump Maintenance Kit (Includes: PTFE frit, outlet cap, active inlet cartridge, gold disk seal, 2 piston seals, glass solvent filter)	1050, 1100	G1311-68710	kit	25270	
Outlet Ball Valve, Binary Pump	1100, 1200	G1312-60012	ea.	25267	
Outlet Ball Valve	1050, 1100, 1200	G1311-60012	ea.	25276	
Sieves for Outlet Valve	1050, 1100, 1200	5063-6505	10-pk.	25266	
Check Valve Cartridge Assembly	1090	79835-67101	ea.	25344	
Piston Seals, Teflon w/Graphite, Black*	1050, 1100, 1200	5063-6589	2-pk.	22482	
Piston Seals, Teflon w/Graphite, Black*	1050, 1100, 1200	5063-6589	10-pk.	22483	
Piston Seals (Black)	1090	5062-2494	4-pk.	25347	
Seal Wash Kit, Binary Pump (4 seals, 4 gaskets)	1100	—	kit	25268	
Seal Wash Kit (2 seals, 2 gaskets)	1050, 1100	—	kit	25269	
Wash Seal	1050, 1100, 1200	0905-1175	ea.	25277	
Sapphire Piston	1050, 1100, 1200	5063-6586	ea.	25273	
Sapphire Piston	1090	6980-0672	ea.	25345	
Needle Seat	1050	79846-67101	ea.	25258	
Needle Seat	1090	79846-67101	ea.	25348	
Needle Seat Assembly	1100	G1313-87101	ea.	25265	
Needle Assembly	1100	G1313-87201	ea.	25278	
Rotor Seal (not for use with 7125 injection valve)	1050	0101-0626	ea.	25272	
Rotor Seal	1100	0100-1853	ea.	25275	
Rotor Seal (Rheodyne-style)	1090	1535-4048	ea.	25349	
Frits, PTFE	1050, 1100, 1200	01018-22707	5-pk.	25466	
Seal, Gold Disk (outlet)	1050, 1100, 1200	5001-3707	ea.	25467	
Outlet Cap	1050, 1100	5062-2485	4-pk.	25139	
Outlet Cap & Gold Seal Assembly	1050, 1100	—	2-pk.	25140	
Connecting Tube	1050, 1100	G1311-67304	ea.	25058	
Bottle Head Assembly	—	G1311-60003	ea.	25059	
Detector Lamp, 1090 DA, 1050 VW/DA/MWD	1090, 1050	79883-60002	ea.	25260	
Lamp, DAD G1315A, G1365A	1100, 1200	2140-0590	ea.	25261	
Lamp, VWD G1314A	1100, 1200	G1314-60100	ea.	25262	
8453 Deuterium Lamp	—	2140-0605	ea.	25263	
G1321 Fluorescence Detector Flash Lamp	—	2140-0600	ea.	25264	
Lamp, DAD Long Life Deuterium (2000 hours)	1100	5181-1530	ea.	25399	
Helium Tubing, 5m, PTFE, 0.057" ID	1050, 1100	5062-2461	ea.	24990	
Injector Lubricant, PTFE, 10g	1050, 1100	79841-65501	ea.	26520	

*Graphite-filled Teflon; best for organic solvents.


26528


26525


26531


26532

26537

Capillary Stainless Steel Tubing Assemblies for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#	price
Capillary SS Tubing, 130mm x 0.17mm ID, with fittings	1090	01090-87305	ea.	26525	
Capillary SS Tubing, 800mm x 0.17mm ID, with fittings	1050	01078-87305	ea.	26526	
Capillary SS Tubing, 180mm x 0.17mm ID, with fittings	1100	G1313-87305	ea.	26527	
Capillary SS Tubing, 700mm x 0.25mm ID, with fittings	1050	01018-67305	ea.	26528	
Capillary SS Tubing, 700mm x 0.25mm ID, with fittings	1050	01078-87306	ea.	26529	
Seat Capillary, SS Tubing, 0.17mm ID	1050	01078-87303	ea.	26530	
Capillary SS Tubing, 105mm x 0.17mmID	—	5021-1816	ea.	26531	
Mixing Capillary Assembly	1100	G1312-67302	ea.	26532	
Capillary SS Tubing, Valve to Metering Head	1100	G1313-87301	ea.	26533	
Capillary SS Tubing, 150mm x 0.17mm ID	—	5021-1817	ea.	26534	
Capillary SS Tubing, 280mm x 0.17mm ID	—	5021-1818	ea.	26535	
Capillary SS Tubing, 400mm x 0.17mm ID	—	5021-1819	ea.	26536	
1/16" SS Fitting, Front and Back Ferrules	—	5062-2418	10-pk.	26537	

Outlet Cap and Gold Seal Assembly Tool for Agilent 1050 & 1100 HPLC Systems

Easily install the gold seal into the outlet cap.



Put Outlet Cap on male part of Assembly Tool.



Push the Assembly Tool together, then hold on to Outlet Cap and pull Assembly Tool apart.



Put Gold Seal over pin on male part of Assembly Tool.



Push the Assembly Tool together and press the Gold Seal in the Outlet Cap.



Pull the Assembly Tool apart and remove assembled Outlet Cap and Gold Seal.

Description	qty.	cat.#	price
Outlet Cap and Gold Seal Assembly Tool for Agilent 1050 & 1100 HPLC Systems	ea.	24989	
Seal, Gold Disk (outlet)	ea.	25467	
Outlet Cap	4-pk.	25139	
Outlet Cap & Gold Seal Assembly	2-pk.	25140	





25140

Restek Replacement Parts for Beckman HPLC Systems

Description	Model #	Similar to Beckman part #	qty.	cat.#	price
Inlet Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128 Pumps	240720	ea.	25439	
Outlet Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128 Pumps	240721	ea.	25440	
Inlet Check Valve Cartridge for Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128 Pumps	240620	ea.	25441	
Outlet Check Valve Cartridge for Check Valve Assembly	110A&B, 112, 114M, 116, 118, 125, 126, 127, 128 Pumps	240621	ea.	25442	
Guide Sleeve for Graphite Plunger Guide	110 Series Pumps	243713	ea.	25444	
Outlet Check Filter Frit Assembly	110 Series Pumps	240619	ea.	25445	
Piston Guide Assembly	110 Series and 112 Pumps	243045	ea.	25446	
Plunger	110 Series and 112 Pumps	243053	ea.	25447	
Plunger Seal	110 Series Pumps	887138	ea.	25448	
Sapphire Plunger	114M, 116, 118, 125, 126, 127, 128 Pumps	240714	ea.	25450	
Plunger Seal	114M, 116, 118, 126, 127, 128 Pumps	241037	ea.	25451	
Pump Seal, Gold**	114, 116, 125, 126, 127, 128 Pumps	241037	ea.	25452	
Plunger Wash Seal	125, 126, 127, 128 Pumps	728772	ea.	25453	
Deuterium Lamp	DU60, 62, 64, 65	596791	ea.	25454	

**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.



25440



25450

Restek Replacement Parts for Hitachi HPLC Systems

Description	Model #	Similar to Hitachi part #	qty.	cat.#	price
SS Check Valve Cartridges ($^{3}/_{16}$" Ruby Ball)	655/6000/6200	AN0-085	2-pk.	25455	
Inlet Check Valve Assembly	655/6000/6200	AN0-0833	ea.	25456	
Outlet Check Valve Assembly	655/6000/6200	AN0-0834	ea.	25457	
Plunger Assembly	655, 6000, 6200, 7100	810-1033	ea.	25458	
Plunger Seal, Black*	L655A, 6000, 6200, 7100	655-1080	ea.	25459	
Plunger Seal, Gold**	655, 6000, 6200, 7100	655-1080	ea.	25460	
Inlet Check Valve Assembly	L-7100	AN0-0836	ea.	25461	
Outlet Check Valve Assembly	L-7100	AN0-0837	ea.	25462	
Rotor Assembly for Dilutor Valve	AS-7200 Autosampler	810-3085	ea.	25463	
Rotor Seal Kit	AS-7200, AS-7250 Injection Valve	AN0-0818	ea.	25464	
Deuterium Lamp, Prealigned	L4000, L4200, L4250, L7400	AN0-0424	ea.	25465	

*Graphite-filled Teflon; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.



25459
25460
25465
25458







25435



25433

Restek Replacement Parts for PerkinElmer HPLC Systems

Description	Model #	Similar to PE part #	qty.	cat.#	price
Inlet Check Valve	PE 200, 4, 250, 400, 410, 620	2540177	ea.	25438	
Outlet Check Valve	PE 200, 4, 250, 400, 410, 620	2540197	ea.	25437	
High Pressure Seal Kit	PE Series 200 Pumps--1, 2, 3, 3B, 4, 10, 250, 400, 410, 620, Int. 4000 Pump	2540275	ea.	25433	
Standard High Pressure Seal, Gold**	PE Series 200 Pumps--1, 2, 3, 3B, 4, 10, 250, 400, 410, 620, Int. 4000 Pump	9907324	ea.	25434	
Low Pressure Seal, Gold**	PE Series 200 Pumps	9907339	ea.	25435	
Needle	PE Series 200 Pumps	N2930023	ea.	25432	
Deuterium Lamp	PE Lambda--2, 5, 7, 8, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 40, 800, 900	B0160917	ea.	25436	
Deuterium Lamp	PE 200/785A	N2920149	ea.	25431	

**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.





26521

Restek Replacement Parts for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu part #	qty.	cat.#	price
Inlet Check Valve	LC-6A, LC-10AS	228-12353-91	ea.	25287	
Inlet Check Valve	LC-600, LC-9A, LC-10AD	228-18522-91	ea.	25295	
Inlet Check Valve	LC-10ADvp	228-39093-92	ea.	24984	
Inlet Check Valve	LC-10AT, LC-10ATvp	228-32166-91	ea.	26521	
Outlet Check Valve	LC-6A, LC-10AS	228-09054-93	ea.	25288	
Outlet Check Valve Rebuild Kit	LC-6A, LC-10AS	228-11200-91	2-pk.	25289	
Outlet Check Valve	LC-600, LC-9A, LC-10AD, LC-10AT	228-18522-92	ea.	25282	
Outlet Check Valve	LC-10ADvp, LC-10ATvp	228-34976-91	ea.	24983	
Plunger Seal, Gold**	LC-6A	228-11999-00	ea.	25285	
Plunger Seal, Polyethylene, Gold**	LC-10AS, LC-10AT, LC-10ATvp	228-21975-00	ea.	25290	
Plunger Seal	LC-600, LC-9A, LC-10AD	228-18745-00	ea.	25293	
Plunger Seal, Black*	LC-10ADvp, LC 20AD	228-35146-00	ea.	24980	
Plunger Seal, Gold**	LC-10ADvp	228-32628-00	ea.	24981	
Plunger Seal, Black*	SIL-10ADvp, LC-10ATvp	228-35145-00	ea.	24985	
Plunger Rinse Seal	LC-10AS	228-28499-00	ea.	25292	
Sapphire Plunger	LC-6A	228-12904-93	ea.	25286	
Sapphire Plunger	LC-10AS	228-17019-93	ea.	25291	
Sapphire Plunger	LC-600, LC-9A, LC-10AD	228-18523-91	ea.	25294	
Needle Seal	SIL-10A, 10XL, 10ADvp	228-33355-04	ea.	25468	
Rotor Seal	SIL-10ADvp	228-21217-97	ea.	24986	
Rotor Seal Assembly	SIL-10A, 10AXL	228-21217-91	ea.	25469	
Stator Assembly	SIL-10A, 10AXL	228-21220-91	ea.	25470	
Syringe, 500µL	SIL-10A, 10AXL	228-25237-04	ea.	25471	
Plunger Assembly, Ceramic	LC-10ADvp	228-35601-91	ea.	25472	
Plunger Assembly, Ceramic	LC-10ATvp	228-35009-92	ea.	25473	
Plunger Assembly, Sapphire	LC-10ADvp	228-35601-92	ea.	24982	
Deuterium Lamp	SPD-6A	062-65056-02	ea.	25283	
Deuterium Lamp	SPD-10A, 10AV, M20A	228-34016-02	ea.	25284	

*Graphite-filled Teflon; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.



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Restek Replacement Parts for Thermo Separation HPLC Systems

Description	Model #	Similar to SP/TSP part #	qty.	cat.#	price
Inlet Check Valve Assembly	SP8800 & P-Series Pumps	A3495-010	ea.	25474	
Outlet Check Valve Assembly	SP8800 Series Pumps	A3490-010	ea.	25475	
Piston	SP8800 & P-Series Pumps	A3102-010	ea.	25476	
Back-up Seal	SP8800 & P-Series Pumps	A2963-010	ea.	25477	
Plunger Seal, Gold** Superseal	SP8800 & P-Series Pumps	A2962-010	ea.	25478	
Check Valve and Transducer Assembly	P-Series Pumps	A3990-010	ea.	25479	
Kel-F Washer	P-Series Pumps	A2973-010	ea.	25480	
Rotor Seal Assembly, Rheodyne 7010	TSP AS100, 300, 1000, 3000, 3500, 8875, and 8880 Autosamplers	7010-039	ea.	25481	
Syringe Assembly, 250µL	TSP AS100, 300, 1000, 3000, 3500, 8875, and 8880 Autosamplers	A3588-020	ea.	25482	
Syringe, 500µL	8800 Series	3301-0100	ea.	25483	
Lamp, UV	Linear UV-200, 203, 204, 205, 206, and UV 100, 150, 1000, and 2000 Detectors	9551-0023	ea.	25484	

Description	Model #	Similar to TSP part #	qty.	cat.#	price
Check Valve Cartridge	LDC Constametric Pumps	900946	ea.	25485	
Sapphire Plunger	LDC Constametric Pumps	801306	ea.	25486	
Plunger Seal Kit, Gold**	LDC Constametric Pumps	31-36-00754	ea.	25487	
Plunger Seal, Black*	LDC Constametric Pumps	206129001	ea.	25488	
Plunger Seal, Gold**	LDC Constametric Pumps	206156001	ea.	25489	
Lamp, Deuterium	LDC SM-I, II, III, 3000, 3100, 3100X, and 4000 Detectors	108035	ea.	25490	

*Graphite-filled Teflon; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.


25474


25482


25484


25476

Restek Rheodyne® Style Replacement Parts for Waters HPLC Systems

Description	Similar to Rheodyne part #	qty.	cat.#	price
7010 Vespel Rotor Seal	7010-039	ea.	25279	
7125 Vespel Rotor Seal	7125-047	ea.	25280	
Isolation Seal, 7010	7010-015	ea.	25281	

For easy access to Rheodyne fittings, use a ValvTool Wrench—see page 347.


25280
(both sides shown)

Restek Replacement Parts for Waters Detectors

Description	Model #	Similar to Waters part #	qty.	cat.#	price
Window Gasket	484, 486, 490	80335	ea.	25423	
Lamp Side Gasket	484, 486, 490	80336	ea.	25424	
Quartz Lens	486	80687	ea.	25427	
Xenon Lamp (w/o holder or mirror)	470	—	ea.	25404	
Xenon Lamp	474	—	ea.	25405	
Deuterium Lamp (UV/Vis)	480, 481	99499	ea.	25403	
Deuterium Lamp (UV/Vis)	484	80357	ea.	25406	
Deuterium Lamp (UV/Vis)	486	80678	ea.	25407	
Deuterium Lamp	996, 2996	WAT052586	ea.	25408	
Deuterium Lamp	2487	WAS081142	ea.	25409	
Deuterium Lamp, long life (2,000 hours)*	486	80678	ea.	25410	

*Standard lamps have nominal 1,000-hour life.



also **available**

HPLC autosampler syringes. See **pages 288-289**.





Restek Replacement Parts for Waters HPLC Systems





25145



25360



25496

Description	Model #	Similar to Waters part #	qty.	cat.#	price
Preventative Maintenance Kit Includes: sparge diffuser, filter insert, compression screws, SS ferrule, battery for 2690/717, 250µL WISP syringe, seal wash plunger seal kits (2), wash tube seal kits (4), 2690 seal pack rebuild kit (steel bodies not included), 2690 head plunger seal kits (2), solvent reservoir 20µm filters (4), Alliance check valve cartridges (2), Alliance plunger assemblies (2), 2690 face seals (4)	Alliance 2690, 2695	WAT270944	kit	25143	
Preventative Maintenance Kit Includes: PerformancePLUS cartridges (2), sparge diffusers (4), Super Seals (2), solvent reservoir 20µm filters (2), sapphire plungers (2), reference valve rebuild kit, inlet manifold kit	600 Pump	WAT052675	kit	25144	
Preventative Maintenance Kit Includes: 717 seal pack with needle, filter insert, 250µL WISP syringe	717 Autosampler	WAT052669	kit	25145	
Preventative Maintenance Kit Includes: 616/326/625 plunger assemblies (2), pump seal kit, sparge diffusers (4), solvent reservoir 20µm filters (4), 616 cartridge assemblies (4)	616 Pump	WAT052672	kit	25146	
Preventative Maintenance Kit Includes: PerformancePLUS check valves (2), sparge diffuser, solvent 10µm filter, sapphire plungers (2), plunger seals (2)	515 Pump	WAT052587	kit	26519	
Inlet Check Valve Assembly	M6KA, 501, 510, 515, 590, 600E	33679, 25214	ea.	25360	
Inlet Check Valve Housing	M6KA, 501, 510, 515, 590, 600E	25203	ea.	25361	
Inlet Check Valve Rebuild Kit	M6KA, 501, 510, 515, 590, 600E	60495	2-pk.	25362	
Outlet Check Valve Assembly (Actuator Style)	M6KA, 501, 510, 515, 590, 600E	25030	ea.	25363	
Outlet Check Valve Housing (Actuator Style)	M6KA, 501, 510, 515, 590, 600E	25212	ea.	25364	
Outlet Check Valve Rebuild Kit (Actuator Style)	M6KA, 501, 510, 515, 590, 600E	26016	2-pk.	25365	
Outlet Check Valve Assembly (Ball & Seat Style)	M6KA, 501, 510, 515, 590, 600E	25216	ea.	25366	
Outlet Check Valve Housing (Ball & Seat Style)	M6KA, 501, 510, 515, 590, 600E	25207	ea.	25367	
Outlet Check Valve Rebuild Kit (Ball & Seat Style)	M6KA, 501, 510, 515, 590, 600E	26014	2-pk.	25368	
Inlet Check Valve Assembly, 225µL (Extended Flow)	M6KA, 501, 510, 515, 590, 600E	60307	ea.	25369	
PerformancePLUS Check Valve Cartridge	M6KA, 501, 510, 515, 590, 600E	700000254	2-pk.	25370	
Check Valve Rebuild Kit (Extended Flow)	M6KA, 501, 510, 515, 590, 600E	88223	2-pk.	25371	
PerformancePLUS Check Valve Housing	M6KA, 501, 510, 515, 590, 600E	—	ea.	25372	
Check Valve Cartridges	Alliance	WAT270941	2-pk.	25373	
Super Seal for Analytical Heads	M6KA, 501, 510, 515, 590, 600E	22946, 22934	ea.	25374	
Plunger Seal, Gold for Analytical Heads**	M6KA, 501, 510, 515, 590, 600E	22934	ea.	25375	
Plunger Seal, Black for graphite-filled Teflon*	M6KA, 501, 510, 515, 590, 600E	26613	ea.	25378	
Plunger Seal, Black for EF Heads*	510, 590, 600E	26644	ea.	25379	
Plunger Seal, Gold for EF Heads**	510, 590, 600E	26644	ea.	25380	
Seal Wash Plunger Seal	Alliance	WAT271018	2-pk.	25386	
Head Plunger Seal Kit	Alliance	WAT270938	2-pk.	25387	
Head Plunger Seal Kit (Black)	Alliance	WAT271066	2-pk.	25388	
Insert Seal Parts Kit	M6KA, 501, 510, 515, 590, 600E	60012	kit	25389	
Sapphire Plunger	M6KA, 510, 590, 600	25656	ea.	25381	
Sapphire Plunger (Extended Flow)	510, 590, 600E	60304	ea.	25382	
Sapphire Plunger	M45, M501	26524	ea.	25383	
Sapphire Plunger Assembly Kit	M515	WAS207069	ea.	25384	
Sapphire Plunger	616, 625, 626	31788	ea.	25420	
Sapphire Plunger	Alliance	WAT270959	ea.	25385	
Draw-Off Tube Assembly	510, 515, 600, 610	25470	ea.	25392	
Inlet Manifold Kit	M45, 501, 510, 590, 600E	60448	kit	25412	
Ferrule, Stainless Steel	515	22330	ea.	25417	
Wash Face Seal	Alliance 2690	WAT271017	ea.	25428	
Wash Tube Seal Kit	Alliance 2690	WAT270940	4-pk.	25429	
Rebuild Kit, Reference Valve	600 Pump	25746	ea.	25492	
Compression Screws, Stainless Steel	Alliance 2690	—	2-pk.	25493	
Battery	Alliance 2690, 717, 486, 484	—	ea.	25494	
Seal Pack Rebuild Kit, without Seal Wash Tube Assembly	Alliance 2690	WAT271019	ea.	25495	
717 Seal Pack (Rebuilt) with Needle	717 Autosampler	4559	ea.	25496	
Seal Kit, Pump	616 Pump, 626, 625	31790	ea.	25497	
Cartridge Assembly, Stainless Steel	616 Pump	24960	ea.	25498	

*Graphite-filled Teflon; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion, best for buffers.



ASI Piston Seals for Agilent HPLC Systems

Over time the piston seal in every HPLC system becomes worn and must be replaced. Our piston seals are constructed of Teflon® material with an additive that reduces their tendency to "cold flow" and improves their wear characteristics. Teflon® seals are more resistant to any HPLC solvent than UHMWPE seals, but they are less wear-resistant and rugged. For Agilent 1050 and 1100 HPLC systems.

Description	qty.	cat.#	price
ASI Piston Seal	ea.	25175	
ASI Piston Seal	10-pk.	25176	



ASI Check Valves

ASI subjects each valve to a rigorous series of tests, including self-priming capability, which means you typically won't need a syringe or draw-off valves to prime your pump. A high-pressure test ensures that the valve will not leak, even at pressures up to 12,000psi (82,737kPa). A low-pressure test verifies that the valve closes properly, even without a high backpressure force. The cartridge design allows easy, convenient replacement of worn or damaged valves.

ASI Check Valves for Agilent 1050 & 1100

Description	Material	qty.	cat.#	price
Outlet Check Valve (cartridge and housing)	Sapphire & Ruby Ball & Seat	ea.	25170	
Outlet Check Valve (cartridge and housing)	Ceramic Ball & Seat	ea.	25173	
Outlet Cartridges	Sapphire & Ruby Ball & Seat	ea.	25171	
Outlet Cartridges	Ceramic Ball & Seat	ea.	25174	
Outlet Housing	—	ea.	25172	

ASI Check Valves for Waters Alliance® Model 2690

Description	Material	qty.	cat.#	price
Inlet and Outlet Cartridges	Sapphire & Ruby Ball & Seat	ea.	25160	
Inlet and Outlet Cartridges	Ceramic Ball & Seat	ea.	25162	



Valves for HPLC

Our valves have low internal volumes and are rated to 15,000psi (103,421kPa). They feature a 2-piece stem assembly in which the rotating upper shank is coupled through a ball joint to a static lower stem. Only fingertight torque is required to make the seal.

Description	qty.	cat.#	price
Two-Way Through Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26400	
Two-Way Angle Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26401	
Three-Way Bottom Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26402	
Side Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26403	
Dual Stem Three Way Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26404	
Prime/Purge Valve for HPLC, 1/4-28 Flanged Seat, Stainless Steel, with Tubing and Fittings	ea.	26406	
Prime/Purge Valve Repair Kit for Prime/Purge Valve	kit	26407	



In-Line Check Valves for HPLC

Our 316 stainless steel in-line check valves have a soft seat and 1/16" fittings. Nuts and ferrules are included.

Description	qty.	cat.#	price
Check Valve, Soft Seat, for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26405	



High-Pressure Frit-Type In-Line Filter

Restek's high-pressure in-line filter is a stand-alone version of the Trident column protection system, specifically designed for ease of use, low dead-volume, and flexibility. The filter has a replaceable, PEEK™ encapsulated 316 stainless steel frit with a surface area of 12mm^2. The standard frit with 2.0µm porosity may be replaced with an optional 0.5µm porosity frit. Use of this filter can greatly extend column life, thereby reducing costs and saving maintenance time. Tubing $^1/_{16}$" OD; connectors–CPI.

Description	Porosity	qty.	cat.#	price
Frit-Type In-Line Filter	2.0µm	ea.	25041	
Replacement Cap Frits: 4mm, 0.5µm		5-pk.	25023	
Replacement Cap Frits: 4mm, 2.0µm		5-pk.	25022	



High-Pressure Cup-Type In-Line Filter

This high-pressure cup-type filter can be used in fluid streams operating to 15,000psi (103,421kPa). The cup-shaped filter elements have a large (2.5 cm^2) surface area to give long operating lifetime. Mounted in screw-type adapters, they are easily removed for cleaning. Normally, backflushing and cleaning in an ultrasonic bath with an appropriate solvent will restore them. If they become permanently clogged, replacement elements are available.

Housings and all wetted parts are 316 stainless steel. Filters are packaged with gland nuts and ferrules. A bulkhead type fitting is available for thru-panel mounting. Tubing $^1/_{16}$" OD; connectors–CPI.

Description	Porosity	qty.	cat.#	price
Cup-Type In-Line Filter	0.5µm	ea.	25000	
Cup-Type In-Line Filter	2.0µm	ea.	25001	
Replacement Filter Elements & Seals	0.5µm	2-pk.	25002	
Replacement Filter Elements & Seals	2.0µm	2-pk.	25003	



Low-Pressure Slip-On Inlet Filter for Mobile Phase Reservoir

A type 316 stainless steel tip with a Tefzel® collar seals to a corrosion-resistant type 316 stainless steel filter element. The slip-on filter easily attaches to the pump inlet line, without the use of wrenches. The universal tip accommodates standard Teflon® tubing inner diameters. The cylindrical filter is standard 10µm porosity. $^1/_8$" OD. Fits Altex, ISCO, LDC, Varian, Waters, PerkinElmer, and other pumps.

Description	qty.	cat.#	price
Slip-on Inlet Filter	ea.	25008	



Low-Pressure CPI Inlet Filter for Mobile Phase Reservoir

A 316 stainless steel knurled cap and Tefzel® CPI ferrule seal to $^1/_8$" OD Teflon® tubing when finger-tightened onto the precision-machined filter holder. The filter element is replaceable. Standard 10µm porosity protects delicate pump components from particles but introduces very little pressure drop. $^1/_8$" OD. May be used as a helium sparging diffuser.

Description	qty.	cat.#	price
CPI Inlet Filter	ea.	25009	
Replacement Elements: 10µm filter	2-pk.	25010	



also **available**

Trident Direct high-pressure filter—protection against particulate matter. See **page 328** for details.

Mobile Phase Sparge Filter; Inlet Filter

The 2µm helium sparge filter is an inexpensive way to prepare and maintain mobile phases free of dissolved gas. Both filters are made from 316 stainless steel and PEEK™ and are compatible with most solvents.



Description	qty.	cat.#	price
Mobile Phase Sparge Filter: 2µm	ea.	25311	
Inlet Filter: 10µm	ea.	25312	
Inlet Filter: 20µm	ea.	25313	





Last Drop Filter

The flat filter element sits parallel to the bottom of the mobile phase reservoir, allowing the filter to draw 98% of the mobile phase without drawing air into the system. Conventional cylindrical mobile phase filters begin to draw air into the system when approximately 10% of the solvent remains in the reservoir. The Last Drop Filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. 22.1mm OD.



Description	qty.	cat.#	price
Last Drop Filter: 2µm	ea.	25314	
Last Drop Filter: 10µm	ea.	25315	

Membrane Microfiltration Glassware

47mm filtration apparatus with fritted glass support is recommended for routine filtration of corrosive liquids and removal of particles from HPLC solvents. The ground joint connection eliminates phthalate contamination that can occur when using silicone or neoprene stoppers. The support base has a coarse porosity glass frit and an integral vacuum connection, located above the drip tip to prevent contamination of the vacuum line with filtrate droplets. Each apparatus includes a funnel, an anodized aluminum clamp, a 47mm fritted glass support base, and a filtration flask.

All-Glass Microfiltration Apparatus	qty.	cat.#	price
300mL Funnel, 1000mL Flask	ea.	KT953825-0000	
500mL Funnel, 2000mL Flask	ea.	KT953835-0000	
1000mL Funnel, 4000mL Flask	ea.	KT953845-0000	
Replacement Parts for Microfiltration Apparatus	**qty.**	**cat.#**	**price**
40/35 PTFE Joint Sleeve	6-pk.	KT676001-4035	
Flask Cap, 40/35 Outer Joint	ea.	KT953830-0000	
Fritted Glass Support, 47mm, 40/35 Joint	ea.	KT953826-0000	
Glass Funnel, 47mm, 100mL	ea.	KT953761-0000	
Glass Funnel, 47mm, 300mL	ea.	KT953751-0000	
Glass Funnel, 47mm, 500mL	ea.	KT953771-0000	
Glass Funnel, 47mm, 1000mL	ea.	KT953781-0000	
Flask, 1000mL, 40/35 Joint	ea.	KT953827-0000	
Flask, 2000mL, 40/35 Joint	ea.	KT953828-0000	
Flask, 4000mL, 40/35 Joint	ea.	KT953829-0000	
Aluminum Clamp, 47mm	ea.	KT953753-0000	
Membrane Filters	**qty.**	**cat.#**	**price**
Polypropylene Membrane Filters, 47mm, 0.45µm	100-pk.	26396	
Polypropylene Membrane Filters, 47mm, 0.22µm	100-pk.	26397	
Nylon Membrane Filters, 47mm, 0.45µm	100-pk.	26398	
Nylon Membrane Filters, 47mm, 0.22µm	100-pk.	26399	

Mobile Phase Degasser

Dissolved oxygen can cause flow rate instability and increased baseline noise. Also, it has a quenching effect on fluorescence detection and increases the background of UV detectors. Dissolved gases can out-gas in the HPLC system, forming bubbles in check valves, at connections, or in detector flow cells.

In-line vacuum degassing is more effective at removing dissolved gas from mobile phases than sonication or helium sparging. In-line degassers work by withdrawing gas across a gas-permeable membrane encased in a sealed chamber. Traditionally, the membrane has been made of PTFE tubing, but the Degasys Ultimate Degasser uses tubing composed of an amorphous fluoropolymer that is 200 to 300 times more gas permeable than PTFE. This translates into the ability to use shorter tubing for removing dissolved gas. This new material also has better tubular burst strength than PTFE. To prevent cross contamination, each channel on this Degasys unit is individually encased within its own vacuum chamber.

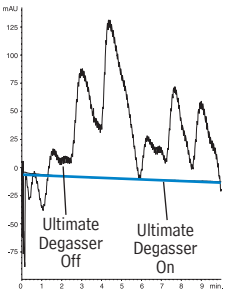


Specifications:

Residual Oxygen[1]	0.9ppm	**Wetted Parts**	Teflon AF, PTFE, ETFE, PPS
Pressure Loss[1]	0.24psi (1.65kPa)	**Max Flow Rate**	7mL/min./channel
Internal Volume	500µL		

[1]At a flow rate of 1mL/min.

Degasys Ultimate Degasser provides highly stable baselines



Mobile Phase: water:methanol 50:50
Flow: 1.0mL/min.
Det.: UV @ 210nm

LC_0196

Description	qty.	cat.#	price
110V Mobile Phase Degasser (4 Channel, 7mL/min./channel)	ea.	25189	
220V Mobile Phase Degasser (4 Channel, 7mL/min./channel)	ea.	25194	

To prevent system damage, do not use the Degasys system with solutions containing TFA at concentrations greater than 5%.



Solvent Debubbler

Bubbles in an HPLC system can cause check valve malfunctions and pump cavitation, seriously affecting pump performance. The debubbler removes bubbles from the fluid stream before it enters the pump.

Special geometry at the base of the housing allows bubbles entrained in the inlet fluid stream to rise and be trapped in the reservoir. The gas/liquid interface is easily visible through the translucent wall of the device. Loosening the airtight cap releases the trapped gas. The debubbler is fitted with a bracket and universal connecting tips.

Description	qty.	cat.#	price
Solvent Debubbler with Bracket	ea.	25014	



Sonic Debubbler



- Fast.
- Easy to use.
- Less solvent waste; less clean-up.

CE

Just touch the Sonic Debubbler to the inlet line or check valve — sonic vibrations will quickly dislodge or redissolve trapped air bubbles. Reduces downtime or conversion time from one mobile phase to another.

Description	qty.	cat.#	price
Sonic Debubbler (110V)	ea.	20444	
Sonic Debubbler (220V)	ea.	25098	



Bottle not included



Waste Overflow Indicator for HPLC Systems

- Avoid messy pooling around mobile phase waste containers.
- Audible alarm instantly alerts user, preventing overflow.
- Compact, battery operated unit.

The Restek Waste Overflow Indicator will help keep your mobile phase waste where it belongs—in the waste container! Compact, battery operated unit fits securely on 4-liter solvent bottles and accommodates two waste streams. An audible alarm is given as the solvent waste container approaches capacity, giving you time to empty or change the container. Another innovative design from Restek!

Description	qty.	cat.#	price
Waste Overflow Indicator for HPLC Systems	kit	26543	
Replacement AA Battery for the Waste Overflow Indicator	ea.	26544	
Replacement AA Batteries for the Waste Overflow Indicator	3-pk.	26545	



25303

Opti-Cap™ Bottle Top

The most economical way to helium-sparge and deliver HPLC mobile phases. The Opti-Cap™ top fits all standard GL-45 bottles and has two $^1/_8$-inch holes and one $^1/_{16}$-inch hole for tubing.

Description	qty.	cat.#	price
Opti-Cap (Cap and PEEK Plug)	ea.	25300	
Opti-Cap Kit (Opti-Cap, 3 meters of tubing, sparging filters)	kit	25301	
Opti-Cap Kit with 1L Bottle	kit	25302	
Opti-Cap Kit with 2L Bottle	kit	25303	
Related items and replacement parts	**qty.**	**cat.#**	price
Mobile Phase Sparge Filter: 2µm, stainless steel	ea.	25311	
Mobile Phase Inlet Filter: 10µm	ea.	25312	
Teflon Tubing, $^1/_8$" OD x 0.094" ID x 3m (2.4mm ID)	3m	25307	
Teflon Tubing, $^1/_8$" OD x 0.063" ID x 3m (1.6mm ID)	3m	25306	
PEEK Plug, $^1/_4$"-28 threads	3-pk.	25319	
1L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25304	
2L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25305	

also **available**

See **page 342** for Hub-Cap bottle tops, adapters, and filter kits.



We help novice and veteran chemists alike solve tough analytical problems every day. How can we help you?

Domestic: support@restek.com
International: intltechsupp@restek.com

Restek's Technical Service Specialists
pictured: Al Carusone, Tom Bloom, Jonathan Keim, Al Sensue, Mark Badger, Terry Reid, Tim Herring



25395

Eco-Cap Bottle Top, PTFE

Fits all standard GL-45 bottles; has two $^1/_8$-inch holes and one $^1/_{16}$-inch hole for tubing.

Description	qty.	cat.#	price
Eco-Cap Bottle Top, includes 1 Male Luer Plug	ea.	25395	



Hub-Cap 4 Liter Bottle Tops

Hub-Cap bottle tops are a great way to neatly keep your mobile phase lines where they belong. Use instead of parafilm, aluminum foil, or tape on your mobile phase reservoirs.


26541

Description	qty.	cat.#	price
Hub-Cap (assembly of the bottle cap and plug)	kit	26541	
Hub-Cap Multi-pack	3-pk.	26542	


26538


26540

Hub-Cap Adapters

Allow the use of the Opti-Cap™ with 4-liter solvent bottles.

Description	qty.	cat.#	price
Hub-Cap Adapter	ea.	26538	
Hub-Cap Adapter Multi-pack	3-pk.	26539	
Hub-Cap Adapter and Opti-Cap	kit	26540	

tech tip

Mobile Phase Additives

Mobile phase additives such as triethylamine, trifluoroacetic acid, and ion-pairing reagents can compete with sample ions, decreasing sensitivity and, in some cases, reducing sample ion intake into the MS. To obtain symmetric peaks and/or sufficient retention, use base deactivated, state-of-the-art Type B silica packings that minimize the need for additives.

Transfer and filter mobile phase in a single step!


26395


Polypropylene Membrane Filters

Hub-Cap Filter Kit

Kit includes: bottle adapter, bottle adapter nut, filter inlet cap, grid support, vacuum hose barb, tube compression fitting, 47mm grid, 47mm 0.22µm filter membrane, 47mm 0.45µm filter membrane, 1/4" OD x 1/8" ID ultra chemical resistant, Teflon® FEP lined Tygon® tubing (3'), 6" x 6" box with shrink wrap insert.


Bottle not included.

Assembles quickly and easily!


Unscrew and lift off top.


Place membrane filter on top of grid.


Reattach top.


Connect vacuum line to side port.

Description	qty.	cat.#	price
Hub-Cap Filter Kit	kit	26395	
Replacement Membrane Filters	**qty.**	**cat.#**	**price**
Polypropylene Membrane Filters, 47mm, 0.45µm	100-pk.	26396	
Polypropylene Membrane Filters, 47mm, 0.22µm	100-pk.	26397	
Nylon Membrane Filters, 47mm, 0.45µm	100-pk.	26398	
Nylon Membrane Filters, 47mm, 0.22µm	100-pk.	26399	


26516

Sidewinder Column Heater

- Easy to set up!
- Operation range: 5°C above ambient to 85°C, ±1°C.
- Lightweight, compact design fits in small spaces.
- Column holder can be placed in any orientation.

This unique design completely encloses any HPLC analytical column up to 25cm in length. Two lengths of heater jackets are available: the short column holder accommodates columns up to 10cm in length, while the long column holder holds columns up to 25cm in length. The control module provides optimum heating performance, accuracy to within 1°C, and stability to within 0.1°C. The new Sidewinder controller has fast 10Hz sampling for improved responsiveness. Power requirements: 24V control unit for maximum stability; RS232 control allows external programming.

Description	qty.	cat.#	price
Temperature Control Module and Long Column Holder (25cm)	ea.	26516	
Temperature Control Module and Short Column Holder (10cm)	ea.	26517	


26518

Sidewinder Heater/Cooler Temperature Control Module

- Operation range: 5-55°C, ±0.2°C.
- Ability to program multiple temperature points.
- Accommodates columns up to 30cm in length and 7.8mm ID.
- Compact design.

The Sidewinder heater/cooler unit has a doubly insulated cover to maintain the programmed temperature to within 0.2°C. The 24V control unit provides maximum stability and rapid equilibration times; RS232 control allows external programming.

Description	qty.	cat.#	price
Sidewinder Heater/Cooler Temperature Control Module	ea.	26518	

also **available**

Looking for a nitrogen generator for your LC/MS?
Restek offers a full line of Parker LC/MS generators. See **page 233**.


22484

Mobile Phase Pre-Heater

- Heats mobile phase before it enters a heated column.
- Minimizes temperature changes, to help keep analyte peaks sharp.

Description	qty.	cat.#	price
Mobile Phase Pre-heater	ea.	22484	

Super-Clean Gas Trapping System for LC/MS

- Changing filters is quick and easy.
- Up to 20L of hydrocarbon-free nitrogen per minute.



The Super-Clean Gas Trapping System is the latest technology in cartridge-style gas filtration for purifying nitrogen, and is ideal for use in LC/MS systems. The two-position base plate (installed in the gas line) allows cartridges to be exchanged without introducing oxygen into the system. Spring-loaded check valves seal when a cartridge is removed and open only when a new cartridge has been locked in place. There is no need for loosening and tightening fittings every time you change cartridges, and your system cannot become contaminated during the changing process.

To meet the high flow needs of the LC/MS system, the activated charcoal-filled cartridges are positioned and connected in parallel. The incoming gas stream is split equally between the cartridges, and the two streams are rejoined after purification but before the gas exits the base plate. This approach allows longer contact between the nitrogen and the adsorbent, ensuring higher gas purity and eliminating a potential source of contaminants to your analyses.

A handy date wheel, included with the system, indicates the cartridge installation date and the recommended replacement date.

Description	qty.	cat.#	price
Super-Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062	
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061	

it's a **fact**

A Super-Clean quick-change cartridge system efficiently removes hydrocarbons from nitrogen!


25322

kits

Kits are convenient and economical, compared to ordering individual items!


25097

PEEK™ Survival Kit for HPLC

The PEEK™ Survival Kit is an invaluable parts kit that contains tubing, fittings, and tools essential for setting up and maintaining your HPLC system: PEEK™ tubing, connectors, and elbows, Teflon® tubing, a tubing cutter and extra blades, a ValvTool wrench, open-end wrenches, and more.

For start-up and maintenance in all HPLC systems.

Description	qty.	cat.#	price
PEEK Survival Kit for HPLC	kit	25322	

Contents:

Description	qty.	cat.#	price
PEEK Column Connector (beige, round body)	10-pk.	25015	
PEEK Tubing, 1/16" OD x 0.005" ID x 3m (red stripe)	ea.	25065	
PEEK Tubing, 1/16" OD x 0.007" ID x 3m (yellow stripe)	ea.	25066	
PEEK Tubing, 1/16" OD x 0.010" ID x 3m (blue stripe)	ea.	25067	
PEEK Tubing Elbow 90°	5-pk.	25308	
PEEK Tubing Elbow 180°	5-pk.	25309	
Teflon Tubing, 1/8" OD x 0.063" ID x 3m (1.6mm ID)	3m	25306	
Teflon Tubing, 1/8" OD x 0.094" ID x 3m (2.4mm ID)	3m	25307	
Tubing Clip	5-pk.	25310	
ValvTool Wrench	ea.	25321	
Open-End Wrenches (1/4" x 5/16")	2-pk.*	20110	
Clean-Cut Tubing Cutter	ea.	25069	
Replacement Blade for Clean-Cut Cutter	ea.	25070	
PEEK Union Connector 1/16"	2-pk.	25323	
Mobile Phase Sparge Filter: 2µm	ea.	25311	
Inlet Filter: 10µm	ea.	25312	

*Kit contains 1 wrench, replacement (cat.# 20110) is a 2-pk.

HPLC PEEK™ Performance Kit

This HPLC PEEK™ Performance Kit is a useful complement to your HPLC system. Includes:

- Hub-Cap Adapter w/Cap (1)
- Tubing Clips (3)
- Clean Cut Tubing Cutter (1)
- PEEK Finger Tight Fittings (5)
- PEEK Column Plugs (5)
- PEEK 90° Tubing Elbows (2)
- PEEK 180° Tubing Elbows (2)
- PEEK Column Connectors (2)

NEW!



Description	qty.	cat.#	price
HPLC PEEK Performance Kit	kit	26394	

Stainless Steel Survival Kit for HPLC

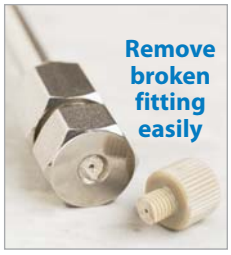
The stainless steel survival kit contains a wide range of tubing, fittings, and tools necessary to set up and maintain your HPLC system: a selection of lengths and IDs of 1/16-inch tubing, plus nuts, ferrules, a ValvTool wrench, and a zero-dead-volume union.

Description	qty.	cat.#	price
Stainless Steel Survival Kit for HPLC	kit	25097	

Contents:

Description	color	qty.	cat.#	price
HPLC Capillary Tubing, SS 1/16" x 0.005" x 5cm	red	3-pk.	25240	
HPLC Capillary Tubing, SS, 1/16" x 0.005" x 10cm	red	3-pk.	25241	
HPLC Capillary Tubing, SS, 1/16" x 0.005" x 20cm	red	3-pk.	25242	
HPLC Capillary Tubing, SS, 1/16" x 0.005" x 30cm	red	3-pk.	25243	
HPLC Capillary Tubing, SS, 1/16" x 0.007" x 5cm	gray	3-pk.	25244	
HPLC Capillary Tubing, SS, 1/16" x 0.007" x 10cm	gray	3-pk.	25245	
HPLC Capillary Tubing, SS, 1/16" x 0.007" x 20cm	gray	3-pk.	25246	
HPLC Capillary Tubing, SS, 1/16" x 0.007" x 30cm	gray	3-pk.	25247	
HPLC Capillary Tubing, SS, 1/16" x 0.010" x 5cm	blue	3-pk.	25248	
HPLC Capillary Tubing, SS, 1/16" x 0.010" x 10cm	blue	3-pk.	25249	
HPLC Capillary Tubing, SS, 1/16" x 0.010" x 20cm	blue	3-pk.	25250	
HPLC Capillary Tubing, SS, 1/16" x 0.010" x 30cm	blue	3-pk.	25251	
HPLC Capillary Tubing, SS, 1/16" x 0.020" x 5cm	yellow	3-pk.	25252	
HPLC Capillary Tubing, SS, 1/16" x 0.020" x 10cm	yellow	3-pk.	25253	
HPLC Capillary Tubing, SS, 1/16" x 0.020" x 20cm	yellow	3-pk.	25254	
HPLC Capillary Tubing, SS, 1/16" x 0.020" x 30cm	yellow	3-pk.	25255	
1/16" Rheodyne Style Nut		10-pk.	25095	
1/16" Rheodyne Style Ferrule		10-pk.	25096	
ValvTool Wrench		ea.	25321	
1/16" Stainless Steel Ferrules		10-pk.	20286	
1/16" Stainless Steel Nuts		10-pk.	20287	
Zero-Dead-Volume Internal Union		ea.	20148	





PEEK™ Fitting Extractor

Drill into the broken fitting, then screw the extractor into the fitting and remove it easily. Eliminates the need for heat or other techniques that could damage your column.



Description	qty.	cat.#	price
PEEK Fitting Extractor	ea.	25325	



PEEK™ Union Connector

Allows you to quickly and reliably connect two pieces of 1/16-inch tubing. 0.3mm union bore. End fittings included.

Description	qty.	cat.#	price
PEEK Union Connector 1/16"	2-pk.	25323	



Zero-Dead-Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. 300 series stainless steel. For 1/16" OD tubing. Stainless steel ferrules included.

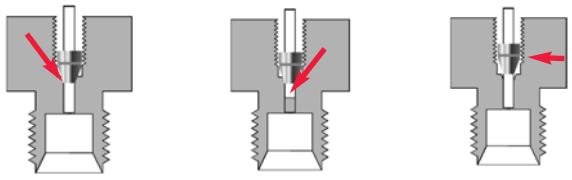
Description	Union Bore	Valco #	qty.	cat.#	price
Internal Union	0.15mm	ZU1XC	ea.	20147	
Internal Union	0.25mm	ZU1C	ea.	20148	
Internal Union	0.75mm	ZU1	ea.	20149	
Internal Union	1/16"	ZU1T	ea.	20150	

Improving Column Connections

A good connection is necessary for trouble-free chromatography. Connecting incompatible fittings from different manufacturers can result in leaks, poor peak shape, and increased void volume (Figure 1). Each type of end-fitting has a unique seat depth or style. Generally, Restek, Valco®, Parker, and Upchurch Scientific® fittings are interchangeable; whereas Waters, SSI, Rheodyne®, and Gasukura fittings are not (Figure 2).

Our wrenchless universal 10-32 PEEK™ column connector (cat.# 25015, page 347) can be used with any style of end fitting, and all 1/16-inch tubing. It is reusable and will adjust to any seat, depth, or style.

Figure 1 Incompatible fittings create problems.

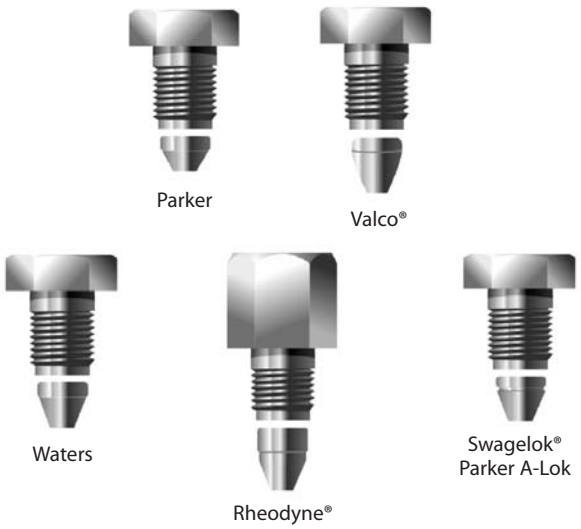


Tubing and ferrule seated correctly

Tubing not seated, causing dead volume

Ferrule can't seal

Figure 2 Fitting styles differ among various manufacturers.







HPLC Piston Seal Insertion Tool

Simplify pump maintenance: use one end to remove your old seal, then simply slip your new seal on the other end and push it flush into position. The tool cannot mar the surrounding metal surface of the pump housing.



Remove a seal



Seat a seal



Description	qty.	cat.#	price
HPLC Piston Seal Insertion Tool	ea.	21356	

Secure-Fit Fittings

A good connection between HPLC components is necessary for trouble-free chromatography. Secure-Fit connectors from Restek and Selerity Technologies ensure a consistent, leak-free seal—and they eliminate excess dead volume! An internal spring mechanism holds the capillary tubing at the proper depth in the female fitting. This seal is maintained while you finger-tighten the nut. These fittings are available in stainless steel or PEEK™, and in a variety of tubing lengths and internal diameters.

Secure-Fit Fittings—Single Connectors

	Stainless Steel			PEEK			
Length	0.005" ID	0.007" ID	0.010" ID	0.005" ID	0.007" ID	0.010" ID	price
6cm	25181	25185	25190	25230	25234	25217	
10cm	25182	25186	25191	25231	25235	25218	
20cm	25183	25187	25192	25232	25236	25219	
30cm	25184	25188	25193	25233	25237	25220	
50cm	26510	26511	26512	—	—	—	

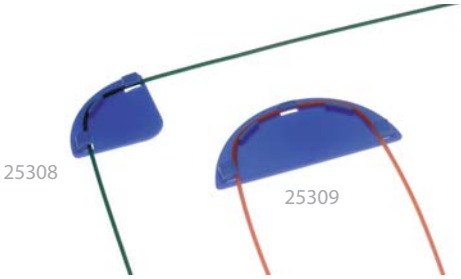
Secure-Fit Fittings—Two Connectors

	Stainless Steel			PEEK			
Length	0.005" ID	0.007" ID	0.010" ID	0.005" ID	0.007" ID	0.010" ID	price
10cm	25208	25211	25214	25221	25224	25227	
20cm	25209	25212	25215	25222	25225	25228	
30cm	25210	25213	25216	25223	25226	25229	
50cm	26513	26514	26515	—	—	—	

also **available**

HPLC Syringes
See pages 285-289.





PEEK™ Tubing Elbows

Tubing Elbows (90° and 180°) are ideal for routing 1/16-inch PEEK™ tubing through your system. Simply snap the tubing into the elbow. Prevent pinching of PEEK™ tubing which can cause high pressure.

Description	qty.	cat.#	price
PEEK Tubing Elbow 90°	5-pk.	25308	
PEEK Tubing Elbow 180°	5-pk.	25309	



Tubing Dressing Tool

Opens stainless steel tubing bore and removes burrs. For 1/16-inch OD tubing or 1/8-inch OD tubing.

Description	qty.	cat.#	price
1/16" Tubing Dressing Tool	ea.	20188	
Replacement Insert for 1/16" Tubing Dressing Tool	ea.	20189	
1/8" Tubing Dressing Tool	ea.	20190	
Replacement Insert for 1/8" Tubing Dressing Tool	ea.	20191	



Clean-Cut Tubing Cutter

- Burr-free, perpendicular cuts that will not distort the tubing OD or close the ID.
- Use on PEEK™, Teflon®, Tefzel®, other polymeric tubing.

Description	qty.	cat.#	price
Clean-Cut Tubing Cutter	ea.	25069	
Replacement Blade for Clean-Cut Cutter	ea.	25070	

For stainless steel tubing cutters, see page 248 or visit www.restek.com.



Universal 10-32 PEEK™ Column Connectors and Plugs

Universal PEEK™ Connectors allow easy installation of all 1/16-inch tubing, including stainless steel. See "Improving Column Connections" data on page 345.

Description	qty.	cat.#	price
PEEK Column Connector (beige, round body)	10-pk.	25015	
PEEK Column Plug (black)	10-pk.	25016	
PEEK Fingertight Fittings (blue, flat-sided)	10-pk.	25324	



Rheodyne® Style Nut and Ferrule

Replacement long nut for connecting stainless steel tubing to a Rheodyne® 6-port valve or other Rheodyne® part.

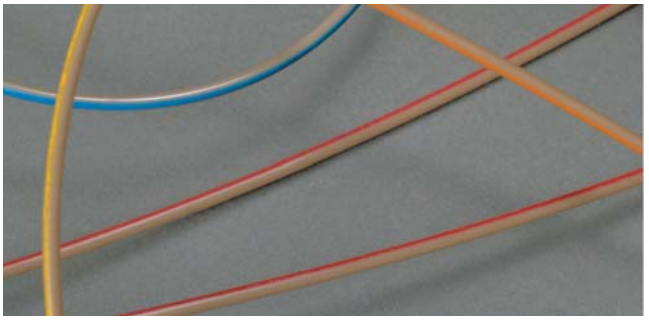
Description	qty.	cat.#	price
1/16" Rheodyne Style Nut	10-pk.	25095	
1/16" Rheodyne Style Ferrule	10-pk.	25096	



ValvTool Wrench

The ValvTool is a time-saving device that provides easy access to many hard-to-reach Rheodyne® or Valco® valves. For 1/4-inch nuts.

Description	qty.	cat.#	price
ValvTool Wrench	ea.	25321	



Inert PEEK™ Tubing

- Replaces stainless steel, titanium, Teflon® or Tefzel® tubing.
- Less oxygen permeable and more temperature resistant (to 250°C) than Teflon® or Tefzel® tubing.
- Use with PEEK™ fingertight or flangeless fittings.
- Use to 7,000psi (48,263kPa).

Description	Color Code	qty.	cat.#	price
PEEK Tubing, 1/16" OD x 0.0025" ID x 1m	pink dash stripe	3-pk.	25320	
PEEK Tubing, 1/16" OD x 0.005" ID x 3m	red stripe	ea.	25065	
PEEK Tubing, 1/16" OD x 0.007" ID x 3m	yellow stripe	ea.	25066	
PEEK Tubing, 1/16" OD x 0.010" ID x 3m	blue stripe	ea.	25067	
PEEK Tubing, 1/16" OD x 0.020" ID x 3m	orange stripe	ea.	25068	



HPLC Stainless Steel Capillary Tubing

- 316 grade stainless steel.
- Precise pre-cut lengths.
- Smooth surface finish.
- Ultra clean.

Whether you need to replace system tubing as part of your troubleshooting or want to reduce the dwell volume of your system as you move to narrower columns, Restek has the quality tubing in the lengths and IDs you need. Each ID is color-coded so it is easy to identify and replace correctly.

		0.005" ID (red)		0.007" ID (gray)		0.010" ID (blue)		0.020" ID (yellow)	
Length	qty.	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1/16" OD Tubing									
5cm	3-pk.	25240		25244		25248		25252	
10cm	3-pk.	25241		25245		25249		25253	
20cm	3-pk.	25242		25246		25250		25254	
30cm	3-pk.	25243		25247		25251		25255	



Teflon® Tubing

- Ideal for mobile phase inlet lines.
- Chemically inert.
- Use to 500psi (3,447kPa) and 80°C.

Description	qty.	cat.#	price
Teflon Tubing, 1/8" OD x 0.063" ID x 3m (1.6mm ID)	3m	25306	
Teflon Tubing, 1/8" OD x 0.094" ID x 3m (2.4mm ID)	3m	25307	



Tubing Clip

Securely holds 1/16-inch or 1/8-inch tubing in beaker, flask, or bottle up to 4mm thick.

Description	qty.	cat.#	price
Tubing Clip	5-pk.	25310	



25328



25326

QuickSplit Post-Column Flow Splitters

Fluid resistor technology eliminates adjustments to capillary tubing for optimizing split ratio. Wide range of interchangeable resistors available.

Fixed Flow Splitters for HPLC & LC/MS

- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 10,000psi (68,948kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0mL/min.

Adjustable Flow Splitter

- Adjustable metering valve gives convenient control of split ratio.
- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 5,000psi (34,474kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0mL/min.

Description	Split Ratio	qty.	cat.#	price
Binary Fixed Flow Splitter	100:01:00	ea.	25326	
	50:01:00	ea.	25327	
	20:01	ea.	25328	
	10:01	ea.	25329	
	5:01	ea.	25330	
Replacement Fixed Flow Splitter Resistor Set	100:01:00	ea.	25331	
	50:01:00	ea.	25332	
	20:01	ea.	25333	
	10:01	ea.	25334	
	5:01	ea.	25335	
Adjustable Flow Splitter	5:1 to 100:1	ea.	25336	
	1:1 to 20:1	ea.	25337	
	50:1 to 1000:1	ea.	26416	
Replacement Adjustable Flow Splitter Resistor Set	5:1 to 100:1	ea.	25338	
	1:1 to 20:1	ea.	25339	



25342

HPLC Mixers

- Reduced baseline noise.
- Increased sensitivity.
- Improved gradient accuracy, for more reproducible results.
- Increased reaction efficiency in post-column derivatization.

An efficient cross-flow shearing mechanism and interchangeable cartridges produce vortex shear mixing over a wide range of flows. Stainless steel or PEEK™.

HyperShear Static In-Line Mixers

	Stainless Steel			PEEK		
Description	qty.	cat.#	price	qty.	cat.#	price
1µL In-Line Mixer	ea.	26409		ea.	26410	
25µL In-Line Mixer	ea.	26411		ea.	26412	
50µL In-Line Mixer	ea.	25341		ea.	26413	
150µL In-Line Mixer	ea.	25342		ea.	26414	
250µL In-Line Mixer	ea.	25343		ea.	26415	



25138

Ternary Tee Mixer

Description	qty.	cat.#	price
25µL Ternary Tee Mixer	ea.	25138	

also **available**

We are pleased to offer HPLC accessory items from Analytical Scientific Instruments (ASI). ASI specializes in HPLC system components and parts that often exceed the original equipment manufacturer's performance. See **page 337.**


25340

FlatLine Pulse Damper

- Rupture-proof, no diaphragm—minimal risk of failure or leaks.
- Clean flush-out design—no sample carryover.
- Low internal volume—negligible effect on analyte bandwidth.

The ASI FlatLine Pulse Damper combines performance and reliability in a simple, easy-to-use housing. Standard 10-32 inlet and outlet ports allow quick connection into virtually any HPLC system. Solid core technology provides reliable long-term operation without the down time associated with ruptured or leaking membrane dampers. 600–700µL internal volume at ambient pressure.

Description	qty.	cat.#	price
FlatLine Pulse Damper	ea.	25340	


25238

MicroPulse Pulse Dampers

- Compact unit (2.5" x 1.5") can be placed almost anywhere.
- Small, 150µL dead volume at atmospheric pressure.
- PEEK™ unit can withstand pressures to 5,000psi (34,474kPa).
- 316 Stainless steel unit can withstand pressures to 6,000psi (41,369kPa).

Improves system baseline stability while increasing the total system volume by only 150µL. The MicroPulse pulse damper is ideal for applications where minimizing the total system volume is critical. Stainless steel and PEEK™ options for a wide range of applications.

Description	qty.	cat.#	price
MicroPulse Pulse Damper, Stainless Steel	ea.	25238	
MicroPulse Pulse Damper, PEEK	ea.	25239	


25013

LO-Pulse Pulse Damper

The LO-Pulse Pulse Damper is a patented, wide-dynamic-range 316 stainless steel device that smooths pulsations and maintains constant flow at system pressures up to 6,000psi (41,369kPa). The flow path volume is only 0.9mL and the path is efficiently swept, eliminating solvent memory effects when changing mobile phases.

The LO-Pulse pulse damper also is available in a space-saving, economical kit that includes hardware for mounting the pulse damper on a bracket, or for installing feet on it for bench-top use.

Description	qty.	cat.#	price
Model LP-21 LO-Pulse Pulse Damper	ea.	25012	
Pulse Damper Kit	kit	25013	


25017
25018
25020

Backpressure Regulators

Backpressure regulators can improve detector performance by preventing bubble formation in the detector flow cell. They also are useful in post-column reaction lines and between detectors and fraction collectors in preparatory work. Regulators are superior to more specific alternative solutions, like small-bore tubing, in which pressure varies with flow rate.

Our end-of-line and flow-through backpressure regulators are adjustable to assure constant backpressure over a wide range of mobile-phase viscosities and flow rates. The end-of-line model is available with 1/4-28 plastic flange-type fittings or high-pressure $^{1}/_{16}$-inch compression fittings; this design adjusts from 15 to 60psi (103 to 414kPa). The flow-through design has $^{1}/_{16}$-inch compression fittings and is adjustable from 7 to 75psi (48 to 517kPa).

Description	qty.	cat.#	price
Backpressure Regulator: end-of-line, $^{1}/_{16}$-inch OD tubing, flanged	ea.	25017	
Backpressure Regulator: end-of-line, high-pressure seat	ea.	25018	
Backpressure Regulator: flow-through, 5µL internal volume	ea.	25020	





HPLC Column Tubing

Restek tubing is manufactured from fine, chromatographic-grade 316 stainless steel. It is corrosion resistant, ultrasonically cleaned and passivated. We polish the tubing and promise a burr-free cut. You can use this tubing immediately—there is no need for additional treatment.

	2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price
1/4" OD Tubing						
30mm	25100		25106		25112	
50mm	25101		25107		25113	
100mm	25102		25108		25114	
150mm	25103		25109		25115	
200mm	25104		25110		25116	
250mm	25105		25111		25117	



Packing particle size	Use this pore size:
3–4µm	0.5µm
5–20µm	2.0µm

1/4-Inch HPLC Frits

We manufacture our frits from fine, chromatographic-grade 316 stainless steel, and we offer sizes to fit most column and pore sizes. To choose the correct frit, check its pore size compatibility with the particle size of the packing in the column (see chart above). If the packing has a smaller particle size than the pore size of the frit, the packing can clog the frit.

ID	Pore Size	qty.	cat.#	price
4.6mm	2.0µm	10-pk.	25071	
4.6mm	0.5µm	10-pk.	25072	
3.2mm	2.0µm	10-pk.	25073	
3.2mm	0.5µm	10-pk.	25074	
2.1mm	2.0µm	10-pk.	25075	
2.1mm	0.5µm	10-pk.	25076	

Column End-Fittings

1/4-inch end-fittings are compatible with Valco® and Parker fittings.

Description	qty.	cat.#	price
Column End-Fitting for 4.6mm Column	ea.	25077	
Column End-Fitting Flat Bottom	ea.	25078	



Empty Chromatography Columns

- 316 stainless steel tubing complete with end-fittings, frits, nuts, and ferrules.
- Preassembled prior to shipment, unless otherwise requested.
- Internal 1/16-inch seats are compatible with Valco® and Parker fittings.

	2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price
1/4" OD Tubing						
30mm	25118		25124		25130	
50mm	25119		25125		25131	
100mm	25120		25126		25132	
150mm	25121		25127		25133	
200mm	25122		25128		25134	
250mm	25123		25129		25135	



Restek Pack in a Box Kit

Restek's Pack in a Box Kit is a complete column-packing system. Everything you need to pack your own analytical HPLC columns is included: pump, 20mL reservoir, column hardware (two, 150 x 4.6mm), and system control software (computer not included). Detailed packing instructions and a DVD video also are included. The packing pump is electric, so no pressurized air is required. AC input requirement: 85-265 VAC. 10,000psi maximum pressure.

Description	qty.	cat.#	price
Pack in a Box Kit	kit	26408	

HPLC Organizers*



LCLocker HPLC Organizer



Deluxe BenchBooster Organizer



Mini pHPerch Storage Unit



TopLoader BalanceBank Storage Unit



HPLC 30-Column Storage Cabinet



Book Holders



Open Supply Bins, 13-bin unit



Glove Box Dispensers

Description	dimensions	qty.	cat.#	price
LCLocker	24 x 12 x 6"	ea.	25149	
BenchBooster	24 x 7 x 12"	ea.	25150	
Mini pHPerch	13 x 12 x 6"	ea.	25147	
TopLoader	12 x 12 x 7"	ea.	25148	
30 Column Cabinet	$17^{3}/_{8}$ x 15 x $2^{7}/_{8}$"	ea.	25159	
Book Holder, Small	0.75" ID	ea.	25151	
Book Holder, Large	1.5" ID	ea.	25152	
Open Supply Bin, 4-bin Unit	24 x 12 x 10"	ea.	25153	
Open Supply Bin, 5-bin Unit	12 x 16 x 10.5"	ea.	25154	
Open Supply Bin, 13-bin Unit	12 x 7.5 x 12"	ea.	25155	
Glove Box Dispenser, Single	$5^{3}/_{8}$ x $11^{1}/_{2}$ x $4^{1}/_{2}$"	ea.	25156	
Glove Box Dispenser, Double	$10^{3}/_{8}$ x $11^{1}/_{2}$ x $4^{1}/_{2}$"	ea.	25157	
Glove Box Dispenser, Triple	$15^{3}/_{8}$ x $11^{1}/_{2}$ x $4^{1}/_{2}$"	ea.	25158	

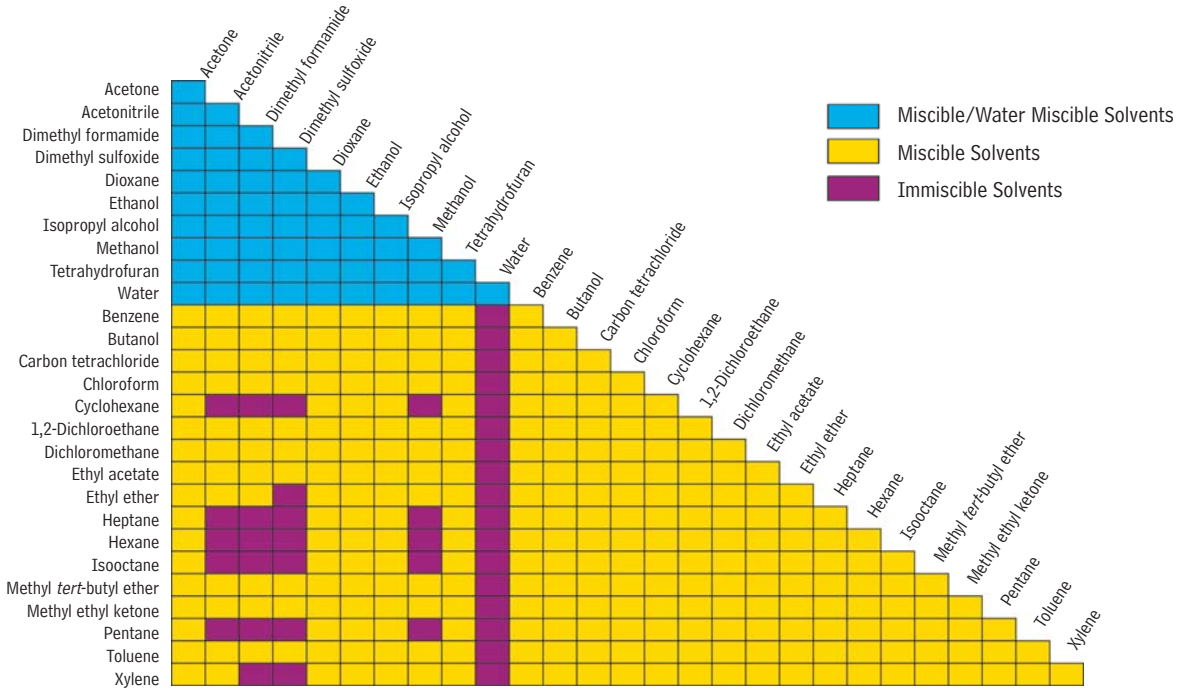
*Please note: Accessories and supplies in photographs are not included.

HPLC Pump Pressure Conversion Table

Pressure	psi	atm	kg/cm²	torr	kPa	bar	inches Hg
1 psi =	1	0.068	0.0703	51.713	6.8948	0.06895	2.0359
1 atm =	14.696	1	1.0332	760	101.32	1.0133	29.921
1 kg/cm² =	14.223	0.967	1	735.5	98.06	0.9806	28.958
1 torr =	0.0193	0.00132	0.00136	1	0.1330	0.00133	0.0394
1 kPa =	0.1450	0.00987	0.0102	7.52	1	0.0100	0.2962
1 bar =	14.5038	0.9869	1.0197	751.88	100	1	29.5300
1 in Hg =	0.49612	0.0334	0.0345	25.400	3.376	0.03376	1

Multiply units in the left-most column by the conversion factors listed in the columns to the right.
e.g., 10 psi x 0.068 = 0.68atm
10 bar x 29.5300 = 295.300 inches Hg

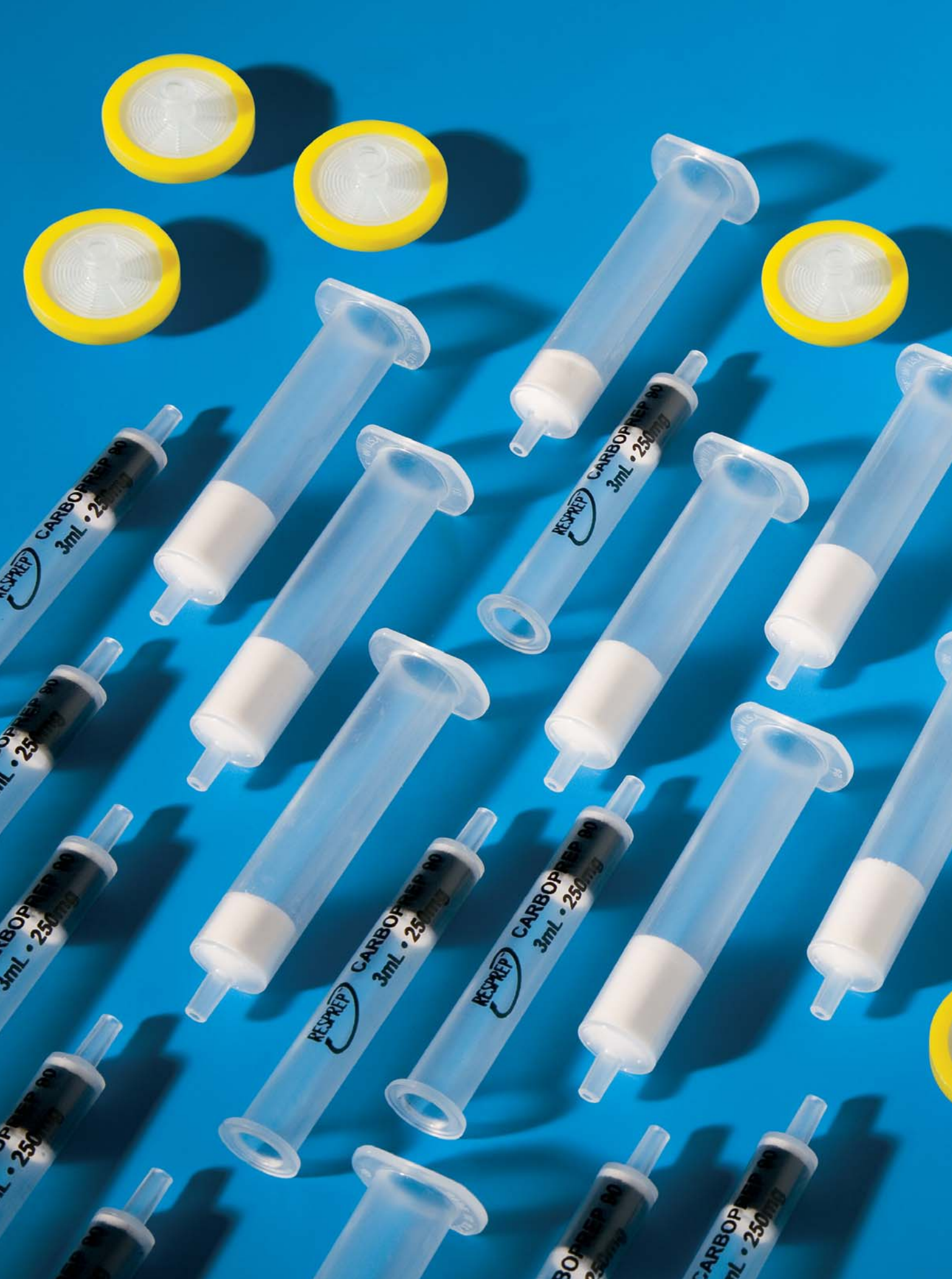
Solvent Miscibility and Solubility





also **available**

HPLC Syringes
See pages 285-289.


RESPREP
CARBOPREP 90
3mL • 250mg

Sample Preparation



SPE Cartridges 356-358
QuEChERS Tubes 359
Bulk Adsorbents 360
SPE Disks, Flow Filters, Diskcover-47 Extraction 361
SPE Manifolds 362
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Parts for ASE Systems 364-366
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All cartridges are manufactured using high density polypropylene and have polyethylene frits unless otherwise noted.

Resprep™ SPE Cartridges: Normal Phase

Hydrophilic (polar) adsorbents used to extract hydrophilic analytes from nonpolar matrices, such as organic solvents (e.g., polar contaminants from sample extracts).

	3mL/500mg (50-pk.)	6mL/500mg (30-pk.)	6mL/1000mg (30-pk.)	6mL/1000mg (100-pk.)	15mL/2g (100-pk.)
Florisil (EPA SW 846 methods and CLP protocols)	24031 24032*	— 26086**	24034 26085**	26205 —	26228 —
Silica (EPA SW 846 methods)	24035 24036*	— —	24038 —	— —	— —

NEW!

*Teflon frits
**Glass tubes with Teflon frits

Resprep™ SPE Cartridges: Ion Exchange Phases

Ionized phases bonded to silica-based adsorbents used to extract positively- or negatively-charged analytes from aqueous matrices (e.g., tricyclic antidepressants from plasma).

	1mL/100mg (100-pk.)	3mL/200mg (50-pk.)	3mL/500mg (50-pk.)	6mL/500mg (30-pk.)	6mL/1000mg (30-pk.)
SAX, quaternary amine	26054	—	26055	—	—
SCX, propyl	26056	—	26057	—	—
SCX, benzyl	—	26058	—	26059	26060
WAX, NH_2, primary amine	26050	26051	26052	26053	—
WCX, COOH, carboxylic acid	26061	—	26062	—	—

Strong Anion Exchange (SAX); Strong Cation Exchange (SCX); Weak Anion Exchange (WAX); Weak Cation Exchange (WCX)

Resprep™ SPE Cartridges: Bonded Reversed Phases

Hydrophobic (nonpolar) silica-based adsorbents, used to extract hydrophobic analytes from polar matrices, such as water (e.g., pesticides from water).

	1mL/100mg (100-pk)	3mL/200mg (50-pk.)	3mL/500mg (50-pk.)	6mL/500mg (30-pk.)	6mL/1000mg (30-pk.)	20mL/5g (20-pk.)	60mL/10g (16-pk.)
C18 (high load, endcapped)	26030	26031	24050	24052	24051	26034	26035
C8 (high load, endcapped)	26036	26037	26038	26039	26040	—	—
Cyclohexyl (endcapped)	—	—	—	—	26043	—	—



25989

Resprep™ SPE Cartridges: Polymeric DVB Adsorbents

Polymeric adsorbents are used to extract a wide range of polar aromatic and unsaturated analytes from aqueous matrices and can tolerate a wider pH range than silica based adsorbents.

	6mL/500mg (50-pk.)
DVB (Teflon frits)	25989

FREE Sample Packs Available!

Free sample packs of SPE cartridges are available by adding -248 to the catalog number when you call to place your order.

CarboPrep™ SPE Cartridges

- Improved recovery of sulfonylurea herbicides, phenols, carbamates, and triazine herbicides, compared to C18 and C8 cartridges.
- Wide range of selectivity for both analytes and their metabolites or degradation products.
- Rapid sampling flow rates; uncompromised recoveries.
- Maximum capacity for contaminant cleanup.
- Controlled manufacturing improves cleanliness and ensures reproducible performance.

CarboPrep™ cartridges are manufactured from chromatographic-grade, nonporous, graphitized carbon. Our manufacturing process minimizes variability and improves recovery and cleanup procedures. We offer two types of carbons: CarboPrep™ 90 has a surface area of approximately 90m²/g, CarboPrep™ 200 has a surface area of 200m²/g. Both have higher capacity than silica-based packings for a variety of compounds.

CarboPrep™ cartridges can be used for both sample extraction of organic compounds and extract cleanup of matrix interferences.

SPE Cartridge	Tube Volume, Bed Weight	qty.	cat#	price
CarboPrep 90	3mL, 250mg	50-pk.	26091	
CarboPrep 90	6mL, 500mg	30-pk.	26092	
CarboPrep 200	3mL, 250mg	50-pk.	26088	
CarboPrep 200	6mL, 500mg	30-pk.	26087	

CarboPrep™ Reversing SPE Cartridges

- High adsorbent capacity (surface area ~200m²/g) for large volume sampling.
- Chromatographic grade graphitized carbon provides consistent and quantitative recoveries of a wide variety of semivolatiles, pesticides and herbicides.
- 500mg bed weight (100mg and 900mg bed weights available on request).

Reversing cartridge design allows convenient inverted elution of strongly retained analytes using minimum solvent volumes. Ideal design for extraction of pesticides in water.[1]

SPE Cartridge	Bed Weight	qty.	cat#	price
CarboPrep 200 Reversing Cartridge	500mg	30-pk.	26206	

[1]Crescenzi, C.; DiCorcia, A.; Guerriero, E.; and Saperi, R. Development of a Multiresidue Method for Analyzing Pesticide Traces in Water Based on Solid-Phase Extraction and Electrospray Liquid Chromatography Mass Spectrometry, *Environmental Science & Technology* vol.31, no. 2 (1997) 479-488.



26206

Closed End SPE Cartridge: Activated Sodium Sulfate

- High quality anhydrous sodium sulfate.
- Approximately 1 gram prepackaged in a convenient capped cartridge with both male and female luer ends for easy connection to a variety of devices or equipment.
- The adsorbent is fully activated and ready to use for removal of excess water from small volumes of organic solvent solutions, prior to many types of analysis.
- Capped cartridges will remain active for long periods of storage in the lab.

SPE Cartridge	Bed Weight	qty.	cat#	price
Activated Sodium Sulfate	1000mg	50-pk.	26207	



26207

for more info

For cartridge components, see page 363.

please note

If you need a custom SPE cartridge, contact our Technical Service chemists or your Restek representative.

Method Specific SPE Cartridges

These cartridges have been specifically designed to provide consistent and reproducible results for the method or application stated.

Description	Applications	Tube Volume, Bed Weight	qty.	cat.#	price
Massachusetts EPH	Extraction of hexane-extractable petroleum hydrocarbons from soil and waste samples. Specially treated to reduce contaminants and increase capacity. Silica packing.	20mL, 5g	20-pk.	26065	
EPA Method 521	For use in EPA Method 521: Nitrosamines in Drinking Water. This method calls for large volume injection and CI/MS/MS. Activated charcoal packing for NDMA.	6mL, 2g	30-pk.	26032	
EPA Method 548.1	Extraction of endothal from aqueous samples. Weak anion exchange resin (BioRex 5) packing.	6mL	30-pk.	26063	
Ultra Quat SPE	For use in HPLC analysis of paraquat/diquat, as an alternative to EPA 549.2. For an HPLC column developed specifically for this application, see page 320.	6mL, 500mg	30-pk.	25499	
EPA Method 552.1	Extraction of haloacetic acids from aqueous samples. Strong anion exchange resin (Ag 1x8) packing.	1mL	100-pk.	26064	
EPA Method 8321 (AH SPE)	For use in HPLC analysis of phenoxy acid herbicides.	6mL, 500mg	30-pk.	26029	
Organo Tin	High-capacity clean-up of butyl and phenyl tin compounds from soil, water, and biota. Mixed bed.	60mL	16-pk.	24049	
Drug Prep I	Suitable for acidic, basic, and neutral drugs. Mixed-mode hydrophobic and ion exchange sites provide selective, reproducible extraction of biological samples containing therapeutic or illegal drugs.	3mL, 200mg 10mL, 200mg	50-pk. 50-pk.	26044 26045	
Drug Prep II	Extraction of THCA from biological samples. Copolymeric anion exchange sites provide selective, reproducible extraction of THCA from urine.	3mL, 200mg 10mL, 200mg	50-pk. 50-pk.	26046 26047	
GHB	Extraction of γ-hydroxybutyric acid from biological samples. Provides reproducible extraction of GHB from urine, blood, or tissue without conversion to GBL (γ-butyrolactone).	10mL, 200mg	50-pk.	26208	
RDX	Extraction of explosive compounds (similar to EPA Method 8095 and 8330 list) from water samples.	6mL, 500mg	30-pk.	26093	



26194



26195



26128

Pesticide Residue Cleanup SPE Cartridges

- Convenient, multiple adsorbent beds in a single cartridge.
- For use in multiple-residue pesticide analysis, to remove matrix interferences.

SPE Cartridge	qty.	cat.#	price
6mL Combo SPE Cartridge, Packed with 500mg CarboPrep 90/500mg Aminopropyl, Polyethylene Frits	30-pk.	26193	
6mL Combo SPE Cartridge, Packed with 500mg CarboPrep 90/500mg PSA, Polyethylene Frits	30-pk.	26194	
6mL SPE Cartridge, Packed with 500mg PSA, Polyethylene Frits	30-pk.	26195	
6mL Combo SPE Cartridge, Packed with 200mg CarboPrep 200 and 400mg PSA, Teflon Frits	30-pk.	26127	
6mL Combo SPE Cartridge, Packed with 250mg CarboPrep 200 and 500mg PSA, Teflon Frits	30-pk.	26128	
6mL Combo SPE Cartridge, Packed with 500mg CarboPrep 200 and 500mg PSA, Teflon Frits	30-pk.	26129	


Catch the Buzz
Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

QuEChERS SPE Tubes for Extraction and Clean-Up of Pesticide Residue Samples from Food Products

- Fast, simple sample extraction and cleanup using dSPE.
- Fourfold increases in sample throughput.
- Fourfold decreases in material cost.
- Convenient, ready to use centrifuge tubes with ultra pure, preweighed adsorbent mixes.

Quick, Easy, Cheap, Effective, Rugged, and Safe, the QuEChERS ("catchers") method, developed by the USDA Eastern Regional Research Center[1], has become very popular for extraction and clean-up of pesticide residue samples. Our products are available in three centrifuge tube sizes to meet the needs of both extraction and cleanup of a wide variety of sample matrices following various methods.

The researchers developed a simple two-step procedure. First, the homogenized samples are extracted and partitioned, using an organic solvent and salt solution. Then, the supernatant is further extracted and cleaned, using a dispersive SPE technique. Multiple adsorbents are placed in a centrifuge tube, along with the 1mL of organic solvent and the extracted residues partitioned from step 1. The contents are thoroughly mixed, then centrifuged, producing a clean extract ready for a variety of GC or HPLC analytical techniques.[2] Validation and proficiency data for the QuEChERS method are available for a wide variety of pesticides in several common food matrices at www.quechers.com

Description	Material	Methods	qty.	cat#	price
50mL Centrifuge Tubes for Sample Extraction					
Resprep Q110	4g $MgSO_4$, 1g NaCl, 1g trisodium citrate dihydrate, .5g disodium hydrogencitrate sesquihydrate	Mini-Multiresidue, European prEN-15662	50-pk.	26213	
Resprep Q150	6g $MgSO_4$, 1.5g NaOAc	AOAC 2007.1	50-pk.	26214	
Empty 50mL Centrifuge Tube	—	Mini-Multiresidue, European prEN-15662, AOAC 2007.1	25-pk.	26227	
2mL Micro-Centrifuge Tubes for dSPE (clean-up of 1mL extract)					
Resprep Q210	150mg $MgSO_4$, 25mg PSA	Mini-Multiresidue, European prEN-15662	100-pk.	26215	
Resprep Q211	150mg $MgSO_4$, 25mg PSA, 25mg C18	Mini-Multiresidue	100-pk.	26216	
Resprep Q212	150mg $MgSO_4$, 25mg PSA, 2.5mg GCB	Mini-Multiresidue, European prEN-15662	100-pk.	26217	
Resprep Q213	150mg $MgSO_4$, 25mg PSA, 7.5mg GCB	Mini-Multiresidue, European prEN-15662	100-pk.	26218	
Resprep Q250	150mg $MgSO_4$, 50mg PSA	AOAC 2007.1	100-pk.	26124	
Resprep Q251	150mg $MgSO_4$, 50mg PSA, 50mg C18	AOAC 2007.1	100-pk.	26125	
Resprep Q253	150mg $MgSO_4$, 50mg PSA, 50mg GCB	—	100-pk.	26123	
Resprep Q252	150mg $MgSO_4$, 50mg PSA, 50mg C18, 50mg GCB	AOAC 2007.1	100-pk.	26219	
15mL Centrifuge Tubes for dSPE (clean-up of 6mL extract)					
Resprep Q350	1200mg $MgSO_4$, 400mg PSA	AOAC 2007.1	50-pk.	26220	
Resprep Q351	1200mg $MgSO_4$, 400mg PSA, 400mg C18	AOAC 2007.1	50-pk.	26221	
Resprep Q352	1200mg $MgSO_4$, 400mg PSA, 400mg C18, 400mg GCB	AOAC 2007.1	50-pk.	26222	
Resprep Q370	900mg $MgSO_4$, 150mg PSA	European prEN-15662	50-pk.	26223	
Resprep Q371	900mg $MgSO_4$, 150mg PSA, 15mg GCB	European prEN-15662	50-pk.	26224	
Resprep Q372	900mg $MgSO_4$, 150mg PSA, 45mg GCB	European prEN-15662	50-pk.	26225	
Resprep Q373	900mg $MgSO_4$, 150mg PSA, 150mg C18	—	50-pk.	26226	
Resprep Q374	900mg $MgSO_4$, 300mg PSA, 150mg GCB	—	50-pk.	26126	

PSA—primary and secondary amine exchange material
GCB—graphitized carbon black

Reference (not available from Restek)

1. Anastassiades, M., S.J. Lehotay, D. Stajnbaher, F.J. Schenck, "Fast and Easy Multiresidue Method Employing Acetonitrile Extraction/Partitioning and "Dispersive Solid-Phase Extraction" for the Determination of Pesticide Residues in Produce", *J AOAC International*, 2003, vol 86 no 22, pp 412-431.
2. Schenck, F.J., SPE Cleanup and the Analysis of PPB Levels of Pesticides in Fruits and Vegetables. Florida Pesticide Residue Workshop, 2002.



Visit **www.restek.com/quechers** for free literature and resources on QuEChERS.

did you **know**?

Multiple sorbents are used to extract different types of interferences.

$MgSO_4$	removes excess water
PSA	removes sugars, fatty acids, organic acids, and anthocyanine pigments
C18	removes nonpolar interferences
GCB	removes pigments, sterols, and nonpolar interferences







also **available**

Custom adsorbent mix combinations available upon request.

FREE Sample Packs Available!

Free sample packs of QuEChERS SPE Tubes are available by adding -248 to the catalog number when you call to place your order.



Al Carusone, Technical Service

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

Outside the U.S.

Contact your Restek representative.

Sodium Sulfate

- Ideal for removing water from sample extracts.
- Requires activation before use.
- Packaged in recloseable 5kg buckets.

Anhydrous sodium sulfate is the most common drying agent used to remove moisture from sample extracts. We package our 60 mesh material in recloseable buckets.

Description	qty.	cat.#	price
Sodium Sulfate	5kg	26204	

Florisil® PR

- Pesticide residue grade.
- Each lot certified to meet AOAC method requirements.
- Packaged in glass containers.

Florisil® PR is commonly used to remove polar interferences from pesticide residues. This bulk material is ideal for labs packing their own chromatography columns for pesticide residue extractions.

Description	qty.	cat.#	price
Florisil PR, 60/100 mesh	500gms	26135	

Granulated Activated Copper

- Convenient form for removing sulfur from environmental extracts.
- Acidified and activated—ready for use.

Activated copper effectively removes elemental sulfur from environmental extracts. Our acid-washed and activated material can be used right out of the package. The 30 mesh granular material eliminates the potential for fine copper particles in filtered extracts.

Description	qty.	cat.#	price
Granulated Activated Copper, 30 mesh	1kg	26136	

Ottawa Sand

- Sample medium for matrix spikes and laboratory control blanks.
- Packaged in convenient 5kg buckets.

Ottawa sand is listed in several US EPA methods as the specified medium for matrix spike and laboratory control blanks.

Description	qty.	cat.#	price
Ottawa Sand	5kg	26137	

Diatomaceous Earth

- Improves extraction efficiency.
- Adsorbs moisture from samples.

Diatomaceous earth is used as a filter aid to improve extraction efficiency of densely packed soils, such as clays. By mixing the sample with diatomaceous earth, recoveries can be improved and excess moisture can be absorbed. We package our 30/40 mesh material in a convenient 1kg quantity.

Description	Similar to Dionex part #	qty.	cat.#	price
Diatomaceous Earth, 30/40 mesh	062819	1kg	26033	

Resprep™-C18 and Resprep™-C8 SPE Disks

- Glass fiber disks embedded with C18 or C8 bonded silica.
- Extract semivolatile organic compounds.
- Deep-pore design reduces clogging and allows faster flow rates.
- Meet requirements for EPA Methods 525.1, 506, 550.1, and 549.1.
- Lower cost than Teflon® disks.

Description	qty.	cat.#	price
Resprep-C8 47mm SPE Disks	24-pk.	24048	
Resprep-C18 47mm SPE Disks	20-pk.	24004	
Resprep-C18 90mm SPE Disks	12-pk.	25988	

Resprep™ Oil & Grease SPE Disks

- 47mm glass fiber disks embedded with specialty bonded silica.
- Meet requirements for EPA Method 1664.*
- Reduce emulsion formation and amount of solvent required by previous EPA methods.
- No chlorofluorocarbons needed.

Description	qty.	cat.#	price
Resprep Oil & Grease SPE Disks	20-pk.	26022	

*A sodium sulfate drying tube and a 0.45µm PTFE syringe filter (cat.# 26145, page 363) also may be used.

Resprep™ SPE Flow Filters

- Designed specifically to improve flow when filtering oil and grease samples.
- Use with Resprep™ Diskcover-47 reservoir, or any 47mm glass sample reservoir.

Description	qty.	cat.#	price
Resprep SPE Flow Filters	20-pk.	26024	

Resprep™ Resin SPE Disks

- 47mm glass fiber disks embedded with styrene/DVB resin.
- For chlorinated, benzidine-containing, or nitrogen-containing pesticides.
- Meet requirements of EPA Methods 515.2 and 553.

Description	qty.	cat.#	price
Resprep Resin SPE Disks	20-pk.	26023	



Resprep™ disks & flow filters extract analytes of interest at high flow rates, and significantly reduce clogging.

also available

For an alternative membrane filtration system, see **page 339**.

Parts for Diskcover-47 Extraction System

Diskcover-47 Extraction Disk Holder

- Compatible with most vacuum manifold systems that accept 1/8-inch male luer fittings.
- Sample can be automatically introduced via 1/8-inch Teflon® tubing or from the optional Diskcover-47 reservoir.

Description	qty.	cat.#	price
Diskcover-47 Extraction Disk Holder	ea.	24020	
Diskcover-47 Extraction Disk Holder	6-pk.	24021	
Teflon Tube Luer Adaptors (1/8" OD)	6-pk.	24017	
Teflon Sample Tubing (2ft./0.6m, 1/8" OD)	6-pk.	24025	



24020

Diskcover-47 Reservoir*

The Diskcover-47 open-top reservoir allows you to pour up to 125mL of sample directly onto the filter disk holder. It easily installs on top of the Diskcover-47 extraction disk holder.

Description	qty.	cat.#	price
Diskcover-47 Reservoir	ea.	24029	
Diskcover-47 Reservoir	6-pk.	24030	
Teflon O-Ring**	ea.	24027	
Teflon O-Ring**	6-pk.	24028	

*Must be used with the Diskcover-47 extraction disk holder.
**Order when using PTFE extraction filters.



24029



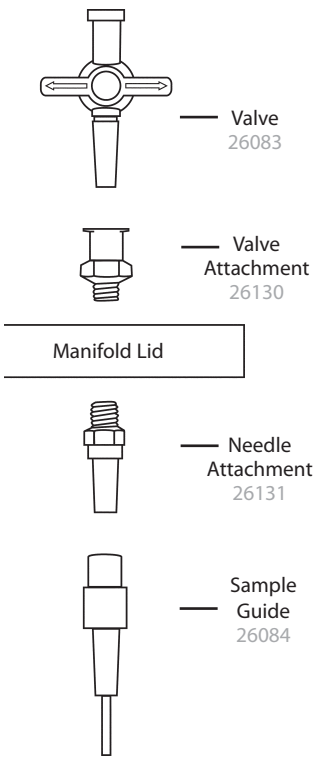
Resprep™ 12- or 24-Port SPE Manifolds

- Use with any standard male luer-end SPE cartridges.
- Inert, Teflon® sample guides reduce cross-contamination and carryover.
- Flexible sample collection rack will accommodate a variety of receiving vessels.
- Quick vacuum-release valve for better system control.
- Individual vacuum control for each cartridge—improves reproducibility.



Description	qty.	cat.#	price
Complete Resprep 12-Port SPE Manifold (includes glass basin with built-in vacuum regulator, polypropylene lid with 12 individual control valves, 12-position collection rack, 12 Teflon sample guides, and waste container)	kit	26077	
Complete Resprep 24-Port SPE Manifold (includes glass basin with built-in vacuum regulator, polypropylene lid with 24 individual control valves, 24-position collection rack, and 24 Teflon sample guides)	kit	26080	

Resprep™ Manifold Replacement Parts



Resprep™ Manifold Replacement Parts

Description	qty.	cat.#	price
Replacement Waste Container, 12-port	ea.	24014	
Collection Rack			
Collection Rack, 12-port	ea.	26079	
Collection Rack, 24-port	ea.	26082	
Manifold Lid			
Replacement Manifold Lid, 12-port (sample guides not included)	ea.	26078	
Replacement Manifold Lid, 24-port (sample guides not included)	ea.	26081	
Manifold Lid Replacement Parts			
Valves, 12 or 24-port	2-pk.	26083	
Valve Attachment	48-pk.	26130	
Needle Attachment	48-pk.	26131	
Sample Guides, 12 or 24-port	12-pk.	26084	

*Not included in 24-port manifold (cat.# 26080 or 26082).



Oil-Free Vacuum/Pressure Station for 12-Port Resprep™ SPE Systems

Allows switching from pressure to vacuum in a matter of seconds. Quiet, oil-free unit won't contaminate the extraction system or your samples. Provides 20" Hg (68kPa) vacuum or 18psi (124kPa) pressure.

Description	qty.	cat.#	price
Oil-Free Vacuum/Pressure Station, 115VAC, 60Hz, US	ea.	24002	
Oil-Free Vacuum/Pressure Station, 230VAC, 50Hz, Europe	ea.	24003	
Vacuum Tubing (10ft./3m, 1/4" ID)	ea.	24016	

Not recommended for use with 24-port manifold.

Syringe Filters with Luer Lock Inlet

- Variety of filter types, porosities, and diameters.
- Color coded for easy identification.
- Polypropylene housing.
- Reusable storage container.
- Quantity break pricing, for greater savings.

Excellent syringe filters—great prices!



Price per 100-pack

Size	Porosity	Color	qty.	cat.#	1-4 packs	5-9 packs	10 or more packs
Cellulose Acetate							
13mm	0.22µm	green	100-pk.	26156	/pk.	/pk.	/pk.
13mm	0.45µm	blue	100-pk.	26155	/pk.	/pk.	/pk.
25mm	0.22µm	green	100-pk.	26158	/pk.	/pk.	/pk.
25mm	0.45µm	blue	100-pk.	26157	/pk.	/pk.	/pk.
Nylon							
13mm	0.22µm	yellow	100-pk.	26146	/pk.	/pk.	/pk.
13mm	0.45µm	pink	100-pk.	26147	/pk.	/pk.	/pk.
25mm	0.22µm	yellow	100-pk.	26148	/pk.	/pk.	/pk.
25mm	0.45µm	pink	100-pk.	26149	/pk.	/pk.	/pk.
PTFE (polytetrafluoroethylene)							
13mm	0.22µm	purple	100-pk.	26142	/pk.	/pk.	/pk.
13mm	0.45µm	orange	100-pk.	26143	/pk.	/pk.	/pk.
25mm	0.22µm	purple	100-pk.	26144	/pk.	/pk.	/pk.
25mm	0.45µm	orange	100-pk.	26145	/pk.	/pk.	/pk.
PVDF (polyvinyldifluoride)							
13mm	0.22µm	brown	100-pk.	26150	/pk.	/pk.	/pk.
13mm	0.45µm	red	100-pk.	26151	/pk.	/pk.	/pk.
25mm	0.22µm	brown	100-pk.	26152	/pk.	/pk.	/pk.
25mm	0.45µm	red	100-pk.	26153	/pk.	/pk.	/pk.

NEW!

Cellulose Acetate, Nylon, PVDF - hydrophilic applications
PTFE - hydrophobic applications, resistant to acids and bases, used mostly with nonaqueous samples



free literature

For a helpful membrane selection guide, download **lit. cat.# GNFF1072** from **www.restek.com**.

FREE Sample Packs Available!

Free sample packs of syringe filters are available by adding -248 to the catalog number when you call to place your order.

Resprep™ SPE Tube Parts & Accessories

Empty Tubes (polypropylene)	Volume	qty.	cat.#	price
	1mL	50-pk.	26010	
	3mL	50-pk.	26011	
	6mL	50-pk.	26012	
	15mL	50-pk.	26013	
	sample reservoir, 25mL	12-pk.	26014	
	sample reservoir, 70mL	12-pk.	26015	
Frits (polyethylene), 20µm	**Fits Tube Volume, Diameter**	**qty.**	**cat.#**	price
	1mL, 6mm	100-pk.	26016	
	3mL, 9mm	100-pk.	26017	
	6mL, 1.2cm	100-pk.	26018	
	15mL, 1.6cm	100-pk.	26019	
	25mL, 2.0cm*	100-pk.	26020	
	70mL, 2.6cm**	100-pk.	26021	
Tube Caps	**Fits Tube Volume**	**qty.**	**cat.#**	price
	1mL	12-pk.	26001	
	3mL	12-pk.	26002	
	6mL	12-pk.	26003	
	15mL	12-pk.	26004	
	25mL*	12-pk.	26005	
	70mL**	12-pk.	26006	
Female Luer End Caps	**Fits Tube Volume**	**qty.**	**cat.#**	price
	universal	12-pk.	26000	
Connectors	**Fits Tube Volume**	**qty.**	**cat.#**	price
	1, 3, 6mL	12-pk.	26007	
	25mL*	12-pk.	26008	
	70mL**	12-pk.	26009	


26012


26018


26003


26000


26007

*For 20mL packed tubes.
**For 60mL packed tubes.

did you **know**?

You can elute an SPE tube manually with our connectors and NORM-JECT® syringes (see **page 289**).



Accelerated solvent extraction has become a common technique for fast and reliable extraction of organic materials from solid matrices, using EPA SW-846 Method 3545, Pressurized Fluid Extraction (PFE). Restek offers a wide range of replacement parts to keep your extraction system running smoothly. All parts are economically priced to save you money and are designed to meet or exceed the performance of the original manufacturer's parts.

For handy tools designed for use with ASE® systems, see page 367. For diatomacous earth and sodium sulfate, see page 360.

Replacement Parts for ASE® 200 Systems, Manufacturer's Design

Extraction Cell Parts for ASE® 200 Systems

- Choose original equipment-equivalent stainless steel, or Siltek® deactivation for improved inertness.
- Inner surfaces polished, for easier cleaning.
- Caps include frit, washer, PTFE O-ring, and threaded insert.



Description	Similar to Dionex part #	Stainless Steel qty.	Stainless Steel cat.#	price	Siltek Treated qty.	Siltek Treated cat.#	price
Extraction Cell Body for ASE 200, 1mL	054973	ea.	26110		ea.	26111	
Extraction Cell Body for ASE 200, 5mL	054974	ea.	26112		ea.	26113	
Extraction Cell Body for ASE 200, 11mL	048820	ea.	26114		ea.	26115	
Extraction Cell Body for ASE 200, 22mL	048821	ea.	26098		ea.	26099	
Extraction Cell Body for ASE 200, 33mL	048822	ea.	26116		ea.	26117	
Replacement Extraction Cell End Caps for ASE 200	049450	2-pk.	26096		2-pk.	26097	
Cap Inserts for ASE 200		2-pk.	26166				
Replacement Frits for ASE 200	049453	10-pk.	26100		10-pk.	26101	



Description	Similar to Dionex part #	qty.	cat.#	price
Snap Rings for Caps for ASE 200	049456	10-pk.	26184	
Funnel for ASE 200	056958	ea.	26180	
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187	
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188	



PEEK™ Washers for ASE® 200 Systems

- Meet original equipment manufacturer's performance.
- Available in 4 quantities.

Description	Similar to Dionex part #	qty.	cat.#	price
PEEK Washers for ASE 200	049454	12-pk.	25256	
		48-pk.	25257	
		250-pk.	26120	
	NEW!	1,000-pk.	26229	



20mm Filters for ASE® 200 Extraction Cells

- Cellulose or glass fiber construction.
- Cellulose filters available in economical 1,000-packs.

Description	Similar to Dionex part #	qty.	cat.#	price
Cellulose Filters for ASE 200	049458	100-pk.	26118	
Cellulose Filters for ASE 200	049458	1,000-pk.	26190	
Glass Fiber Filters for ASE 200	047017	100-pk.	26119	

60mL Sample Collection Vials for ASE® 200 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and Teflon®-lined septa included.

Description	Similar to Dionex part #	qty.	cat.#	price
60mL Collection Vials, Clear Glass, for ASE 200	048784	72-pk.	26121	
60mL Collection Vials, Amber Glass, for ASE 200	048781	72-pk.	26122	
Replacement Septa for 20, 40 & 60mL Vials and 250mL Bottles (24mm Teflon-lined 0.125" silicone septa)	—	100-pk.	24694	



Autoseal Tip Assembly for ASE® 200 Systems

- Meets original equipment manufacturer's performance.
- Choose original equipment-equivalent stainless steel, or Siltek® deactivation for improved inertness and extended lifetime.

Description	Similar to Dionex part #	Stainless Steel qty.	Stainless Steel cat.#	Stainless Steel price	Siltek Treated qty.	Siltek Treated cat.#	Siltek Treated price
Autoseal Tip Assembly for ASE 200 Systems	048811	ea.	26162		ea.	26161	

NEW!



26161



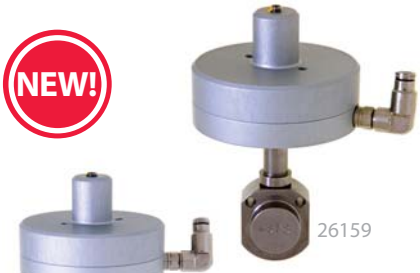
26162

Valves for ASE® 100/200/300 Systems

- Fits ASE® 100, 200, 300 systems.
- Meets original equipment manufacturer's performance.

Description	Similar to Dionex part #	qty.	cat.#	price
Pressure Relief Valve for ASE 100/200/300 Systems	048889	ea.	26159	
Static Valve for ASE 100/200/300 Systems	048778	ea.	26160	

NEW!



26159



26160



Replacement Parts for ASE® 300/100 Systems, Manufacturer's Design

For handy tools designed for use with ASE® systems, see page 367. For diatomacous earth and sodium sulfate, see page 360.


26167


26169

Extraction Cell Parts for ASE® 300/100 Systems

- Choose original equipment-equivalent stainless steel, or Siltek® deactivation for improved inertness.
- Inner surfaces polished, for easier cleaning.
- Caps include frit, washer, PTFE O-ring, and threaded insert.

Description	Similar to Dionex part #	Stainless Steel qty.	Stainless Steel cat.#	Stainless Steel price	Siltek Treated qty.	Siltek Treated cat.#	Siltek Treated price
Extraction Cell Body for ASE 100, 10mL	059793	ea.	26172		ea.	26173	
Extraction Cell Body for ASE 300/100, 34mL	056646	ea.	26176		ea.	26177	
Extraction Cell Body for ASE 300/100, 66mL	056696	ea.	26178		ea.	26179	
Extraction Cell Body for ASE 300/100, 100mL	056693	ea.	26132		ea.	26133	
Replacement Extraction Cell End Caps for ASE 300	056921	2-pk.	26170		2-pk.	26171	
Cap Inserts for ASE 300		2-pk.	26167				
Replacement Frits for ASE 300/100		6-pk.	26174		6-pk.	26175	


26187


26188

Description	Similar to Dionex part #	qty.	cat.#	price
Snap Rings for Caps for ASE 300/100	056778	12-pk.	26134	
Funnel for ASE 300/100	056699	ea.	26169	
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187	
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188	

PEEK™ Washers for ASE® 300/100 Systems

- Meet original equipment manufacturer's performance.
- Available in 2 quantities.


25393

Description	Similar to Dionex part #	12-pk.	48-pk.
PEEK Washers for ASE 300/100	061687	25393	25394

30mm Filters for ASE® 300/100 Extraction Cells

- Cellulose or glass fiber construction.


26168

Description	Similar to Dionex part #	qty.	cat.#	price
Cellulose Filters for ASE 300/100	056780	100-pk.	26168	
Glass Filters for ASE 300/100	056781	100-pk.	26189	

250mL Sample Collection Bottles for ASE® 300/100 Systems

- Cleaned, assembled, and ready to use.
- Clear glass.
- Caps and Teflon®-lined septa included.


26191

Description	Similar to Dionex part #	qty.	cat.#	price
250mL Collection Bottles, Clear Glass, for ASE 300/100	056284	12-pk.	26191	
Replacement Septa for 20, 40 & 60mL Vials and 250mL Bottles (24mm Teflon-lined 0.125" silicone septa)	—	100-pk.	24694	

Resprep™ Tools for ASE® Systems

- Specialized tools that simplify routine chores.
- Use with ASE® 100, ASE® 200, or ASE® 300 systems.

2-in-1 Filter/O-Ring Insertion Tool Kit for ASE® 100/200/300



26181

Inserting a Filter (ASE® 100/200/300 systems)
Using Filter Insertion Attachments on Resprep™ Tool Handle.



Screw the appropriate size attachment onto the end of the Resprep™ Tool Handle.



Place a filter at the top of the extraction cell.



Push the filter to the bottom of the extraction cell.



26182

Inserting an O-Ring (ASE® 100/200/300 systems)
Using Resprep™ Tool Handle.



Place the O-ring over the tip of the tool.



Insert the tool into the center hole of the extraction cell cap.



Press the tool firmly inside the cap until the O-ring snaps into place.



26183

Description	qty.	cat.#	price
2-in-1 Filter/O-Ring Insertion Tool Kit for ASE 100/200/300 (includes Resprep Tool Handle and Filter Insertion Attachments)	kit	26181	
Resprep Tool Handle for ASE 100/200/300	ea.	26182	
Filter Insertion Attachments for ASE 100/200/300 (1mL, 5mL, 11mL, 33mL)	4-piece set	26183	

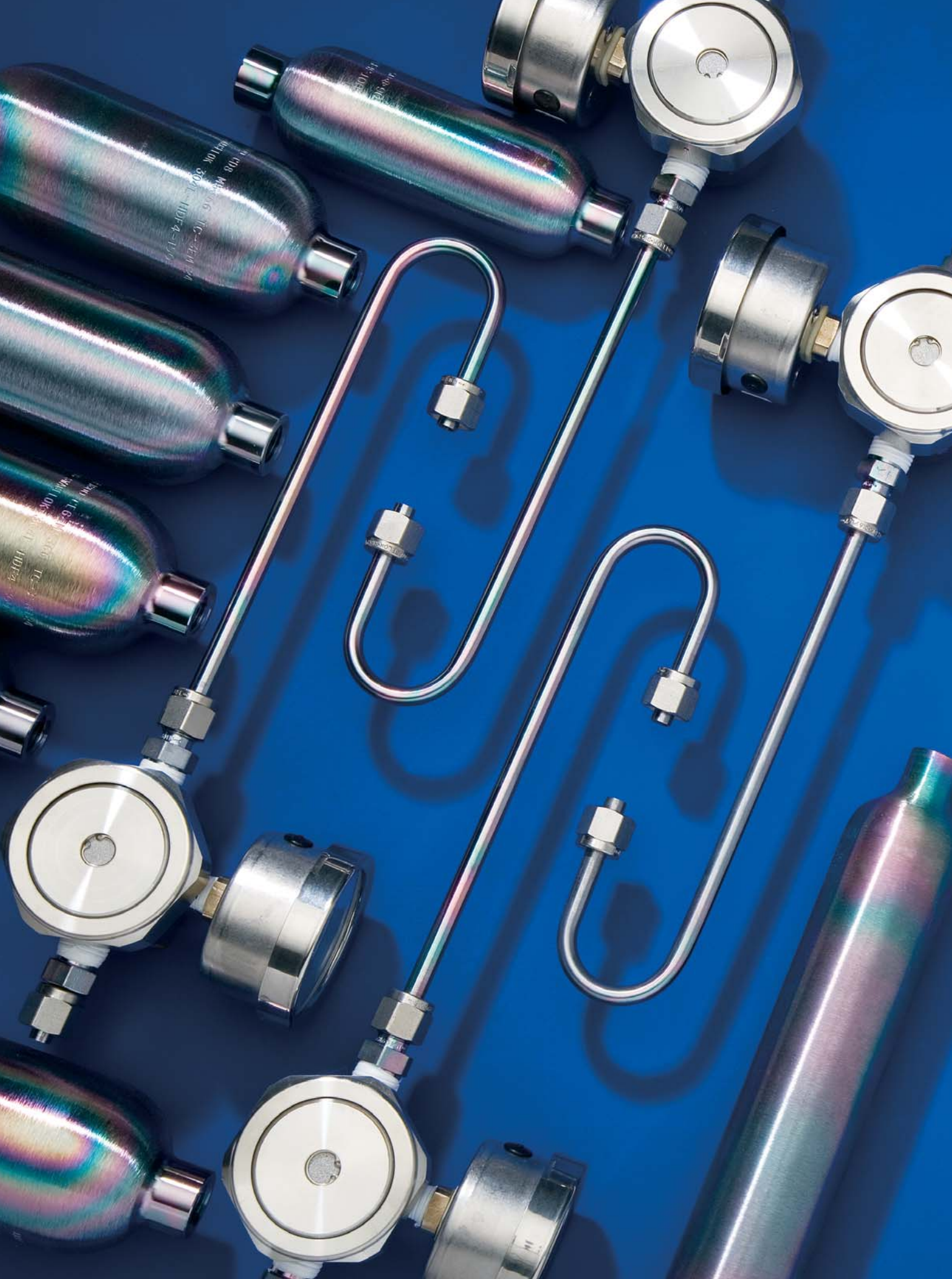
Retaining Ring Pliers for ASE® 100/200/300 Systems

- Can be used for internal or external retaining rings.
- Works to remove retaining ring in all ASE® cell caps.

Description	qty.	cat.#	price
Retaining Ring Pliers for ASE 100/200/300 Systems	ea.	26185	



26185



Air Monitoring



SilcoCan Canisters 370-371
Canister Carrying Supplies 371
TO-Can Canisters 372
Canister Maintenance/Reconditioning 373
Canister Supplies 374-375
Passive Air Sampling Kits & Parts 376-377
Miniature Air Sampling Canisters 378-379
Gas Sampling Bags 379
Thermal Desorption Unit Tubes 380-381
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Gas Standards 383-389
Cylinder Stand 386
Reference Cylinder Regulators 386-387, 389
High-Pressure Sample Cylinders & Valves 390
Sampling Valves, Sample Loops 391
Air Monitoring Syringes 391
Reference Books .....www.restek.com



Canisters are the gold standard for ambient VOC monitoring.

SilcoCan® Air Monitoring Canisters
Ideal for low-level reactive sulfur (1-20ppb), TO-14A, or TO-15 compounds

Features	Benefits
Siltek® treated.	High inertness—ensures sample stability.
High-purity, 2/3-turn valve with stainless steel diaphragms.	No sample adsorption at the valve, for more accurate results; easy to use.
Vacuum/pressure gauge (optional).	Ascertain internal conditions at a glance.
Variety of sizes.	Meet extensive range of sampling needs.
Stable to 250°C.	Heat canister to 250°C for superior cleaning.
Siltek® valve available (add suffix "-650" to cat.#).	Completely passive sample pathway for maximum sample stability.

Optional gauge
- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 90°C during cleaning.

Newest surface technology
To ensure sample stability, SilcoCan® canisters are deactivated with Restek's innovative Siltek® surface treatment, which chemically bonds a fused silica layer to the metal inner surface of the canister. This layer offers unsurpassed inertness for active compounds, including polar and sulfur-containing molecules. It will not crack, chip, or flake off, despite harsh handling in the field or during transport.



Enhanced valve and canister bracket
Canister holder and valve bracket protect canister, tube stub, and valve.

1/4" tube stub
Allows user to interchange valves.

Serial-controlled label
For quick, sure identification.



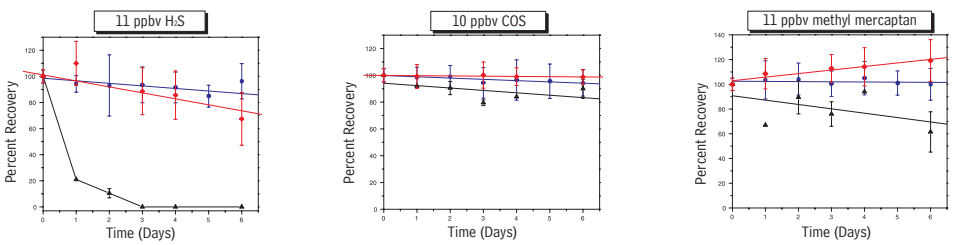
did you **know**?

SilcoCan® canisters are cleaned prior to shipping.

- Excellent stability for long-term storage of sulfur-containing volatile organic compounds.
- More accurate sampling.

Whether you are monitoring for TO-14A, TO-15, or reactive sulfur compounds, SilcoCan® canisters are your best choice for inertness. In Tedlar® bags, the stability of low-level (100ppbv) sulfur volatile organic compounds (VOCs) is poor, even within 24 hours of sampling. Sulfur compounds react with the metal surface in electropolished canisters, so these canisters are unsuitable for collecting and storing low-level sulfur VOCs. SilcoCan® air monitoring canisters, which feature a Siltek® treated surface, offer excellent storage stability for sulfur VOCs at very low levels (1–20ppbv), under dry or humid conditions. The versatility of the SilcoCan® canister makes it an excellent choice for collecting and storing TO-14A or TO-15 compounds.

Figure 1 SilcoCan® canisters effectively store very low levels of sulfur compounds.



Standards: Dry standards were made by adding 2mL of a 100ppm stock sulfur standard to each precleaned and evacuated canister, then pressurizing to 30psi with ultra-pure nitrogen. The resultant concentrations are listed in Applications Note #59347A (download your free copy from www.restek.com). Humidified standards were made by injecting 100µL of deionized water into the evacuated canisters prior to adding 2mL of stock standard. This produced 50% RH.
GC Column: Rtx®-1 , 60m, 0.53mm ID, 7.0µm; **Detector:** Sievers Model 355 Sulfur Chemiluminescence Detector

SilcoCan® Air Monitoring Canisters

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- Sizes to support a wide range of sampling needs.
- 2-port or 3-port valve available; 3-port valve includes -30" Hg/60psi vacuum/pressure gauge (other gauges available).
- Unsurpassed inertness, even for sulfur-containing or brominated compounds.
- For critical applications, order a Siltek® treated valve—add suffix "-650" to the catalog number of the canister.

		1L Volume		3L Volume*		6L Volume		15L Volume	
Description	qty.	cat.#	price	cat.#	price	cat.#	price	cat.#	price
SilcoCan Canister, 1/4" Valve	ea.	24180		24181		24182		24183	
SilcoCan Canister, Siltek Treated 1/4" Valve	ea.	24180-650		24181-650		24182-650		24183-650	
SilcoCan Canister with Gauge, 1/4" Valve	ea.	24140		24141		24142		24143	
SilcoCan Canister with Gauge, Siltek Treated 1/4" Valve	ea.	24140-650		24141-650		24142-650		24143-650	
SilcoCan Canister without Valve	ea.	22090		22091		22092		22093	

Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4 x 10⁻⁹cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a 1/4" inlet and outlet.
*If attaching any of Restek's passive sampling kits to a 3L canister, use a Siltek treated (cat.# 563646) or stainless steel (cat.# 563647) connector between the two components.

Get the ultimate insurance plan—order your SilcoCan® canister with a Siltek® treated valve.



24182

also **available**

For additional gauge and valve options, see **page 374.**

Dimensions/Weights of SilcoCan® Air Canisters

Can Volume	Dimensions (height x sphere diameter)		Weight	
1 liter	8.5 x 5.25"	21.6 x 13.3cm	2.5 lbs	1.13kg
3 liter	11.5 x 7.25"	29.2 x 18.4cm	4 lbs	1.81kg
6 liter	12.5 x 9.25"	31.8 x 23.5cm	7 lbs	3.18kg
15 liter	17 x 12.25"	43.2 x 31.1cm	13 lbs*	5.90kg

*16 lbs shipped UPS Air, 22 lbs shipped Fed Ex (USA).

SEE Example Applications p. 607-611

Quickly confirm vacuum or pressure. Request a high-quality gauge mounted on your SilcoCan® or TO-Can® canister.

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
-30" Hg/15psi	-651
-30" Hg/30psi	-652

*No price difference for these substituted gauges.

Canister Carrying Supplies

Canister Carrying Box Kit

6-liter carrying boxes with plastic handles simplify canister transport. These boxes also accommodate our passive sampling kit. 4 carrying boxes and one shipping box per kit.

Description	qty.	cat.#	price
Canister Carrying Box Kit	kit	24215	


24215

Restek canisters are shipped in boxes with handles for easy transportation.

Canister Carrying Case

- Heavy-duty, all-aluminum design, fits two 6L SilcoCan® or TO-Can® canisters tightly without foam.
- Weight: 9 lbs.
- Inside dimensions: length 18", width 9 1/8", height 12 1/2" (46 x 23 x 32cm).
- No organic contaminants from foam or plastics.

Description	qty.	cat.#	price
Deluxe Canister Carrying Case	ea.	24226	


24226



24173

please **note**

- SUMMA canister equivalent.
- Excellent analyte recovery—even after 14 days of storage.

did you **know**?

TO-Can® canisters are cleaned prior to shipping.

Quickly confirm vacuum or pressure. Request a high-quality gauge mounted on your SilcoCan® or TO-Can® canister.

also **available**

We also offer sampling kits, sampling bags, and a range of gas reference standards to meet your environmental gas sampling requirements.
See **pages 376-389.**



22107

Improved TO-Can® Air Monitoring Canisters (Summa Can Equivalent)

Optimized for EPA Methods TO-14A and TO-15, and ASTM D5466

- Proprietary electropolished surface that maintains compound stability.
- High quality, metal-to-metal seal, $^{2}/_{3}$-turn valve with stainless steel diaphragms.
- 2-port or 3-port valve available; 3-port valve includes -30" Hg/60psi vacuum/pressure gauge (other gauges available).

Features	Benefits
Metal to metal seat, valve with stainless steel diaphragms.	No sample adsorption, for more accurate results.
Vacuum/pressure gauge (optional).	Ascertain internal conditions at a glance.
Stable to 250°C.	Heat canister to 250°C for superior cleaning.

US EPA Compendium of Air Methods TO-14A and TO-15 regulate the collection, storage, and analysis of volatile organic compounds (VOCs) using treated air sampling canisters. Restek offers a complete line of TO-Can® canisters (SUMMA can equivalent), electropolished using a proprietary process and extensively cleaned using an ultrasonic method. This ensures a high-quality, passivated surface that maintains the stability of TO-14A/TO-15 compounds during storage. The frame surrounds the electropolished canister, eliminating the need for weld marks on the sphere, thereby preventing active sites on the canister. The Parker Hannifin metal-to-metal diaphragm valve supports the excellent performance of the canister.

The unique holder attaches the handle and base to the canister without welds, and protects the canister, tube stub, and valve. The $^{2}/_{3}$-turn diaphragm valve has a metal-to-metal seat and a temperature limit of 250°C. We leak check the system with helium to ensure the TO-Can® canister and valve are leak-tight, then pressurize the canister with contaminant-free nitrogen before we ship it.

		1L Volume		3L Volume**		6L Volume		15L Volume	
Description	qty.	cat.#	price	cat.#	price	cat.#	price	cat.#	price
TO-Can Canister, $^{1}/_{4}$" Valve	ea.	24172		24173		24174		24175	
TO-Can Canister with Gauge, $^{1}/_{4}$" Valve	ea.	24176		24177		24178		24179	
TO-Can Canister without Valve	ea.	22094		22095		22096		22097	

Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4 x 10^{-9}cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a $^{1}/_{4}$" inlet and outlet. For additional gauge and valve options, see page 374.

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
-30" Hg/15psi	-651
-30" Hg/30psi	-652

*No price difference for these substituted gauges.

TO-Can® Canisters with Swagelok® SS4H Bellows-Sealed Valve

- All metal flow path prevents sample adsorption, giving more accurate results.
- Withstands temperatures of up to 300°C.
- Rugged performance in the field.

Valves are bellows-sealed for durability and meet all EPA requirements for air monitoring by methods TO-14A and TO-15.

		1L Volume		3L Volume**		6L Volume		15L Volume	
Description	qty.	cat.	price	cat.	price	cat.	price	cat.	price
TO-Can Canister with $^{1}/_{4}$" Swagelok SS4H Bellows-Sealed Valve	ea.	22105		22106		22107		22108	

Replacement valves are available on page 374.

**If attaching any of Restek's passive sampling kits to a 3L canister, use a Siltek treated (cat.# 563646) or stainless steel (cat.# 563647) connector between the two components.

How to Extend Canister Life

What reduces canister performance and longevity? Leakage is the most common reason for canister failure, but contamination and damage to the fused silica lining can also send canisters to the scrap yard prematurely. Here are some tips to protect your investment:

1. **Prevent leaks**
   Use proper handling to avoid these 3 leading causes of leaks.
   a. Particles in the valve
      You can prevent particles from entering the valve by always using a 2 or 7µm particulate filter during sampling **and** on your canister cleaning equipment. Also, protect the valve inlet by replacing the brass dust cap when not in use. The EPA-recommended metal-to-metal sealing valves provide the greatest inertness, but tend to be more sensitive to particulate damage than other valve types.

   b. Galled thread fittings
      Avoid galled thread fittings by using a gap gauge to prevent overtightening of compression fittings. Turning only ¼-turn past finger-tight is another rule of thumb to prevent overtightening. Use brass compression fittings on stainless steel, during nonsampling activities, such as cleaning or calibration, to minimize thread damage. Galled threads may also cause a poor connection to vacuum/pressure gauges, resulting in inaccurate measurements and the misleading conclusion that canister leakage exists.

   c. Overtightened valve
      Canister valves are designed to close securely with hand tightening only. Overtightening a valve closure with a wrench can damage the valve seat where the seal is made.

2. **Reduce contamination**
   a. Segregate high concentration (ppm) cans and trace concentration (ppb) cans. Use dedicated canisters, or gas sampling bags, for ppm level sampling, since it is extremely difficult to remove impurities from ppm sampling to a level suitable for trace sampling.

   b. Clean the entire sampling train as you would the can to minimize introduction of contaminants into a clean can. Maximum temperature is 80°C on the gauge and 90°C on Restek's Veriflo® flow controller.

   c. High temperature (>100°C) humidified air (steam cleaning) provides the most effective way to remove contamination from electropolished cans (TO-Can® or SUMMA canisters), but can damage fused silica lined cans. See #3 below for proper cleaning of fused silica lined cans.

3. **Avoid damage to fused silica lined cans**
   Be sure to follow method recommendations when cleaning your canisters to avoid damaging the fused silica lining. Cleaning studies of SilcoCan® canisters using humidified air and heat at 80°C and 125°C have shown reduced recoveries of sulfur compounds, when compared to using nitrogen under the same conditions. This irreversible damage is due to oxidation of the surface, creating active sites that may affect the recovery of reactive or polar compounds. Strong acids and bases may also result in damage to the internal can surface.

Canister and Flow Controller Repair Service

Save money and increase performance with Restek's canister and flow controller repair service.

Normal wear and tear on canisters and components can result in damage causing leakage. Restek's repair service allows you to extend the life of your equipment for much less than the cost to replace with new products. Contact Customer Service at 800-356-1688, or your Restek representative, to take advantage of this service. You will be given instructions and an SRV # to return the parts to us.

Sampling Kit/Flow Controller Repair
Includes all new rubber seals in flow controller and orifice and frit replacement

	550131	enquire

Canister Repair
Includes valve replacement, leak test & cleaning

	560838	enquire





24144

Gauges and Valves for Air Monitoring Applications

1/4" Replacement Valves for Air Monitoring Canisters*

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- 2-port or 3-port valve available; 3-port valve includes -30"Hg/60psi vacuum/ pressure gauge (other gauges available).

	Non-Treated Valve			Siltek-Treated Valve		
Description	qty.	cat.#	price	qty.	cat. #	price
1/4" Replacement Valve (2-port)	ea.	24145		ea.	24144	
1/4" Replacement Valve (3-port)	ea.	24147		ea.	24146	

*All Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4 x 10⁻⁹cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a 1/4" inlet and outlet.



24148

Swagelok® SS4H Bellows-Sealed Valve, 1/4-inch, 2-Port, Stainless Steel

- All metal flow path prevents sample adsorption, giving more accurate results.
- Unique serial number on each valve for complete traceability.
- Withstands temperatures of up to 300°C.
- Rugged performance in the field.
- Fast delivery from Restek!

Restek offers Swagelok® SS4H canister valves. These popular, rugged valves are available separately or already assembled on our TO-Can® canisters. Valves are bellows-sealed for durability and meet all EPA requirements for air monitoring by methods TO-14A and TO-15.

Description	qty.	cat.	price
Replacement 1/4" Swagelok SS4H Bellows-Sealed Valve	ea.	24148	

Replacement 1/4" Swagelok SS4H Bellows-Sealed Valves are available on SilcoCan canisters as a custom product. Contact Technical Service for more information.

Replacement Combination Vacuum/Pressure Gauges

2-inch vacuum/pressure gauges, 316 stainless steel with 1/8" NPT fitting and center back mount. Recommended for use with canisters.

Description	qty.	cat.#	price
-30"Hg/15psi Vacuum/Pressure Gauge	ea.	24100	
-30"Hg/30psi Vacuum/Pressure Gauge	ea.	24104	
-30"Hg/60psi Vacuum/Pressure Gauge	ea.	24108	



24120

Vacuum Gauges

High-quality vacuum gauges with 316 stainless steel wetted surfaces. -30" Hg. Recommended for use with passive sampling kits.

Description	qty.	cat.#	price
2-Inch Vacuum Gauge; 1/8" NPT	ea.	24269	
2-Inch Vacuum Gauge; 1/4" NPT	ea.	24270	
1 1/2-Inch Vacuum Gauge; 1/8" NPT	ea.	24120	

NEW!



24285



24268

Ashcroft Test Gauges

- Accurate measurement of vacuum to -30"Hg and pressure to 60psi.
- Available in both analog and digital formats.
- Accuracy to +/- 0.25%.

High accuracy test gauges are recommended for verifying the vacuum/pressure in canisters before and after sampling. The 6-inch face on the analog gauge allows for easy reading. The digital gauge operates on two AAA batteries and offers an unambiguous readout. Both gauges have an accuracy of +/- 0.25% and all metal wetted parts.

Description	qty.	cat.#	price
Analog Test Gauge, 6" diameter, 1/4" NPT	ea.	24285	
Digital Test Gauge, 3" diameter, 1/4" NPT	ea.	24268	

Canister Air Sampling Timer

- Program up to 12 timed events!
- Capable of both manual and automated operation.
- Perfect for either grab or time-integrated sampling.
- Long battery life; recharges conveniently using the USB port on any PC.
- All stainless steel sample flow path ensures inertness, improving accuracy.



These timers are designed to simplify both automated and manual air sampling. The easy-to-use keypad and graphic display facilitate the programming of up to 12 timed events. They offer the convenience of remote start/stop sampling and permit intermittent sampling throughout a test period. The LCD remains in sleep mode when not in use, greatly extending battery life. Timers are compatible with any canister and flow controller.

Features include: solenoid valve for sampling control, 1/4" Swagelok® inlet and outlet fittings, highly inert stainless steel flow path, and water-proof exterior for outdoor use.

Description	qty.	cat.#	price
Canister Air Sampling Timer	ea.	24267	



Simplify automated and manaul air sampling with a Sampling Timer (cat.# 24267).

Canister and passive air sampling kit must be purchased separately.



did you **know**?

SilcoCan® and TO-Can® Canisters are Cleaned Prior to Shipping

After assembly, every Restek SilcoCan® and TO-Can® canister is evacuated to 50mTorr, then pressurized with humidified nitrogen to 30psi. The cleaning system is programmed to repeat this cycle two times to ensure thorough cleaning. We ship our canisters clean and under pressure at 30psi with dry nitrogen.

Air Canister Heating Jacket

- Closely simulates oven environment—heats entire canister and valve.
- Two temperature settings, 75°C and 150°C.*
- Prevents sample condensation, for accurate sub-sampling.
- Easily fits canister up to 6 liters.
- Lightweight; comfortable to the touch when heated.
- Connect up to five Canister Heating Jackets to one 15 amp circuit.

Description	qty.	cat.#	price
Air Canister Heating Jacket (110 volt)	ea.	24123	

*Not CE certified.



The ultimate in controlled heating, for reliably cleaning your air canisters!

Humidification Chamber

When cleaning SilcoCan® or TO-Can® canisters, it is important to use humidified air or nitrogen to help remove volatile organic contaminants. We incorporated our humidification chamber into the design of our cleaning system. Restek's humidification chamber is made of acrylic and withstands pressure up to 90psi. The 1/4-inch inlet and outlet compression fittings allow easy connection to pressure lines on your cleaning system. Our humidification chamber also has an easy-to-open lid for filling with water.

Description	qty.	cat.#	price
Humidification Chamber	ea.	24282	



Restek's canister cleaning system with humidification chamber.



24282



Passive Air Sampling Kits

- Provide accurate integrated sampling without a sampling pump.
- Siltek® treated components ensure a very inert surface.
- Excellent for sampling times from 0.5 hour to 125 hours.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples, and is easy to assemble for field sampling.* The improved filter design greatly reduces the number of potential leak sites. The passive air sampling kit is available in seven sampling flow ranges, and in stainless steel or Siltek® treated finish. The stainless steel kit is ideal to partner with the Restek TO-Can® air sampling canister for TO-14A and TO-15 methods. Use the Siltek® treated version with the Restek SilcoCan® air sampling canister when collecting low-level volatile sulfur compounds, or other active compounds.

Canister Volume*/Sampling Time					Flow	Orifice	Siltek Treated	Stainless Steel
400cc	1 Liter	3 Liter	6 Liter	15 Liter	(sccm)	size	Sampling Kits	Sampling Kits
8 hour	24 hour	48 hour	125 hour	—	0.5–2	0.0008"	24217	24216
2 hour	4 hour	12 hour	24 hour	60 hour	2–4	0.0012"	24160	24165
1 hour	2 hour	6 hour	12 hour	30 hour	4–8	0.0016"	24161	24166
—	1 hour	4 hour	8 hour	20 hour	8–15	0.0020"	24162	24167
—	—	2 hour	3 hour	8 hour	15–30	0.0030"	24163	24168
—	—	—	1.5 hour	4 hour	30–80	0.0060"	24164	24169
—	—	—	0.5 hour	1 hour	80–340	0.0090"	22101	22100

*Air sampling canisters sold separately.

Note: If attaching any of Restek's passive sampling kits to a 3L canister, use a Siltek treated (cat.# 563646) or stainless steel (cat.# 563647) connector between the two components.

also available

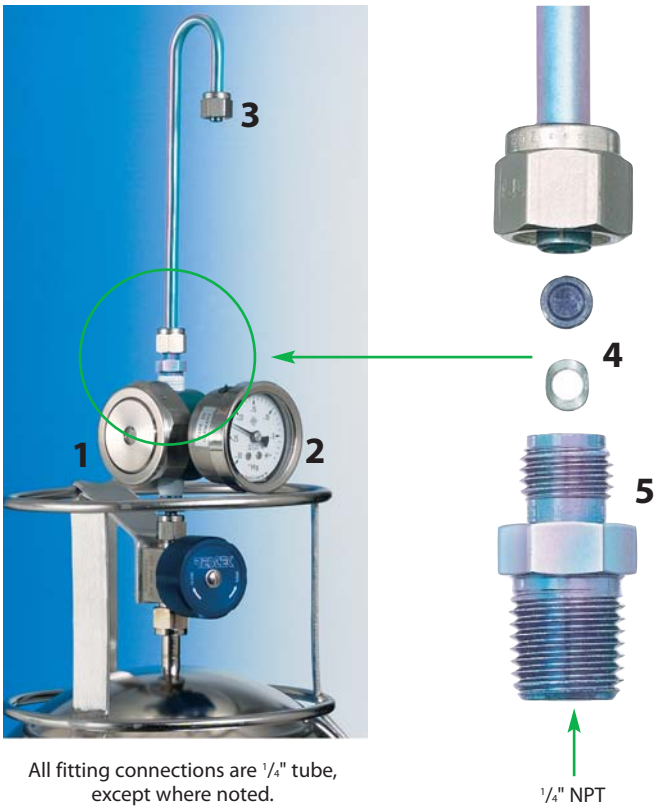
Miniature air sampling kits. See page 379.

Canister and flow controller repair service. See page 373.

1. Veriflo® SC423XL flow controller
This flow controller is the heart of the sampling train. It is a high-quality device designed to maintain a constant mass flow as the pressure changes from -30" Hg to 7" Hg (we recommend you stop sampling at or before 7" Hg of vacuum). All wetted parts of the flow controller can be Siltek® treated.

2. Stainless steel vacuum gauge
Fitted to the flow controller, the gauge monitors canister vacuum change during sampling.

3. 1/4-inch Siltek® sample inlet
The 0.3m x 1/4-inch tubing includes a stainless steel nut on the inlet end, to prevent water droplets from accumulating at the edge of the tubing, where they could be pulled into the sampling train.



All fitting connections are 1/4" tube, except where noted.

4. 2-micron frit filter and washer
Located prior to the critical orifice to prevent airborne particles from clogging the critical orifice. Replaceable. Available in stainless steel, or Siltek® treated for optimum inertness.

5. Interchangeable critical orifice
An interchangeable ruby critical orifice allows you to control the flow with very high precision. To select the correct critical orifice for your sample, see table above. Available in stainless steel, or Siltek® treated for optimum inertness.

please note

For individual components, see page 377.

Buy only the parts you need!





Replacement Orifices

Use these orifices with a Veriflo® 423XL flow controller to change the flow range for alternative sampling times.

Flow (sccm)	Orifice size	Siltek Treated cat.#	price	Stainless Steel cat.#	price
0.5–2	0.0008"	24219		24218	
2–4	0.0012"	24233		24245	
4–8	0.0016"	24234		24246	
8–15	0.0020"	24235		24247	
15–30	0.0030"	24236		24248	
30–80	0.0060"	24237		24249	
80–340	0.0090"	22099		22098	

2µm Frit Filters

For use in critical orifice fitting. Includes washers.

Description	qty.	cat.#	price
Siltek Replacement Frit Filter	3-pk.	24171	
Stainless Steel Replacement Frit Filter	3-pk.	24170	



Veriflo® Flow Controllers

Veriflo® 423XL flow controllers are offered in a Siltek® and stainless steel version. The flow device is available with or without a critical orifice. (Vacuum gauge sold separately. See page 374.)

The critical orifice in a Veriflo® flow controller is interchangeable. Order orifices for alternate sampling times, or replacement orifices, separately.

Flow (sccm)	Orifice size	Siltek Treated cat.#	price	Stainless Steel cat.#	price
0.5–2	0.0008"	24232		24229	
2–4	0.0012"	24255		24260	
4–8	0.0016"	24256		24261	
8–15	0.0020"	24257		24262	
15–30	0.0030"	24258		24263	
30–80	0.0060"	24259		24264	
80–340	0.0090"	22103		22102	
—	without orifice	24238		24239	





7µm In-Line Filter

This 316 stainless steel filter is designed to collect particles larger than 7 microns. We offer a Siltek® and stainless steel version (1/4" compression fitting on both ends).

Description	qty.	cat.#	price
Siltek 7µm In-Line Filter	ea.	24265	
Stainless Steel 7µm In-Line Filter	ea.	24266	

Note: frit is not replaceable.



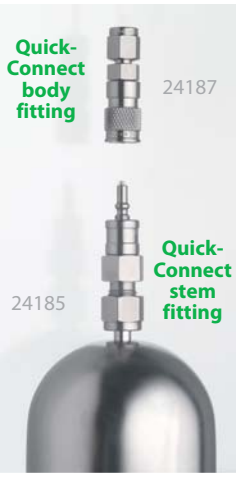
Sample Inlets

- 1/4" stainless steel compression fitting on each end.
- One end connects to flow controller or canister; nut on other end serves as rain guard.
- Includes nuts and ferrules.
- Two different lengths for use with large canisters and miniature canisters.

Description	qty.	Siltek Treated cat.#	price	Stainless Steel cat.#	price
Sample Inlet, 6" Length	ea.	26210		26209	
Sample Inlet, 1.5" Length	ea.	26212		26211	



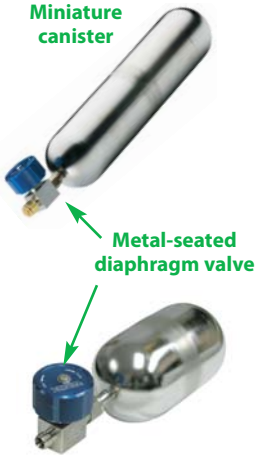
Miniature Air Sampling Canisters



Dimensions:
400cc = 2.75" diameter, 5.35" long (7 x 13.6cm)
1,000cc = 2.75" diameter, 11.92" long (7 x 30cm)



Attach quick-connect body fitting to stem fitting to open canister. Attach quick-connect stem protector to stem fitting when not sampling to prevent canister from accidentally opening.





Miniature Air Sampling Canisters

- Ideal for indoor air, personal, emergency response, or soil gas sampling.
- 400cc or 1,000cc.
- Low pressure applications not exceeding 40psig.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- Also available with nontreated or Siltek® treated valve.

These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers. The 1,000cc canister is suitable for sampling volatile organic compounds in air according to US EPA Methods TO-14A and TO-15.

Restek offers these products in stainless steel or Siltek® treated, for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Siltek® treated canister to achieve the ultimate in analyte stability.

Miniature Air Sampling Canisters with Quick-Connect Stem Fittings

		400cc		1,000cc	
Description	qty.	cat.#	price	cat.#	price
Electro-Polished Miniature Canister with Quick-Connect Stem Fitting	ea.	24188		24194	
Siltek Treated Miniature Canister with Quick-Connect Stem Fitting	ea.	24189		24195	
Siltek Treated Miniature Canister with Siltek Treated Quick-Connect Stem Fitting	ea.	24190		24196	

Quick-Connect Fittings for Miniature Air Sampling Canisters

Connection: 1/4" tube fitting.

Description	qty.	cat.#	price
Quick-Connect Stem Fitting	ea.	24185	
Siltek Treated Quick-Connect Stem Fitting	ea.	24186	
Quick-Connect Stem Protector, Stainless Steel NEW!	ea.	24121	
Quick-Connect Body Fitting	ea.	24187	

Note: Quick-connect body fitting (cat.# 24187) must be ordered separately to sample with quick-connect stem fitting.

Miniature Air Sampling Canisters with Metal-Seated Diaphragm Valve

		400cc		1,000cc	
Description	qty.	cat.#	price	cat.#	price
Electro-Polished Miniature Canister with Metal-Seated Diaphragm Valve	ea.	24191		24197	
Siltek Treated Miniature Canister with Metal-Seated Diaphragm Valve	ea.	24192		24198	
Siltek Treated Miniature Canister with Siltek Treated Diaphragm Valve	ea.	24193		24199	

Miniature Air Sampling Canisters with Nut & Ferrule

		400cc		1,000cc	
Description	qty.	cat.#	price	cat.#	price
Electro-Polished Miniature Canister with Nut & Ferrule	ea.	24205		24206	
Siltek Treated Miniature Canister with Nut & Ferrule	ea.	24207		24208	

Gap Inspection Gauge

- Confirm that fittings are sufficiently tightened.
- For use with 1/4", 3/8", 1/2" Swagelok® fittings.
- For Swagelok® fittings in new installations only.

Description	qty.	cat.#	price
Gap Inspection Gauge	ea.	22624	

Miniature Air Sampling Kits

- Provide accurate integrated sampling without a sampling pump.
- Convenient smaller size connects easily to miniature canisters.
- Available in stainless steel or Siltek® treated components for greater inertness.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples, and is easy to assemble for field sampling.* Kit includes flow controller, critical orifice, 2µm frit filter, vacuum gauge, and sample inlet. The gauge (cat.# 24120) and sample inlet (cat.#s 26211, 26212) are downsized for partnering with smaller canisters. Refer to page 376 for sampling kit details and pages 374 and 377 for individual components.



26252

Canister Volume*/Sampling Time		Flow	Orifice	Siltek Treated	Stainless Steel
400cc	1 Liter	(sccm)	size	Sampling Kits	Sampling Kits
8 hour	24 hour	0.5–2	0.0008"	26253	26252
2 hour	4 hour	2–4	0.0012"	26255	26254
1 hour	2 hour	4–8	0.0016"	26257	26256
—	1 hour	8–15	0.0020"	26259	26258

*Air sampling canisters sold separately.

Tedlar® Sampling Bags

- Find the bags you need—we offer sizes from 0.5 liters to 100 liters.
- Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- Polypropylene or stainless steel valve.
- Both valves conveniently connect to $^{3}/_{16}$" ID Teflon® tubing.


22050 22039

	Description	qty.	Polypropylene Valve cat.#	price	Stainless Steel Valve cat.#	price
0.5L	6" x 6"	10-pk.	22049		22038	
1L	7" x 7"	10-pk.	22050		22039	
3L	9.5" x 10"	10-pk.	22051		22040	
5L	12" x 12.5"	10-pk.	22052		22041	
10L	11.75" x 22"	10-pk.	22053		22042	
12L	13" x 24"	10-pk.	22054		22043	
25L	17.5" x 24"	5-pk.	22055		22044	
40L	24" x 24.25"	5-pk.	22056		22045	
80L	28.25" x 32.5"	5-pk.	22057		22046	
100L	28" x 36"	3-pk.	22058		22047	
Teflon Faced Silicone Replacement Septum, 4mm diameter		10-pk.	22104		22048	

tech tip

Use septum puller (cat.# 20117, page 209) to replace septum in sampling bag valve.

Vacuum Bag Sampler

- Fast bag sampling without sample passing through pump.
- Bag capacity up to 10L.

The Model 1062 Vacuum Bag Sampler provides fast sampling with zero cross-contamination. A vacuum created in the box draws air into the sampling bag without drawing it through the vacuum pump first, as is the case with standard air sampling pumps, thereby preventing contamination of the sample. This bag sampler can fill a 10L bag in two minutes with an automatic shut-off switch, which stops the sample bag from overfilling. The filling rate is adjusted with a vent rotometer valve. An external battery recharging port enables continuous operation with battery charger. In addition, the quick exhaust valve allows for fast removal of the sampling bag. The sampler comes with a universal power adapter/charger, battery, instruction manual, and 1-year limited warranty.



22118

Specifications:

Sampling Bag:	1 bag up to 10L size
Running Time:	8 hours
Flow Rate (Fill Rate):	1-5L/min.
Power Requirements:	12V battery, 4.5 Amp
Charge Time:	9 hours
Dimensions:	9" x 14.6" x 21.7"
Weight:	17 lbs

Features:

- Observation window on case lid
- Sample inlet accepts $^{1}/_{4}$" OD tubing
- Case designed for rugged outdoor use
- CE certified

Description	qty.	cat.#	price
Vacuum Bag Sampler Model 1062 (includes power adapter, battery, manual)	ea.	22118	
Replacement Battery for Vacuum Bag Sampler Model 1062	ea.	22119	
Universal Battery Charger for Vacuum Bag Sampler Model 1062 (115/230 VAC)	ea.	22120	



method applications

Method	Application
US EPA	TO-17
ASTM	D-6196
NIOSH	2549
DIN EN ISO	16017

Specifications

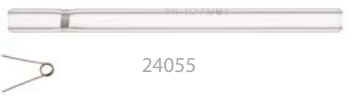
Dimensions: 1/4" OD x 3-1/2" long
Low sampling rates: 0.01-0.20 L/min. (<10L total volume)
Long-term storage caps are supplied with conditioned tubes


24061


24062


24067


24054


24055


24071


24070


24074

Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs, including Tenax® and carbon sorbents.
- Use glass tubes for maximum inertness in active sampling.
- Choose stainless steel tubes for either active or passive sampling. No sampling pump necessary for passive sampling with diffusion caps!
- Individually etched with unique serial number for convenient sample identification.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption.

High-quality thermal desorption tubes by Markes International. These sorbent tubes are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, and industrial hygiene environments. Available in both stainless steel and glass (for thermally labile VOCs), they fit Markes ULTRA-UNITY™, PerkinElmer, and Shimadzu thermal desorbers. Packed tubes come with a report detailing the total mass of sorbent in the tube; conditioned tubes also include a blank chromatogram.

Thermal Desorption Tube Sorbent	Vapor Phase Organics Applications
Tenax TA	C6/7 to C26
Graphitized Carbon	C5/6 to C14
Tenax GR/Carbopack B	*n*-C5/6 to *n*-C20 (EPA Methods TO-14A/TO-15/TO-17)
Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C12/14 (EPA Methods TO-14A/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C16/20 (EPA Methods TO-14A/TO-15/TO-17)

Thermal Desorption Unit Tubes, Unconditioned and Conditioned & Capped

		Unconditioned				Conditioned & Capped			
		Stainless Steel		Glass		Stainless Steel		Glass	
Description	qty.	cat.#	price	cat.#	price	cat.#	price	cat.#	price
TDU Tubes, Tenax TA	10-pk.	24056		24062		24080		24086	
TDU Tubes, Graphitized Carbon	10-pk.	24057		24063		24081		24087	
TDU Tubes, Tenax GR/Carbopack B	10-pk.	24058		24064		24082		24088	
TDU Tubes, Carbopack B/Carbosieve SIII	10-pk.	24059		24065		24083		24089	
TDU Tubes, Tenax TA/Graphitized Carbon/Carboxen 1000	10-pk.	24060		24066		24084		24090	
TDU Tubes, Carbopack C/ Carbopack B/Carbosieve SIII	10-pk.	24061		24067		24085		24091	

Thermal Desorption Unit Tubes, Empty

- Empty tubes for direct desorption of VOCs in liquids, solids, or pastes.
- Stainless steel: front sorbent-retaining gauze fitted, rear gauze and gauze retaining spring supplied.
- Glass: with glass frit positioned 15mm from sampling end.

		Stainless Steel		Glass	
Description	qty.	cat.#	price	cat.#	price
TDU Tubes, Empty	10-pk.	24054		24055	

Thermal Desorption Unit Tubes, Calibration

		Stainless Steel		Glass	
Description	qty.	cat.#	price	cat.#	price
TDU Tubes, Calibration, Tenax TA 1cm Bed	10-pk.	24075		24076	

Description	qty.	cat.	price
Calibration Solution Loading Rig	ea.	24077	
Calibration Solution Loading Rig 9.5mm Replacement Septa	10-pk.	24078	
Certified Reference Standard, 100ng BTX on Tenax TA	10-pk.	24079	

Thermal Desorption Unit Tubes, Accessories

Description	Benefits/Uses	qty.	cat.	price
1/4" Brass Cap and PTFE Ferrules	Long-term storage of blank/sampled tubes.	20-pk.	24068	
1/4" PTFE Ferrules	Long-term storage caps.	20-pk.	24069	
CapLok Tool	Use for tightening long-term storage caps.	ea.	24070	
Pen Clip		10-pk.	24071	
TubeMate Tool	Assists with tube packing.	ea.	24072	
1/4" Stainless Steel Union and PTFE Ferrules	Use for connecting tubes in series.	10-pk.	24073	
Diffusion Caps	Required for diffusive sampling with stainless steel tubes.	10-pk.	24074	

Thermal Desorption Tubes vs. Canister Sampling

Which VOC Sampling Technique is Right for You?

Thermal desorption tubes provide a complementary option to canisters for sampling VOCs. Both techniques have advantages and disadvantages, and their features must be evaluated for suitability relative to the sampling environment and analytical capabilities. Table I outlines the similarities and differences between these techniques; use this handy comparison to determine which equipment is best for you.

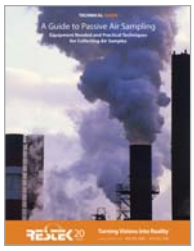
Table I Comparison of thermal desorption tube and canister sampling for VOCs.

Similarities Between Thermal Desorption Tubes and Canisters

- Reusable sampling device.
- Long product lifetime.
- Long-term sample stability.
- Blank certification required prior to sampling.
- Sample concentration required before GC/MS analysis.
- Dry purge helpful to remove moisture before GC injection.
- Ppt sensitivity.
- Method acceptance.
- Collection of wide range of VOCs with single device.
- Useful for screening of unknowns.
- Leak tightness critical to maintaining sample integrity and preventing contamination of a clean device.

Differences Between Thermal Desorption Tubes and Canisters

	Thermal Desorption Tubes	Canisters
Methods	US EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549	US EPA TO-14A, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft
	World-wide acceptance	Gold standard for US ambient air market
Applications	Ambient air, indoor air, industrial hygiene Material emissions Food & flavor Chemical weapons	Ambient air, indoor air, vapor intrusion, emergency response
	C3 to C30	<C3 to ~C10
Handling	Light weight for personal monitoring and general ease of use	Larger and heavier; more costly to ship
Sampling	Active sampling with sampling pump or diffusive sampling without pump is possible with determined diffusion coefficients for each compound.	Passive sampling, no sampling pump required. Long-term sampling possible without battery to recharge.
	Integrated sampling only	Grab & integrated sampling
	Concentrated sample	Whole air
	Proper sorbent selection recommended in methodology.	N/A
	Must sample below sorbent breakthrough volumes to avoid sample loss and irreversible adsorption on sorbent	N/A
	Large sample volumes >100L	Sample volume is function of canister size, 15L max
Analysis	Tube dimensions are instrument specific	Compatible with all manufacturer sample concentrators
	1 injection, more injections possible for some instrumentation	Multiple sample injections
	Concentration range ppt to ppm	Ppt to ppm
	Some sorbents prone to artifact formation.	Low blanks when properly cleaned.
Storage	Sample storage at 4°C recommended for multi-bed tubes to prevent potential migration of compounds to more retentive sorbent, which maybe difficult to recover.	Room temperature
Cleaning	Analytical process automatically cleans tube for reuse. Cleans as it analyzes. Conditioning/cleaning and analysis incorporated in one thermal desorption unit.	Canister cleaning requires separate equipment as additional step prior to background certification and sampling.
Cost	$50-130 each	$200-700 each



free literature

A Guide to Passive Air Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

Technical Guide
lit. cat.# 59977B



Thermal Desorption Tubes: Versatile Air Sampling for a Wide Range of Applications

Flyer
lit. cat.# EVFL1065

Download your copies from **www.restek.com**.



tech guides

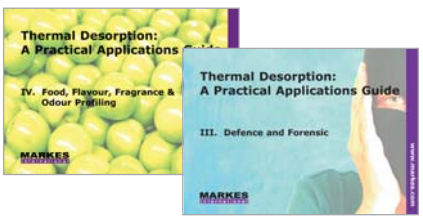
Thermal desorption application guides are available for a broad range of markets. Request your FREE copy today using these part numbers.

Environmental Air Monitoring and Occupational Health & Safety
EVTG1034

Residual Volatiles & Materials Emissions Testing
GNTG1035

Defense & Forensic
CFTG1036

Food, Flavor, Fragrance & Odor Profiling
FFTG1037





Restek's Ultra-Clean resin eliminates the hassle of cleaning and testing resin for air sampling.

Sampling Supplies for Semivolatiles in Air

Everything you need for sampling semivolatile compounds in air: Ultra-Clean resin, PUF sampling cartridges.

Ultra-Clean Resin: Equivalent to XAD-2 Resin; Exclusively from Restek!

- For adsorbing semivolatiles in air.
- Cleaned, GC tested and certified by TO-13A protocol.
- Available in 100 gram quantities.

method applications

Method	Applications
EPA 23	Dioxins
EPA TO-13A	PAHs
ASTM D6209	PAHs

Although resin is an excellent adsorbent for trapping PAHs, it requires extensive clean-up because many of its impurities are PAH compounds. To enable you to eliminate time-consuming clean-up but still meet TO-13A method requirements, we do the cleaning for you! Ultra-Clean resin complies with the specified maximum contamination levels—we test each batch by capillary GC/flame ionization detector to ensure cleanliness.

Description	cat.#	Price-per-bottle 1-4 bottles	5-9 bottles	10+ bottles
Ultra-Clean Resin, 100 grams	24230	/ea.	/ea.	/ea.



SDVB Resin

- Styrene/divinylbenzene, equivalent to XAD-2 resin.
- Untreated, packaged in 1kg plastic containers.
- Spherical, 20 to 60 mesh particles.

Description	qty.	cat.#	price
SDVB Resin	1kg	24053	

Cleaned Polyurethane Foam (PUF) Cartridges

- Precleaned and ready to use for collection of semivolatiles (pesticides, PCBs, PAHs).
- Both large high-volume (220-280L/min.) and small low-volume (1-5L/min.) PUFs available.
- Suitable for ambient, indoor, and industrial hygiene applications.
- PUF/XAD-2 "sandwiches" capture a wider range of semivolatiles.





22114



22115



22116



22117

method applications

Method	Applications	cat.#
EPA TO-10A	Organochlorine and organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
EPA IP-7	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA IP-8	Organochlorine and organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
ASTM D4861	Organochlorine and organophosphorous pesticides, PCB	22116
ASTM D4947	Chlordane and heptachlor residues	22116
Research	Pesticides	22117
EPA TO-4A	Organochlorine pesticides, PCBs	22114
EPA TO-9A	Polychlorinated dibenzo-*p*-dioxins (PCDDs)	22114
EPA TO-13A	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA 600/8-80-038	Organochlorine pesticides, PCBs, PAHs	22115
ASTM D6209	Polycyclic aromatic hydrocarbons (PAHs)	22114

Description	qty.	cat.#	price
Cleaned PUF Plug (7.6cm length, 6cm diameter)	ea.	24295	
Large PUF Cartridge, 65mm OD x 125mm length, 75mm PUF	ea.	22114	
Large PUF/XAD Cartridge, 65mm OD x 125mm length, 25mm PUF/10g XAD-2/50mm PUF	ea.	22115	
Small PUF Cartridge, 22mm OD x 100mm length, 76mm PUF	ea.	22116	
Small PUF/XAD Cartridge, 22mm OD x 100mm length, 30mm PUF/1.5g XAD-2/30mm PUF	ea.	22117	

Environmental Air Monitoring Gas Standards

Our high-quality air monitoring gas calibration standards are provided by Spectra Gases and Scott Specialty Gases—meeting lab requirements for two separate sources of calibration standards. Mixes are produced gravimetrically using NIST (National Institute of Science and Technology) traceable weights. Each comes with a Certificate of Analysis and unique serial number. All cylinders are disposable and do not require rental or demurrage fees. Recertification of cylinders is available directly with our suppliers. All cylinders are drop-shipped from our suppliers to provide fast delivery and the "freshest" standard possible. 12-month stability on all cylinders unless otherwise specified.

TO-14A Calibration Mix (39 components)

benzene
bromomethane
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34400 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34400-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34421 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34421-PI (ea.)

TO-14A 41 Component Mix (41 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34430 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34430-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34431 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34431-PI (ea.)

TO-14A 43 Component Mix (43 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
3-chloropropene
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
4-ethyltoluene
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34432 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34432-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34433 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34433-PI (ea.)

it's a **fact**

Higher concentration = **MORE STANDARD** for your money!

cylinder **design**

Spectra 104L Cylinders:

Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800psi
CGA-180
outlet fitting.
Weight:
1.5 lbs/0.7 kg



Scotty 110L Cylinders (Pi-marked Cylinders for EU Regulations):

Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800psi
CGA-180 outlet fitting.
Weight: 2.2 lbs/1 kg
US DOT Specs: 3AL2216



did you **know**?

Pi-marked Gas Cylinders for EU Countries

Our Pi-marked gas standards from Scott Specialty Gases meet the requirements of Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

We can provide the same mix from two suppliers—meeting your need for second source gas standards.

please **note**

Gas standards are subject to hazardous materials shipping fees by most freight carriers.



TO-14A GC/MS Tuning Mix

4-bromofluorobenzene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34406 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34406-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34424 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34424-PI (ea.)

TO-14A Aromatics Mix (14 components)

benzene
chlorobenzene
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
ethyl benzene
styrene
toluene
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34404 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34404-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34423 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34423-PI (ea.)

TO-14A Chlorinated Hydrocarbon Mix (19 components)

carbon tetrachloride
chloroform
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethylene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethyl chloride
hexachloro-1,3-butadiene
methyl chloride
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethylene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
vinyl chloride

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34402 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34402-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34422 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34422-PI (ea.)

TO-14A Internal Standard Mix

bromochloromethane
chlorobenzene-d5
1,4-difluorobenzene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34412 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34412-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34427 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34427-PI (ea.)

TO-14A Internal Standard/Tuning Mix

bromochloromethane
1-bromo-4-fluorobenzene
(4-bromofluorobenzene)
chlorobenzene-d5
1,4-difluorobenzene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34408 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34408-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34425 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34425-PI (ea.)

TO-15 Subset 25 Component Mix (25 components)

acetone
allyl chloride
benzyl chloride*
bromodichloromethane
bromoform
1,3-butadiene
2-butanone (MEK)
carbon disulfide*
cyclohexane
dibromochloromethane
trans-1,2-dichloroethene
1,4-dioxane
ethyl acetate
4-ethyltoluene
heptane
hexane
2-hexanone (MBK)
4-methyl-2-pentanone
methyl *tert*-butyl ether (MTBE)
2-propanol
propylene
tetrahydrofuran
2,2,4-trimethylpentane
vinyl acetate
vinyl bromide

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34434 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34434-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34435 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34435-PI (ea.)

*Stability of this compound cannot be guaranteed.

TO-15 64 Component Mix (64 components)

acetone
acrolein
benzene
benzyl chloride*
bromodichloromethane
bromoform
bromomethane
1,3-butadiene
2-butanone (MEK)
carbon disulfide*
carbon tetrachloride
chlorobenzene
chloroethane
chloroform
chloromethane
cyclohexane
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
1,4-dioxane
ethanol*
ethyl acetate
ethyl benzene
ethylene dibromide
(1,2-dibromoethane)
4-ethyltoluene
trichlorofluoromethane (Freon 11)
dichlorodifluoromethane (Freon 12)
1,1,2-trichloro-1,2,2-trifluoroethane
(Freon 113)
1,2-dichlorotetrafluoroethane
(Freon 114)
heptane
hexachloro-1,3-butadiene
hexane
2-hexanone (MBK)
4-methyl-2-pentanone (MIBK)
methylene chloride
methyl *tert*-butyl ether (MTBE)
methyl methacrylate
2-propanol
propylene
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl acetate
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34436 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34436-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34437 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34437-PI (ea.)

*Stability of this compound cannot be guaranteed.

also **available**

See **page 386** for high-purity regulator.

TO-14A/TO-15/TO-17 Performance Test Standard

Restek is pleased to offer the Performance Testing/VOC Audit Sample Program in cooperation with Spectra Gases. This is an on-going testing program in which laboratories, and/or other users of VOC standards, are able to evaluate their own capabilities, as well as compare their results and accuracy against other laboratories. As a participant in the program, you will receive a disposable cylinder, directly from Spectra Gases, containing multiple unknown TO-14A/TO-15 components at varying concentrations that are to be identified, quantified, and reported via the Spectra Gases P-T Audit Program forms. The results will be published and distributed for peer review. To ensure confidentiality, all participating laboratories will be anonymous, and only the individual laboratory will know their own results. To provide statistical analysis, the audit sample will be shipped to all laboratories at the same time, once a year during the fourth quarter.

cylinder **design**

Performance Test Standard

Size: 5A disposable (3.2" x 12")
Volume/Pressure: 150L @ 1,800psig
CGA 180 outlet fitting
Weight: 2.2 lbs

150 liters @ 1,800psig
cat. # 34560 (ea.)

BTEX Gas Mix

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34414 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34414-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34428 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34428-PI (ea.)

BTEX and MTBE Gas Mix

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34541 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34541-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34542 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34542-PI (ea.)

Sulfur 5-Component Mix

12-month stability. +/- 10% accuracy.

carbonyl sulfide
dimethyl sulfide
ethyl mercaptan
hydrogen sulfide
methyl mercaptan

1ppm in nitrogen, 110 liters @ 1,800psi
cat. # 34561 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34561-PI (ea.)

Massachusetts APH Mix (26 components)

benzene
1,3-butadiene
butylcyclohexane
cyclohexane
n-decane
2,3-dimethylheptane
2,3-dimethylpentane
n-dodecane
ethylbenzene
n-heptane
n-hexane
isopentane
isopropylbenzene
p-isopropyltoluene
methyl *tert*-butyl ether
1-methyl-3-ethylbenzene
n-nonane
n-octane
toluene
toluene-d8 (IS)
1,2,3-trimethylbenzene
1,3,5-trimethylbenzene
n-undecane
o-xylene
m/*p*-xylene (combined)

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34540 (ea.)

1ppm in nitrogen, 21 liters @ 350psig (Pi-marked Cylinder)
cat. # 34540-PI (ea.)

Japan Calibration Mix (9 components)

acrylonitrile
benzene
1,3-butadiene
chloroform
1,2-dichloroethane
dichloromethane
tetrachloroethylene
trichloroethylene
vinyl chloride

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34418 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34418-PI (ea.)

cylinder **design**

Spectra 104L Cylinders:

Aluminum construction
Size: 8 x 24 cm
Volume/Pressure: 104 liters of gas @ 1,800psi
CGA-180 outlet fitting.
Weight: 1.5 lbs/0.7 kg



Scotty 110L Cylinders (Pi-marked Cylinders for EU Regulations):

Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure: 110 liters of gas @ 1,800psi
CGA-180 outlet fitting.
Weight: 2.2 lbs/1 kg
US DOT Specs: 3AL2216



please **note**

Gas standards are subject to hazardous materials shipping fees by most freight carriers.

for **reference books**

Visit **www.restek.com**

did you **know**?

Pi-marked Gas Cylinders for EU Countries

Our Pi-marked gas standards from Scott Specialty Gases meet the requirements of Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

also **available**

Custom air standards!

Visit **www.restek.com** for our custom air standards ordering form.



Ozone Precursor Mixture/PAMS (57 components)

acetylene	isopropylbenzene
benzene	methylcyclohexane
n-butane	methylcyclopentane
1-butene	2-methylheptane
cis-2-butene	3-methylheptane
trans-2-butene	2-methylhexane
cyclohexane	3-methylhexane
cyclopentane	2-methylpentane
n-decane	3-methylpentane
m-diethylbenzene	*n*-nonane
p-diethylbenzene	*n*-octane
2,2-dimethylbutane	*n*-pentane
2,3-dimethylbutane	1-pentene
2,3-dimethylpentane	*cis*-2-pentene
2,4-dimethylpentane	*trans*-2-pentene
n-dodecane	propane
ethane	*n*-propylbenzene
ethylbenzene	propylene
ethylene	styrene
m-ethyltoluene	toluene
o-ethyltoluene	1,2,3-trimethylbenzene
p-ethyltoluene	1,2,4-trimethylbenzene
n-heptane	1,3,5-trimethylbenzene
n-hexane	2,2,4-trimethylpentane
1-hexene	2,3,4-trimethylpentane
isobutane	*n*-undecane
isopentane	*o*-xylene
isoprene	*m*/*p*-xylene (combined)

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34420 (ea.)

1ppm in nitrogen, 30 liters @ 500psi (Pi-marked Cylinder)
cat. # 34420-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34429 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34429-PI (ea.)

Ozone Precursor/PAMS Mix

(57 components at EPA concentrations: ppbC)

acetylene	40	isopropylbenzene	40
benzene	30	methylcyclohexane	30
n-butane	40	methylcyclopentane	25
1-butene	30	2-methylheptane	25
cis-2-butene	35	3-methylheptane	25
trans-2-butene	25	2-methylhexane	25
cyclohexane	40	3-methylhexane	25
cyclopentane	20	2-methylpentane	20
n-decane	30	3-methylpentane	40
m-diethylbenzene	40	*n*-nonane	25
p-diethylbenzene	25	*n*-octane	30
2,2-dimethylbutane	40	*n*-pentane	25
2,3-dimethylbutane	50	1-pentene	25
2,3-dimethylpentane	50	*cis*-2-pentene	35
2,4-dimethylpentane	40	*trans*-2-pentene	25
n-dodecane	40	propane	40
ethane	25	*n*-propylbenzene	30
ethylbenzene	25	propylene	25
ethylene	20	styrene	40
m-ethyltoluene	25	toluene	40
o-ethyltoluene	30	1,2,3-trimethylbenzene	25
p-ethyltoluene	40	1,2,4-trimethylbenzene	40
n-heptane	25	1,3,5-trimethylbenzene	25
n-hexane	30	2,2,4-trimethylpentane	30
1-hexene	60	2,3,4-trimethylpentane	25
isobutane	25	*n*-undecane	30
isopentane	40	*o*-xylene	25
isoprene	40	*m*/*p*-xylene (combined)	40

20-60ppb C in nitrogen, 104 liters @ 1,800psi
cat. # 34445 (ea.)

20-60ppb C in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34445-PI (ea.)

NEW!



24129

Small Cylinder Stand

- Supports and stabilizes disposable gas cylinders.
- Fits cylinders up to 3⅜" (8cm) in diameter.
- Adjustable screw secures cylinder in place.

This cylinder stand is designed to support small diameter cylinders, such as 104L and 110L disposable cylinders. It is a simple, safe, and economical way to stabilize the position of small cylinders, while keeping them within close proximity. The stand is constructed of heavyweight painted steel and includes an adjustable screw for safely securing cylinders.

Description	qty.	cat.#	price
Small Cylinder Stand	ea.	24129	



21572

Spectra Gas 7621 High-Purity VOC Regulator

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- 3,000psig maximum inlet pressure.
- Stainless steel diaphragm and Kel-F® seat.
- ⅛-inch tube compression outlet.
- Low internal volume: 3.03cc.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.

Description	qty.	cat.#	price
0–30psig outlet pressure gauge	ea.	21572	
0–100psig outlet pressure gauge	ea.	21572-R100	

Natural Gas and Refinery Gas Standards

- Each available in three varying concentrations.
- Mini-regulator designed specially for these standards.

Natural Gas Standards

Available in three mixes, from lean to rich. Each has an extended list of C6+ components.

	Natural Gas Standard #1 cat.# 34438, ea. 663.70 % each compound**	Natural Gas Standard #2 cat.# 34439, ea. 663.70 % each compound**	Natural Gas Standard #3 cat.# 34440, ea. 663.70 % each compound**
nitrogen	1.000	2.500	5.000
carbon dioxide	0.500	1.000	1.500
methane UHP	94.750	85.250	70.000
ethane UHP	2.000	5.000	9.000
propane	0.750	3.000	6.000
isobutane	0.300	1.000	3.000
n-butane	0.300	1.000	3.000
isopentane	0.150	0.500	1.000
n-pentane	0.150	0.500	1.000
hexanes plus*	0.100	0.250	0.500
Concentration	mole	mole	mole
Volume	13.16L @ 200psig	13.16L @ 200psig	5.5L @ 75psig
Ideal Heating Value (Dry BTU/SCF)	1048 gross	1142 gross	1317 gross

Refinery Gas Standards

Available in three mixes with varying C5 unsaturates or extended C6+ components.

	Refinery Gas Standard #1 cat.# 34441, ea. 942.30 % each compound**	Refinery Gas Standard #2 cat.# 34442, ea. 942.30 % each compound**	Refinery Gas Standard #5 cat.# 34443, ea. 942.30 % each compound**
hydrogen	40.750	12.500	12.500
argon	0.500	1.000	1.000
nitrogen	4.000	37.200	37.200
carbon monoxide	1.000	1.000	1.000
carbon dioxide	3.000	3.000	3.000
methane	8.500	5.000	5.000
ethane	6.000	4.000	4.000
ethylene	2.000	2.000	2.000
acetylene	—	1.000	1.000
propane	7.000	6.000	6.000
propylene	3.000	3.000	3.000
propadiene	0.850	1.000	1.000
cyclopropane	—	0.040	—
isobutane	6.000	5.000	5.000
n-butane	4.000	4.000	4.000
isobutylene	2.000	1.000	1.000
1,3 butadiene	3.000	3.000	3.000
cis-2-butene	2.000	2.000	2.000
trans-2-butene	2.000	3.000	3.000
butene-1	2.000	2.000	2.000
2-methyl-2-butene	—	0.200	0.200
isopentane	1.000	1.000	1.000
n-pentane	1.000	1.000	1.000
cis-2-pentene	—	0.400	0.400
trans-2-pentene	—	0.160	0.200
pentene-1	—	0.400	0.400
n-hexane	0.500	0.100	—
hexanes plus	—	—	0.100
Concentration	mole	mole	mole
Volume	5.2L @ 70psig	4.9L @ 60psig	4.6L @ 60psig

*Contact Restek or your Restek representative for a complete list of hexanes plus.
**Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

Mini-Regulator for natural gas and refinery gas standards

- 0–300psig inlet pressure range.
- 0–15psig outlet pressure range.
- Supplied with 0–15psig outlet pressure gauge, brass CGA 170 nut and nipple.

Description	qty.	cat.#	price
Mini-Regulator	ea.	22032	

please **note**

Gas standards on this page are not available in Pi-marked cylinders for EU countries.



cylinder **design**

DCG Partnership Cylinders:

Size: 7.6 x 24 cm
CGA-170/110 connection.
US DOT Specs: DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.



22032

Scott Transportable Pure Gases and Mixtures in 14-, 48-, and 110-Liter Sizes

We offer a wide range of Scott Transportable Gases, from pure gases for purging or calibrating to multi-component mixes which are ideal for peak identification work.

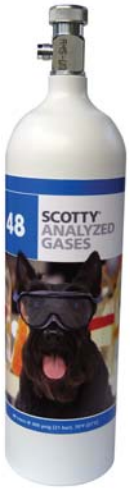
The 14-liter container has a CGA 160 connection for more precise integration with analytical systems. The 48-liter cylinder has a CGA 165 connection, and can deliver large volumes of sample. The 110-liter cylinder has a CGA 180 connection.

Scotty® 14
Contents: 14 liters
Pressure: 240psig (17 bar)
Outlet Fitting: CGA 160
Weight: 1.5 lbs/0.7 kg
Dimensions: 3" diameter x 11" height (7.6 x 28cm)
DOT Specifications: 4B240

Please note: this cylinder is not approved for use in Canada.



Scotty® 48
Contents: 48 liters
Pressure: 300psig (21 bar)
Outlet Fitting: CGA 165
Weight: 1.75 lbs/0.8 kg
Dimensions: 4" diameter x 16 ¼" height (10.2 x 41cm)
DOT Specifications: 39 NRC



Scotty® 110 (Pi-marked Cylinders for EU Regulations)
Contents: 110 liters
Pressure: 1800psig (124 bar)
Outlet Fitting: CGA 180
Weight: 2.2 lbs/1 kg
Dimensions: 3.25" diameter x 11.625" height (8.3 x 29.5cm)
DOT Specifications: 3AL2216



Description	Shelf Life	Scotty 14 (14 Liter) cat.#	price	Scotty 48 (48 Liter) cat.#	price	Scotty 110 (110 Liter) cat.#	price
Pure Gases							
Air, zero (THC < 1ppm)	2 yrs.	34448		34449		34449-PI	
Argon, 99.995%	2 yrs.	34457		—	—	34457-PI	
Carbon dioxide, 99.80%	2 yrs.	34451		34452		34452-PI	
Hydrogen, 99.99%	2 yrs.	34453		—	—	34453-PI	
Methane, 99.00%	2 yrs.	34454		—	—	34454-PI	
Oxygen, 99.60%	2 yrs.	34455		—	—	34455-PI	
Two-Component Mixtures							
Benzene in air (1ppm)	1 yr.	—	—	34458		34458-PI	
Benzene in air (100ppm)	1 yr.	—	—	34459		34459-PI	
1,3-Butadiene in nitrogen (10ppm)	2 yrs.	34460		34461		34461-PI	
Carbon dioxide in helium (100ppm)	2 yrs.	34462		—	—	34462-PI	
Carbon dioxide in nitrogen (100ppm)	2 yrs.	34463		34464		34464-PI	
Carbon dioxide in nitrogen (1000ppm)	2 yrs.	34465		34466		34466-PI	
Ethylene in air (8-10ppm)	2 yrs.	34467		34468		34468-PI	
Ethylene in helium (100ppm)	2 yrs.	34489		—	—	34489-PI	
Hydrogen in helium (100ppm)	2 yrs.	34469		—	—	34469-PI	
Hydrogen in nitrogen (1%)	2 yrs.	34471		34472		34472-PI	
Hydrogen in nitrogen (100ppm)	2 yrs.	34473		34474		34474-PI	
Methane in helium (100ppm)	2 yrs.	34476		34477		34477-PI	
Methane in nitrogen (100ppm)	2 yrs.	34478		—	—	34478-PI	
Methane in nitrogen (1%)	2 yrs.	34482		34483		34483-PI	
Nitrogen in helium (100ppm)	2 yrs.	34479		—	—	34479-PI	
Nitrous oxide in nitrogen (1ppm)	2 yrs.	34484		34485		34485-PI	
Oxygen in helium (100ppm)	2 yrs.	34480		—	—	34480-PI	
Oxygen in nitrogen (2%)	2 yrs.	34487		34488		34488-PI	
Oxygen in nitrogen (6%)	2 yrs.	34491		34492		34492-PI	
1,1,1-Trichloroethane in nitrogen (10ppm)	2 yrs.	—	—	34493		34493-PI	
Trichloroethylene in nitrogen (10ppm)	2 yrs.	34494		34495		34495-PI	
Vinyl chloride in nitrogen (1ppm)	2 yrs.	34496		34497		34497-PI	
Vinyl chloride in nitrogen (10ppm)	2 yrs.	34498		34499		34499-PI	
Vinyl chloride in nitrogen (50ppm)	2 yrs.	34500		—	—	34500-PI	
Vinyl chloride in nitrogen (100ppm)	2 yrs.	34501		—	—	34501-PI	
Vinyl chloride in nitrogen (1000ppm)	2 yrs.	34502		—	—	34502-PI	

Description	Shelf Life	Scotty 14 (14 Liter) cat.#	price	Scotty 48 (48 Liter) cat.#	price	Scotty 110 (110 Liter) cat.#	price
Multi-Component Mixtures							
Carbon monoxide, carbon dioxide, hydrogen and oxygen in nitrogen (0.5% each)	2 yrs.	34504		34505		34505-PI	
Carbon monoxide, carbon dioxide, hydrogen and oxygen in nitrogen (1% each)	2 yrs.	34507		34508		34508-PI	
Carbon monoxide, carbon dioxide, methane, ethane, ethylene and acetylene in nitrogen (1% each)	1 yr.	—	—	34511		34511-PI	
Carbon monoxide, carbon dioxide, nitrogen, and oxygen, (5% each) and methane and hydrogen (4% each) in helium	2 yrs.	34512		—	—	34512-PI	
Carbon monoxide (7%), carbon dioxide (15%) and oxygen (5%) in nitrogen	2 yrs.	34514		—	—	34514-PI	
Carbon monoxide (7%), oxygen (4%), carbon dioxide (15%) and methane (4.5%) in nitrogen	2 yrs.	34515		34516		34516-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (15ppm each)	2 yrs.	34518		34519		34519-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (100ppm each)	2 yrs.	34521		34522		34522-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (1000ppm each)	2 yrs.	34524		34525		34525-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (100ppm each)	2 yrs.	34527		34528		34528-PI	
C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium (100ppm each)	2 yrs.	34529		34530		34530-PI	
C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen (100ppm each)	2 yrs.	34531		34532		34532-PI	
Branched Paraffins: 2,2-dimethylbutane, 2,2-dimethylpropane, isobutane, 2-methylbutane, 2-methylpentane, 3-methylpentane in nitrogen (15ppm each)	2 yrs.	34534		—	—	34534-PI	
Methane, ethane, ethylene, acetylene, propane, propylene, *n*-butane, propyne in nitrogen (15ppm each)	1 yr.	—	—	34537		34537-PI	
n-butane, isobutane, *cis*-2-butene, *trans*-2-butene, 1-butene, iso-butylene, 1,3-butadiene, ethyl acetylene in nitrogen (15ppm each)	1 yr.	—	—	34539		34539-PI	

did you **know**?

Pi-marked Gas Cylinders for EU Countries

Our Pi-marked gas standards from Scott Specialty Gases meet the requirements of Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

also **available**

Custom air standards!

Visit **www.restek.com** for our custom air standards ordering form.

Regulators for use with 14-liter and 48-liter Scott Transportable Gases

Specifications:
Maximum Inlet Pressure: 300psig
Outlet Pressure Range: 2–10psig
Maximum Delivery Pressure: 25psig
Operating Temperature Range: 35°F to 150°F (2°C to 65°C)
Outlet Connection: 1/4" female NPT

Materials of Construction:
Body: Brass
Diaphragm: Viton®
Seat: Acetal
Seal: Viton®

Use the CGA 160 inlet connection with 14-liter Scott Transportable Gases. Use the CGA 165 inlet connection with 48-liter Scott Transportable Gases.


22690

Description	qty.	cat.#	price
Regulator with CGA 160 Inlet Connection	ea.	22690	
Regulator with CGA 165 Inlet Connection	ea.	22691	

also **available**

Regulators with CGA-180 connections for the 110L cylinders are listed on **page 386**.

Syringe Adapter Kit for Single-Stage VOC Regulator

Use to withdraw sample from a high-pressure cylinder after pressure reduction through the high-purity VOC single-stage regulator.

Kit contains one nickel-plated brass 1/4" NPT to female luer fitting, which can be used with an A-2 Luer syringe (cat.# 20162 or 20163), and one stainless steel 1/4" NPT x 1/8" compression fitting with septum (can be used with any syringe needle).


21118

Description	qty.	cat.#	price
Syringe Adapter Kit	kit	21118	



also **available**

Certificates are available upon request.



NEW! TPED compliant cylinders now available for shipping into EU countries.





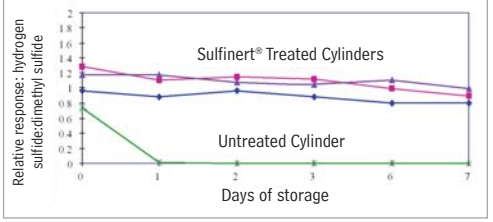


Sulfinert® Treated High Pressure Sample Cylinders

- Sulfinert® coating provides stable storage of sulfur and mercury at ppb levels in petroleum samples.
- Inert coating doesn't flake; more durable than Teflon®.
- TPED compliant cylinders now available for shipping into EU countries.
- All cylinders have 1/4" female NPT threads on both ends.

Sulfur compounds are stable in Sulfinert® treated stainless steel systems.

17ppbv hydrogen sulfide in 500mL cylinders



Refinery and natural gas samples often contain trace amounts of sulfur-containing compounds which can interfere with reactions or poison catalysts in petrochemical processes. Because sulfur compounds quickly react with stainless steel surfaces, accurate determination of these compounds is impossible when samples are collected and stored in untreated sample cylinders. Restek's Sulfinert® passivation technique bonds an inert silica layer into the surface of stainless steel, preventing active compounds from reacting with or adsorbing to the steel. These Swagelok® high pressure sample cylinders are Sulfinert® treated for greater stability of sulfur compounds and mercury. DOT rating to 1,800 and 5,000psig allows sampling at gas wellheads as well as in the refinery. Use of high pressure sample cylinders is cited in ASTM D1265, Standard Practice for Sampling Liquefied Petroleum (LP) Gases, Manual Method.

304L Stainless Steel

		1,800psig			TPED, 1,450psig		
Size	qty.	Swagelok part #	cat.#	price	Swagelok part #	cat.#	price
75cc	ea.	304L-HDF4-75	24130				
150cc	ea.	304L-HDF4-150	24131		304L-HDF4-150-PD	24131-PI	
300cc	ea.	304L-HDF4-300	24132		304L-HDF4-300-PD	24132-PI	
500cc	ea.	304L-HDF4-500	24133		304L-HDF4-500-PD	24133-PI	
1000cc	ea.	304L-HDF4-1000	24134		304L-HDF4-1000-PD	24134-PI	
2250cc	ea.	304L-HDF4-2250	21394		304L-HDF4-2250-PD	21394-PI	

316L Stainless Steel

		5,000psig			TPED, 4,350psig		
Size	qty.	Swagelok part #	cat.#	price	Swagelok part #	cat.#	price
150cc	ea.	316L-50DF4-150	22111		316L-50DF4-150-PD	22111-PI	
300cc	ea.	316L-50DF4-300	22112		316L-50DF4-300-PD	22112-PI	
500cc	ea.	316L-50DF4-500	22113		316L-50DF4-500-PD	22113-PI	

Sulfinert® Treated Alta-Robbins Sample Cylinder Valves

- All wetted parts are Sulfinert® treated for inertness.
- Compatible with Sulfinert® treated Swagelok® sample cylinders.
- Large, durable, Kel-F® seat ensures leak-free operation; temperature range: -40°C to 120°C.
- All valves have 1/4" male NPT inlet fittings.

Description	DOT Pressure Rating	qty.	cat.#	price
1/4" Male NPT Outlet	3,500psig	ea.	21400	
1/4" Male Compression Outlet	3,500psig	ea.	21401	
1/4" Male NPT with Dip Tube*	3,500psig	ea.	21402	enquire
1/4" Male NPT with 2,850psi Rupture Disc	3,500psig	ea.	21403	
1/4" Female NPT Outlet with 2,850psi Rupture Disc	3,500psig	ea.	21404	
1/4" Male NPT Outlet	6,000psig	ea.	22109	
1/4" Female NPT Outlet	6,000psig	ea.	22110	

*To order catalog #21402 (Sulfinert Alta-Robbins Sample Cylinder Valve, 1/4" NPT with Dip Tube), please call Customer Service at 800-356-1688, ext. 3, or contact your Restek representative. Specify dip tube length or % outage when ordering (maximum length = 5.25"/ 13.3cm). Note: End of part will not be treated after cutting tube to length.

Sulfinert® Treated Rupture Disc Tee

2,850psig (19,650kPa) rating; 1/4" NPT connections.

Description	qty.	cat.#	price
Sulfinert Treated Rupture Disc Tee (1/4" NPT connections)	ea.	21396	
Replacement Rupture Disc (not Sulfinert treated)	ea.	24298	


21396

Sulfinert® Treated Gas Sampling Valves and Sample Loops

- Ideal for samples containing low concentrations of sulfur or other active compounds.
- Sample loop sizes from 5µL to 5cc.

Sulfinert® treatment eliminates active sites in the valve or loop, for better recovery of active compounds.


20585

Sulfinert® Treated Gas Sampling Valves (1/16" fittings, 0.40mm port diameter; "W Type" valve)

Description	qty.	cat.#	price
Sulfinert Gas Sampling Valve; 4-Port	ea.	20584	
Sulfinert Gas Sampling Valve; 6-Port	ea.	20585	
Sulfinert Gas Sampling Valve; 10-Port	ea.	20586	

Replacement Rotors (Not Coated)

Description	qty.	cat.#	price
Replacement Rotor for 4-Port Sulfinert Gas Sampling Valve	ea.	20587	
Replacement Rotor for 6-Port Sulfinert Gas Sampling Valve	ea.	20588	
Replacement Rotor for 10-Port Sulfinert Gas Sampling Valve	ea.	20589	

Sulfinert® Treated Gas Sample Loops (1/16" fittings, for "W Type" valves)

Description	Size	qty.	cat.#	price
Sulfinert Sample Loops	5µL	ea.	22840	
Sulfinert Sample Loops	10µL	ea.	22841	
Sulfinert Sample Loops	20µL	ea.	22842	
Sulfinert Sample Loops	25µL	ea.	22843	
Sulfinert Sample Loops	50µL	ea.	22844	
Sulfinert Sample Loops	100µL	ea.	22845	
Sulfinert Sample Loops	250µL	ea.	22846	
Sulfinert Sample Loops	500µL	ea.	22847	
Sulfinert Sample Loops	1mL	ea.	22848	
Sulfinert Sample Loops	2mL	ea.	22849	
Sulfinert Sample Loops	5mL	ea.	22850	



Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer-lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.


21276

	SGE		Restek		
Volume	Model	cat.#	qty.	cat.#	price
500mL	500MAR-LL-GT	009910	ea.	21275	
1000mL	1000MAR-LL-GT	009920	ea.	21276	
2000mL	20000MAR-LL-GT	009930	ea.	21277	

Syringe O-Rings


21279

21278

Syringe Volume	SGE cat.#	qty.	Restek cat.#	price
500mL	032527	ea.	21278	
1000mL	032532	ea.	21279	



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Ethers, Alcohol
30626 434
30627 401,434
30628 401,434
30629 399,434
30631 399,434

Ethers-Haloethers
30456 443
30475 433
31034 421

Explosives
31450 440
31451 440
31607 429
31608 429
31890 399
33204 440
33205 401,440
33900 416
33901 401,416
33902 403,416
33903 404,416
33904 403,416
33905 440

Glycols
30471 432,463,465

Herbicides, Chlorinated Acids
32054 411,422,431
32055 411,422
32056 400,411,419,422,431,440
32057 400,411,419,422,431
32058 422,431
32059 422,431
32061 411,431
32062 411,431
32443 411
32444 411

Herbicides, Paraquat/Diquat
32437 417

Herbicides, Phenoxyacid
31868 454
32014 426
32054 411,422,431
32055 411,422,431
32058 422,431
32059 422,431
32429 419,440
32430 419,440
32431 419,440

Hydrocarbons
30604 464
30605 464
31064 467
31214 462,465,466
31222 469

Hydrocarbons *(cont'd)*
31266 462,463
31459 464
31489 467
31614 463
31674 469
31675 469
31678 456
31698 457,466
31814 466
31819 457,461
31830 463
31832 463
31838 400,458
31839 402,458
31877 403,463
31878 463
31880 401,458,460,471
33906 487
33908 487

Hydrocarbons, Aromatic
30001 442
30035 420
30051 427,432,459
30095 459,467
30488 427,432,459
30496 463
30213 427,432,459
30222 427

Hydrocarbons, Halogenated
30010 443,444
30020 422
30042 408,413,427,432,433,443
31035 421

Hydrocarbons, Halogenated Polyaromatic
31842 400,439

Isocyanates
33000 404,470
33001 404,470
33002 402,470
33003 402,470

Ketones-Aldehydes
30006 432,434,443,444
30602 413
31808 439
31833 400
31837 402,439

Methadone & Metabolites
34005 402,478

Nitroaromatics
31033 421

Nitrosamines
31032 421
31898 412
33009 415
33910 403,412
33911 403

Opiates & Metabolites
34000 400,478
34002 402,478
34006 403,478
34007 403,478
34063 402,478
34065 403,478

Organometallic/Organotin
31472 452
31473 452
31474 404,452
31475 404,452
31476 404,452
31477 404,452
31478 404,452

Oxazoladines
33004 402,470

Oxygenates
30619 413

PAHs (Polyaromatic Hydrocarbons)
31011 430,447,448
31264 421
31455 421
31458 462,464
31469 462,467
31622 438
31841 439
31843 439
31857 430
31869 454

PCBs, Aroclor
32006 399,425
32007 399,425,438,451
32008 399,425,438,451
32009 399,425,438,451
32010 399,425,438
32011 399,425,438,451
32012 399,438,451
32039 425,438,451
32064 399,425,438,451
32065 399,425,438,451
32066 399,425,438,451
32067 399,425,438,451
32068 399,425,438,451
32069 399,425,438,451
32070 399,425,438,451
32299 425,438,451
32409 399,425,438,451
32410 399,425,438,451
32456 425,438,451

PCB Congeners
32283 404,452
32284 404,452
32285 403,452
32286 402,452
32287 402,452
32288 402,452
32289 400,410,449,452
32290 452,455
32293 403,452
32294 452,455
32416 429
32420 414

Pesticides, Nitrogen/Phosphorus
32423 410,414
33012 410,414

Pesticides, Organochlorine
32454 449
32455 487
33011 415

Pesticides, Organohalide
31012 447
32003 451
32004 451
32013 426
32022 421
32024 409
32033 450
32034 450
32040 450
32094 410
32095 410
32096 410
32291 428,450
32292 429,450
32297 450
32298 450
32415 414,429,437,450
32417 410,421,449

Pesticides, Organophosphorus
31623 438
32277 430
32278 430
32418 455
32419 437
32423 410,414
32426 402,417
32427 402,417
32428 399,417
32436 403
33008 415
33013 410,414

Petrochemicals
30096 404,458,476
30097 404,476
30098 404,476
30099 404,476
30436 404,476
31222 469
31223 469
31224 469
31613 469
31674 469
31675 469
31676 456
31677 456
31678 456
31679 456
31680 456
31681 404,456
31682 456
31683 456

Phenols
31008 447
31027 426
31029 420
31088 428
31089 428
31208 448
31209 448
31494 446
31618 437
31694 416
31695 416
31697 416

Phenylurea
32433 417

Semivolatiles
31625 437
31806 437
31829 424
31850 436
31862 448

Solvents, OVI
36274 480
36275 480

Solvents, Residual
36271 479
36272 479
36273 479

Triazines
32445 400,455
32446 400,455
32447 404,455
32448 403,455
32449 403,455
33007 415

Volatiles
30431 408
30432 408
30438 443
30456 443
30475 433
30492 444
30497 422
30601 413
30603 408,412

Other Exempted Drugs
34003 402,478
34004 402,478
34008 400,478
34009 404,478
34022 399,478
34023 401,478
34024 403,478
34025 403,478
34026 403,478
34027 403,478
34059 402,478
34060 403,478
34062 403,478
34064 402,478
34066 400,478



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NEAT & SINGLE ANALYTE SOLUTIONS

Individual Compounds 399-404





Top: Mike Moore, Shipping Technician
Bottom: Matt Hepfer, Manufacturing Technician

What's **NEW?** look for this circle

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
acenaphthene	83-32-9	M	1,000	31267	
acenaphthylene	208-96-8	M	1,000	31268	
acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074	
acetochlor	34256-82-1	M	100	33208	
acetochlor ESA sodium salt	187022-11-3	M	100	33092	
acetochlor OA	184992-44-4	M	100	33094	
acetone	67-64-1	PTM	5,000	30245	
acetone-2,4-DNPH	1567-89-1	ACN	100	33075	
acetonitrile	75-05-8	DMSO	2.05mg/mL	36281	
acetonitrile	75-05-8	PTM	1,000	30495	
acetophenone	98-86-2	PTM	5,000	30621	
acifluorfen	50594-66-6	M	1,000	32255	
acifluorfen methyl ester	50594-67-7	M	1,000	32256	
acrolein	107-02-8	PTM	10,000	30499	
acrolein	107-02-8	W	10,000	30478	
acrolein-2,4-DNPH	888-54-0	ACN	100	33076	
acrylamide	79-06-1	M	1,000	30494	
acrylonitrile	107-13-1	PTM	2,000	30246	
alachlor	15972-60-8	M	1,000	32204	
alachlor	15972-60-8	M	100	33207	
alachlor ESA sodium salt	142363-53-9	M	100	33096	
alachlor OA	171262-17-2	M	100	33099	
aldrin	309-00-2	M	1,000	32205	
allyl chloride	107-05-1	PTM	2,000	30248	
alprazolam	28981-97-7	PTM	1,000	34042	enquire
2-amino-4,6-dinitrotoluene	35572-78-2	ACN	1,000	31670	enquire
4-amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671	enquire
aminomethyl phosphonic acid (AMPA)	1066-51-9	W	100	32428	
ammonium picrate	131-74-8	ACN	2,000	31890	enquire
amobarbital	64-43-7	PTM	1,000	34028	enquire
d-amphetamine	51-63-8	PTM	1,000	34020	enquire
tert-amyl alcohol	75-85-4	PTM	10,000	30631	
tert-amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617	
tert-amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629	
5-α-androstane	438-22-2	D	2,000	31065	
aniline	62-53-3	M	1,000	31470	
anthracene	120-12-7	A	1,000	31269	
anthracene-d10	1719-06-08	D	2,000	31037	
antifoam agent for purge & trap	N/A	Neat	1mL	31822	
aprobarbital	77-02-1	PTM	1,000	34029	enquire
Aramite	140-57-8	H	2,000	31624	
Aroclor 1016	12674-11-2	H	1,000	32006	
Aroclor 1016	12674-11-2	I	200	32064	
Aroclor 1016	12674-11-2	TO	500mg/kg	32076	
Aroclor 1016	12674-11-2	TO	50mg/kg	32075	
Aroclor 1221	11104-28-2	H	1,000	32007	
Aroclor 1221	11104-28-2	I	200	32065	
Aroclor 1221	11104-28-2	TO	500mg/kg	32078	
Aroclor 1221	11104-28-2	TO	50mg/kg	32077	
Aroclor 1232	11141-16-5	H	1,000	32008	
Aroclor 1232	11141-16-5	I	200	32066	
Aroclor 1232	11141-16-5	TO	500mg/kg	32080	
Aroclor 1232	11141-16-5	TO	50mg/kg	32079	
Aroclor 1242	53469-21-9	H	1,000	32009	
Aroclor 1242	53469-21-9	I	200	32067	
Aroclor 1242	53469-21-9	TO	500mg/kg	32082	
Aroclor 1242	53469-21-9	TO	50mg/kg	32081	
Aroclor 1248	12672-29-6	H	1,000	32010	
Aroclor 1248	12672-29-6	I	200	32068	
Aroclor 1248	12672-29-6	TO	500mg/kg	32084	
Aroclor 1248	12672-29-6	TO	50mg/kg	32083	
Aroclor 1254	11097-69-1	H	1,000	32011	
Aroclor 1254	11097-69-1	I	200	32069	
Aroclor 1254	11097-69-1	TO	500mg/kg	32086	
Aroclor 1254	11097-69-1	TO	50mg/kg	32085	
Aroclor 1260	11096-82-5	H	1,000	32012	
Aroclor 1260	11096-82-5	I	200	32070	
Aroclor 1260	11096-82-5	TO	500mg/kg	32088	
Aroclor 1260	11096-82-5	TO	50mg/kg	32087	

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
Aroclor 1262	37324-23-5	H	1,000	32409	
Aroclor 1268	11100-14-4	H	1,000	32410	
atrazine	1912-24-9	A	1,000	32208	
aviation gas (5mL)	8006-69-1	PTM	50,000	30208	
aviation gas	8006-69-1	PTM	2,500	30094	
aviation gas	8006-69-1	PTM	50,000	30207	
azobenzene	103-33-3	D	1,000	31496	
barbital	57-44-3	PTM	1,000	34030	enquire
bentazon	25057-89-0	M	1,000	32257	
benzaldehyde	100-52-7	D	2,000	33017	
benzaldehyde-2,4-DNPH	1157-84-2	ACN	100	33077	
benzene	71-43-2	DMSO	10mg/mL	36282	
benzene	71-43-2	D	250	35262	
benzene	71-43-2	PTM	2,000	30249	
benzene-d6	1076-43-3	PTM	2,000	30025	
benzidine	92-87-5	M	1,000	31441	
benzo(a)anthracene	56-55-3	M	1,000	31270	
benzo(a)pyrene	50-32-8	A	1,000	31271	
benzo(b)fluoranthene	205-99-2	A	1,000	31272	
benzo(ghi)perylene	191-24-2	D	1,000	31273	
benzo(k)fluoranthene	207-08-9	A	1,000	31274	
benzoic acid	65-85-0	D	2,000	31879	
benzoic acid	65-85-0	M	1,000	31415	
benzoylecgonine	519-09-5	PTM	1,000	34016	enquire
benzphetamine	5411-22-3	PTM	1,000	34022	enquire
benzyl benzoate	120-51-4	H	5,000	31847	
α-BHC	319-84-6	M	1,000	32206	
ß-BHC	319-85-7	A	1,000	32209	
δ-BHC	319-86-8	M	1,000	32217	
γ-BHC (lindane)	58-89-9	M	1,000	32226	
bis(2-ethylhexyl)adipate	103-23-1	M	1,000	31449	
bis(2-ethylhexyl)phthalate	117-81-7	D	1,000	31420	
bromazepam	1812-30-2	PTM	1,000	34043	enquire
bromobenzene	108-86-1	PTM	2,000	30250	
2-bromobutanoic acid	80-58-0	MTBE	2,000	31881	
2-bromobutyrate	3196-15-4	MTBE	2,000	31882	
2-bromochlorobenzene	694-80-4	PTM	2,000	30228	
4-bromochlorobenzene	106-39-8	PTM	2,000	30230	
1-bromo-2-chloroethane	107-04-0	PTM	2,000	30469	
bromochloromethane	74-97-5	PTM	2,000	30225	
2-bromo-1-chloropropane	3017-95-6	PTM	2,000	30226	
bromodichloromethane	75-27-4	PTM	2,000	30251	
4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)	3766-81-2	M	100	32274	
1-bromo-4-fluorobenzene	460-00-4	A	1,000	31854	
4-bromofluorobenzene	460-00-4	PTM	2,000	30026	
4-bromofluorobenzene	460-00-4	PTM	2,500	30067	
4-bromofluorobenzene	460-00-4	PTM	5,000	30003	
4-bromofluorobenzene	460-00-4	PTM	10,000	30082	
bromoform	75-25-2	PTM	2,000	30252	
bromomethane	74-83-9	PTM	2,000	30253	
1-bromo-2-nitrobenzene	577-19-5	A	1,000	32279	
2-bromopropionic acid	598-72-1	MTBE	1,000	31653	
butabarbital	125-40-6	PTM	1,000	34031	enquire
butachlor ESA sodium salt		M	100	33202	
1,3-butadiene	106-99-0	PTM	1,000	30622	
butalbital	77-26-9	PTM	1,000	34032	enquire
1,4-butanediol	110-63-4	M	1,000	34078	enquire
(s)-(-)-1,2,4-butanetriol	42890-76-6	pyridine	1,000	33024	
(s)-(-)-1,2,4-butanetriol (5mL)	42890-76-6	pyridine	1,000	33032	
1-butanol	71-36-3	D	250	35260	
1-butanol	71-36-3	PTM	50,000	30474	
tert-butanol	75-65-0	PTM	50,000	30470	
tert-butanol-d9	25725-11-5	PTM	20,000	30618	
2-butanone (MEK)	78-93-3	PTM	5,000	30254	
2-butanone-2,4-DNPH	958-60-1	ACN	100	33078	
n-butyraldehyde-2,4-DNPH	1527-98-6	ACN	100	33079	
γ-butyrolactone (GBL)	96-48-0	ACN	1,000	34077	enquire

Solvent code:

A=acetone
ACN=acetonitrile
C=carbon disulfide
Cy=cyclohexane
D=methylene chloride
DMSO=dimethyl sulfoxide
EA=ethyl acetate
H=hexane
I=isooctane
Ip=isopropanol
M=methanol
MTBE=methyl *tert*-butyl ether
PTM=purge & trap grade methanol
T=toluene
TO-transformer oil
W=water (DI)

*Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.



Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	Individual cat.#	Individual price
caffeine	74051-80-2	W	5	31804	
caffeine	74051-80-2	W	25	31803	
caffeine	74051-80-2	W	125	31802	
caffeine	74051-80-2	W	250	31801	
caffeine	74051-80-2	W	500	31800	
caffeine	58-08-2	M	1,000	34084	enquire
cannabidiol	13956-24-1	PTM	1,000	34011	enquire
cannabinol	521-35-7	PTM	1,000	34010	enquire
ε-caprolactam	105-60-2	D	2,000	31833	
carbazole	86-74-8	D	1,000	31836	
carbazole	86-74-8	M	1,000	31430	
carbon disulfide	75-15-0	PTM	2,000	30258	
carbon tetrachloride	56-23-5	DMSO	20mg/mL	36283	
carbon tetrachloride	56-23-5	PTM	2,000	30259	
chloral hydrate	302-17-0	ACN	1,000	30609	
chlordane (technical)	57-74-9	H	1,000	32021	
chlordane (technical)	57-74-9	I	5,000	32072	
chlordane (technical)	57-74-9	M	2,000	32016	
α-chlordane	5103-71-9	M	1,000	32207	
γ-chlordane	5566-34-7	M	1,000	32227	
chlordiazepoxide	438-41-5	PTM	1,000	34044	enquire
4-chloroaniline	106-47-8	D	2,000	31211	
chlorobenzene	108-90-7	DMSO	1.8mg/mL	36284	
chlorobenzene	108-90-7	PTM	2,000	30261	
chlorobenzene-d5	3114-55-4	PTM	2,000	30223	
chlorobenzilate	510-15-6	M	1,000	32211	
chloroethane	75-00-3	PTM	2,000	30263	
2-chloroethanol	107-07-3	PTM	2,000	30264	
2-chloroethyl vinyl ether	110-75-8	PTM	2,000	30265	
1-chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040	
1-chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066	
chloroform	67-66-3	DMSO	0.3mg/mL	36285	
chloroform	67-66-3	PTM	2,000	30266	
chloromethane	74-87-3	PTM	2,000	30267	
2-chloronaphthalene	91-58-7	M	1,000	31284	
1-chloro-3-nitrobenzene	121-73-3	H	1,000	31875	
4-chloro-3-nitrobenzotrifluoride	121-17-5	A	1,000	32282	
1-chlorooctadecane	3386-33-2	D	10,000	31098	
1-chlorooctane	111-85-3	PTM	10,000	30084	
chloroprene	126-99-8	PTM	5,000	30238	
4-chlorotoluene	106-43-4	PTM	2,000	30269	
chlorpyrifos	2921-88-2	M	1,000	32212	
chrysene	218-01-9	A	1,000	31275	
clobazam	22316-47-8	PTM	1,000	34045	enquire
clonazepam	1622-61-3	PTM	1,000	34046	enquire
cocaethylene	529-38-4	ACN	1,000	34066	enquire
cocaine	53-21-4	PTM	1,000	34015	enquire
codeine	76-57-3	PTM	1,000	34000	enquire
continine	486-56-6	M	1,000	34086	enquire
creosote oil	8001-58-9	D	50,000	31838	
crotonaldehyde-2,4-DNPH	1527-96-4	ACN	100	33080	
cyanazine	21725-46-2	A	1,000	32215	
cyclohexane	110-82-7	DMSO	19.4mg/mL	36286	

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	Individual cat.#	Individual price
2,4-D (2,4-dichlorophenylacetic acid)	94-75-7	M	1,000	32239	
2,4-D methyl ester	1928-38-7	M	1,000	32240	
Dacthal (DCPA dimethyl ester)	1861-32-1	M	1,000	32216	
dalapon	75-99-0	ACN	1,000	32432	
dalapon	75-99-0	M	1,000	32253	
dalapon	75-99-0	M	2,000	32056	
dalapon methyl ester	17640-02-7	H	2,000	32057	
dalapon methyl ester	17640-02-7	M	1,000	32254	
2,4-DB	94-82-6	M	1,000	32241	
DCPA diacid	2136-79-0	M	200	32261	
2,4'-DDD	53-19-0	M	1,000	32098	
4,4'-DDD	72-54-8	M	1,000	32201	
2,4'-DDE	3424-82-6	M	1,000	32099	
4,4'-DDE	72-55-9	M	1,000	32202	
2,4'-DDT	789-02-6	M	1,000	32200	
4,4'-DDT	50-29-3	M	1,000	32203	
decachlorobiphenyl (BZ #209) (5mL)	2051-24-3	A	200	32030	
decachlorobiphenyl (BZ #209)	2051-24-3	A	200	32029	
decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289	
decafluorobiphenyl	434-90-2	A	1,000	31855	
decafluorobiphenyl	434-90-2	D	2,000	31041	
decafluorobiphenyl	434-90-2	ACN	1,000	31842	
decafluorotriphenylphosphine (DFTPP)	5074-71-5	D	2,500	31001	
n-decane	124-18-5	Neat	1mL	31858	
desethyl-atrazine	6190-65-4	A	1,000	32445	
desisopropylatrazine	1007-28-9	A	1,000	32446	
dextromethorphan HBr monohydrate	125-69-9	M	1,000	34081	enquire
dextro-propoxyphene	1639-60-7	PTM	1,000	34008	enquire
diazepam	439-14-5	PTM	1,000	34047	enquire
dibenzo(a,h)anthracene	53-70-3	D	1,000	31276	
4,4'-dibromobiphenyl	92-86-4	D	2,000	31039	
4,4'-dibromobiphenyl	92-86-4	EA	500	32092	
dibromochloromethane (chlorodibromochloromethane)	124-48-1	PTM	2,000	30271	
1,2-dibromo-3-chloropropane (DBCP)	96-12-8	PTM	2,000	30270	
dibromofluoromethane	1868-53-7	Neat	100mg	30634	
1,2-dibromoethane	106-93-4	PTM	2,000	30272	
dibromomethane	74-95-3	PTM	2,000	30430	
4,4'-dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040	
4,4'-dibromooctafluorobiphenyl	10386-84-2	H	250	32053	
4,4'-dibromooctafluorobiphenyl	10386-84-2	MTBE	2,000	31856	
2,3-dibromopropionic acid	600-05-5	MTBE	1,000	31655	
2,5-dibromotoluene	615-59-8	PTM	1,000	30435	
2,5-dibromotoluene	615-59-8	PTM	10,000	30453	
dibutylchlorendate	1770-80-5	A	200	32025	
dicamba	1918-00-9	M	1,000	32247	
dicamba methyl ester	6597-78-0	M	1,000	32248	

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs

For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.



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*Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
1,2-dichlorobenzene	95-50-1	M	1,000	31442	
1,3-dichlorobenzene	541-73-1	M	1,000	31443	
1,4-dichlorobenzene	106-46-7	ACN	1,000	30498	
1,4-dichlorobenzene	106-46-7	M	1,000	31444	
1,2-dichlorobenzene-d4	2199-69-1	PTM	2,000	30049	
3,3'-dichlorobenzidine	91-94-1	D	2,000	31835	
3,3'-dichlorobenzidine	91-94-1	M	2,000	31026	
3,3'-dichlorobenzidine-free base	91-94-1	Neat	100mg	31884	
3,5-dichlorobenzoic acid	51-36-5	MTBE	1,000	31652	
3,5-dichlorobenzoic acid methyl ester	2905-67-1	M	1,000	32264	
3,5-dichlorobenzoic acid methyl ester	2905-67-1	MTBE	1,000	31649	
1,4-dichlorobutane	110-56-5	PTM	2,000	30227	
trans-1,4-dichloro-2-butene	110-57-6	PTM	2,000	30274	
dichlorodifluoromethane (CFC-12)	75-71-8	PTM	2,000	30275	
1,1-dichloroethane	75-34-3	PTM	2,000	30276	
1,2-dichloroethane	107-06-2	DMSO	25mg/mL	36288	
1,2-dichloroethane	107-06-2	PTM	2,000	30277	
1,2-dichloroethane-d4	17060-07-0	PTM	2,000	30027	
1,1-dichloroethene	75-35-4	DMSO	40mg/mL	36287	
1,1-dichloroethene	75-35-4	PTM	2,000	30278	
cis-1,2-dichloroethene	156-59-2	PTM	2,000	30279	
trans-1,2-dichloroethene	156-60-5	PTM	2,000	30280	
cis-1,2-dichloroethylene	156-59-2	DMSO	4.67mg/mL	36289	
trans-1,2-dichloroethylene	156-60-5	DMSO	4.67mg/mL	36290	
2,6-dichlorophenol	87-65-0	M	1,000	31409	
2,4-dichlorophenylacetic acid	19719-28-9	M	200	32049	
2,4-dichlorophenyl acetic acid methyl ester	55954-23-9	H	200	32050	
1,2-dichloropropane	78-87-5	PTM	2,000	30281	
2,2-dichloropropane	594-20-7	PTM	2,000	30283	
cis-1,3-dichloropropene	10061-01-5	PTM	2,000	30284	
trans-1,3-dichloropropene	10061-02-6	PTM	2,000	30285	
2,3-dichloropropionic acid	565-64-0	MTBE	1,000	31650	
2,3-dichloropropionic acid methyl ester	3674-09-7	MTBE	1,000	31651	
1,2-dichlorotetrafluoroethane (CFC-114)	76-14-2	PTM	2,000	30476	
dichlorprop	120-36-5	M	1,000	32249	
dichlorprop methyl ester	57153-17-0	M	1,000	32250	
dieldrin	60-57-1	M	1,000	32218	
diesel fuel #2 composite (5mL)	68334-30-5	D	50,000	31259	
diesel fuel #2 composite	68334-30-5	D	5,000	31093	
diesel fuel #2 composite	68334-30-5	D	50,000	31258	
diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234	
diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235	
diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236	
diesel fuel #2: unweathered	68334-30-5	D	5,000	31233	
diesel/biodiesel 80:20	67784-80-9	D	5,000	31880	
diethyl ether (ethyl ether)	60-29-7	PTM	2,000	30286	
1,4-difluorobenzene	540-36-3	PTM	2,000	30032	
diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627	
dimethachlor ESA sodium salt		M	100	33203	

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
1,2-dimethoxyethane	173201-80-4	DMSO	0.5mg/mL	36291	
N,N-dimethylacetamide	127-19-5	DMSO	5.45mg/mL	36292	
2,5-dimethylbenzaldehyde-2,4-DNPH	152477-96-8	ACN	100	33081	
dimethyldichlorosilane (DMDCS) (20mL)	75-78-5	Neat	20mL	31840	
N,N-dimethylformamide	68-12-2	DMSO	4.4mg/mL	36293	
2,6-dimethylphenol	576-26-1	M	1,000	31410	
3,5-dinitroaniline	618-87-1	ACN	1,000	31661	enquire
1,2-dinitrobenzene	528-29-0	M	1,000	31453	enquire
1,3-dinitrobenzene	99-65-0	ACN	1,000	31662	enquire
1,4-dinitrobenzene	100-25-4	ACN	2,000	33205	enquire
2,4-dinitrophenol	51-28-5	M	1,000	31291	
2,4-dinitrotoluene	121-14-2	ACN	1,000	31663	enquire
2,6-dinitrotoluene	606-20-2	ACN	1,000	31664	enquire
3,4-dinitrotoluene	610-39-9	EA	2,000	33901	enquire
3,4-dinitrotoluene	610-39-9	M	1,000	31452	enquire
di-*n*-octyl phthalate	117-84-0	M	1,000	31426	
dinoseb	88-85-7	M	1,000	32251	
dinoseb methyl ether	6099-79-2	M	1,000	32252	
diolein (1,3-di[*cis*-octadecenoyl] glycerol)	2465-32-9	pyridine	5,000	33022	
1,4-dioxane	123-91-1	DMSO	1.9mg/mL	36294	
1,4-dioxane	123-91-1	D	2,000	31853	
1,4-dioxane	123-91-1	PTM	2,000	30287	
1,4-dioxane-d8	17647-74-4	PTM	2,000	30614	
1,2-diphenylhydrazine	122-66-7	M	1,000	31497	
diuron	330-54-1	ACN	200	32450	
ecgonine	5796-31-6	PTM	1,000	34017	enquire
ecgonine methyl ester	38969-40-3	PTM	1,000	34018	enquire
EDDP perchlorate	66729-78-0	M	1,000	34069	enquire
EGDN	628-96-6	M	1,000	31601	enquire
endosulfan I	959-98-8	M	1,000	32221	
endosulfan II	33213-65-9	M	1,000	32222	
endosulfan sulfate	1031-07-8	M	1,000	32223	
endrin	72-20-8	M	1,000	32219	
endrin aldehyde	7421-93-4	M	1,000	32224	
endrin ketone	53494-70-5	M	1,000	32220	
ethanol	64-17-5	PTM	2,000	30288	
ethanol	64-17-5	W	10,000	30466	
2-ethoxyethanol	110-80-5	DMSO	0.8mg/mL	36295	
ethylbenzene	100-41-4	DMSO	1.84mg/mL	36296	
ethylbenzene	100-41-4	PTM	2,000	30290	
ethylbenzene-d10	25837-05-2	PTM	2,000	30029	
ethylbenzene-d5	20302-26-5	PTM	2,000	30028	
ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628	
ethylenediamine	107-15-3	M	540	35222	
ethylene glycol	3775-85-7	DMSO	3.1mg/mL	36297	
ethylene oxide	75-21-8	DMSO	500	36005	
ethyl methacrylate	97-63-2	PTM	2,000	30289	
fenfluramine	16105-77-4	PTM	1,000	34023	enquire
fentanyl	437-38-7	M	1,000	34082	enquire
nor-fentanyl oxalate	1609-66-1	M	1,000	34083	enquire

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Solvent code:

A=acetone
ACN=acetonitrile
C=carbon disulfide
Cy=cyclohexane
D=methylene chloride
DMSO=dimethyl sulfoxide
EA=ethyl acetate
H=hexane
I=isooctane
Ip=isopropanol
M=methanol
MTBE=methyl *tert*-butyl ether
PTM=purge & trap grade methanol
T=toluene
TO-transformer oil
W=water (DI)

*Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.



Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	Individual cat.#	Individual price
flunitrazepam	1622-62-4	PTM	1,000	34049	enquire
fluoranthene	206-44-0	M	1,000	31277	
fluorene	86-73-7	M	1,000	31278	
fluorobenzene	462-06-6	PTM	2,000	30030	
2-fluorobiphenyl	321-60-8	D	2,000	31091	
2-fluorobiphenyl	321-60-8	D	10,000	31096	
1-fluoronaphthalene	321-38-0	D	2,000	31092	
2-fluorophenol	367-12-4	D	2,000	31047	
flurazepam	1172-18-5	PTM	1,000	34050	enquire
formaldehyde-DNPH	1081-15-8	ACN	500	31837	
formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082	
formaldehyde oxazoladine	—	T	2,000	33004	
formamide	75-12-7	DMSO	1.1mg/mL	36298	
fuel oil # 4	68476-31-3	D	5,000	31216	
fuel oil # 4	68476-31-3	D	50,000	31244	
fuel oil # 5	70892-11-4	D	5,000	31217	
fuel oil # 5	70892-11-4	D	50,000	31246	
fuel oil # 6 (5mL)	68553-00-4	D	50,000	31249	
fuel oil # 6	68553-00-4	D	5,000	31218	
fuel oil # 6	68553-00-4	D	50,000	31248	
DL-glutethimide	18389-24-7	PTM	1,000	34058	enquire
glycerin	56-81-5	pyridine	500	33020	
glycolaldehyde-2,4-DNPH	—	ACN	100	33091	
glyphosate (5mL)	1071-83-6	W	1,000	32427	
glyphosate	1071-83-6	W	1,000	32426	
1,6-HDIP	72375-27-0	DMSO	1,000	33002	
heptachlor	76-44-8	M	1,000	32228	
heptachlor epoxide (isomer B)	1024-57-3	M	1,000	32230	
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)	35065-29-3	I	10	32288	
hexachlorobenzene	118-74-1	A	1,000	32231	
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)	35065-28-2	I	10	32286	
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)	35065-27-1	I	10	32287	
hexachloro-1,3-butadiene	87-68-3	M	1,000	31435	
hexachlorocyclopentadiene	77-47-4	M	1,000	32232	
hexachloroethane	67-72-1	M	1,000	31436	
hexachlorophene	70-30-4	D	2,000	31811	
hexaldehyde-2,4-DNPH	1527-97-5	ACN	100	33083	
hexane	8031-34-3	DMSO	1.45mg/mL	36299	
hexobarbital	56-29-1	PTM	1,000	34033	enquire
hexyl 2-ethylhexyl phthalate	75673-16-4	H:A	1,000	33228	
HMX	2691-41-0	ACN	1,000	31665	enquire
hydraulic oil	64741-89-5	D	50,000	31839	
hydrocodone	34195-34-1	PTM	1,000	34002	enquire
hydromorphone	71-68-1	PTM	1,000	34063	enquire
indeno(1,2,3-cd)pyrene	193-39-5	D	1,000	31279	
iodomethane	74-88-4	PTM	2,000	30292	
isobutyl alcohol	78-83-1	PTM	2,000	30293	
isobutyraldehyde-2,4-DNPH	2057-82-1	ACN	100	33084	
isopropylbenzene	98-82-8	PTM	2,000	30294	
isovaleraldehyde-2,4-DNPH	2256-01-1	ACN	100	33085	
jet fuel A (5mL)	64742-47-8	D	50,000	31243	
jet fuel A	64742-47-8	D	5,000	31215	
jet fuel A	64742-47-8	D	50,000	31242	
JP-4 military fuel	8008-20-6	D	5,000	31219	
JP-4 military fuel	8008-20-6	D	50,000	31250	
JP-4 military fuel	8008-20-6	PTM	50,000	30472	
JP-5 military fuel (5mL)	8008-20-6	D	50,000	31253	
JP-5 military fuel	8008-20-6	D	5,000	31220	
JP-5 military fuel	8008-20-6	D	50,000	31252	
JP-8 military fuel	8008-20-6	D	5,000	31262	
JP-8 military fuel	8008-20-6	D	50,000	31254	
kerosene composite (5mL)	84742-81-0	D	50,000	31257	
kerosene composite	84742-81-0	D	5,000	31094	
kerosene composite	84742-81-0	D	50,000	31256	
kerosene: 25% weathered	84742-81-0	D	5,000	31230	
kerosene: 50% weathered	84742-81-0	D	5,000	31231	
kerosene: 75% weathered	84742-81-0	D	5,000	31232	
kerosene: unweathered	84742-81-0	D	5,000	31229	
LAMPA	40158-98-3	ACN	1,000	34075	enquire
levorphanol	5985-38-6	PTM	1,000	34003	enquire
lorazepam	846-49-1	PTM	1,000	34051	enquire
LSD	50-37-3	ACN	25	34089	enquire
LSD	50-37-3	ACN	100	34088	enquire
MCPA	97-74-6	M	1,000	32269	
MCPP	93-65-2	M	1,000	32271	
3,4-MDA HCl	4764-17-4	M	1,000	34070	enquire
3,4-MDEA HCl	82801-81-8	M	1,000	34072	enquire
4,4'-MDIP	72375-24-7	DMSO	1,000	33003	
3,4-MDMA HCl	42542-10-9	M	1,000	34071	enquire
meperidine	50-13-5	PTM	1,000	34004	enquire
mephobarbital	115-38-8	PTM	1,000	34034	enquire
meprobamate	57-53-4	PTM	1,000	34059	enquire
methacrolein-2,4-DNPH	5077-73-6	ACN	100	33095	
methacrylonitrile	126-98-7	PTM	2,000	30297	
methadone	1095-90-5	PTM	1,000	34005	enquire
(+)methamphetamine	51-57-0	PTM	1,000	34021	enquire
methanol	67-56-1	DMSO	15mg/mL	36401	
methanol	67-56-1	W	10,000	30467	
methaqualone	340-56-7	PTM	1,000	34064	enquire
methohexital	151-83-7	PTM	1,000	34035	enquire
methoxychlor	72-43-5	M	1,000	32233	
2-methoxyethanol	109-86-4	DMSO	0.25mg/mL	36402	
1-(methylamino)anthraquinone	82-38-3	D	100	31823	
methyl arachidate	1120-28-1	Neat		35056	
methyl arachidonate	2566-89-4	Neat		35060	
methyl behenate	929-77-1	Neat		35062	
methyl 2-bromopropionate	5445-17-0	MTBE	1,000	31654	
methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402	
methylbutylketone	591-78-6	DMSO	0.25mg/mL	36400	
methyl caprate	110-42-9	Neat		35041	
methyl caproate	106-70-7	Neat		35037	
methyl caprylate	111-11-5	Neat		35039	
methylcyclohexane	108-87-2	DMSO	5.9mg/mL	36403	enquire
methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656	
2-methyl-4,6-dinitrophenol	534-52-1	M	1,000	31292	
methyl eicosadienoate	2463-02-7	Neat		35058	
methyl eicosatrienoate	55682-88-7	Neat		35059	
methyl eicosenoate	2390-09-2	Neat		35057	
methyl erucate	1120-34-9	Neat		35063	
methyl heneicosanoate	6064-90-0	Neat		35061	
methyl heptadecanoate	1731-92-6	Neat		35050	
methyl heptanoate	106-73-0	Neat		35038	

free data

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Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
methyl laurate	111-82-0	Neat		35043	
methyl lignocerate	2442-49-1	Neat		35064	
methyl linoleate	112-63-0	Neat		35053	
methyl linolenate	301-00-8	Neat		35054	
methyl methacrylate	80-62-6	PTM	2,000	30299	
methyl myristate	124-10-7	Neat		35045	
methyl myristoleate	56219-06-8	Neat		35046	
1-methylnaphthalene	90-12-0	M	1,000	31283	
2-methylnaphthalene	91-57-6	D	1,000	31285	
methyl nervonate	2733-88-2	Neat		35065	
2-methyl-4-nitroaniline	99-55-8	M	1,000	31612	enquire
methyl nonadecanoate	1731-94-8	Neat		35055	
methyl nonanoate	1731-84-6	Neat		35040	
methyl oleate	112-62-9	Neat		35052	
methyl palmitate	112-39-0	Neat		35048	
methyl palmitoleate	1120-25-8	Neat		35049	
methyl pentadecanoate	7162-64-1	Neat		35047	
4-methyl-2-pentanone (MIBK)	108-10-1	PTM	5,000	30400	
3-methylphenol	108-39-4	M	1,000	31403	
N-methylpyrrolidone	872-50-4	DMSO	2.65mg/mL	36405	
methyl stearate	112-61-8	Neat		35051	
methyl tridecanoate	1731-88-0	Neat		35044	
methyl undecanoate	1731-86-8	Neat		35042	
α-methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079	enquire
methylene chloride (dichloromethane)	75-09-2	DMSO	3mg/mL	36404	
methylene chloride (dichloromethane)	75-09-2	PTM	2,000	30401	
methyprylon	125-64-4	PTM	1,000	34060	enquire
metolachlor	51218-45-2	M	100	33209	
metolachlor ESA sodium salt	171118-09-5	M	100	33200	
metolachlor OA	152019-73-3	M	100	33201	
metribuzin	21087-64-9	A	1,000	32436	
mineral spirits: 25% weathered	8030-30-6	D	5,000	31226	
mineral spirits: 50% weathered	8030-30-6	D	5,000	31227	
mineral spirits: 75% weathered	8030-30-6	D	5,000	31228	
mineral spirits: unweathered (5mL)	8030-30-6	D	50,000	31261	
mineral spirits: unweathered	8030-30-6	D	5,000	31225	
mineral spirits: unweathered	8030-30-6	D	50,000	31260	
monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)	111-03-5	pyridine	5,000	33021	
monopalmitin	524-44-9	pyridine	5,000	33026	
morphine	6211-15-0	PTM	1,000	34006	enquire
motor oil composite	64742-47-8	D	50,000	31464	
naphthalene	91-20-3	M	1,000	31280	
naphthalene-d8	1146-65-2	D	2,000	31043	
nicotine	54-11-5	M	1,000	34085	enquire
nitrazepam	146-22-5	PTM	1,000	34053	enquire
nitrobenzene	99-95-3	ACN	1,000	31657	enquire
nitrobenzene-d5	4165-60-0	D	2,000	31044	
nitrobenzene-d5	4165-60-0	D	2,000	33904	
nitroglycerin	55-63-0	M	1,000	31498	enquire
nitroguanidine	556-88-7	M	1,000	31602	enquire
2-nitromesitylene	603-71-4	M	2,000	33902	
nitromethane	75-52-5	DMSO	0.25mg/mL	36406	
4-nitrophenol	100-02-7	M	1,000	31296	
1-nitropropane	108-03-2	D	250	35263	
2-nitropropane	79-46-9	PTM	2,000	30403	
N-nitrosodimethylamine	62-75-9	M	1,000	31427	
N-nitrosodimethylamine-d6	17829-05-9	D	1,000	33910	
N-nitrosodiphenylamine	86-30-6	M	1,000	31429	

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
N-nitroso-di-*n*-propylamine	621-64-7	M	1,000	31428	
N-nitrosodi-*n*-propylamine-d14	93951-96-3	D	1,000	33911	
2-nitrotoluene	88-72-2	ACN	1,000	31659	enquire
3-nitrotoluene	99-08-1	ACN	1,000	31660	enquire
4-nitrotoluene	99-99-0	ACN	1,000	31658	enquire
nonatriacontane (C39) (10mL)	7194-86-7	C	3,000	31877	
n-nonatriacontane (C39)	7194-86-7	C	3,000	31456	
n-octacosane (C28)	630-02-4	D	1,000	31672	
oxazepam	604-75-1	PTM	1,000	34054	enquire
oxycodone	124-90-3	PTM	1,000	34007	enquire
oxymorphone	76-41-5	PTM	1,000	34065	enquire
pentachloroanisole	1825-21-4	M	1,000	32268	
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)	37680-73-2	I	10	32285	
2,3',4,4',5-pentachlorobiphenyl (BZ #118)	31508-00-6	I	10	32293	
pentachloroethane	76-01-7	PTM	2,000	30404	
pentachloronitrobenzene	82-68-8	EA	100	32091	
pentachlorophenol	87-86-5	M	1,000	31297	
n-pentacontane (C50)	6596-40-3	T	10	31685	
pentacosane (C25)	629-99-2	D	10,000	31487	
pentafluorobenzene	363-72-4	PTM	2,000	30031	
pentafluorophenol	771-61-9	D	2,000	31048	
2-pentanone	107-87-9	D	250	35261	
pentazocine	64024-15-3	PTM	1,000	34062	enquire
pentobarbital	76-74-4	PTM	1,000	34036	enquire
perfluorotributylamine (PFTBA)	311-89-7	Neat	1mL	30482	
perfluorotributylamine (PFTBA)	311-89-7	Neat	1g	33027	
PETN (pentaerythritol tetranitrate)	78-11-5	M	1,000	31600	enquire
phenanthrene	85-01-8	M	1,000	31281	
phenanthrene-d10	1517-22-2	D	2,000	31045	
phencyclidine	956-90-1	PTM	1,000	34027	enquire
phendimetrazine	50-58-8	PTM	1,000	34025	enquire
phenmetrazine	1707-14-8	PTM	1,000	34026	enquire
phenobarbital	50-06-6	PTM	1,000	34037	enquire
phenol	108-95-2	M	1,000	31298	
phenol-d6	13127-88-3	D	2,000	31049	
phentermine	1197-21-3	PTM	1,000	34024	enquire
phenylpropanolamine HCl	154-41-6	M	1,000	34073	enquire
picloram	1918-02-1	M	1,000	32265	
picloram methyl ester	14143-55-6	M	1,000	32266	
picric acid	88-89-1	M	1,000	31499	enquire
Polywax 500	9002-88-4	Neat	1g	36224	
Polywax 655	9002-88-4	Neat	1g	36225	
Polywax 850	9002-88-4	Neat	1g	36226	
Polywax 1000	9002-88-4	Neat	1g	36227	
prazepam	2955-38-6	PTM	1,000	34055	enquire
prometryne	7287-19-6	A	1,000	32449	
propachlor	1918-16-7	M	1,000	32235	
2-propanol	67-63-0	W	50,000	30473	
propazine	139-40-2	A	1,000	32448	
propionaldehyde-2,4-DNPH	725-00-8	ACN	100	33086	
propionitrile	107-12-0	PTM	2,000	30407	
propylene glycol dinitrate (PGDN)	6423-43-4	M	1,000	31821	enquire
pyrene	129-00-0	M	1,000	31282	
pyridine	85404-20-2	DMSO	1mg/mL	36407	
pyridine	110-86-1	PTM	2,000	30409	
pyridine-d5	7291-22-7	D	2,000	31046	

Solvent code:

A=acetone
ACN=acetonitrile
C=carbon disulfide
Cy=cyclohexane
D=methylene chloride
DMSO=dimethyl sulfoxide
EA=ethyl acetate
H=hexane
I=isooctane
Ip=isopropanol
M=methanol
MTBE=methyl *tert*-butyl ether
PTM=purge & trap grade methanol
T=toluene
TO-transformer oil
W=water (DI)

*Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.



Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
RDX	121-82-4	ACN	1,000	31666	enquire
secobarbital	29071-21-4	PTM	1,000	34038	enquire
simazine	122-34-9	A	1,000	32236	
stearyl stearate (10mL)	2778-96-3	Cy	2,000	31636	
stearyl stearate (10mL)	2778-96-3	H	2,000	31681	
stearyl stearate	2778-96-3	Neat	100mg	31860	
Stoddard solvent	8052-41-3	PTM	10,000	30487	
styrene	100-42-5	PTM	2,000	30410	
sulfolane	126-33-0	DMSO	0.8mg/mL	36413	
2,4,5-T	93-76-5	M	200	32243	
2,4,5-T methyl ester	1928-37-6	M	1,000	32244	
talbutal	115-44-6	PTM	1,000	34039	enquire
2,4-TDIP	72375-21-4	DMSO	1,000	33001	
2,6-TDIP	195625-39-9	DMSO	1,000	33000	
temazepam	896-50-4	PTM	1,000	34056	enquire
terbuthylazine	5915-41-3	A	1,000	32447	
o-terphenyl	84-15-1	A	2,000	31066	
o-terphenyl	84-15-1	D	10,000	31097	
p-terphenyl	92-94-4	D	10,000	31095	
p-terphenyl-d14	1718-51-0	D	1,000	31828	
α-terpineol	98-55-5	D	2,000	33912	
2,2',5,5'-tetrachlorobiphenyl (BZ #52)	35693-99-3	I	10	32284	
1,1,1,2-tetrachloroethane	630-20-6	PTM	2,000	30411	
1,1,2,2-tetrachloroethane	79-34-5	PTM	2,000	30412	
tetrachloroethene	127-18-4	PTM	2,000	30413	
2,3,4,6-tetrachlorophenol	58-90-2	M	1,000	31402	
2,4,5,6-tetrachloro-*m*-xylene (5mL)	877-09-8	A	200	32028	
2,4,5,6-tetrachloro-*m*-xylene	877-09-8	A	200	32027	
n-tetracontane (C40)	4181-95-7	Neat	100mg	31859	
tetrahydrofuran (THF)	109-99-9	DMSO	3.6mg/mL	36408	
tetrahydrofuran (THF)	109-99-9	PTM	2,000	30414	
tetralin	119-64-2	DMSO	0.5mg/mL	36409	
tetrapentyltin	3765-65-9	D	2,000	31475	
tetra-*n*-propyltin	2176-98-9	D	2,000	31474	
tetryl	479-45-8	ACN	1,000	31667	enquire
Δ⁹-THC	1972-08-3	M	1,000	34067	enquire
(±)11-nor-9-carboxy-Δ⁹-THC	104874-50-2	M	100	34068	enquire
thebaine	115-37-7	PTM	1,000	34009	enquire
thiamylal	337-47-3	PTM	1,000	34040	enquire
thiopental	71-73-8	PTM	1,000	34041	enquire
Tinuvin P	2440-22-4	Ip	51.8	31629	
m-tolualdehyde-2,4-DNPH	2880-05-9	ACN	100	33088	
o-tolualdehyde-2,4-DNPH	1773-44-0	ACN	100	33087	
p-tolualdehyde-2,4-DNPH	2571-00-8	ACN	100	33089	
toluene	108-88-3	DMSO	4.45mg/mL	36410	
toluene	108-88-3	PTM	2,000	30415	
toluene-d8	2037-26-5	PTM	2,000	30224	
toxaphene	8001-35-2	H	1,000	32005	
toxaphene	8001-35-2	I	5,000	32071	
toxaphene	8001-35-2	M	2,000	32015	
2,4,5-TP (Silvex)	93-72-1	M	1,000	32245	
2,4,5-TP (Silvex) methyl ester	4841-20-7	M	1,000	32246	
transformer oil (PCB-free)	64742-53-6	Neat	50mL	32425	
transformer oil (PCB-free)	64742-53-6	Neat	5mL	32424	
n-triacontane-d62 (C30)	638-68-6	D	500	31816	
triazolam	28911-01-5	PTM	1,000	34057	enquire
2,4,6-tribromophenol	118-79-6	M	1,000	31401	
tributylphosphate	126-73-8	A	1,000	32280	
tributyltin chloride	1461-22-9	D	2,000	31478	

Compound Packaged 1mL/ampul*	CAS#	Solvent Code	µg/mL*	cat.#	Individual price
tricaprin (1,2,3-tricaprinoylglycerol)	621-71-6	pyridine	8,000	33025	
tricaprin (1,2,3-tricaprinoylglycerol) (5mL)	621-71-6	pyridine	8,000	33033	
1,2,3-trichlorobenzene	87-61-6	PTM	2,000	30416	
1,2,4-trichlorobenzene	120-82-1	M	1,000	31439	
2,4,4'-trichlorobiphenyl (BZ #28)	7012-37-5	I	10	32283	
1,1,1-trichloroethane	74552-83-3	DMSO	50mg/mL	36411	
1,1,1-trichloroethane	71-55-6	PTM	2,000	30418	
1,1,2-trichloroethane	79-00-5	PTM	2,000	30419	
trichloroethene	79-01-6	DMSO	0.4mg/mL	36412	
trichloroethene	79-01-6	PTM	2,000	30420	
trichlorofluoromethane (CFC-11)	75-69-4	PTM	2,000	30421	
2,4,5-trichlorophenol	95-95-4	A	1,000	32017	
2,4,5-trichlorophenol	95-95-4	M	1,000	31299	
2,4,6-trichlorophenol	88-06-2	M	1,000	31400	
1,2,3-trichloropropane	96-18-4	MTBE	1,000	31648	
1,2,3-trichloropropane	96-18-4	PTM	2,000	30429	
1,1,2-trichlorotrifluoroethane (CFC-113)	76-13-1	PTM	2,000	30462	
α,α,α-trifluorotoluene	98-08-8	PTM	2,000	30048	
α,α,α-trifluorotoluene	98-08-8	PTM	2,500	30068	
α,α,α-trifluorotoluene	98-08-8	PTM	10,000	30083	
trifluralin	1582-09-8	M	1,000	32238	
1,2,4-trimethylbenzene	95-63-6	PTM	2,000	30422	
1,3,5-trimethylbenzene	108-67-8	PTM	2,000	30423	
1,2,4-trimethyl-5-nitrobenzene	610-91-3	M	2,000	33903	
1,3,5-trinitrobenzene	99-35-4	ACN	1,000	31668	enquire
2,4,6-trinitrotoluene	118-96-7	ACN	1,000	31669	enquire
tri-*n*-propyltin chloride	995-25-5	D	2,000	31476	
triolein (1,2,3-Tri[*cis*-octadecenoyl] glycerol)	122-32-7	pyridine	5,000	33023	
tripentyltin chloride	3342-67-4	D	2,000	31477	
triphenylphosphate	115-86-6	A	1,000	32281	
unleaded gasoline composite (5mL)	8006-61-9	PTM	50,000	30206	
unleaded gasoline composite	8006-61-9	PTM	2,500	30081	
unleaded gasoline composite	8006-61-9	PTM	50,000	30205	
unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097	
unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098	
unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099	
unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436	
unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096	
used motor oil composite	64742-65-0	D	50,000	31465	
valeraldehyde-2,4-DNPH	2057-84-3	ACN	100	33090	
γ-valerolactone	108-29-2	ACN	1,000	34080	enquire
vinyl acetate	108-05-4	PTM	2,000	30216	
vinyl chloride	75-01-4	PTM	2,000	30089	
vinyl chloride	75-01-4	PTM	2,500	30093	
m-xylene	108-38-3	DMSO	6.51mg/mL	36414	
m-xylene	108-38-3	PTM	2,000	30424	
o-xylene	95-47-6	DMSO	0.97mg/mL	36415	
o-xylene	95-47-6	PTM	2,000	30425	
p-xylene	106-42-3	DMSO	1.52mg/mL	36416	
p-xylene	106-42-3	PTM	2,000	30426	

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs

For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Solvent code:

A=acetone
ACN=acetonitrile
C=carbon disulfide
Cy=cyclohexane
D=methylene chloride
DMSO=dimethyl sulfoxide
EA=ethyl acetate
H=hexane
I=isooctane
Ip=isopropanol
M=methanol
MTBE=methyl *tert*-butyl ether
PTM=purge & trap grade methanol
T=toluene
TO-transformer oil
W=water (DI)

*Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

searching for the perfect solution?

Let Restek's Analytical Reference Materials Team create the right solution for you!

Restek should be your first choice for custom-made reference materials. Maximum convenience, maximum value, minimum time spent blending calibration mixtures in your laboratory.

- Quick quotations.
- Mixtures made to your specifications.
- Most reference materials shipped within 10 working days after receipt of your order*

We have more than 2,000 pure, characterized, neat compounds in our inventory!
If you do not see the **EXACT** mixture you need listed on any of the following pages, contact us.

* Availability of raw materials and final product testing requested may affect delivery of some mixtures.



Restek's Analytical Reference Materials Group
pictured: Mike Maye, Rebecca Lauver, Randy Fisher, John Lidgett, Joe Tallon, Joe Moodler, Andrea Gill, Matt Hepfer, Kim Dawson, Jessie Emel, Jason Fisher, Mary Ellen Martin, Marty Rockey, Dave Krantz, (not pictured: Ann Glace)

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Method 418.1 426
Method 1311 426
Method 1664 426
Method 3500 426
8000 Series Solid Waste Analyses 427-441
Contract Lab Program 442-451
PCBs 451-452
Organotins 452
Minnesota Dept. of Agriculture Pesticides 453
International Environmental Mixes 454-456
Underground Storage Tank Monitoring 457-467





Top: Joe Tallon, Manufacturing Technician
Bottom: Don McCandless, Head Coach

What's **NEW?** look for this circle

500 Series Methods - US EPA Safe Drinking Water Act (SDWA)

US EPA Method No.	Compound Class
501.1, 501.2, 501.3	Trihalomethanes
502.1, 502.2	Volatile Halogenated Organics
504.1	Ethylene Dibromide/Dibromochloropropane
505	Organohalide Pesticides & PCBs
506	Phthalate & Adipate Esters
507	Nitrogen & Phosphorus Pesticides
508, 508.1, 508A	Chlorinated Pesticides
515, 515.4	Chlorinated Acid Herbicides
521	Nitrosamines
524.1, 524.2	Volatile Organics
525, 525.1, 525.2 NEW!	Semivolatile Organics
526	Semivolatile Organics
527	Pesticides & Flame Retardants (GC/MS)
528	Phenols
529	Nitroaromatics & Nitramines
531.1, 531.2	Carbamates
532	Phenylurea Pesticides
535 NEW!	Chloroacetanilide Herbicide Degradates
547	Glyphosate
549.2	Paraquat/Diquat
551.1	Chlorinated Pesticides & Herbicides
552, 552.1, 552.2, 552.3	Haloacetic Acids and Dalapon
555	Chlorinated Acids
—	Drinking Water Odor Standard

Method 501.1, 501.2, 501.3 (Trihalomethanes)

501 Trihalomethane Mix

bromodichloromethane
bromoform
chloroform
dibromochloromethane

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30036 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30211 (ea.)

DW-VOC Mix #1 (8 components)

benzene
carbon tetrachloride
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
1,1,1-trichloroethane
trichloroethene
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30037 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30219 (ea.)

DW-VOC Mix #2 (12 components)

chlorobenzene
1,2-dichlorobenzene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
ethylbenzene
styrene
tetrachloroethene
toluene
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30038 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30220 (ea.)

DW-VOC Mix #3

methylene chloride
1,2,4-trichlorobenzene
1,1,2-trichloroethane

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30209 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30235 (ea.)

Revised DW-VOC Kit (200µg/mL)

kit

30036: 501 Trihalomethane Mix
30037: DW-VOC Mix #1
30038: DW-VOC Mix #2
30209: DW-VOC Mix #3

Contains 1mL each of these mixtures.
cat. # 30210 (kit)

DW-VOC Kit #2 (2,000µg/mL)

kit

30211: 501 Trihalomethane Mix
30219: DW-VOC Mix #1
30220: DW-VOC Mix #2
30235: DW-VOC Mix #3

Contains 1mL each of these mixtures.
cat. # 30221 (kit)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.



Method 502.1, 502.2 (Volatile Halogenated Organics)

502.2 Internal Standard #1

1-chloro-2-fluorobenzene

2,000µg/mL in P&T methanol, 1mL/ampul

cat. # 30040 (ea.)

502.2 Internal Standard Mix #2

2-bromo-1-chloropropane
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30041 (ea.)

8021/502.2 Surrogate Mix #1

1-bromo-2-chloroethane
fluorobenzene
1-chloro-3-fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30463 (ea.)

8021/502.2 Surrogate Mix #2

1-bromo-2-chloroethane
1-chloro-3-fluorobenzene
4-bromochlorobenzene
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30464 (ea.)

Volatiles MegaMix® with Gases

(60 components)

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane (methyl bromide)
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane (ethyl chloride)
chloroform
chloromethane (methyl chloride)
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane (CFC-12)
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)



methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane (CFC-11)
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul

cat. # 30603 (ea.)

502.2 MegaMix® (54 components)

Includes all target analytes except the six gases, which are available separately as 502.2 Calibration Mix #1.

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroform
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul

cat. # 30432 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30431 (ea.)

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul

cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30042 (ea.)

502.2 Calibration Mix #2 (14 components)

bromodichloromethane
bromoform
carbon tetrachloride
chloroform
1,1-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,3-dichloropropane
2,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,1-trichloroethane
trichloroethene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30043 (ea.)

Antifoam Agent for Purge & Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap, and possibly into the GC column. Our silica-containing antifoam agent is effective over a wide pH range, and will not conflict with chromatography of target analytes.

Neat, 1mL/ampul

cat. # 31822 (ea.)

No data pack available.

Method 502.1, 502.2 (Volatile Halogenated Organics), *cont'd*

502.2 Calibration Mix #3 (14 components)

bromochloromethane
dibromochloromethane
1,2-dibromo-3-chloropropane
1,2-dibromoethane
dibromomethane
1,2-dichloroethane
cis-1,2-dichloroethene
1,2-dichloropropane
1,1-dichloropropene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,2-trichloroethane
1,2,3-trichloropropane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30044 (ea.)

502.2 Calibration Mix #4 (9 components)

benzene
tert-butylbenzene
chlorobenzene
isopropylbenzene
n-propylbenzene
styrene
toluene
1,3,5-trimethylbenzene
m-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30045 (ea.)

502.2 Calibration Mix #5 (10 components)

bromobenzene
n-butylbenzene
sec-butylbenzene
2-chlorotoluene
1,3-dichlorobenzene
ethylbenzene
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30046 (ea.)

502.2 Calibration Mix #6 (7 components)

4-chlorotoluene
1,2-dichlorobenzene
1,4-dichlorobenzene
hexachlorobutadiene
4-isopropyltoluene
naphthalene
1,2,3-trichlorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30047 (ea.)

502.2 VOA Calibration Kit #1 (2,000µg/mL)

30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6

Contains 1mL each of these mixtures.
cat. # 30444 (kit)

502.2 VOA Calibration Kit #2 (2,000µg/mL)

30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix

Contains 1mL each of these mixtures.
cat. # 30445 (kit)

502.2 VOA Calibration Kit #3 (200µg/mL)

30439: 502.2 Calibration Mix #1
30432: 502.2 MegaMix

Contains 1mL each of these mixtures.
cat. # 30446 (kit)

Method 504.1 (Ethylene Dibromide/ Dibromochloropropane)

504.1 Calibration Mix

1,2-dibromo-3-chloropropane
1,2-dibromoethane
1,2,3-trichloropropane

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30239 (ea.)

Method 505 (Organohalide Pesticides & PCBs)

505 Organohalide Pesticide Mix (16 components)

aldrin
alachlor
atrazine
γ-BHC (lindane)
α-chlordane
γ-chlordane
dieldrin
endrin
heptachlor
heptachlor epoxide (isomer B)
hexachlorobenzene
hexachlorocyclopentadiene
methoxychlor
cis-nonachlor
trans-nonachlor
simazine

200µg/mL each in methanol, 1mL/ampul
cat. # 32024 (ea.)

Toxaphene Solutions

1,000µg/mL in hexane, 1mL/ampul
cat. # 32005 (ea.)

2,000µg/mL in methanol, 1mL/ampul
cat. # 32015 (ea.)

5,000µg/mL in isooctane, 1mL/ampul
cat. # 32071 (ea.)

Method 506 (Phthalate & Adipate Esters)

506 Calibration Mix (7 components)

benzyl butyl phthalate
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
di-*n*-butylphthalate
di-*n*-octyl phthalate
diethylphthalate
dimethylphthalate

1,000µg/mL in isooctane, 1mL/ampul
cat. # 31845 (ea.)

506 Laboratory Performance Check Mix (7 components)

benzyl butyl phthalate	250µg/mL	di-*n*-octyl phthalate	650
bis(2-ethylhexyl)adipate	1,200	diethylphthalate	100
bis(2-ethylhexyl)phthalate	250	dimethylphthalate	100
di-*n*-butylphthalate	100		

In P&T methanol, 1mL/ampul
cat. # 31844 (ea.)

free data

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For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Method 507 (Nitrogen & Phosphorus Pesticides)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

alachlor
ametryn
atraton
atrazine
bromacil
butachlor
butylate
chlorpropham
cyanazine (Bladex)
cycloate
diphenamid
EPTC
etridiazole (Terrazole)
fenarimol
fluridone (Sonar)
hexazinone (Velpar)
metolachlor
metribuzin
MGK-264
molinate
napropamide (Devrinol)
norflurazon
pebulate
prometon
prometryne
pronamide (propyzamide)
propachlor
propazine
simazine
simetryn
tebuthiuron
terbacil
terbutryn
triadimefon
tricyclazole (Beam)
trifluralin
vernolate

500µg/mL each in acetone, 1mL/ampul
cat. # 33012 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2

(7 components)

chlorpyrifos (Dursban)
dichlorvos (DDVP)
disulfoton sulfone
ethoprop (ethoprophos)
methyl paraoxon (parathion methyl-O-analog)
mevinphos (phosdrin)
stirofos (tetrachlorvinphos)

500µg/mL each in acetone, 1mL/ampul
cat. # 33013 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

carboxin
diazinon
disulfoton
fenamiphos
merphos
terbufos

1,000µg/mL each in acetone, 1mL/ampul
cat. # 32423 (ea.)

Method 508, 508.1, 508A (Chlorinated Pesticides)

508.1 Internal Standard

pentachloronitrobenzene

100µg/mL in ethyl acetate, 1mL/ampul
cat. # 32091 (ea.)

508.1 Surrogate

4,4'-dibromobiphenyl

500µg/mL in ethyl acetate, 1mL/ampul
cat. # 32092 (ea.)

508.1 GC Degradation Check Mix

4,4'-DDT
endrin

100µg/mL each in ethyl acetate, 1mL/ampul
cat. # 32093 (ea.)

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Method 508, 508.1, 508A (Chlorinated Pesticides) *cont'd*

508 Performance Check Mix

δ-BHC	0.4µg/mL	chlorpyrifos	0.02
chlorothalonil	0.5	DCPA (Dacthal)	0.5

At concentrations listed in methyl *tert*-butyl ether, 1mL/ampul
cat. # 32045 (ea.)

508.1 Calibration Mix #1 (17 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

500µg/mL each in ethyl acetate, 1mL/ampul
cat. # 32094 (ea.)

508.1 Calibration Mix #2 (11 components)

chlorobenzilate
α-chlordane
γ-chlordane
chlorneb
DCPA (Dacthal)
etridiazole
hexachlorobenzene
cis-permethrin*
trans-permethrin*
propachlor
trifluralin

500µg/mL each in ethyl acetate, 1mL/ampul
cat. # 32095 (ea.)

*1,000µg/mL total permethrin. Exact content of each isomer listed on certificate of analysis.

508.1 Calibration Mix #3 (8 components)

alachlor
atrazine
chlorthalonil
cyanazine
hexachlorocyclopentadiene
metolachlor
metribuzin
simazine

500µg/mL each in ethyl acetate, 1mL/ampul
cat. # 32096 (ea.)

Toxaphene Solutions

1,000µg/mL in hexane, 1mL/ampul
cat. # 32005 (ea.)

2,000µg/mL in methanol, 1mL/ampul
cat. # 32015 (ea.)

5,000µg/mL in isooctane, 1mL/ampul
cat. # 32071 (ea.)

Organochlorine Pesticide System Evaluation Mix

4,4'-DDT	200µg/mL
endrin	100µg/mL

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 32417 (ea.)

Decachlorobiphenyl, 508A

200µg/mL in acetone, 1mL/ampul
cat. # 32029 (ea.)

200µg/mL in acetone, 5mL/ampul
cat. # 32030 (ea.)

10µg/mL in isooctane, 1mL/ampul
cat. # 32289 (ea.)

Method 508, 508.1, 508A (Chlorinated Pesticides) *cont'd*

508.1 Pesticide Kit

kit

32045: 508 Performance Check Mix
32091: 508.1 Internal Standard Mix
32092: 508.1 Surrogate Mix
32093: 508.1 GC Degradation Check Mix
32094: 508.1 Calibration Mix #1
32095: 508.1 Calibration Mix #2
32096: 508.1 Calibration Mix #3

Contains 1mL each of these mixtures.
cat. # 32097 (kit)

Method 515, 515.4 (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-dibromooctafluorobiphenyl

250µg/mL in hexane, 1mL/ampul
cat. # 32053 (ea.)

2,000µg/mL in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31856 (ea.)

Herbicide Surrogate

Free Acid Form:
2,4-dichlorophenylacetic acid (DCAA)

200µg/mL in methanol, 1mL/ampul
cat. # 32049 (ea.)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32439 (ea.)

Derivatized Form:
2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200µg/mL in hexane, 1mL/ampul
cat. # 32050 (ea.)

Herbicide Lab Performance Check Mix

	4µg/mL
dinoseb methyl ether	
DCAA methyl ester	500
4,4'-dibromooctafluorobiphenyl	250
3,5-dichlorobenzoic acid methyl ester	600
4-nitroanisole	1,600

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 32063 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form:

2,4-D
2,4-DB
2,4,5-T
2,4,5-TP
dicamba
dichlorprop
dinoseb

200µg/mL each in methanol, 1mL/ampul
cat. # 32054 (ea.)

Derivatized Form:

2,4-D methyl ester
2,4-DB methyl ester
2,4,5-T methyl ester
2,4,5-TP methyl ester
dicamba methyl ester
dichlorprop methyl ester
dinoseb methyl ether

200µg/mL each in hexane, 1mL/ampul
cat. # 32055 (ea.)

Method 515, 515.4 (Chlorinated Acid Herbicides) *cont'd*

Herbicide Mix #2

Free Acid Form:
dalapon

2,000µg/mL in methanol, 1mL/ampul
cat. # 32056 (ea.)

Derivatized Form:
dalapon methyl ester

2,000µg/mL in hexane, 1mL/ampul
cat. # 32057 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form:

acifluorfen
bentazon
chloramben
DCPA diacid
3,5-dichlorobenzoic acid
4-nitrophenol
pentachlorophenol
picloram

200µg/mL each in methanol, 1mL/ampul
cat. # 32061 (ea.)

Derivatized Form:

acifluorfen methyl ester
bentazon methyl ester
chloramben methyl ester
DCPA (Dacthal)
3,5-dichlorobenzoic acid methyl ester
4-nitroanisole
pentachloroanisole
picloram methyl ester

200µg/mL each in hexane, 1mL/ampul
cat. # 32062 (ea.)

515.4 Calibration Mix (16 components)

	50µg/mL		
acifluorfen (Blazer)		3,5-dichlorobenzoic acid	50
bentazon	100	dichlorprop	100
chloramben	50	dinoseb	100
2,4-D	100	pentachlorophenol	10
dalapon	100	picloram	50
2,4-DB	100	quinclorac	50
DCPA diacid (tetrachloroterephthalic acid)	50	2,4,5-T	25
		2,4,5-TP (Silvex)	25
dicamba	50		

In acetone, 1mL/ampul
cat. # 32443 (ea.)

515.4 Methylated Chlorinated Acids Mix (16 components)

	50µg/mL		
acifluorfen methyl ester		dichlorprop methyl ester	100
bentazon methyl ester	100	dinoseb methyl ether	100
chloramben methyl ester	50	pentachloroanisole	10
dalapon methyl ester	100	picloram methyl ester	50
2,4-D methyl ester	100	quinclorac methyl ester	50
2,4-DB methyl ester	100	2,4,5-T methyl ester	25
DCPA (Dacthal)	100	2,4,5-TP (Silvex) methyl ester	25
dicamba methyl ester	50		
3,5-dichlorobenzoic acid methyl ester	50		

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 32444 (ea.)



also **available**

Additional chlorinated acid herbicides mixes:

see Method 555, **page 419.**
and Method 8321, **page 440**.

Method 521 (Nitrosamines)

Nitrosamine Calibration Mix, Method 521 (7 components)

N-nitrosodiethylamine
N-nitrosodimethylamine
N-nitrosodi-*n*-butylamine
N-nitrosodi-*n*-propylamine
N-nitrosomethylethylamine
N-nitrosopiperidine
N-nitrosopyrrolidine

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31898 (ea.)

N-Nitrosodimethylamine-d6

N-nitrosodimethylamine-d6
1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 33910 (ea.)

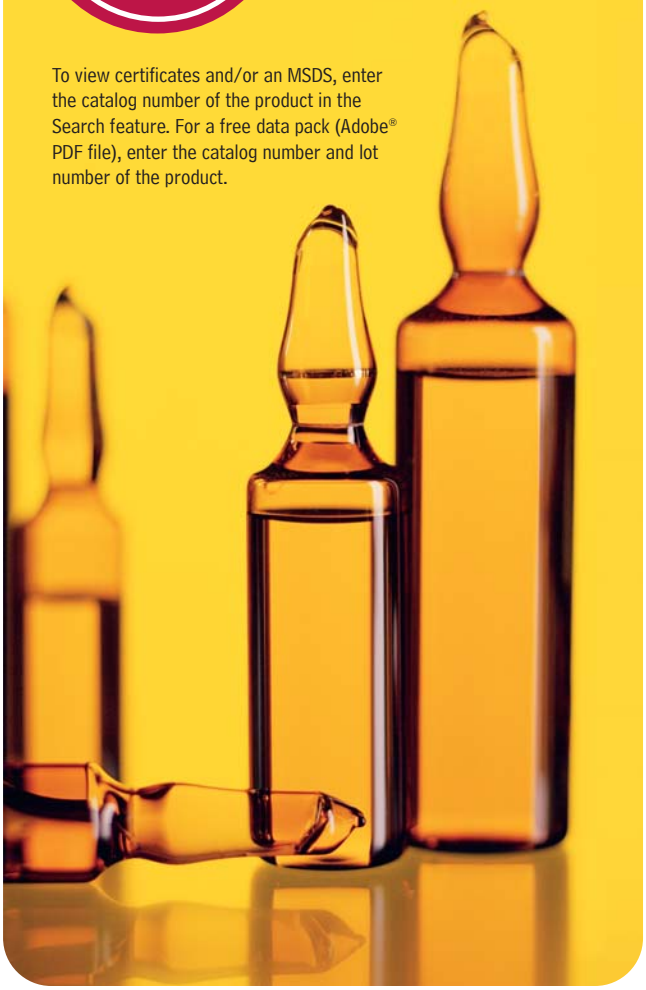
N-Nitrosodi-*n*-propylamine-d14

N-nitrosodi-*n*-propylamine-d14
1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 33911 (ea.)

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Method 524.1, 524.2 (Volatile Organics)

524 Internal Standard/Surrogate Mix

4-bromofluorobenzene
1,2-dichlorobenzene-d4
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30201 (ea.)

Surrogate Standard

4-bromofluorobenzene
α,α,α-trifluorotoluene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30484 (ea.)

524.2 Surrogate Standard

1-bromo-4-fluorobenzene
1,2-dichlorobenzene-d4

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30607 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1mL/ampul
cat. # 30482 (ea.)

Neat, 1g
cat. # 33027 (ea.)

No data pack available.

Volatiles MegaMix® with Gases (60 components)

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane (methyl bromide)
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane (ethyl chloride)
chloroform
chloromethane (methyl chloride)
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane (CFC-12)
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane (CFC-11)
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30603 (ea.)

Method 524.1, 524.2 (Volatile Organics) *cont'd*

Drinking Water VOA MegaMix®, 524.2 Rev. 4.1 (73 components)

acrylonitrile
allyl chloride
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon disulfide
carbon tetrachloride
chloroacetonitrile
chlorobenzene
1-chlorobutane
chlorodibromomethane (dibromochloromethane)
chloroform
2-chlorotoluene
4-chlorotoluene
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (ethylene dibromide)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
trans-1,4-dichloro-2-butene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
diethyl ether (ethyl ether)
ethylbenzene
ethyl methacrylate
hexachloro-1,3-butadiene
hexachloroethane
iodomethane (methyl iodide)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methacrylonitrile
methyl acrylate
methyl *tert*-butyl ether (MTBE)
methylene chloride (dichloromethane)
methyl methacrylate
naphthalene
nitrobenzene
2-nitropropane
pentachloroethane
propionitrile (ethylcyanide)
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30601 (ea.)

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30042 (ea.)

Ketones Mix, 524.2 Rev. 4.1 (5 components)

acetone
2-butanone (MEK)
1,1-dichloro-2-propanone
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000µg/mL each in 90% P&T methanol:10% water, 1mL/ampul
cat. # 30602 (ea.)



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SPE Cartridges and Disks
See **pages 356 and 361** for details.

Oxygenates Standard

diisopropyl ether (DIPE)	2,000µg/mL
ethyl-*tert*-butyl ether (ETBE)	2,000
tert-amyl ethyl ether (TAEE)	2,000
tert-amyl methyl ether (TAME)	2,000
tert-butyl alcohol (TBA)	10,000

In P&T methanol, 1mL/ampul
cat. # 30619 (ea.)

524 Calibration Mix #7 (12 components)

Note: Due to compound interactions, this mixture is a two ampul set.

Ampul 1:
acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)
tetrahydrofuran

Ampul 2:
acrylonitrile
allyl chloride
ethyl methacrylate
methyl acrylate
methyl methacrylate
nitrobenzene
pentachloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30202 (ea.)

524 Calibration Mix #8 (12 components)

carbon disulfide
chloroacetonitrile
1-chlorobutane
trans-1,4-dichloro-2-butene
1,1-dichloro-2-propanone
diethyl ether
hexachloroethane
iodomethane (methyl iodide)
methacrylonitrile
methyl *tert*-butyl ether
2-nitropropane
propionitrile

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30203 (ea.)

524 Rev. 4.0 Volatile Organics Kit (2,000µg/mL)

kit

30201: 524 Internal Standard/Surrogate Mix
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30202: 524 Calibration Mix #7
30203: 524 Calibration Mix #8

Contains 1mL each of these mixtures.
cat. # 30204 (kit)

524 Rev. 4.0 VOA Kit #2 (2,000µg/mL)

kit

30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix
30202: 524 Calibration Mix #7
30203: 524 Calibration Mix #8
30201: 524 Surrogate/Internal Standard Mix

Contains 1mL each of these mixtures.
cat. # 30447 (kit)

Note: For a listing of additional individual VOA surrogate and internal standards, see page 423.

did you **know**?

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Method 525, 525.1, 525.2 (Semivolatile Organics)

Method 525.2 Internal Standard Mix

acenaphthene-d10
chrysene-d12
phenanthrene-d10

1,000µg/mL each in acetone, 1mL/ampul
cat. # 31825 (ea.)

Method 525.2 Surrogate Standard Mix

2-nitro-*m*-xylene
perylene-d12
pyrene-d10
triphenylphosphate

1,000µg/mL each in acetone, 1mL/ampul
cat. # 31826 (ea.)

Method 525.2 Herbicide Analytes

NEW!

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.) price
acetochlor	M	100	33208
alachlor	M	100	33207
metolachlor	M	100	33209

M=methanol

Method 525.2 Herbicide Mix

NEW!

acetochlor
alachlor
metolachlor

100µg/mL in methanol, 1mL/ampul
cat. # 33211 (ea.)

Method 525.2 Semivolatile Mix (revised) (28 components)

acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzylbutylphthalate
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
chrysene
dibenzo(a,h)anthracene
diethylphthalate
dimethylphthalate
di-*n*-butylphthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octylphthalate
fluoranthene
fluorene
hexachlorobenzene
hexachlorocyclopentadiene
indeno(1,2,3-cd)pyrene
isophorone
naphthalene
pentachlorophenol*
phenanthrene
pyrene

1,000µg/mL each in acetone, 1mL/ampul*
cat. # 31899 (ea.)

*pentachlorophenol at 4,000µg/mL.



also **available**

Try our CLPesticides columns for these applications.

See **pages 80-82** for details.

Method 525.2 PCB Congener Mix (8 components)

2-chlorobiphenyl (BZ#1)
2,3-dichlorobiphenyl (BZ#5)
2,4,5-trichlorobiphenyl (BZ#29)
2,2',4,4'-tetrachlorobiphenyl (BZ#47)
2,2',3',4,6-pentachlorobiphenyl (BZ#98)
2,2',4,4',5,6'-hexachlorobiphenyl (BZ#154)
2,2',3,3',4,4',6-heptachlorobiphenyl (BZ#171)
2,2',3,3',4,5',6,6'-octachlorobiphenyl (BZ#200)

200µg/mL each in acetone, 1mL/ampul
cat. # 32420 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
α-chlordane
γ-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul
cat. # 32415 (ea.)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

alachlor
ametryn
atraton
atrazine
bromacil
butachlor
butylate
chlorpropham
cyanazine (Bladex)
cycloate
diphenamid
EPTC
etridiazole (Terrazole)
fenarimol
fluridone (Sonar)
hexazinone (Velpar)
metolachlor
metribuzin
MGK-264
molinate
napropamide (Devrinol)
norflurazon
pebulate
prometon
prometryne
pronamide (propyzamide)
propachlor
propazine
simazine
simetryn
tebuthiuron
terbacil
terbutryn
triadimefon
tricyclazole (Beam)
trifluralin
vernolate

500µg/mL each in acetone, 1mL/ampul
cat. # 33012 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2

(7 components)

chlorpyrifos (Dursban)
dichlorvos (DDVP)
disulfoton sulfone
ethoprop (ethoprophos)
methyl paraoxon (parathion methyl-O-analog)
mevinphos (phosdrin)
stirofos (tetrachlorvinphos)

500µg/mL each in acetone, 1mL/ampul
cat. # 33013 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

carboxin
diazinon
disulfoton
fenamiphos
merphos
terbufos

1,000µg/mL each in acetone, 1mL/ampul
cat. # 32423 (ea.)

also **available**

See **pages 408-409** for 502.2 MegaMix® and 502.2 calibration mixes.

Method 525, 525.1, 525.2 (Semivolatile Organics) *cont'd*

Organochlorine Pesticide Mix #2 (Rev), Method 525.2
(8 components)

chlorobenzilate
chloroneb
chlorothalonil
DCPA (Dacthal)
heptachlor epoxide (isomer A)
trans-nonachlor
cis-permethrin
trans-permethrin

500µg/mL each in acetone, 1mL/ampul
cat. # 33011 (ea.)

Method 525.2 Fortification Recovery Standard
p-terphenyl-d14

1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31828 (ea.)

Method 525.2 GC/MS Performance Check Mix
4,4'-DDT
DFTPP (decafluorotriphenylphosphine)
endrin

1,000µg/mL each in acetone, 1mL/ampul
cat. # 31827 (ea.)

Method 526 (Semivolatile Organics)

Internal Standard Mix, EPA 526
acenaphthene-d10
chrysene-d12
phenanthrene-d10

500µg/mL each in acetone, 1mL/ampul
cat. # 31692 (ea.)

Surrogate Standard Mix, EPA 526
2-nitro-*m*-xylene
triphenylphosphate

500µg/mL each in acetone, 1mL/ampul
cat. # 31693 (ea.)

Semivolatile Calibration Mix, EPA 526 (11 components)
acetochlor
cyanazine
diazinon
2,4-dichlorophenol
1,2-diphenylhydrazine
disulfoton
fonofos
nitrobenzene
prometon
terbufos
2,4,6-trichlorophenol

200µg/mL each in ethyl acetate, 1mL/ampul
cat. # 31691 (ea.)

Antifoam Agent for Purge & Trap Samples
Foam generated as purge gas passes through a sample can enter the analytical trap, and possibly into the GC column. Our silica-containing antifoam agent is effective over a wide pH range, and will not conflict with chromatography of target analytes.

Neat, 1mL/ampul
cat. # 31822 (ea.)

No data pack available.

Method 527 (Pesticides & Flame Retardants-GC/MS)

Internal Standard, Method 527
acenaphthene-d10
chrysene-d12
phenanthrene-d10

500µg/mL each in acetone, 1mL/ampul
cat. # 33010 (ea.)

Method 525.2 Internal Standard Mix
acenaphthene-d10
chrysene-d12
phenanthrene-d10

1,000µg/mL each in acetone, 1mL/ampul
cat. # 31825 (ea.)

Surrogate Standard, Method 527
1,3-dimethyl-2-nitrobenzene
perylene-d12
triphenylphosate

500µg/mL each in acetone, 1mL/ampul
cat. # 33009 (ea.)

Method 525.2 Surrogate Standard Mix
2-nitro-*m*-xylene
perylene-d12
pyrene-d10
triphenylphosphate

1,000µg/mL each in acetone, 1mL/ampul
cat. # 31826 (ea.)

PBDE Mix
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)
2,2',4,4',5,5'-hexabromobiphenyl
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)

50µg/mL each in isooctane:ethyl acetate (4:1), 1mL/ampul
cat. # 33098 (ea.)

Pesticides Mix #1, Method 527 (16 components)
atrazine
bifenthrin
esbiol (Bioallethrin, S-cyclopentyl isomer)
bromacil
esfenvalarate
fenvalarate
hexazinone
kepone
mirex
nitrofen
norflurazon
oxychlordane
prometryne
propazine
thiobencarb
vinclozolin

500µg/mL each in ethyl acetate, 1mL/ampul
cat. # 33007 (ea.)

Pesticides Mix #2, Method 527
chloropyrifos (Dursban)
dimethoate
malathion
parathion
terbufos sulfone

500µg/mL each in ethyl acetate, 1mL/ampul
cat. # 33008 (ea.)

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Method 528 (Phenols)

Internal Standard Mix, EPA 528

3-nitro-*o*-xylene	1,000µg/mL
2,3,4,5-tetrachlorophenol	2,000

In methylene chloride, 1mL/ampul

cat. # 31696 (ea.)

Surrogate Standard Mix, EPA 528

2-chlorophenol-d4	1,000µg/mL
2,4-dimethylphenol-3,5,6-d3	1,000
2,4,6-tribromophenol	2,000

In methanol, 1mL/ampul

cat. # 31697 (ea.)

Phenol Calibration Mix, EPA 528 (12 components)

4-chloro-3-methylphenol	2-methyl-4,6-dinitrophenol
2-chlorophenol	2-nitrophenol
o-cresol	4-nitrophenol
2,4-dichlorophenol	pentachlorophenol
2,4-dimethylphenol	phenol
2,4-dinitrophenol	2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31694 (ea.)

Phenols Fortification Mix, EPA 528 (12 components)

4-chloro-3-methylphenol	100µg/mL	2-methyl-4,6-dinitrophenol	500
2-chlorophenol	100	2-nitrophenol	100
o-cresol	100	4-nitrophenol	500
2,4-dichlorophenol	100	pentachlorophenol	500
2,4-dimethylphenol	100	phenol	100
2,4-dinitrophenol	500	2,4,6-trichlorophenol	100

In methanol, 1mL/ampul

cat. # 31695 (ea.)

Method 529 (Nitroaromatics & Nitramines)

529 Internal Standard Mix

3,4-dinitrotoluene

2,000µg/mL in ethyl acetate, 1mL/ampul

cat. # 33901 (ea.) enquire

529 Surrogate Standard #1

2-nitromesitylene

2,000µg/mL in methanol, 1mL/ampul

cat. # 33902 (ea.)

529 Surrogate Standard #2

1,2,4-trimethyl-5-nitrobenzene

2,000µg/mL in methanol, 1mL/ampul

cat. # 33903 (ea.)

529 Surrogate Standard #3

nitrobenzene-d5

2,000µg/mL in methylene chloride, 1mL/ampul

cat. # 33904 (ea.)

Nitroaromatics and Nitramine Explosives in Drinking Water

(14 components)

3,5-dinitroaniline	2-nitrotoluene
1,3-dinitrobenzene	3-nitrotoluene
2-amino-4,6-dinitrotoluene	4-nitrotoluene
4-amino-2,6-dinitrotoluene	RDX
2,4-dinitrotoluene	tetryl
2,6-dinitrotoluene	1,3,5-trinitrobenzene
nitrobenzene	2,4,6-trinitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul

cat. # 33900 (ea.) enquire

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Method 531.1, 531.2 (Carbamates)

Internal Standard
4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)
100µg/mL in methanol, 1mL/ampul
cat. # 32274 (ea.)

531.1 Performance Check Mix

aldicarb sulfoxide	100µg/mL	3-hydroxycarbofuran	2
BDMC	10	methiocarb	20

In methanol, 1mL/ampul
cat. # 32275 (ea.)

531.1 Carbamate Pesticide Calibration Mixture (10 components)

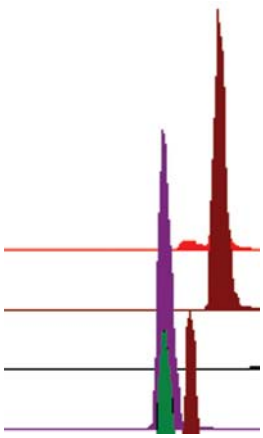
aldicarb	3-hydroxycarbofuran
aldicarb sulfone	methiocarb
aldicarb sulfoxide	methomyl
carbaryl (Sevin)	oxamyl
carbofuran	propoxur (Baygon)

100µg/mL each in methanol, 1mL/ampul
cat. # 32273 (ea.)

531.2 Carbamate Pesticide Calibration Mixture (11 components)

aldicarb	methiocarb
aldicarb sulfone	methomyl
aldicarb sulfoxide	1-naphthol
carbaryl (Sevin)	oxamyl
carbofuran	propoxur (Baygon)
3-hydroxycarbofuran	

100µg/mL in acetonitrile, 1mL/ampul
cat. # 32435 (ea.)



also **available**

See the LC Applications section for carbamate pesticides chromatograms page 507.

Method 532 (Phenylurea Pesticides)

Phenylurea Surrogate Mixture

carbazole	monuron

500µg/mL each in methanol:acetonitrile (50:50), 1mL/ampul
cat. # 32433 (ea.)

Phenylurea Pesticide Mixture (8 components)

diflubenzuron	propanil
diuron	siduron
fluometuron	tebuthiuron
linuron	thidiazuron

200µg/mL each in acetonitrile:acetone (90:10), 1mL/ampul
cat. # 32434 (ea.)

Method 535 (Chloroacetanilide Herbicide Degradates)

Method 535 Internal Standard
butachlor ESA sodium salt
100µg/mL in methanol, 1mL/ampul
cat. # 33202 (ea.)

Method 535 Surrogate Standard
dimethachlor ESA sodium salt
100µg/mL in methanol, 1mL/ampul
cat. # 33203 (ea.)

Method 535 Individual Compounds
Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
acetochlor ESA sodium salt	M	100	33092	
acetochlor OA	M	100	33094	
alachlor ESA sodium salt	M	100	33096	
alachlor OA	M	100	33099	
metolachlor ESA sodium salt	M	100	33200	
metolachlor OA	M	100	33201	

M=methanol

Method 547 (Glyphosate)

Glyphosate Standard
glyphosate
1,000µg/mL in DI water, 1mL/ampul
cat. # 32426 (ea.)
1,000µg/mL in DI water, 5mL/ampul
cat. # 32427 (ea.)

AMPA (glyphosate metabolite)
aminomethyl phosphonic acid (AMPA)
100µg/mL in DI water, 1mL/ampul
cat. # 32428 (ea.)

Method 549.2 (Paraquat/Diquat)

Paraquat & Diquat Calibration Mix

diquat dibromide	paraquat dichloride

1,000µg/mL each in water, 1mL/ampul
cat. # 32437 (ea.)

Ultra Quat Reagent Solution
Use with Ultra Quat HPLC column. Dilute to 1 liter water, per instructions.

In water, 20mL/bottle
cat. # 32441 (ea.)

Method 551.1 (Chlorinated Pesticides & Herbicides)

551.1 Internal Standard
1-bromo-4-fluorobenzene
1,000µg/mL in acetone, 1mL/ampul
cat. # 31854 (ea.)

551.1 Surrogate Standard
decafluorobiphenyl
1,000µg/mL in acetone, 1mL/ampul
cat. # 31855 (ea.)

Method 551.1 Pesticide/Herbicide Mix (16 components)

alachlor	heptachlor
atrazine	heptachlor epoxide (isomer B)
bromacil	hexachlorobenzene
cyanazine (Bladex)	hexachlorocyclopentadiene
endrin	methoxychlor
endrin aldehyde	metolachlor
endrin ketone	simazine
γ-BHC (lindane)	trifluralin

1,000µg/mL each in acetone, 1mL/ampul
cat. # 32438 (ea.)

Method 551.1 MTBE Lab Performance Check Mix
(7 components)

alachlor	83µg/mL	endrin	30
γ-BHC (lindane)	0.2	hexachlorocyclopentadiene	20
bromacil	83	trichloroethylene	30
bromodichloromethane	30		

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 32440 (ea.)

Disinfection By-Product and Chlorinated Solvents Mix
(19 components)

bromochloroacetonitrile	dichloroacetonitrile
bromodichloromethane	1,1-dichloro-2-propanone
bromoform	tetrachloroethylene
carbon tetrachloride	trichloroacetonitrile
chloroform	1,1,1-trichloroethane
chloropicrin	1,1,2-trichloroethane
dibromoacetonitrile	trichloroethylene
dibromochloromethane	1,2,3-trichloropropane
1,2-dibromo-3-chloropropane (DBCP)	1,1,1-trichloro-2-propanone
1,2-dibromoethane (EDB)	

2,000µg/mL each in acetone, 1mL/ampul
cat. # 30615 (ea.)

Chloral Hydrate
chloral hydrate
1,000µg/mL in acetonitrile, 1mL/ampul
cat. # 30609 (ea.)

Method 551.1 (Chlorinated Pesticides & Herbicides) *cont'd*

Disinfection By-Product Mix (7 components)

bromochloroacetonitrile	1,1-dichloro-2-propanone
chloropicrin	trichloroacetonitrile
dibromoacetonitrile	1,1,1-trichloro-2-propanone
dichloroacetonitrile	

2,000µg/mL each in acetone, 1mL/ampul
cat. # 30616 (ea.)

Laboratory Performance Check Solution/ Pentane Extract
(7 components)

alachlor	83µg/mL	endrin	30
γ-BHC	0.2	hexachlorocyclopentadiene	20
bromacil	83	trichloroethylene	30
bromodichloromethane	30		

In pentane, 1mL/ampul
cat. # 32442 (ea.)

Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon)

Haloacetic Acid Mix (9 components)

bromochloroacetic acid	monobromoacetic acid
bromodichloroacetic acid	monochloroacetic acid
chlorodibromoacetic acid	tribromoacetic acid
dibromoacetic acid	trichloroacetic acid
dichloroacetic acid	

1,000µg/mL each in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31896 (ea.)

Haloacetic Acid Methyl Ester Mix (9 components)

methyl bromochloroacetate	methyl monobromoacetate
methyl bromodichloroacetate	methyl monochloroacetate
methyl chlorodibromoacetate	methyl tribromoacetate
methyl dibromoacetate	methyl trichloroacetate
methyl dichloroacetate	

1,000µg/mL each in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31897 (ea.)

Haloacetic Acid Mix #1 (6 components)

bromochloroacetic acid	monobromoacetic acid
dibromoacetic acid	monochloroacetic acid
dichloroacetic acid	trichloroacetic acid

2,000µg/mL each in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31644 (ea.)

Haloacetic Acid Methyl Ester Mix #1 (6 components)

methyl bromochloroacetate	methyl monobromoacetate
methyl dibromoacetate	methyl monochloroacetate
methyl dichloroacetate	methyl trichloroacetate

1,000µg/mL each in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31645 (ea.)

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Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon) *cont'd*

Haloacetic Acid Mix #2 (9 components)

bromochloroacetic acid	400µg/mL	monobromoacetic acid	400
bromodichloroacetic acid	400	monochloroacetic acid	600
chlorodibromoacetic acid	1,000	tribromoacetic acid	2,000
dibromoacetic acid	200	trichloroacetic acid	200
dichloroacetic acid	600		

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 31646 (ea.)

Haloacetic Acid Methyl Ester Mix #2 (9 components)

methyl bromochloroacetate	400µg/mL	methyl dichloroacetate	600
methyl bromodichloroacetate	400	methyl monobromoacetate	400
methyl chlorodibromoacetate	1,000	methyl monochloroacetate	600
methyl dibromoacetate	200	methyl tribromoacetate	2,000
		methyl trichloroacetate	200

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 31647 (ea.)

Dalapon (2,2-dichloropropionic acid)

dalapon
1,000µg/mL in acetonitrile, 1mL/ampul
cat. # 32432 (ea.)
1,000µg/mL in methanol, 1mL/ampul
cat. # 32253 (ea.)
2,000µg/mL in methanol, 1mL/ampul
cat. # 32056 (ea.)

Dalapon Methyl Ester

dalapon methyl ester
1,000µg/mL in methanol, 1mL/ampul
cat. # 32254 (ea.)
2,000µg/mL in hexane, 1mL/ampul
cat. # 32057 (ea.)

Internal Standards and Surrogates

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
Internal Standard:				
1,2,3-trichloropropane	MTBE	1,000	31648	
Surrogates for Method 552, 552.1:				
2,3-dichloropropionic acid	MTBE	1,000	31650	
3,5-dichlorobenzoic acid	MTBE	1,000	31652	
3,5-dichlorobenzoic acid methyl ester	MTBE	1,000	31649	
2,3-dichloropropionic acid methyl ester	MTBE	1,000	31651	
Surrogates for Method 552.2:				
2-bromopropionic acid	MTBE	1,000	31653	
2,3-dibromopropionic acid	MTBE	1,000	31655	
methyl 2-bromopropionate	MTBE	1,000	31654	
methyl-2,3-dibromopropionate	MTBE	1,000	31656	
Surrogates for Method 552.3:				
2-bromobutanoic acid	MTBE	2,000	31881	
2-bromobutyrate	MTBE	2,000	31882	

MTBE = methyl *tert*-butyl ether

Method 555 (Chlorinated Acids)

Chlorinated Acids by HPLC, Mix A (8 components)

acifluorfen (Blazer)	dicamba
bentazon	dichlorprop
chloramben	picloram
2,4-D	2,4,5-TP (Silvex)

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32431 (ea.)

Chlorinated Acids by HPLC, Mix B (8 components)

2,4-DB	MCPP (mecoprop)
3,5-dichlorobenzoic acid	4-nitrophenol
dinoseb	pentachlorophenol
MCPA	2,4,5-T

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32430 (ea.)

Chlorinated Acid Herbicide Mix

2,4-dichlorophenoxyacetic acid (2,4-D)
2,4,5-TP (Silvex)
1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32429 (ea.)

Drinking Water Odor Standard

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10ppt) and purge and trap analyses usually are used to quantify them.

(+/-)-geosmin	2-methylisoborneol

100µg/mL in P&T methanol, 1mL/ampul
cat. # 30608 (ea.)

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600 Series Methods - US EPA Clean Water Act (CWA)

US EPA Method No.	Compound Class
601	Purgeable Hydrocarbons
602	Purgeable Aromatics
603	Acrolein/Acrylonitrile
604	Phenols
605	Benzidine/3,3'-Dichlorobenzidine
606	Phthalate Esters
607	Nitrosamines
608	Organochlorine Pesticides and PCBs
609	Nitroaromatics/Isophorone
610	Polycyclic Aromatic Hydrocarbons (PAHs)
611	Haloethers
612	Chlorinated Hydrocarbons
615	Chlorinated Acid Herbicides
624	Purgeable Halocarbons
625	Semivolatiles

Method 601 (Purgeable Hydrocarbons)

VOA Purgeable Halocarbon Mix #1 (23 components)

bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30212 (ea.)

Method 602 (Purgeable Aromatics)

602 Purgeable Aromatics Calibration Mix (7 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30035 (ea.)

Method 603 (Acrolein/Acrylonitrile)

Acrolein/Acrylonitrile

acrolein
acrylonitrile

2,000µg/mL each in DI water, 1mL/ampul
cat. # 30600 (ea.)

Acrolein

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30499 (ea.)

10,000µg/mL in water, 1mL/ampul
cat. # 30478 (ea.)

Acrylonitrile

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30246 (ea.)

Method 604 (Phenols)

604 Phenols Calibration Mix (11 components)

4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,6-trichlorophenol

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31029 (ea.)

Method 605 (Benzidine/3,3′-Dichlorobenzidine)

605 Benzidines Calibration Mix

benzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31030 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31834 (ea.)

Method 606 (Phthalate Esters)

606 Phthalate Esters Calibration Mix

bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
diethyl phthalate
dimethyl phthalate
di-*n*-butyl phthalate
di-*n*-octyl phthalate

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31031 (ea.)

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Method 607 (Nitrosamines)

607 Nitrosamines Calibration Mix

N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
N-nitrosodiphenylamine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31032 (ea.)

Method 608 (Organochlorine Pesticides & PCBs)

608 Calibration Mix (16 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide (isomer B)

200µg/mL each in hexane:toluene (1:1), 1mL/ampul
cat. # 32022 (ea.)

Organochlorine Pesticide System Evaluation Mix

4,4'-DDT	200µg/mL
endrin	100µg/mL

In methyl *tert*-butyl ether, 1mL/ampul
cat. # 32417 (ea.)

608 Complete Kit

kit

32022: 608 Calibration Mix
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260
32005: toxaphene
32021: chlordane (technical)

Contains 1mL each of these mixtures.
cat. # 32060 (kit)

Please see page 425 for individual Aroclor, toxaphene, and chlordane information.

Method 609 (Nitroaromatics/Isophorone)

609 Nitroaromatics & Isophorone Calibration Mix

2,4-dinitrotoluene
isophorone
2,6-dinitrotoluene
nitrobenzene

2,000µg/mL each in hexane, 1mL/ampul
cat. # 31033 (ea.)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Method 610 (Polycyclic Aromatic Hydrocarbons [PAHs])

SV Calibration Mix #5 / 610 PAH Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31011 (ea.)

610 PAH Calibration Mix A (16 components)

For HPLC/fluorescence detection.

acenaphthene	1,000µg/mL	chrysene	500
acenaphthylene	1,000	dibenzo(a,h)anthracene	500
anthracene	1,000	fluoranthene	500
benzo(a)anthracene	500	fluorene	1,000
benzo(a)pyrene	500	indeno(1,2,3-cd)pyrene	500
benzo(b)fluoranthene	500	naphthalene	1,000
benzo(k)fluoranthene	500	phenanthrene	500
benzo(ghi)perylene	500	pyrene	500

In methylene chloride, 1mL/ampul
cat. # 31264 (ea.)

610 PAH Calibration Mix B (16 components)

For HPLC/UV detection.

acenaphthene	1,000µg/mL	chrysene	100
acenaphthylene	2,000	dibenzo(a,h)anthracene	200
anthracene	100	fluoranthene	200
benzo(a)anthracene	100	fluorene	200
benzo(a)pyrene	100	indeno(1,2,3-cd)pyrene	100
benzo(b)fluoranthene	200	naphthalene	1,000
benzo(k)fluoranthene	100	phenanthrene	100
benzo(ghi)perylene	200	pyrene	100

In methylene chloride:methanol (1:1), 1mL/ampul
cat. # 31455 (ea.)

Method 611 (Haloethers)

611 Haloethers Calibration Mix

bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
4-bromophenyl phenyl ether
4-chlorophenyl phenyl ether

2,000µg/mL each in acetone, 1mL/ampul
cat. # 31034 (ea.)

Method 612 (Chlorinated Hydrocarbons)

612 Chlorinated Hydrocarbons Calibration Mix (9 components)

2-chloronaphthalene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
1,2,4-trichlorobenzene

2,000µg/mL each in isooctane, 1mL/ampul
cat. # 31035 (ea.)

Method 615 (Chlorinated Acid Herbicides)

Herbicide Surrogate

Free Acid Form:

2,4-dichlorophenylacetic acid (DCAA)

200µg/mL in methanol, 1mL/ampul
cat. # 32049 (ea.)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32439 (ea.)

Derivatized Form:

2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200µg/mL in hexane, 1mL/ampul
cat. # 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form:

2,4-D
2,4-DB
2,4,5-T
2,4,5-TP
dicamba
dichlorprop
dinoseb

200µg/mL each in methanol, 1mL/ampul
cat. # 32054 (ea.)

Derivatized Form:

2,4-D methyl ester
2,4-DB methyl ester
2,4,5-T methyl ester
2,4,5-TP methyl ester
dicamba methyl ester
dichlorprop methyl ester
dinoseb methyl ether

200µg/mL each in hexane, 1mL/ampul
cat. # 32055 (ea.)

Herbicide Mix #2

Free Acid Form:

dalapon

2,000µg/mL in methanol, 1mL/ampul
cat. # 32056 (ea.)

Derivatized Form:

dalapon methyl ester

2,000µg/mL in hexane, 1mL/ampul
cat. # 32057 (ea.)

Herbicide Mix #3

Free Acid Form:

MCPA
MCPP

20,000µg/mL each in methanol, 1mL/ampul
cat. # 32058 (ea.)

Derivatized Form:

MCPA methyl ester
MCPP methyl ester

20,000µg/mL each in hexane, 1mL/ampul
cat. # 32059 (ea.)



also **available**

Additional chlorinated acid herbicides mixes:

see Method 555, **page 419**
and Method 8321, **page 440**

Method 624 (Purgeable Halocarbons)

Volatiles MegaMix®, EPA Method 624 (26 components)

benzene
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30497 (ea.)

624 Internal Standard Mix

bromochloromethane
2-bromo-1-chloropropane
1,4-dichlorobutane

1,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30023 (ea.)

624 Surrogate Standard Mix

4-bromofluorobenzene
fluorobenzene
pentafluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30243 (ea.)

Surrogate Standard

4-bromofluorobenzene
α,α,α-trifluorotoluene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30484 (ea.)

624 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
trichlorofluoromethane (CFC-11)
vinyl chloride

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30020 (ea.)

624 Calibration Mix #2 (12 components)

benzene
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
dibromochloromethane
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
methylene chloride
tetrachloroethene
1,1,2-trichloroethane
trichloroethene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30021 (ea.)

624 Calibration Mix #3 (14 components)

bromodichloromethane
bromoform
chloroform
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,2-dichloroethane
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
1,1,2,2-tetrachloroethane
toluene
1,1,1-trichloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30022 (ea.)

Method 624 (Purgeable Halocarbons) *cont'd*

624 Complete Kit

30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix
30243: 624 Surrogate Standard Mix

Contains 1mL each of these mixtures.

cat. # 30244 (kit)

624 Kit

30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix

Contains 1mL each of these mixtures.

cat. # 30055 (kit)

Individual VOA Surrogate and Internal Standards for EPA Methods

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
benzene-d6	PTM	2,000	30025	
2-bromochlorobenzene	PTM	2,000	30228	
4-bromochlorobenzene	PTM	2,000	30230	
bromochloromethane	PTM	2,000	30225	
2-bromo-1-chloropropane	PTM	2,000	30226	
4-bromofluorobenzene	PTM	2,000	30026	
chlorobenzene-d5	PTM	2,000	30223	
1-chloro-2-fluorobenzene	PTM	2,000	30040	
1,2-dichlorobenzene-d4	PTM	2,000	30049	
1,4-dichlorobutane	PTM	2,000	30227	
1,2-dichloroethane-d4	PTM	2,000	30027	
1,4-difluorobenzene	PTM	2,000	30032	
ethylbenzene-d5	PTM	2,000	30028	
ethylbenzene-d10	PTM	2,000	30029	
fluorobenzene	PTM	2,000	30030	
pentafluorobenzene	PTM	2,000	30031	
toluene-d8	PTM	2,000	30224	
α,α,α-trifluorotoluene	PTM	2,000	30048	

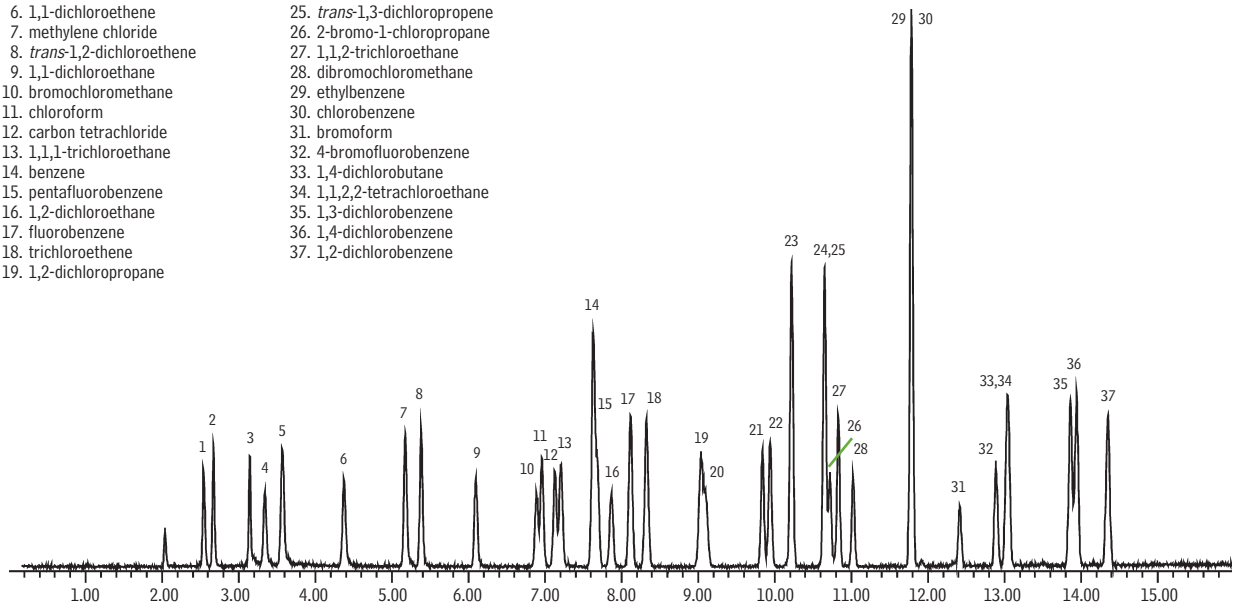
PTM = Purge & trap grade methanol

EPA Method 624 on an Rtx®-VMS column.

1. chloromethane
2. vinyl chloride
3. bromomethane
4. chloroethane
5. trichlorofluoromethane
6. 1,1-dichloroethene
7. methylene chloride
8. *trans*-1,2-dichloroethene
9. 1,1-dichloroethane
10. bromochloromethane
11. chloroform
12. carbon tetrachloride
13. 1,1,1-trichloroethane
14. benzene
15. pentafluorobenzene
16. 1,2-dichloroethane
17. fluorobenzene
18. trichloroethene
19. 1,2-dichloropropane
20. bromodichloromethane
21. 2-chloroethyl vinyl ether
22. *cis*-1,3-dichloropropene
23. toluene
24. tetrachloroethene
25. *trans*-1,3-dichloropropene
26. 2-bromo-1-chloropropane
27. 1,1,2-trichloroethane
28. dibromochloromethane
29. ethylbenzene
30. chlorobenzene
31. bromoform
32. 4-bromofluorobenzene
33. 1,4-dichlorobutane
34. 1,1,2,2-tetrachloroethane
35. 1,3-dichlorobenzene
36. 1,4-dichlorobenzene
37. 1,2-dichlorobenzene

Our Rtx®-VMS capillary GC column is optimized for EPA Method 624!

See **page 90** for more information.



GC_EV00425

Column:	Rtx®-VMS, 30m, 0.25mm ID, 1.40µm (cat#19915)
Conc.:	20 ppb in 5mL of RO water
Concentrator:	Tekmar LSC-3000 Purge and Trap
Trap:	Vocarb 3000 (type K)
Purge:	11 min. @ 40mL/min. (ambient temperature)
Dry purge:	1 min. @ 40mL/min. (MCS bypassed using Silcosteel® tubing)
Desorb preheat:	245°C
Desorb:	250°C for 2 min., Flow 10mL/min.
Bake:	260°C for 8 min.
GC Interface:	1:10 split at injection port. 1mm ID liner.
GC:	Agilent 6890
Oven temp.:	40°C (hold 4 min.) to 95°C @ 24°C/min. (hold 3 min.), to 210°C @ 40°C/min. (hold 6 min.)
Carrier gas:	helium @ ~1mL/min. constant flow Adjust dichlorodifluoromethane to a retention time of 2.54 min. @ 40°C
Detector:	Agilent 5973 MSD
Scan range:	25-300amu

Method 625 (Semivolatiles)

Semivolatiles MegaMix®, EPA Method 625 (54 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
2,4-dichlorophenol
diethylphthalate
2,4-dimethylphenol
dimethylphthalate
di-*n*-butylphthalate
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octylphthalate
diphenylamine*
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene
hexachlorocyclopentadiene*
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
naphthalene
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitrosodimethylamine*
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
1,2,4-trichlorobenzene
2,4,6-trichlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31829 (ea.)

*Listed as an "additional compound" in Method 625 (listed compound N-nitrosodiphenylamine decomposes to MegaMix component diphenylamine). The six other "additional compounds" are components in other Restek reference mixes used for Method 625: benzidine is included in cat.# 31030 (page 420); β-BHC, δ-BHC, endosulfan I, endosulfan II, endrin are in cat.# 32291 (page 428) and cat.# 32415 (page 429).

625 Kit

Because most laboratories do not routinely analyze pesticides, PCBs, toxaphene, and chlordane in their calibration mixtures for Method 625, these mixtures are not included in the 625 Kit. They may be purchased separately or in the 608 Complete Kit (cat. # 32060, page 421).

31029: 604 Phenols Mix
31030: 605 Benzidines Mix
31031: 606 Phthalate Esters Mix
31032: 607 Nitrosamines Mix
31033: 609 Nitroaromatics/Isophorone Mix
31011: 610 PAH Mix (SV Calibration Mix #5)
31034: 611 Haloethers Mix
31035: 612 Chlorinated Hydrocarbons Mix

Contains 1mL each of these mixtures.
cat. # 31036 (kit)

Kit components described on pages 420–421.

Individual Semivolatile Surrogate and Internal Standards for EPA Methods

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
anthracene-d10	D	2,000	31037	
decafluorobiphenyl	D	2,000	31041	
decafluorobiphenyl	A	1,000	31855	
4,4'-dibromobiphenyl	D	2,000	31039	
4,4'-dibromooctafluorobiphenyl	D	2,000	31040	
2-fluorobiphenyl	D	2,000	31091	
1-fluoronaphthalene	D	2,000	31092	
2-fluorophenol	D	2,000	31047	
naphthalene-d8	D	2,000	31043	
nitrobenzene-d5	D	2,000	31044	
pentafluorophenol	D	2,000	31048	
phenanthrene-d10	D	2,000	31045	
phenol-d6	D	2,000	31049	
pyridine-d5	D	2,000	31046	
p-terphenyl-d14	D	1,000	31828	
2,4,6-tribromophenol	M	1,000	31401	

D= methylene chloride
M = methanol

SV Internal Standard Mix

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31206 (ea.)

4,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31006 (ea.)

Antifoam Agent for Purge & Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap, and possibly into the GC column. Our silica-containing antifoam agent is effective over a wide pH range, and will not conflict with chromatography of target analytes.

Neat, 1mL/ampul
cat. # 31822 (ea.)

No data pack available.



also **available**

Try Restek's Rxi®-5Sil MS columns for EPA Methods 625 and 8270.

Guaranteed for low GC/MS bleed, excellent phenol response, and the resolution needed to quantify critical pairs and structural isomers.

See **page 78** for more information.

Tuning Mixtures

VOA Tuning Compound

4-bromofluorobenzene

5,000µg/mL in P&T methanol, 1mL/ampul

cat. # 30003 (ea.)

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)

2,500µg/mL in methylene chloride, 1mL/ampul

cat. # 31001 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1mL/ampul

cat. # 30482 (ea.)

Neat, 1g

cat. # 33027 (ea.)

No data pack available.

GC/MS Tuning Mixture

benzidine
4,4'-DDT
DFTPP
pentachlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31615 (ea.)

Technical Chlordane, Toxaphene Solutions

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
chlordane (technical)	H	1,000	32021	
chlordane (technical)	I	5,000	32072	
chlordane (technical)	M	2,000	32016	
toxaphene	H	1,000	32005	
toxaphene	I	5,000	32071	
toxaphene	M	2,000	32015	

H = hexane
I = isooctane
M = methanol

Aroclor Solutions

Volume is 1mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	Solvent	Conc.	cat.# (ea.)	price
Aroclor 1016	H	1,000	32006	
Aroclor 1016	I	200	32064	
Aroclor 1016	TO	50mg/kg	32075	
Aroclor 1016	TO	500mg/kg	32076	
Aroclor 1221	H	1,000	32007	
Aroclor 1221	I	200	32065	
Aroclor 1221	TO	50mg/kg	32077	
Aroclor 1221	TO	500mg/kg	32078	
Aroclor 1232	H	1,000	32008	
Aroclor 1232	I	200	32066	
Aroclor 1232	TO	50mg/kg	32079	
Aroclor 1232	TO	500mg/kg	32080	
Aroclor 1242	H	1,000	32009	
Aroclor 1242	I	200	32067	
Aroclor 1242	TO	50mg/kg	32081	
Aroclor 1242	TO	500mg/kg	32082	
Aroclor 1248	H	1,000	32010	
Aroclor 1248	I	200	32068	
Aroclor 1248	TO	50mg/kg	32083	
Aroclor 1248	TO	500mg/kg	32084	
Aroclor 1254	H	1,000	32011	
Aroclor 1254	I	200	32069	
Aroclor 1254	TO	50mg/kg	32085	
Aroclor 1254	TO	500mg/kg	32086	
Aroclor 1260	H	1,000	32012	
Aroclor 1260	I	200	32070	
Aroclor 1260	TO	50mg/kg	32087	
Aroclor 1260	TO	500mg/kg	32088	
Aroclor 1262	H	1,000	32409	
Aroclor 1268	H	1,000	32410	
Aroclor 1016/1260	H	1,000	32039	
Aroclor 1016/1260	I	200	32299	
Aroclor 1016/1260	A	400	32456	

A = acetone
H = hexane
I = isooctane
TO = transformer oil (PCB-free)

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also **available**

For a complete listing of solutions of individual environmental compounds, please see **pages 399-404**.



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8000 Series Methods - Resource Conservation and Recovery Act (RCRA)

US EPA Method No.	Compound Class
418.1	Total Recoverable Petroleum Hydrocarbons (TRPH)
1311	Toxicity Characteristics Leaching Procedure (TCLP)
1664	Oil & Grease
3500	Organic Extraction Surrogates
8010	Halogenated Volatile Organics
8011	1,2-Dibromoethane, 1,2-Dibromo-3-Chloropropane
8020	Aromatic Volatile Organics
8021	Volatile Organics
8040	Phenols
8061A	Phthalate Esters
8080, 8081	Chlorinated Pesticides
8082, 8082A	PCBs
8095	Explosives by GC
8100	Polycyclic Aromatic Hydrocarbons
8140, 8141	Organophosphorus Pesticides
8150, 8151, 8151A	Chlorinated Acid Herbicides
8240	Volatile Organic Compounds (VOC)
8260, 8260A, 8260B	Volatile Organic Compounds (VOC)
8270D, 8270C	Semivolatile Organic Compounds
8310	Polycyclic Aromatic Hydrocarbons (PAHs)
8315	Aldehydes/Ketones-DNPH by HPLC
8321	Chlorinated Acids by HPLC
8330	Nitroaromatics and Nitramines by HPLC

Method 418.1 (Total Recoverable Petroleum Hydrocarbons [TRPH])

418.1 Calibration Mix

chlorobenzene 25.0% (v/v)
n-hexadecane 37.5%
isooctane 37.5%

1mL/ampul

cat. # 30080 (ea.)

Method 1311 (Toxicity Characteristics Leaching Procedure [TCLP])

TCLP VOA Mix (11 components)

benzene
2-butanone (MEK)
carbon tetrachloride
chlorobenzene
chloroform
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
tetrachloroethene
trichloroethene
vinyl chloride

2,000µg/mL each in P&T methanol:water (90:10), 1mL/ampul

cat. # 30024 (ea.)

TCLP Acid Mix

2-methylphenol
3-methylphenol
4-methylphenol
pentachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000µg/mL each in methanol, 1mL/ampul

cat. # 31027 (ea.)

TCLP B/N Mix (7 components)

1,4-dichlorobenzene
2,4-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachloroethane
nitrobenzene
pyridine

2,000µg/mL each in acetone, 1mL/ampul

cat. # 31028 (ea.)

TCLP Pesticide Mix

γ-BHC (lindane)
endrin
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000µg/mL each in methanol, 1mL/ampul

cat. # 32013 (ea.)

Method 1311 (Toxicity Characteristics Leaching Procedure [TCLP]) *cont'd*

TCLP Herbicide Mix

2,4-D (free acid)
Silvex (free acid)

2,000µg/mL each in methanol, 1mL/ampul

cat. # 32014 (ea.)

TCLP Toxaphene Mix

toxaphene

2,000µg/mL in methanol, 1mL/ampul

cat. # 32015 (ea.)

TCLP Chlordane Mix

chlordane (technical)

2,000µg/mL in methanol, 1mL/ampul

cat. # 32016 (ea.)

Method 1664 (Oil & Grease)

1664 Oil & Grease Mix

hexadecane
stearic acid

4,000µg/mL each in acetone, 5mL/ampul

cat. # 31457 (ea.)

See page 361 for Resprep Oil & Grease SPE Disks.

Method 3500 (Organic Extraction Surrogates)

High-Concentration Surrogates and Matrix Spike Mixtures for SW-846

- Highest concentrations commercially available—reduces cost per sample extract.
- Convenient 1mL and 5mL packaging.

See Method 8270, pages 435-438.

did you **know**?

Restek reference materials include a silanized vial for sample transfer.

Method 8010 (Halogenated Volatile Organics)

Note: Method 8010 does not specify internal standards to be used. The analyst must select appropriate internal standards based on the particular samples being analyzed. Potential internal standards are listed on page 423.

624 Internal Standard Mix

bromochloromethane
2-bromo-1-chloropropane
1,4-dichlorobutane

1,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30023 (ea.)

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30042 (ea.)

8010A Calibration Mix #2 (15 components)

benzyl chloride
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,1-dichloroethene
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
tetrachloroethene
trichloroethene
1,2,3-trichloropropane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30056 (ea.)

8010A Calibration Mix #3 (13 components)

bromobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
dibromomethane
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,2-dichloropropane
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
1,1,1-trichloroethane
1,1,2-trichloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30057 (ea.)

8010B Calibration Mix #4

allyl chloride
1-chlorohexane
4-chlorotoluene
1,2-dibromo-3-chloropropane
1,2-dibromoethane
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30058 (ea.)

BTEX Standard

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30051 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30213 (ea.)

2,000µg/mL each in P&T methanol (*m*-xylene and *p*-xylene at 1,000µg/mL), 1mL/ampul
cat. # 30488 (ea.)

tech tip

To analyze compounds listed in Methods 8010 and 8020 concurrently, add BTEX Standard to the calibration curve mix (see above).

Method 8010 (Halogenated Volatile Organics) *cont'd*

BTEX Gas Mix

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra 104L Cylinders:

Size: 8 x 24 cm.
Volume/Pressure:
104 liters of gas
@ 1,800psi
Weight: 1.5 lbs./0.7 kg



Scotty 110L Cylinders (Pi-marked Cylinders for EU Regulations):

Size: 8.3 x 29.5 cm.
Volume/Pressure:
110 liters of gas
@ 1,800psi
Weight: 2.2 lbs./1 kg
US DOT Specs: 3AL2216



1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34414 (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34428 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34414-PI (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34428-PI (ea.)

Requires a high-purity VOC single-stage regulator. See page 386.
No data pack available.

Method 8011 (1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane)

8011 Calibration Mix—EDB/DBCP

1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30062 (ea.)

Method 8020 (Aromatic Volatile Organics)

Internal and Surrogate Standards

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.) price
4-bromofluorobenzene	PTM	2,000	30026
1,4-difluorobenzene	PTM	2,000	30032
fluorobenzene	PTM	2,000	30030
α,α,α-trifluorotoluene	PTM	2,000	30048

PTM = Purge & trap grade methanol

8020A Calibration Mix (10 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30222 (ea.)

Method 8021 (Volatile Organics)

502.2 Internal Standard Mix #2

2-bromo-1-chloropropane
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30041 (ea.)

8021 Surrogate Mix

2-bromochlorobenzene
1,4-dichlorobutane

1,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30086 (ea.)

8021/502.2 Surrogate Mix #1

1-bromo-2-chloroethane
1-chloro-3-fluorobenzene
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30463 (ea.)

8021/502.2 Surrogate Mix #2

1-bromo-2-chloroethane
4-bromochlorobenzene
1-chloro-3-fluorobenzene
fluorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30464 (ea.)

Method 8040 (Phenols)

8040 Surrogate Mix

2-fluorophenol
2,4,6-tribromophenol

2,000µg/mL each in isopropanol, 1mL/ampul
cat. # 31090 (ea.)

8040 Phenols Mix #1 (9 components)

4-chloro-3-methylphenol
2,4-dichlorophenol
2-methyl-4,6-dinitrophenol
3-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,6-trichlorophenol

2,000µg/mL each in isopropanol, 1mL/ampul
cat. # 31088 (ea.)

8040 Phenols Mix #2 (9 components)

sec-butyl-4,6-dinitrophenol (dinoseb)
2-chlorophenol
2,6-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methylphenol
4-methylphenol
2,3,4,6-tetrachlorophenol
2,4,5-trichlorophenol

2,000µg/mL each in isopropanol, 1mL/ampul
cat. # 31089 (ea.)

Method 8061A (Phthalate Esters)

8061A Matrix Spike Solution

benzyl butyl phthalate
bis(2-ethylhexyl)phthalate

2,000µg/mL each in acetone, 1mL/ampul
cat. # 31846 (ea.)

Benzyl Benzoate (Internal Standard)

5,000µg/mL in hexane, 1mL/ampul
cat. # 31847 (ea.)

Method 8061A (Phthalate Esters) *cont'd*

8061A Surrogate Standard

dibenzyl phthalate
diphenyl isophthalate
diphenyl phthalate

500µg/mL each in acetone, 1mL/ampul
cat. # 31848 (ea.)

EPA 8061A Phthalate Esters Mixture (15 components)

NEW!

benzyl butyl phthalate
bis(2-*n*-butoxyethyl)phthalate
bis(2-ethoxyethyl)phthalate
bis(2-ethylhexyl)phthalate (dioctyl
bis(2-methoxyethyl)phthalate
bis(4-methyl-2-pentyl)phthalate
di-*n*-butylphthalate
diethylphthalate
di-*n*-hexyl phthalate
dimethylphthalate
di-nonyl phthalate
di-*n*-octyl phthalate
dipentylphthalate
phthalic acid dicyclohexyl ester
phthalic acid diisobutyl ester

1,000µg/mL each in hexane:acetone (80:20), 1mL/ampul
cat. # 33227 (ea.)

EPA 8061A Hexyl 2-Ethylhexyl Phthalate Standard

NEW!

hexyl 2-ethylhexyl phthalate

1,000µg/mL in hexane:acetone (80:20), 1mL/ampul
cat. # 33228 (ea.)

EPA 8061A Phthalate Esters Kit

NEW!

33227: EPA 8061A Phthalate Esters Mixture
33228: EPA 8061A Hexyl 2-Ethylhexyl Phthalate Standard

Contains 1mL each of these mixtures.
cat. # 33229 (kit)

Method 8080, 8081 (Chlorinated Pesticides)

Organochlorine Pesticide Mix AB #1 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
α-chlordane
γ-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

200µg/mL each in hexane:toluene (1:1), 1mL/ampul
cat. # 32291 (ea.)

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Method 8080, 8081 (Chlorinated Pesticides) *cont'd*

Organochlorine Pesticide Mix AB #2 (20 components)

aldrin	8µg/mL	dieldrin	16
α-BHC	8	endosulfan I	8
β-BHC	8	endosulfan II	16
δ-BHC	8	endosulfan sulfate	16
γ-BHC (lindane)	8	endrin	16
α-chlordane	8	endrin aldehyde	16
γ-chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (isomer B)	8
4,4'-DDT	16	methoxychlor	80

In hexane:toluene (1:1), 1mL/ampul
cat. # 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin	dieldrin
α-BHC	endosulfan I
β-BHC	endosulfan II
δ-BHC	endosulfan sulfate
γ-BHC (lindane)	endrin
α-chlordane	endrin aldehyde
γ-chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (isomer B)
4,4'-DDT	methoxychlor

2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul
cat. # 32415 (ea.)

Pesticide Surrogate Mix

decachlorobiphenyl 2,4,5,6-tetrachloro-*m*-xylene

200µg/mL each in acetone, 1mL/ampul
cat. # 32000 (ea.)

200µg/mL each in acetone, 5mL/ampul
cat. # 32457 (ea.) NEW!

Pesticide Surrogate Mix

decachlorobiphenyl	200µg/mL	2,4,5,6-tetrachloro-*m*-xylene	100

In acetone, 1mL/ampul
cat. # 32453 (ea.)

Method 8082, 8082A (PCBs)

PCB Congener Mix, Method 8082A (19 components)

2-chlorobiphenyl (BZ #1)
2,3-dichlorobiphenyl (BZ #5)
2,2',5-trichlorobiphenyl (BZ #18)
2,4',5-trichlorobiphenyl (BZ #31)
2,2',3,5'-tetrachlorobiphenyl (BZ #44)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,3',4,4'-tetrachlorobiphenyl (BZ #66)
2,2',3,4,5'-pentachlorobiphenyl (BZ #87)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3,3',4',6-pentachlorobiphenyl (BZ #110)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',3,4,5,5'-hexachlorobiphenyl (BZ #141)
2,2',3,5,5',6-hexachlorobiphenyl (BZ #151)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,3',4,4',5-heptachlorobiphenyl (BZ #170)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)
2,2',3,4,4',5',6-heptachlorobiphenyl (BZ #183)
2,2',3,4',5,5',6-heptachlorobiphenyl (BZ #187)
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (BZ #206)

100µg/mL each in isooctane, 1mL/ampul
cat. # 32416 (ea.)

Method 8095 (Explosives by GC)

These materials support nitroaromatic, nitramine, and nitroester analyses by GC/ECD (Method 8095).[1,2] Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

8095 Surrogate

3,4-dinitrotoluene

1,000µg/mL in methanol, 1mL/ampul
cat. # 31452 (ea.) enquire

8095 Surrogate

2-methyl-4-nitroaniline

1,000µg/mL in methanol, 1mL/ampul
cat. # 31612 (ea.) enquire

8095 Matrix Spike Mix A (10 components)

2-amino-4,6-dinitrotoluene	HMX*
4-amino-2,6-dinitrotoluene	RDX
1,3-dinitrobenzene	tetryl
2,4-dinitrotoluene	1,3,5-trinitrobenene
2,6-dinitrotoluene	2,4,6-trinitrotoluene

200µg/mL each in acetonitrile (*HMX at 2,000µg/mL), 1mL/ampul
cat. # 31609 (ea.) enquire

8095 Matrix Spike Mix B (7 components)

3,5-dinitroaniline*	3-nitrotoluene
nitrobenzene	4-nitrotoluene
nitroglycerine	PETN
2-nitrotoluene	

1,000µg/mL each in acetonitrile (*3,5-dinitroaniline at 200µg/mL), 1mL/ampul
cat. # 31610 (ea.) enquire

8095 Calibration Mix A (10 components)

2-amino-4,6-dinitrotoluene	HMX
4-amino-2,6-dinitrotoluene	RDX
1,3-dinitrobenzene	tetryl
2,4-dinitrotoluene	1,3,5-trinitrobenzene
2,6-dinitrotoluene	2,4,6-trinitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 31607 (ea.) enquire

8095 Calibration Mix B (7 components)

3,5-dinitroaniline*	3-nitrotoluene
nitrobenzene	4-nitrotoluene
nitroglycerine	PETN
2-nitrotoluene	

5,000µg/mL each in acetonitrile (*3,5-dinitroaniline at 1,000µg/mL), 1mL/ampul
cat. # 31608 (ea.) enquire

References (Not available from Restek.)
[1]US Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.
[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406-416, August 1998.

also **available**

Method 8095 single-component explosives solutions. See next page.

Method 8095 (Explosives by GC) *cont'd*

Single-Component Explosives Solutions

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
2-amino-4,6-dinitrotoluene	ACN	1,000	31670	enquire
4-amino-2,6-dinitrotoluene	ACN	1,000	31671	enquire
ammonium picrate	ACN	2,000	31890	enquire
3,5-dinitroaniline	ACN	1,000	31661	enquire
1,3-dinitrobenzene	ACN	1,000	31662	enquire
1,4-dinitrobenzene	ACN	2,000	33205	enquire
2,4-dinitrotoluene	ACN	1,000	31663	enquire
2,6-dinitrotoluene	ACN	1,000	31664	enquire
EGDN	M	1,000	31601	enquire
HMX	ACN	1,000	31665	enquire
nitrobenzene	ACN	1,000	31657	enquire
nitroglycerin	M	1,000	31498	enquire
nitroguanidine	M	1,000	31602	enquire
2-nitrotoluene	ACN	1,000	31659	enquire
3-nitrotoluene	ACN	1,000	31660	enquire
4-nitrotoluene	ACN	1,000	31658	enquire
PETN (pentaerythritol tetranitrate)	M	1,000	31600	enquire
picric acid	M	1,000	31499	enquire
propylene glycol dinitrate (PGDN)	M	1,000	31821	enquire
RDX	ACN	1,000	31666	enquire
tetryl	ACN	1,000	31667	enquire
1,3,5-trinitrobenzene	ACN	1,000	31668	enquire
2,4,6-trinitrotoluene	ACN	1,000	31669	enquire

ACN=acetonitrile
M = methanol

Method 8100 (Polycyclic Aromatic Hydrocarbons)

PAH Supplement Mix for Method 8100 (8 components)

benzo(j)fluoranthene
dibenzo(a,h)acridine
dibenzo(a,j)acridine
7H-dibenzo(c,g)carbazole
dibenzo(a,e)pyrene
dibenzo(a,h)pyrene
dibenzo(a,i)pyrene
3-methylcholanthrene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31857 (ea.)

SV Calibration Mix #5 / 610 PAH Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31011 (ea.)



also **available**

Our 30m, 0.32mm ID, 0.50µm Rtx®-OPPesticides column provides fast analyses, low bleed, and better resolution than alternative choices.

See **page 79** for details.

Methods 8140, 8141 (Organophosphorus Pesticides)

The preparation of accurate and stable OP pesticide standards is complicated by their sensitivity to light, pH, heat, and water. Restek has spent many years researching OP pesticide mixtures. Based on this research, our procedures include:

- Solvents are assayed to ensure low water content.
- Reference mixtures are packaged in deactivated amber ampules, under an inert atmosphere.
- Purity is determined by a combination of GC/FID, GC/FPD, GC/NPD, DSC, or HPLC/UV.

8140/8141 Internal Standards & Surrogates

NPD Detector:
Internal Standard: 1-bromo-2-nitrobenzene (cat.# 32279)
Surrogate: 4-chloro-3-nitrobenzotrifluoride (cat.# 32282)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32279 (ea.)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32282 (ea.)

FPD Detector:
Internal Standard: none recommended
Surrogate: tributylphosphate (cat.# 32280) and triphenylphosphate (cat.# 32281)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32280 (ea.)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32281 (ea.)

8140/8141 OP Pesticide Calibration Mix A (20 components)

azinphos methyl
bolstar (sulprofos)
chlorpyrifos
coumaphos
demeton, O & S
diazinon
dichlorvos
disulfoton
ethoprop
fensulfothion
fenthion
merphos
methyl parathion
mevinphos
naled
phorate
ronnel
stirofos
tokuthion (prothiofos)
trichloronate

200µg/mL each in hexane:acetone (95:5), 1mL/ampul
cat. # 32277 (ea.)

8141 OP Pesticide Calibration Mix B (7 components)

dimethoate
EPN
malathion
monocrotophos
parathion
sulfotepp
TEPP

200µg/mL each in hexane:acetone (95:5), 1mL/ampul
cat. # 32278 (ea.)

Stable for at least 12 months

Restek OPP standards are stable for at least 12 months.

also **available**

Additional nitrogen/phosphorus pesticide mixes are listed on **page 414.**

Method 8150, 8151, 8151A (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-dibromooctafluorobiphenyl

250µg/mL in hexane, 1mL/ampul
cat. # 32053 (ea.)

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31040 (ea.)

2,000µg/mL in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31856 (ea.)

Herbicide Surrogate

Free Acid Form:
2,4-dichlorophenylacetic acid (DCAA)

200µg/mL in methanol, 1mL/ampul
cat. # 32049 (ea.)

1,000µg/mL in acetone, 1mL/ampul
cat. # 32439 (ea.)

Derivatized Form:
2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200µg/mL in hexane, 1mL/ampul
cat. # 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form:

2,4-D	dicamba
2,4-DB	dichlorprop
2,4,5-T	dinoseb
2,4,5-TP	

200µg/mL each in methanol, 1mL/ampul
cat. # 32054 (ea.)

Derivatized Form:

2,4-D methyl ester	dicamba methyl ester
2,4-DB methyl ester	dichlorprop methyl ester
2,4,5-T methyl ester	dinoseb methyl ether
2,4,5-TP methyl ester	

200µg/mL each in hexane, 1mL/ampul
cat. # 32055 (ea.)

Herbicide Mix #2

Free Acid Form:
dalapon

1,000µg/mL in acetonitrile, 1mL/ampul
cat. # 32432 (ea.)

1,000µg/mL in methanol, 1mL/ampul
cat. # 32253 (ea.)

2,000µg/mL in methanol, 1mL/ampul
cat. # 32056 (ea.)

Derivatized Form:
dalapon methyl ester

2,000µg/mL in hexane, 1mL/ampul
cat. # 32057 (ea.)

1,000µg/mL in methanol, 1mL/ampul
cat. # 32254 (ea.)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Herbicide Mix #3

Free Acid Form:

MCPA	MCPP

20,000µg/mL each in methanol, 1mL/ampul
cat. # 32058 (ea.)

Derivatized Form:

MCPA methyl ester	MCPP methyl ester

20,000µg/mL each in hexane, 1mL/ampul
cat. # 32059 (ea.)

MCPA

1,000µg/mL in methanol, 1mL/ampul
cat. # 32269 (ea.)

MCPP

1,000µg/mL in methanol, 1mL/ampul
cat. # 32271 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form:

acifluorfen	3,5-dichlorobenzoic acid
bentazon	4-nitrophenol
chloramben	pentachlorophenol
DCPA diacid	picloram

200µg/mL each in methanol, 1mL/ampul
cat. # 32061 (ea.)

Derivatized Form:

acifluorfen methyl ester	3,5-dichlorobenzoic acid methyl ester
bentazon methyl ester	4-nitroanisole
chloramben methyl ester	pentachloroanisole
DCPA (Dacthal)	picloram methyl ester

200µg/mL each in hexane, 1mL/ampul
cat. # 32062 (ea.)

Picloram

1,000µg/mL in methanol, 1mL/ampul
cat. # 32265 (ea.)

3,5-Dichlorobenzoic Acid Surrogate Standard

3,5-dichlorobenzoic acid

1,000µg/mL in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31652 (ea.)

3,5-Dichlorobenzoic Acid Methyl Ester Surrogate Standard

3,5-dichlorobenzoic acid methyl ester

1,000µg/mL in methyl *tert*-butyl ether, 1mL/ampul
cat. # 31649 (ea.)

1,000µg/mL in methanol, 1mL/ampul
cat. # 32264 (ea.)



also **available**

Additional chlorinated acid herbicides mixes:

see Method 555, **page 419**
and Method 8321, **page 440**

Method 8240 (Volatile Organic Compounds [VOC])

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30042 (ea.)

VOA Calibration Mix #1 (ketones)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000µg/mL each in P&T methanol:water (90:10), 1mL/ampul
cat. # 30006 (ea.)

VOA Purgeable Halocarbon Mix #1 (23 components)

bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30212 (ea.)

8240 Volatiles Mix #1A (12 components)

allyl chloride
benzyl chloride
1,2-dibromo-3-chloropropane
1,2-dibromoethane
dibromomethane
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene
1,4-dioxane
iodomethane
pentachloroethane
1,1,1,2-tetrachloroethane
1,2,3-trichloropropane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30217 (ea.)

8240 Volatiles Mix #2A

carbon disulfide
2-picoline
pyridine

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30218 (ea.)

restek **innovation**!

Xylene-Free, Highly-Purified Chloroprene Standard

The R&D chemists at Restek developed a novel procedure that produces a pure, quantitative chloroprene solution specially stabilized in purge & trap-grade methanol. The entire procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene. The final solution is specially stabilized, allowing analysts to make dilutions for working standards in unmodified purge & trap-grade methanol.

Note: Because chloroprene is not analyzed by many laboratories, it is not included in our 8240 VOA mixes. Chloroprene is included in our 8260B MegaMix® Calibration Mix. Refer to **page 433.**

8240 Nitriles Mix (7 components)

acrylonitrile
ethyl methacrylate
malononitrile
methacrylonitrile
methyl methacrylate
propionitrile
styrene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30215 (ea.)

8240 Alcohols Mix

allyl alcohol
2-chloroethanol
ethanol
isobutyl alcohol
propargyl alcohol

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30214 (ea.)

Glycols Standard

ethylene glycol
propylene glycol

50,000µg/mL each in DI water, 1mL/ampul
cat. # 30471 (ea.)

BTEX Standard

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30051 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30213 (ea.)

2,000µg/mL each in P&T methanol (*m*-xylene and *p*-xylene at 1,000µg/mL), 1mL/ampul
cat. # 30488 (ea.)

BTEX Gas Mix

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra 104L Cylinders:

Size: 8 x 24 cm.
Volume/Pressure:
104 liters of gas
@ 1,800psi
Weight: 1.5 lbs./0.7 kg



Scotty 110L Cylinders (Pi-marked Cylinders for EU Regulations):

Size: 8.3 x 29.5 cm.
Volume/Pressure:
110 liters of gas
@ 1,800psi
Weight: 2.2 lbs./1 kg
US DOT Specs: 3AL2216



1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34414 (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34428 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34414-PI (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34428-PI (ea.)

Requires a high-purity VOC single-stage regulator. See page 386.
No data pack available.

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOC])

8260A Internal Standard Mix

chlorobenzene-d5
1,4-dichlorobenzene-d4
fluorobenzene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30241 (ea.)

8260 Internal Standard Mix

chlorobenzene-d5
1,4-dichlorobenzene-d4
1,4-difluorobenzene
pentafluorobenzene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30074 (ea.)

8260A Surrogate Mix

4-bromofluorobenzene
dibromofluoromethane
1,2-dichloroethane-d4
toluene-d8

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30240 (ea.)

8260 Surrogate Mix

4-bromofluorobenzene
dibromofluoromethane
toluene-d8

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30073 (ea.)

8260B Matrix Spike Mix

benzene
chlorobenzene
1,1-dichloroethene
toluene
trichloroethylene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30479 (ea.)

8240/8260 System Performance Check Mix

bromoform
chlorobenzene
chloromethane
1,1-dichloroethane
1,1,2,2-tetrachloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30075 (ea.)

4-Bromofluorobenzene

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30067 (ea.)

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30082 (ea.)

1,4-Dioxane-d8

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30614 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1mL/ampul
cat. # 30482 (ea.)

Neat, 1g
cat. # 33027 (ea.)

No data pack available.

8260B MegaMix® Calibration Mix (76 components)

acetonitrile
acrylonitrile
allyl chloride
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon disulfide
carbon tetrachloride
chlorobenzene
2-chloroethanol
chloroform
chloroprene
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
diethyl ether (ethyl ether)
1,4-dioxane
ethylbenzene
ethyl methacrylate
hexachloro-1,3-butadiene
iodomethane
isobutyl alcohol
isopropylbenzene (cumene)
4-isopropyl toluene (*p*-cymene)
methacrylonitrile
methyl acrylate
methyl methacrylate
methylene chloride (dichloromethane)
naphthalene
nitrobenzene
2-nitropropane
pentachloroethane
propionitrile
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,1,2-trichlorotrifluororethane (CFC-113)
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30633 (ea.)

2-Chloroethyl Vinyl Ether

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30265 (ea.)

8260B MegaMix® Calibration Mix Kit

30633: 8260B MegaMix
30265: 2-chlorethyl vinyl ether

Contains 1mL each of these mixtures.
cat. # 30475 (kit)

8240/8260 Calibration Check Mix

chloroform
1,1-dichloroethene
1,2-dichloropropane
ethylbenzene
toluene
vinyl chloride

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30427 (ea.)

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30042 (ea.)

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOC]) *cont'd*

VOA Calibration Mix #1 (ketones)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000µg/mL each in P&T methanol:water (90:10), 1mL/ampul
cat. # 30006 (ea.)

8260B Acetate Mix

vinyl acetate
ethyl acetate
isopropyl acetate
n-propyl acetate
n-butyl acetate

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30477 (ea.)

8260B Acetate Mix (Revised) (7 components)

n-amyl acetate
butyl acetate
ethyl acetate
isopropyl acetate
methyl acetate
propyl acetate
vinyl acetate

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30489 (ea.)

California Oxygenates Mix

diisopropyl ether (DIPE)	2,000µg/mL	*tert*-butyl alcohol	10,000
ethyl-*tert*-butyl ether (ETBE)	2,000	methyl *tert*-butyl ether (MTBE)	2,000
tert-amyl methyl ether (TAME)	2,000		

In P&T methanol, 1mL/ampul
cat. # 30465 (ea.)

Oxygenates

tert-amyl ethyl ether (TAEE)	2,000µg/mL	diisopropyl ether (DIPE)	2,000
tert-amyl methyl ether (TAME)	2,000	ethyl-*tert*-butyl ether (ETBE)	2,000
tert-butyl alcohol (TBA)	10,000	methyl *tert*-butyl ether (MTBE)	2,000

In P&T methanol, 1mL/ampul
cat. # 30626 (ea.)

Single-Component Oxygenates Solutions

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
ethanol	W	10,000	30466	
methanol	W	10,000	30467	
tert-amyl alcohol	PTM	10,000	30631	
ethanol	PTM	2,000	30288	
methyl *tert*-butyl ether (MTBE)	PTM	2,000	30402	
tert-amyl ethyl ether (TAEE)	PTM	2,000	30617	
diisopropyl ether (DIPE)	PTM	2,000	30627	
ethyl-*tert*-butyl ether (ETBE)	PTM	2,000	30628	
tert-amyl methyl ether (TAME)	PTM	2,000	30629	
tert-butanol-d9	PTM	20,000	30618	
tert-butanol	PTM	50,000	30470	

PTM = purge & trap grade methanol
W = DI water



also **available**

Our Rtx®-VMS column is your best choice for EPA Method 8260.

- Fastest cycle times for VOCs.
- Tuned selectivity for VOCs.
- Excellent separation of gases.

See **page 90** for more information.

Acrolein

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30499 (ea.)

10,000µg/mL in water, 1mL/ampul
cat. # 30478 (ea.)

1,2-Dichlorotetrafluoroethane (CFC-114)

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30476 (ea.)

Chloroprene

5,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30238 (ea.)

Vinyl Acetate

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30216 (ea.)

8260A Volatile Organics Kit (2,000µg/mL)

kit

Changes in this revision of the method include modification of the recommended internal standard and surrogate solutions.

30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500µg/mL)
30240: 8260A Surrogate Mix (2,500µg/mL)
30241: 8260A Internal Standard Mix (2,500µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500µg/mL)

Contains 1mL each of these mixtures.
cat. # 30242 (kit)

Components are listed on pages 408, 409, 433, and 442.

8260 Volatile Organics Kit (2,000µg/mL)

kit

30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500µg/mL)
30073: 8260 Surrogate Mix (2,500µg/mL)
30074: 8260 Internal Standard Mix (2,500µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500µg/mL)

Contains 1mL each of these mixtures.
cat. # 30076 (kit)

Components are listed on pages 408, 409, 433, and 442.

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Method 8270D, 8270C (Semivolatile Organic Compounds)

SV Internal Standard Mix

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31206 (ea.)

4,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31006 (ea.)

Revised SV Internal Standard Mix (7 components)

acenaphthane-d10
chrysene-d12
1,4-dichlorobenzene-d4
1,4-dioxane-d8
naphthalene-d8
perylene-d12
phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31885 (ea.)

4,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31886 (ea.)

B/N Surrogate Mix (4/89 SOW)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31024 (ea.)

5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31062 (ea.)

5,000µg/mL each in methylene chloride, 5mL/ampul
cat. # 31086 (ea.)

5,000µg/mL each in methylene chloride, 10mL/ampul
cat. # 33028 (ea.)

Revised B/N Surrogate Mix

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14
pyrene-d10

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31887 (ea.)

5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31888 (ea.)

5,000µg/mL each in methylene chloride, 5mL/ampul
cat. # 31889 (ea.)

Acid Surrogate Mix (4/89 SOW)

2-fluorophenol
phenol-d6
2,4,6-tribromophenol

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31025 (ea.)

10,000µg/mL each in methanol, 1mL/ampul
cat. # 31063 (ea.)

10,000µg/mL each in methanol, 5mL/ampul
cat. # 31087 (ea.)

10,000µg/mL each in methanol, 10mL/ampul
cat. # 33029 (ea.)

B/N Matrix Spike Mix

acenaphthene
1,4-dichlorobenzene
2,4-dinitrotoluene
N-nitroso-di-*n*-propylamine
pyrene
1,2,4-trichlorobenzene

1,000µg/mL each in methanol, 1mL/ampul
cat. # 31004 (ea.)

5,000µg/mL each in methanol, 1mL/ampul
cat. # 31074 (ea.)

5,000µg/mL each in methanol, 5mL/ampul
cat. # 31084 (ea.)

5,000µg/mL each in methanol, 10mL/ampul
cat. # 33030 (ea.)

Acid Matrix Spike Mix

4-chloro-3-methylphenol
2-chlorophenol
4-nitrophenol
pentachlorophenol
phenol

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31014 (ea.)

10,000µg/mL each in methanol, 1mL/ampul
cat. # 31061 (ea.)

10,000µg/mL each in methanol, 5mL/ampul
cat. # 31071 (ea.)

10,000µg/mL each in methanol, 10mL/ampul
cat. # 33031 (ea.)

GC/MS Tuning Mixture

benzidine
4,4'-DDT
DFTPP
pentachlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31615 (ea.)

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)
2,500µg/mL in methylene chloride, 1mL/ampul
cat. # 31001 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)
Neat, 1mL/ampul
cat. # 30482 (ea.)

Neat, 1g
cat. # 33027 (ea.)

No data pack available.

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.



Sign up for Restek's e-newsletter, *The Buzz*
www.restek.com/buzz

Method 8270D, 8270C (Semivolatile Organic Compounds) *cont'd*

8270 B/N Calibration Check Mix (7 components)

acenaphthene
benzo(a)pyrene
1,4-dichlorobenzene
di-*n*-octyl phthalate
diphenylamine
fluoranthene
hexachlorobutadiene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31616 (ea.)

8270 Acid Calibration Check Mix

4-chloro-3-methylphenol
2,4-dichlorophenol
2-nitrophenol
pentachlorophenol
phenol
2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31617 (ea.)

SV System Performance Check Mix (SPCC)

2,4-dinitrophenol
hexachlorocyclopentadiene
4-nitrophenol
N-nitroso-di-*n*-propylamine

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31689 (ea.)

605 Benzidines Calibration Mix

benzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31030 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31834 (ea.)

8270 Benzidines Mix

benzidine
3,3'-dimethylbenzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31688 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31852 (ea.)



also **available**

Our Rxi®-5Sil MS columns provide high response for 2,4-dinitrophenol, show excellent peak shape of pyridine, and produce outstanding resolution of PAHs.

See **page 88.**

8270 MegaMix® (76 components)

acenaphthene
acenaphthylene
aniline
anthracene
azobenzene[1]
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl alcohol
benzyl butyl phthalate
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
carbazole
4-chloroaniline
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
2,4-dichlorophenol
diethyl phthalate
2,4-dimethylphenol
dimethyl phthalate
di-*n*-butyl phthalate
1,2-dinitrobenzene
1,3-dinitrobenzene
1,4-dinitrobenzene
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[2]
fluoranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
1-methylnaphthalene
2-methylnaphthalene
2-methylphenol
3-methylphenol
4-methylphenol
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
pyridine
2,3,4,6-tetrachlorophenol
2,3,5,6-tetrachlorophenol
1,2,4-trichlorobenzene
2,4,5-trichlorophenol
2,4,6-trichlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul*
cat. # 31850 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500µg/mL.

[1]1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.
[2]N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

8270 Matrix Spike Mix (76 components)

same list as 8270 MegaMix above

200µg/mL each in methanol:methylene chloride (80:20), 5mL/ampul**
cat. # 31687 (ea.)

200µg/mL each in methanol:methylene chloride (80:20), 10mL/ampul**
cat. # 33073 (ea.)

**3-methylphenol and 4-methylphenol concentration is 100µg/mL.

EASIER calibration

8270 MegaMix® and 8270 Matrix Spike Mix include 3-methylphenol and 4-methylphenol at ½ x concentration of other components.

Method 8270D, 8270C (Semivolatile Organic Compounds) *cont'd*

8270/Appendix IX Kit

kit

31850: 8270 MegaMix
31834: 605 Benzidines Calibration Mix
31625: Appendix IX Mix #1
31806: Appendix IX Mix #2

Contains 1mL each of these mixtures.

cat. # 31815 (kit)

Benzoic Acid

2,000µg/mL in methylene chloride, 1mL/ampul

cat. # 31879 (ea.)

Appendix IX Mix #1 (18 components)

2-acetylaminofluorene
4-aminobiphenyl
p-dimethylaminoazobenzene
3,3'-dimethylbenzidine
α,α,-dimethylphenethylamine (free base)
methapyrilene (free base)
1-naphthylamine
2-naphthylamine
5-nitro-*o*-toluidine
N-nitrosodibutylamine
N-nitrosodiethylamine
N-nitrosomethylethylamine
N-nitrosomorpholine
N-nitrosopiperidine
N-nitrosopyrrolidine
1,4-phenylenediamine
2-picoline
o-toluidine

2,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31625 (ea.)

Appendix IX Mix #2 (32 components)

acetophenone
Aramite
atrazine
benzaldehyde
biphenyl
ε-caprolactam
chlorobenzilate
1-chloronaphthalene
diallate
dibenzo(a,j)acridine
2,6-dichlorophenol
7,12-dimethylbenz(a)anthracene
1,4-dioxane
diphenyl ether
ethyl methacrylate
ethyl methanesulfonate
hexachloropropene
isodrin
isosafrole (*cis* & *trans*)
kepone
3-methylcholanthrene
methyl methanesulfonate
1,4-naphthoquinone
4-nitroquinoline-N-oxide
pentachlorobenzene
pentachloroethane
pentachloronitrobenzene
phenacetin
pronamide
safrole
1,2,4,5-tetrachlorobenzene
1,3,5-trinitrobenzene

1,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31806 (ea.) enquire

Organophosphorus Pesticide Mix, 8270/Appendix IX

(9 components)

dimethoate
disulfoton
famphur
methyl parathion
O,O,O-triethyl phosphorothioate
parathion (ethyl parathion)
phorate
sulfotepp
zinophos (thionazine)

2,000µg/mL in methylene chloride, 1mL/ampul

cat. # 32419 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
α-chlordane
γ-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul

cat. # 32415 (ea.)

8270 Calibration Mix #1 (19 components)

benzoic acid
4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,6-dichlorophenol
2,4-dimethylphenol
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
dinoseb
2-methylphenol
3-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,3,4,6-tetrachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31618 (ea.)

8270 Calibration Mix #2 (11 components)

aniline
benzidine
4-chloroaniline
3,3'-dichlorobenzidine
diphenylamine*
2-nitroaniline
3-nitroaniline
4-nitroaniline
N-nitrosodimethylamine
N-nitrosodi-*n*-propylamine
pyridine

2,000µg/mL each in methylene chloride:methanol (85:15), 1mL/ampul

cat. # 31619 (ea.)

*N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

8270 Calibration Mix #3 (23 components)

Aramite
bis(2-chloroethyl)ether
bis(2-chloroethoxy)methane
bis(2-chloroisopropyl)ether
4-bromophenyl phenyl ether
chlorobenzilate
2-chloronaphthalene
4-chlorophenyl phenyl ether
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,3-dinitrobenzene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
hexachloropropene
isodrin
kepone
pentachlorobenzene
pentachloronitrobenzene
1,2,4,5-tetrachlorobenzene
1,2,4-trichlorobenzene

2,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31620 (ea.)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Method 8270D, 8270C (Semivolatile Organic Compounds) *cont'd*

8270 Calibration Mix #4 (22 components)

acetophenone
azobenzene*
benzyl alcohol
bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
dibenzofuran
diethyl phthalate
dimethyl phthalate
di-*n*-butyl phthalate
di-*n*-octyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
ethyl methanesulfonate
isophorone
isosafrole (*cis* & *trans*)
methyl methanesulfonate
1,4-naphthoquinone
nitrobenzene
4-nitroquinoline-1-oxide
phenacetin
safrole
1,3,5-trinitrobenzene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31621 (ea.) enquire

*1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

8270 Calibration Mix #5 (19 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
ideno(1,2,3-cd)pyrene
3-methylcholanthrene
1-methylnaphthalene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31622 (ea.)

8270 Calibration Mix #6 (10 components)

diallate (*cis* & *trans*)
dimethoate
disulfoton
famphur
methyl parathion
parathion
phorate
pronamide
thionazine (zinophos)
0,0,0-triethyl phosphorothioate

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31623 (ea.)

Aramite

2,000µg/mL in hexane, 1mL/ampul
cat. # 31624 (ea.)

605 Benzidines Calibration Mix

benzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31030 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31834 (ea.)

8270/Appendix IX Calibration Kit (2,000µg/mL)

kit

31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31622: 8270 Calibration Mix #5
31623: 8270 Calibration Mix #6
31625: Appendix IX Mix #1

Contains 1mL each of these mixtures.
cat. # 31627 (kit)

8270 Calibration Kit (2,000µg/mL)

kit

31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31622: 8270 Calibration Mix #5

Contains 1mL each of these mixtures.
cat. # 31626 (kit)

Aroclor Solutions

Volume is 1mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	Solvent	Conc.	cat.# (ea.)	price
Aroclor 1016	H	1,000	32006	
Aroclor 1016	I	200	32064	
Aroclor 1016	TO	50mg/kg	32075	
Aroclor 1016	TO	500mg/kg	32076	
Aroclor 1221	H	1,000	32007	
Aroclor 1221	I	200	32065	
Aroclor 1221	TO	50mg/kg	32077	
Aroclor 1221	TO	500mg/kg	32078	
Aroclor 1232	H	1,000	32008	
Aroclor 1232	I	200	32066	
Aroclor 1232	TO	50mg/kg	32079	
Aroclor 1232	TO	500mg/kg	32080	
Aroclor 1242	H	1,000	32009	
Aroclor 1242	I	200	32067	
Aroclor 1242	TO	50mg/kg	32081	
Aroclor 1242	TO	500mg/kg	32082	
Aroclor 1248	H	1,000	32010	
Aroclor 1248	I	200	32068	
Aroclor 1248	TO	50mg/kg	32083	
Aroclor 1248	TO	500mg/kg	32084	
Aroclor 1254	H	1,000	32011	
Aroclor 1254	I	200	32069	
Aroclor 1254	TO	50mg/kg	32085	
Aroclor 1254	TO	500mg/kg	32086	
Aroclor 1260	H	1,000	32012	
Aroclor 1260	I	200	32070	
Aroclor 1260	TO	50mg/kg	32087	
Aroclor 1260	TO	500mg/kg	32088	
Aroclor 1262	H	1,000	32409	
Aroclor 1268	H	1,000	32410	
Aroclor 1016/1260	H	1,000	32039	
Aroclor 1016/1260	I	200	32299	
Aroclor 1016/1260	A	400	32456	

A = acetone
H = hexane
I = isooctane
TO = transformer oil (PCB-free)

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Method 8310 (Polycyclic Aromatic Hydrocarbons [PAHs])

EPA Method 8310 PAH Mixture (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
1-methylnaphthalene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

500µg/mL each in acetonitrile, 1mL/ampul
cat. # 31841 (ea.)

EPA Method 8310 Surrogate Standard

decafluorobiphenyl

1,000µg/mL in acetonitrile, 1mL/ampul
cat. # 31842 (ea.)

EPA Method 8310 Quality Control Check (18 components)

acenaphthene	100µg/mL	dibenzo(a,h)anthracene	10
acenaphthylene	100	fluoranthene	10
anthracene	100	fluorene	100
benzo(a)anthracene	10	indeno(1,2,3-cd)pyrene	10
benzo(a)pyrene	10	1-methylnaphthalene	100
benzo(b)fluoranthene	10	2-methylnaphthalene	100
benzo(ghi)perylene	10	naphthalene	100
benzo(k)fluoranthene	5	phenanthrene	100
chrysene	10	pyrene	10

In acetonitrile, 1mL/ampul
cat. # 31843 (ea.)



did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Method 8315 (Aldehydes/Ketones-DNPH by HPLC)

Aldehyde-Ketone-DNPH TO-11A Calibration Mix

(15 components)

acetaldehyde-DNPH
acetone-DNPH
acrolein-DNPH
benzaldehyde-DNPH
n-butyraldehyde-DNPH
crotonaldehyde-DNPH
2,5-dimethylbenzaldehyde-DNPH
formaldehyde-DNPH
hexaldehyde-DNPH
isovaleraldehyde-DNPH
propionaldehyde-DNPH
m-tolualdehyde-DNPH
o-tolualdehyde-DNPH
p-tolualdehyde-DNPH
valeraldehyde-DNPH

15µg/mL* each in acetonitrile, 1mL/ampul
cat. # 31808 (ea.)

*Concentration calculated as aldehyde.

Formaldehyde-DNPH Mix

formaldehyde-DNPH

500µg/mL* in acetonitrile, 1mL/ampul
cat. # 31837 (ea.)

*Concentration calculated as aldehyde.

CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard

(13 components)

acetaldehyde-2,4-DNPH
acetone-2,4-DNPH
acrolein-2,4-DNPH
benzaldehyde-2,4-DNPH
n-butyraldehyde-2,4-DNPH
crotonaldehyde-2,4-DNPH
formaldehyde-2,4-DNPH
hexaldehyde-2,4-DNPH
methacrolein-2,4-DNPH
methyl ethyl ketone-2,4-DNPH
propionaldehyde-2,4-DNPH
m-tolualdehyde-2,4-DNPH
valeraldehyde-2,4-DNPH

3µg/mL each in acetonitrile, 1mL/ampul
cat. # 33093 (ea.)

DNPH Reference Materials

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
acetaldehyde-2,4-DNPH	ACN	100	33074	
acetone-2,4-DNPH	ACN	100	33075	
acrolein-2,4-DNPH	ACN	100	33076	
benzaldehyde-2,4-DNPH	ACN	100	33077	
2-butanone-2,4-DNPH	ACN	100	33078	
n-butyraldehyde-2,4-DNPH	ACN	100	33079	
crotonaldehyde-2,4-DNPH	ACN	100	33080	
2,5-dimethylbenzaldehyde-2,4-DNPH	ACN	100	33081	
formaldehyde-2,4-DNPH	ACN	100	33082	
glycolaldehyde-2,4-DNPH	ACN	100	33091	
hexaldehyde-2,4-DNPH	ACN	100	33083	
isobutyraldehyde-2,4-DNPH	ACN	100	33084	
isovaleraldehyde-2,4-DNPH	ACN	100	33085	
methacrolein-2,4-DNPH	ACN	100	33095	
propionaldehyde-2,4-DNPH	ACN	100	33086	
m-tolualdehyde-2,4-DNPH	ACN	100	33088	
o-tolualdehyde-2,4-DNPH	ACN	100	33087	
p-tolualdehyde-2,4-DNPH	ACN	100	33089	
valeraldehyde-2,4-DNPH	ACN	100	33090	

ACN = acetonitrile

Method 8321 (Chlorinated Acids by HPLC)

Chlorinated Acids by HPLC, Mix A (8 components)

acifluorfen (Blazer)
bentazon
chloramben
2,4-D
dicamba
dichlorprop
picloram
2,4,5-TP (Silvex)

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32431 (ea.)

Chlorinated Acids by HPLC, Mix B (8 components)

2,4-DB
3,5-dichlorobenzoic acid
dinoseb
MCPA
MCPP (mecoprop)
4-nitrophenol
pentachlorophenol
2,4,5-T

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32430 (ea.)

Chlorinated Acid Herbicide Mix

2,4-dichlorophenoxyacetic acid (2,4-D)
2,4,5-TP (Silvex)

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 32429 (ea.)

Dalapon (2,2-dichloropropionic acid)

1,000µg/mL in acetonitrile, 1mL/ampul
cat. # 32432 (ea.)

1,000µg/mL in methanol, 1mL/ampul
cat. # 32253 (ea.)

2,000µg/mL in methanol, 1mL/ampul
cat. # 32056 (ea.)

Method 8330 (Nitroaromatics and Nitramines by HPLC)

EPA Method 8330 is used to measure explosives residues in water and soil samples, using HPLC with UV detection. Target analytes are nitroaromatic and nitramine explosives and their degradation products.

8330 Internal Standards

3,4-dinitrotoluene

1,000µg/mL in methanol, 1mL/ampul
cat. # 31452 (ea.) enquire

1,4-dinitrobenzene

2,000µg/mL in acetonitrile, 1mL/ampul
cat. # 33205 (ea.) enquire

8330 Surrogate

1,2-dinitrobenzene

1,000µg/mL in methanol, 1mL/ampul
cat. # 31453 (ea.) enquire

Method 8330 (Nitroaromatics and Nitramines by HPLC) *cont'd*

Nitroaromatics and Nitramine Explosives by HPLC, EPA 8330B (17 components)

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
3,5-dinitroaniline
1,3-dinitrobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX
nitrobenzene
nitroglycerin
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
PETN
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 33204 (ea.) enquire

Nitroaromatics and Nitramine Explosives by HPLC (14 components)

1,3-dinitrobenzene
2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX
nitrobenzene
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 33905 (ea.) enquire

8330 Calibration Mix #1 (7 components)

1,3-dinitrobenzene
2,4-dinitrotoluene
HMX
nitrobenzene
RDX
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 31450 (ea.) enquire

8330 Calibration Mix #2 (7 components)

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
2,6-dinitrotoluene
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
tetryl

1,000µg/mL each in acetonitrile, 1mL/ampul
cat. # 31451 (ea.) enquire

did you **know**?

When you order reference materials for Method 8330, be aware that obtaining pure, neat compounds for standards can be very difficult. Some of these commercial-grade materials contain desensitizing agents such as beeswax, water, or other manufacturing by-products. Many are shipped wet and must be carefully dried before preparation. To ensure the highest quality standards, Restek chemists use multiple analytical techniques including GC, HPLC, GC/MS, or DSC to verify raw material purity. All compounds are 98% pure or higher.

also **available**

See **page 425** for chlordane and toxaphene reference materials.

Method 8330 (Nitroaromatics and Nitramines by HPLC) *cont'd*

Single-Component Explosives Solutions

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
2-amino-4,6-dinitrotoluene	ACN	1,000	31670	enquire
4-amino-2,6-dinitrotoluene	ACN	1,000	31671	enquire
ammonium picrate	ACN	2,000	31890	enquire
3,5-dinitroaniline	ACN	1,000	31661	enquire
1,3-dinitrobenzene	ACN	1,000	31662	enquire
1,4-dinitrobenzene	ACN	2,000	33205	enquire
2,4-dinitrotoluene	ACN	1,000	31663	enquire
2,6-dinitrotoluene	ACN	1,000	31664	enquire
EGDN	M	1,000	31601	enquire
HMX	ACN	1,000	31665	enquire
nitrobenzene	ACN	1,000	31657	enquire
nitroglycerin	M	1,000	31498	enquire
nitroguanidine	M	1,000	31602	enquire
2-nitrotoluene	ACN	1,000	31659	enquire
3-nitrotoluene	ACN	1,000	31660	enquire
4-nitrotoluene	ACN	1,000	31658	enquire
PETN (pentaerythritol tetranitrate)	M	1,000	31600	enquire
picric acid	M	1,000	31499	enquire
propylene glycol dinitrate (PGDN)	M	1,000	31821	enquire
RDX	ACN	1,000	31666	enquire
tetryl	ACN	1,000	31667	enquire
1,3,5-trinitrobenzene	ACN	1,000	31668	enquire
2,4,6-trinitrotoluene	ACN	1,000	31669	enquire

ACN=acetonitrile
M = methanol

8330 Nitroaromatics Kit (1,000µg/mL)

kit

31450: 8330 Calibration Mix #1
31451: 8330 Calibration Mix #2
31452: 8330 Internal Standard Mix
31453: 8330 Surrogate Mix

Contains 1mL each of these mixtures.

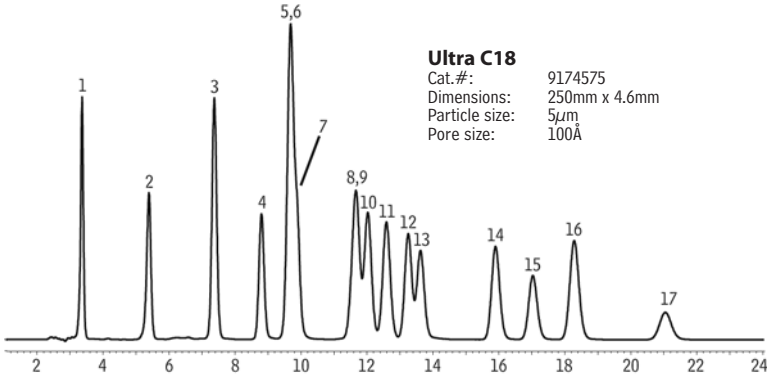
cat. # 31454 (kit) enquire



also available

See materials for GC Method 8095 on **pages 429-430.**

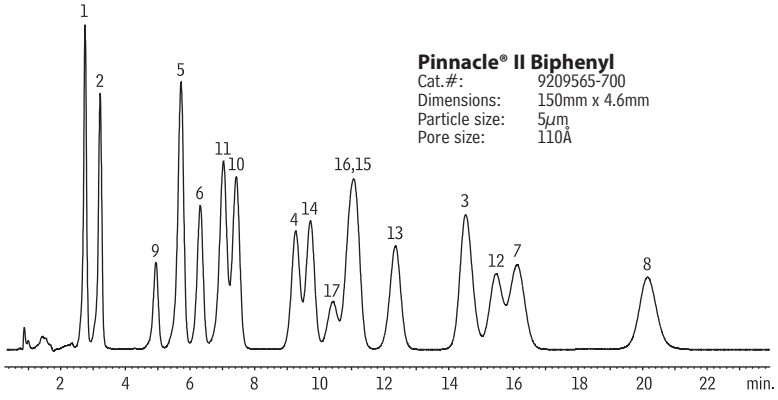
EPA 8330B analytes resolve well on the Ultra C18 column and Pinnacle® II Biphenyl column; differing selectivities allow true confirmational analysis.



Ultra C18
Cat.#: 9174575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

LC_EV0428

Peak List
1. HMX
2. RDX
3. 1,3,5-TNB
4. 1,3-DNB
5. 3,5-DNA
6. NB
7. tetryl
8. 2,4,6-TNT
9. NG
10. 2-A-4,6-DNT
11. 4-A-2,6-DNT
12. 2,4-DNT
13. 2,6-DNT
14. 2-NT
15. 4-NT
16. 3-NT
17. PETN



Pinnacle® II Biphenyl
Cat.#: 9209565-700
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

LC_EV0429

Sample: **50µg/mL each compound diluted in acetonitrile**
8330 Calibration Mix #1 (cat.# 31450)
8330 Calibration Mix #2 (cat.# 31451)
PETN Standard(cat.# 31600)
3,5-dinitroaniline Reference Mix (cat.# 31661)
Nitroglycerin Standard (cat.# 31498)
Inj.: 10µL

Conditions:
Mobile phase: water:methanol (44:56 v/v)
Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV detection @ 210nm

free literature

For more information, download our *Trace-Level Explosives Analysis by HPLC* applications note from **www.restek.com**.
lit. cat.# 59361A

EPA Superfund Contract Lab Program (CLP)

US EPA Method No.	Compound Class
SOM01.1	Volatiles
04.2 and 04.1	Volatiles
10/92 SOW	Volatiles
3/90 SOW	Volatiles
03.2 OLC	Volatiles

US EPA Method No.	Compound Class
SOM01.1	Semivolatiles
03.2 OLC	Semivolatiles
04.2 and 04.1 SOW	Semivolatiles
4/89 and 3/90 SOW	Semivolatiles
SOM01.1, 04.1, 3/90, 4/89 and 2/88 SOW	Pesticides, Aroclor PCBs

SOM01.1 (Volatiles), QA Mixes

SOM01.1 VOA Non-Ketone Deuterated Monitoring Compounds (11 components)

benzene-d6
chloroethane-d5
chloroform-d
1,2-dichlorobenzene-d4
1,2-dichloroethane-d4
1,1-dichloroethene-d2
1,2-dichloropropane-d6
1,3-dichloropropene-d4*
1,1,2,2-tetrachloroethane-d2
toluene-d8
vinyl chloride-d3

500µg/mL each in deuterated methanol (MeOD), 1mL/ampul
cat. # 30624 (ea.)

1,000µg/mL each in deuterated methanol (MeOD), 1mL/ampul
cat. # 30635 (ea.)

*Mix of *cis* and *trans* isomers. Exact proportions will be reported on the data sheet.

SOM01.1 VOA Ketone Deuterated Monitoring Compounds

2-butanone-d5
2-hexanone-d5

500µg/mL each in deuterium oxide (D_2O), 1mL/ampul
cat. # 30625 (ea.)

1,000µg/mL each in deuterium oxide (D_2O), 1mL/ampul
cat. # 30636 (ea.)

SOM01.1 VOA DMC Kit

30624: Non-Ketones
30625: Ketones

500µg/mL. 1mL each of these mixtures.
cat. # 30630 (kit)

1,000µg/mL. 1mL each of these mixtures.
cat. # 30637 (kit)

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes

CLP 04.1 VOA Internal Standard/SMC Spike Mix

bromochloromethane
4-bromofluorobenzene
chlorobenzene-d5
1,2-dichloroethane-d4
1,4-difluorobenzene
toluene-d8

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30457 (ea.)

VOA Internal Standard Mix

bromochloromethane
1,4-difluorobenzene
chlorobenzene-d5

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30011 (ea.)

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes *cont'd*

VOA Surrogate Spike Mix

4-bromofluorobenzene
1,2-dichloroethane-d4
toluene-d8

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30004 (ea.)

VOA Matrix Spike Mix

benzene
chlorobenzene
1,1-dichloroethene
toluene
trichloroethene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30005 (ea.)

VOA Screening Mix #1

benzene
ethylbenzene
toluene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30001 (ea.)

VOA Screening Mix #2

n-dodecane
n-nonane

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30002 (ea.)

VOA Tuning Compound

4-bromofluorobenzene

5,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30003 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1mL/ampul
cat. # 30482 (ea.)

Neat, 1g
cat. # 33027 (ea.)

No data pack available.

L/C VOA Lab Control Sample #1 (11 components)

benzene
bromoform
carbon tetrachloride
1,2-dibromoethane
1,4-dichlorobenzene
1,2-dichloroethane
1,2-dichloropropane
cis-1,3-dichloropropene
tetrachloroethene
1,1,2-trichloroethane
trichloroethene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30092 (ea.)

also **available**
See **pages 539-546** for volatiles analysis chromatograms.

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes *cont'd*

L/C VOA Lab Control Sample #2

vinyl chloride

2,500µg/mL in P&T methanol, 1mL/ampul

cat. # 30093 (ea.)

L/C VOA Internal Standard Mix

chlorobenzene-d5
1,4-dichlorobenzene-d4
1,4-difluorobenzene

2,500µg/mL each in P&T methanol, 1mL/ampul

cat. # 30091 (ea.)

04.2 and 04.1 (Volatiles), Calibration Mixes

CLP 04.1 VOA CAL2000 MegaMix® (40 components)

benzene
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
cyclohexane
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
isopropylbenzene
methyl acetate
methyl *tert*-butyl ether (MTBE)
methylcyclohexane
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30456 (ea.)

502.2 Calibration Mix #1 (gases)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200µg/mL each in P&T methanol, 1mL/ampul

cat. # 30439 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30042 (ea.)

VOA Calibration Mix #1 (ketones)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000µg/mL each in P&T methanol:water (90:10), 1mL/ampul

cat. # 30006 (ea.)

CLP 04.1 VOA Kit #3

30006: VOA Calibration Mix #1 (ketones)
30042: 502.2 Calibration Mix #1 (gases)
30456: CLP 04.1 VOA CAL2000 MegaMix

Contains 1mL each of these mixtures.

cat. # 30460 (kit)

3/90 SOW (Volatiles), Calibration Mixes

CLP VOA CAL2000 MegaMix® (28 components)

benzene
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
dibromochloromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30632 (ea.)

Vinyl Acetate

2,000µg/mL in P&T methanol, 1mL/ampul

cat. # 30216 (ea.)

CLP VOA CAL2000 MegaMix® Kit

30632: CLP VOA CAL2000 MegaMix
30216: vinyl acetate

Contains 1mL each of these mixtures.

cat. # 30438 (kit)

VOA Calibration Mix #2 (7 components)

benzene
carbon disulfide
ethylbenzene
toluene
vinyl acetate
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30007 (ea.)

VOA Calibration Mix #3 (10 components)

carbon tetrachloride
chlorobenzene
chloroform
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
methylene chloride
1,1,2-trichloroethane
trichloroethene
m-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30008 (ea.)

VOA Calibration Mix #4 (12 components)

bromodichloromethane
bromoform
dibromochloromethane
1,2-dichloroethane
cis-1,2-dichloroethene
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30009 (ea.)

VOA Calibration Mix #5 (gases)

bromomethane
chloroethane
chloromethane
vinyl chloride

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30010 (ea.)

CLP VOA Calibration Kit #2

30006: VOA Calibration Mix #1 (ketones)
30010: VOA Calibration Mix #5 (gases)
30632: CLP VOA CAL2000 MegaMix
30216: vinyl acetate

Contains 1mL each of these mixtures.

cat. # 30442 (kit)

OLC 03.2 (Volatiles), Calibration Mixes

OLC 03.2 VOA MegaMix® (42 components)

benzene
bromochloromethane
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
cyclohexane
dibromochloromethane (chlorodibromomethane)
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
isopropylbenzene (cumene)
methyl acetate
methylcyclohexane
methyl *tert*-butyl ether (MTBE)
methylene chloride (dichloromethane)
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,1,2-trichlorotrifluoroethane (CFC-113)
m-xylene*
o-xylene
p-xylene*

2,000µg/mL each (**m*- & *p*-xylene at 1,000µg/mL) in P&T methanol, 1mL/ampul
cat. # 30492 (ea.)

L/C VOA Calibration Mix #6

bromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30090 (ea.)

Additional VOA Calibration Mixes Required:

30006: VOA Calibration Mix #1
30007: VOA Calibration Mix #2
30008: VOA Calibration Mix #3
30009: VOA Calibration Mix #4
30010: VOA Calibration Mix #5
30003: VOA Tuning Compound

See pages 442–443 for mix compositions.

SOM01.1 (Semivolatiles), QA Mixes

SOM01.1 Deuterated Monitoring Compound Mix w/ SIM Compounds (18 components)

acenaphthylene-d8
anthracene-d10
benzo(a)pyrene-d12
bis(2-chloroethyl)ether-d8
4-chloroaniline-d4
2-chlorophenol-d4
2,4-dichlorophenol-d3
dimethylphthalate-d6
4,6-dinitro-2-methylphenol-d
fluoranthene-d10
fluorene-d10
2-methylnaphthalene-d10
4-methylphenol-d8
nitrobenzene-d5
2-nitrophenol-d4
4-nitrophenol-d4
phenol-d5
pyrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 33918 (ea.)

SOM01.1 Deuterated Monitoring Compound Mix SIM Compounds

fluoranthene-d10
2-methylnaphthalene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 33913 (ea.)

CCME F2 Surrogate Standard

2-methylnonane

1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31870 (ea.)

SOM01.1 (Semivolatiles), QA Mixes *cont'd*

SOM01.1 SVOA B/N Matrix Spike Mix

acenaphthene
2,4-dinitrotoluene
N-nitroso-di-*n*-propylamine
pyrene

5,000µg/mL each in methanol, 1mL/ampul
cat. # 33916 (ea.)

5,000µg/mL each in methanol, 5mL/ampul
cat. # 33917 (ea.)

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes

SV Internal Standard Mix

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31206 (ea.)

4,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31006 (ea.)

Revised SV Internal Standard Mix (7 components)

acenaphthane-d10
chrysene-d12
1,4-dichlorobenzene-d4
1,4-dioxane-d8
naphthalene-d8
perylene-d12
phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31885 (ea.)

4,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31886 (ea.)

Acid Surrogate Standard Mix (3/90 SOW)

2-chlorophenol-d4
2-fluorophenol
phenol-d6
2,4,6-tribromophenol

1,500µg/mL each in methanol, 1mL/ampul
cat. # 31003 (ea.)

7,500µg/mL each in methanol, 1mL/ampul
cat. # 31073 (ea.)

7,500µg/mL each in methanol, 5mL/ampul
cat. # 31083 (ea.)

Acid Surrogate Mix (4/89 SOW)

2-fluorophenol
phenol-d6
2,4,6-tribromophenol

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31025 (ea.)

10,000µg/mL each in methanol, 1mL/ampul
cat. # 31063 (ea.)

10,000µg/mL each in methanol, 5mL/ampul
cat. # 31087 (ea.)

10,000µg/mL each in methanol, 10mL/ampul
cat. # 33029 (ea.)

Revised B/N Surrogate Mix

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14
pyrene-d10

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31887 (ea.)

5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31888 (ea.)

5,000µg/mL each in methylene chloride, 5mL/ampul
cat. # 31889 (ea.)

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes *cont'd*

CLP 04.1 BNA Surrogate Mix (8 components)

2-chlorophenol-d4	1,500µg/mL	nitrobenzene-d5	1,000
1,2-dichlorobenzene-d4	1,000	phenol-d6	1,500
2-fluorobiphenyl	1,000	*p*-terphenyl-d14	1,000
2-fluorophenol	1,500	2,4,6-tribromophenol	1,500

In methylene chloride, 1mL/ampul
cat. # 31493 (ea.)

B/N Surrogate Standard Mix (3/90 SOW)

1,2-dichlorobenzene-d4 — nitrobenzene-d5
2-fluorobiphenyl — *p*-terphenyl-d14

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31002 (ea.)

5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31072 (ea.)

5,000µg/mL each in methylene chloride, 5mL/ampul
cat. # 31082 (ea.)

B/N Surrogate Mix (4/89 SOW)

2-fluorobiphenyl — *p*-terphenyl-d14
nitrobenzene-d5

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31024 (ea.)

5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31062 (ea.)

5,000µg/mL each in methylene chloride, 5mL/ampul
cat. # 31086 (ea.)

5,000µg/mL each in methylene chloride, 10mL/ampul
cat. # 33028 (ea.)

Acid Matrix Spike Mix

4-chloro-3-methylphenol — pentachlorophenol
2-chlorophenol — phenol
4-nitrophenol

1,500µg/mL each in methanol, 1mL/ampul
cat. # 31005 (ea.)

7,500µg/mL each in methanol, 1mL/ampul
cat. # 31075 (ea.)

7,500µg/mL each in methanol, 5mL/ampul
cat. # 31085 (ea.)

CLP 04.1 B/N Matrix Spike Mix

acenaphthene — N-nitroso-di-*n*-propylamine
2,4-dinitrotoluene — pyrene

1,000µg/mL each in methanol, 1mL/ampul
cat. # 31492 (ea.)

B/N Matrix Spike Mix

acenaphthene — N-nitroso-di-*n*-propylamine
1,4-dichlorobenzene — pyrene
2,4-dinitrotoluene — 1,2,4-trichlorobenzene

1,000µg/mL each in methanol, 1mL/ampul
cat. # 31004 (ea.)

5,000µg/mL each in methanol, 1mL/ampul
cat. # 31074 (ea.)

5,000µg/mL each in methanol, 5mL/ampul
cat. # 31084 (ea.)

5,000µg/mL each in methanol, 10mL/ampul
cat. # 33030 (ea.)

SV Screening Mix

di-*n*-octyl phthalate — phenol
phenanthrene

2,500µg/mL each in methylene chloride, 1mL/ampul
cat. # 31000 (ea.)

Low Concentration Semivolatiles, QA Mixes

L/C Acid Surrogate Mix

2-fluorophenol	1,000µg/mL	2,4,6-tribromophenol	3,000
phenol-d6	1,000		

In methanol, 1mL/ampul
cat. # 31207 (ea.)

L/C Acid Lab Control Sample

2-chlorophenol — 2,4,6-trichlorophenol
phenol

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31212 (ea.)

L/C B/N Lab Control Sample (12 components)

For extended shelf life, 4-chloroaniline is provided as a separate solution.

Ampul 1:

benzo(a)pyrene — hexachlorethane
bis(2-chloroethyl)ether — isophorone
diethyl phthalate — naphthalene
2,4-dinitrotoluene — N-nitrosodiphenylamine
N-nitroso-di-*n*-propylamine — 1,2,4-trichlorobenzene
hexachlorobenzene

Ampul 2:

4-chloroaniline

1,000µg/mL each in methylene chloride (4-chloroaniline at 2,000µg/mL), 1mL/ampul
cat. # 31241 (ea.)

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)
2,500µg/mL in methylene chloride, 1mL/ampul
cat. # 31001 (ea.)

PFTBA (MS Tuning Compound)

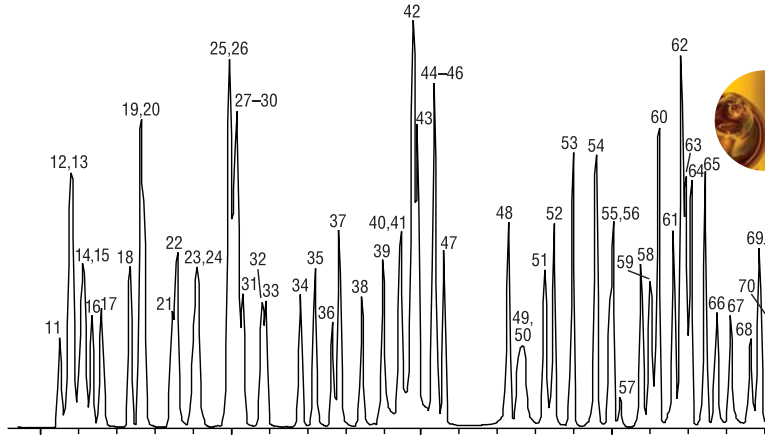
perfluorotributylamine (PFTBA)

Neat, 1mL/ampul
cat. # 30482 (ea.)

Neat, 1g
cat. # 33027 (ea.)

No data pack available.

also **available**
See **pages 547-565** for chromatograms of semivolatiles analysis.



SOM01.1 (Semivolatiles), Calibration Mixes

SOM01.1 SVOA MegaMix® (67 components)

acenaphthene
acenaphthylene
acetophenone
anthracene
atrazine
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
biphenyl
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether (2,2'-oxybis(1-chloropropane))
bis(2-ethylhexyl)phthalate
4-bromophenyl-phenylether
ε-caprolactam
carbazole
4-chloroaniline
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl-phenylether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
3,3'-dichlorobenzidine
2,4-dichlorophenol
diethylphthalate
2,4-dimethylphenol
dimethylphthalate
di-*n*-butylphthalate
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[1]
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
2-methylnaphthalene
2-methylphenol (*o*-cresol)
3-methylphenol (*m*-cresol)*
4-methylphenol (*p*-cresol)*
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
1,2,4,5-tetrachlorobenzene
2,3,4,6-tetrachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 33019 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500µg/mL.

[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

Benzaldehyde

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 33017 (ea.)

SOM01.1 SVOA MegaMix® Kit

33019: SOM01.1 SVOA MegaMix 1,000µg/mL
33017: Benzaldehyde 2,000µg/mL

Contains 1mL each of these mixtures.
cat. # 33005 (kit)

tech tip

CLP OLM 04.1 Semivolatiles Dilution

Atrazine and benzaldehyde react quickly with the methanol stabilizer used in most brands and grades of methylene chloride. This reaction will prevent you from obtaining stable, working-level calibration standards. We prepare **CLP 04.1 B/N MegaMix®** and our **Benzaldehyde** standard from methylene chloride that is stabilized with amylene and is completely free of methanol. We strongly recommend screening the methylene chloride used to dilute these mixtures and confirming that it is free of methanol.

04.2 and 04.1 (Semivolatiles), Calibration Mixes

CLP 04.1 B/N MegaMix® (49 components)

acenaphthene
acenaphthylene
acetophenone
anthracene
atrazine
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
biphenyl
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether (2,2'-oxybis(1-chloropropane))
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
ε-caprolactam
carbazole
4-chloroaniline
2-chloronaphthalene
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
diethylphthalate
dimethylphthalate
di-*n*-butyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[1]
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
2-methylnaphthalene
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
N-nitroso-di-*n*-propylamine
phenanthrene
pyrene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 33018 (ea.)

[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

Benzaldehyde

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 33017 (ea.)

CLP 04.1 B/N MegaMix® Kit

33018: CLP 04.1 B/N MegaMix 1,000µg/mL
33017: Benzaldehyde 2,000µg/mL

Contains 1mL each of these mixtures.
cat. # 33014 (kit)

CLP 04.1 Phenols Calibration Mix (14 components)

4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
2-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31494 (ea.)

Benzidine Mix

benzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31834 (ea.)



also available

See **page 78** for details on our Rxi®-5Sil MS Capillary Columns for semivolatiles analysis.

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes

SV Calibration Mix #1

benzyl alcohol
4-chloroaniline
2-nitroaniline
3-nitroaniline
4-nitroaniline

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31007 (ea.)

SV Calibration Mix #2 (15 components)

benzoic acid
4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
2-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31008 (ea.)

SV Calibration Mix #3 (14 components)

bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
butyl benzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenyl ether
dimethylphthalate
di-*n*-butylphthalate
di-*n*-octylphthalate
N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
N-nitrosodiphenylamine

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31009 (ea.)

SV Calibration Mix #4 (13 components)

carbazole
dibenzofuran
diethyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
isophorone
2-methylnaphthalene
nitrobenzene
1,2,4-trichlorobenzene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31010 (ea.)

SV Calibration Mix #5 / 610 PAH Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31011 (ea.)

SV Calibration Mix #6 (18 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000µg/mL each in toluene:hexane (1:1), 1mL/ampul
cat. # 31012 (ea.)

SV Calibration Mix #7

1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31013 (ea.)

3,3'-Dichlorobenzidine

2,000µg/mL in methanol, 1mL/ampul
cat. # 31026 (ea.)

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31835 (ea.)

605 Benzidines Calibration Mix

benzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31030 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31834 (ea.)

8270 Benzidines Mix

benzidine
3,3'-dimethylbenzidine
3,3'-dichlorobenzidine

2,000µg/mL each in methanol, 1mL/ampul
cat. # 31688 (ea.)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31852 (ea.)

CLP Semivolatile Calibration Kit #2 (without pesticides)

31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neturals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31026: 3,3'-dichlorobenzidine

Contains 1mL each of these mixtures.
cat. # 31462 (kit)

Semivolatile Calibration Kit #3 (with benzidine)

31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neturals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31030: 605 Benzidines Calibration Mix (benzidine & 3,3'-dichlorobenzidine)

Contains 1mL each of these mixtures.
cat. # 31463 (kit)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

03.2 (Semivolatiles), Calibration Mixes

OLC 03.2 SVOA Deuterated Monitoring Compounds (DMC)
(16 components)

acenaphthylene-d8
anthracene-d10
benzo(a)pyrene-d12
4-chloroaniline-d4
bis-(2-chloroethyl)ether-d8
2-chlorophenol-d4
2,4-dichlorophenol-d3
dimethylphthalate-d6
4,6-dinitro-methylphenol-d2
fluorene-d10
4-methylphenol-d8
nitrobenzene-d5
2-nitrophenol-d4
4-nitrophenol-d4
phenol-d5
pyrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31810 (ea.)

OLC 03.2 SVOA MegaMix® (57 components)

acenaphthene
acenaphthylene
acetophenone
anthracene
atrazine
benzaldehyde
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
biphenyl
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
ε-caprolactam
carbazole
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
diethylphthalate
2,4-dimethylphenol
dimethylphthalate
di-*n*-butyl phthalate
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
fluoranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
2-methylnaphthalene
2-methylphenol
4-methylphenol
naphthalene
nitrobenzene
2-nitrophenol
N-nitroso-di-*n*-propylamine
N-nitrosodiphenylamine
pentachlorophenol
phenanthrene
phenol
pyrene
1,2,4,5-tetrachlorobenzene
2,4,6-trichlorophenol

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31862 (ea.)

Fortification Mix (7 components)

4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2-nitroaniline
3-nitroaniline
4-nitroaniline
4-nitrophenol
2,4,5-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31813 (ea.)

3,3'-Dichlorobenzidine

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31835 (ea.)

Hexachlorophene

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31811 (ea.)

did **you** know?

Our **Pesticide Matrix Spike Mix** (cat.# 32018, **page 450**) can be used as a GPC calibration verification solution.

Low Concentration Semivolatiles, Calibration Mixes

L/C Phenol Mix A

2,4-dinitrophenol*
2-methyl-4,6-dinitrophenol*
4-nitrophenol*
pentachlorophenol*
2,4,6-tribromophenol (SS)*
2,4,5-trichlorophenol*

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31208 (ea.)

*Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Phenol Mix B (11 components)

4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2-fluorophenol
2-methylphenol
4-methylphenol
2-nitrophenol
phenol
phenol-d6 (SS)
2,4,6-trichlorophenol

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31209 (ea.)

L/C Aniline Mix A

2-nitroaniline*
3-nitroaniline*
4-nitroaniline*

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31210 (ea.)

*Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Aniline Mix B

4-chloroaniline

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31211 (ea.)

Additional Required SV Calibration Mixes:

See pages 445 and 447 for mix compositions.

31024: B/N Surrogate Mix (4/89 SOW)
31009: SV Calibration Mix #3
31010: SV Calibration Mix #4
31011: SV Calibration Mix #5
31026: 3,3'-dichlorobenzidine
31001: SV Tuning Compound (DFTPP)

GPC Calibration Mix

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

CLP GPC Calibration Mix

bis(2-ethylhexyl) phthalate	10mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	2.0		

In methylene chloride, 1mL/ampul
cat. # 32019 (ea.)

In methylene chloride, 5mL/ampul
cat. # 32023 (ea.)

No data pack available.

Revised GPC Calibration Mix

bis(2-ethylhexyl) phthalate	5mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	1.0		

In methylene chloride, 1mL/ampul
cat. # 32041 (ea.)

In methylene chloride, 5mL/ampul
cat. # 32042 (ea.)

No data pack available.

SOM01.1 (Pesticides), QA Mixes

Pesticide Surrogate Mix

decachlorobiphenyl	200µg/mL
2,4,5,6-tetrachloro-*m*-xylene	100

In acetone, 1mL/ampul

cat. # 32453 (ea.)

Organochlorine Pesticide Resolution Check Mix (with surrogates) (22 components)

aldrin	10µg/mL	endosulfan I	10
α-BHC	10	endosulfan II	20
β-BHC	10	endosulfan sulfate	20
δ-BHC	10	endrin	20
γ-BHC (lindane)	10	endrin aldehyde	20
α-chlordane	10	endrin ketone	20
γ-chlordane	10	heptachlor	10
decachlorobiphenyl (SS)	20	heptachlor epoxide (isomer B)	10
dieldrin	20	methoxychlor	100
4,4'-DDD	20	2,4,5,6-tetrachloro-*m*-xylene (SS)	10
4,4'-DDE	20		
4,4'-DDT	20		

In hexane:toluene, 1mL/ampul

cat. # 32454 (ea.)

04.2, 04.1, 03.2, 3/90, 4/89, and 2/88 SOW (Pesticides), QA Mixes

Pesticide Surrogate Mix

decachlorobiphenyl 2,4,5,6-tetrachloro-*m*-xylene

200µg/mL each in acetone, 1mL/ampul

cat. # 32000 (ea.)

2,4,5,6-Tetrachloro-*m*-xylene

200µg/mL in acetone, 1mL/ampul

cat. # 32027 (ea.)

200µg/mL in acetone, 5mL/ampul

cat. # 32028 (ea.)

Decachlorobiphenyl (BZ #209)

200µg/mL in acetone, 1mL/ampul

cat. # 32029 (ea.)

200µg/mL in acetone, 5mL/ampul

cat. # 32030 (ea.)

10µg/mL in isooctane, 1mL/ampul

cat. # 32289 (ea.)

Dibutylchlorendate

200µg/mL in acetone, 1mL/ampul

cat. # 32025 (ea.)

Florisil® Cartridge Check Standard

2,4,5-trichlorophenol

1,000µg/mL in acetone, 1mL/ampul

cat. # 32017 (ea.)

Organochlorine Pesticide System Evaluation Mix

4,4'-DDT	200µg/mL
endrin	100µg/mL

In methyl *tert*-butyl ether, 1mL/ampul

cat. # 32417 (ea.)

04.2, 04.1, 03.2, 3/90, 4/89, and 2/88 SOW (Pesticides), QA Mixes *cont'd*

Pesticide Resolution Check Mix (7 components)

γ-chlordane	1µg/mL	endosulfan sulfate	2
4,4'-DDE	2	endrin ketone	2
dieldrin	2	methoxychlor	10
endosulfan I	1		

In hexane, 1mL/ampul

cat. # 32001 (ea.)

Pesticide Resolution Check Mix w/Surrogates (9 components)

γ-chlordane	1µg/mL	endosulfan sulfate	2
4,4'-DDE	2	endrin ketone	2
decachlorobiphenyl (SS)	2	methoxychlor	10
dieldrin	2	2,4,5,6-tetrachloro-*m*-xylene (SS)	2
endosulfan I	1		

In hexane, 1mL/ampul

cat. # 32073 (ea.)

Pesticide Performance Evaluation Mix

α-BHC	1µg/mL	4,4'-DDT	10
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25

In hexane, 1mL/ampul

cat. # 32002 (ea.)

Pesticide Performance Evaluation Mix w/Surrogates (8 components)

α-BHC	1µg/mL	decachlorobiphenyl (SS)	2
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25
4,4'-DDT	10	2,4,5,6-tetrachloro-*m*-xylene (SS)	2

In hexane, 1mL/ampul

cat. # 32074 (ea.)

tech tip

Working with solutions containing decachlorobiphenyl

Decachlorobiphenyl has poor solubility in most organic solvents. The maximum concentration that can be prepared in acetone, hexane, or isooctane is 200µg/mL. Temperature will affect the solubility as well. Storing solutions at reduced temperatures will cause decachlorobiphenyl to precipitate.

Products containing decachlorobiphenyl must be sonicated for a minimum of 10 minutes prior to opening the ampul. Because each ultrasonic bath operates at a different energy level, 10 minutes is a guideline only. Longer sonication time will not affect product quality.

These precautions apply to working solutions prepared in your laboratory as well. The amount of compound that precipitates depends on concentration AND temperature. If you store your standards at a temperature lower than 4°C (even dilute solutions), allow extra sonication time.

CLP Pesticides Mixtures, QA Mixes

Pesticide Matrix Spike Mix

aldrin	25µg/mL	dieldrin	50
γ-BHC (lindane)	25	endrin	50
4,4'-DDT	50	heptachlor	25

In acetone, 1mL/ampul

cat. # 32018 (ea.)

Pesticide Matrix Spike Mix (2/88 SOW)

aldrin	200µg/mL	dieldrin	500
γ-BHC (lindane)	200	endrin	500
4,4'-DDT	500	heptachlor	200

In methanol, 1mL/ampul

cat. # 32031 (ea.)

Pesticide Evaluation Mix (2/88 SOW)

aldrin	4,4'-DDT
dibutylchlorendate (SS)	endrin

100µg/mL each in hexane, 1mL/ampul

cat. # 32032 (ea.)

See complete listing of PCBs, page 452.

Low Concentration Pesticides Mixtures, QA Mixes

L/C Pesticide Lab Control Sample (7 components)

γ-BHC (lindane)	10µg/mL	endosulfan sulfate	20
γ-chlordane	10	endrin	20
4,4'-DDE	20	heptachlor epoxide (isomer B)	10
dieldrin	20		

In acetone, 1mL/ampul

cat. # 32040 (ea.)

CLP Pesticides Mixtures, Calibration Mixes

Pesticide Standard Mix A (2/88 SOW) (10 components)

aldrin	10µg/mL	endosulfan II	20
γ-BHC (lindane)	5	endrin aldehyde	25
4,4'-DDT	20	heptachlor	10
dieldrin	10	heptachlor epoxide (isomer B)	10
endosulfan I	10	methoxychlor	100

In hexane, 1mL/ampul

cat. # 32033 (ea.)

Pesticide Standard Mix B (2/88 SOW) (11 components)

aldrin	10µg/mL	4,4'-DDD	20
α-BHC	5	4,4'-DDE	10
β-BHC	10	endosulfan sulfate	20
δ-BHC	10	endrin	10
α-chlordane	10	endrin ketone	20
γ-chlordane	10		

In hexane, 1mL/ampul

cat. # 32034 (ea.)

Pesticide Standard Mix A (9 components)

α-BHC	5µg/mL	endosulfan I	5
γ-BHC (lindane)	5	endrin	10
4,4'-DDD	10	heptachlor	5
4,4'-DDT	10	methoxychlor	50
dieldrin	10		

In hexane:toluene (90:10), 1mL/ampul

cat. # 32297 (ea.)

CLP Pesticides Mixtures, Calibration Mixes *cont'd*

Pesticide Standard Mix B (11 components)

aldrin	5µg/mL	endosulfan II	10
β-BHC	5	endosulfan sulfate	10
δ-BHC	5	endrin aldehyde	10
α-chlordane	5	endrin ketone	10
γ-chlordane	5	heptachlor epoxide (isomer B)	5
4,4'-DDE	10		

In hexane:toluene (90:10), 1mL/ampul

cat. # 32298 (ea.)

Organochlorine Pesticide Mix AB #1 (20 components)

aldrin	dieldrin
α-BHC	endosulfan I
β-BHC	endosulfan II
δ-BHC	endosulfan sulfate
γ-BHC (lindane)	endrin
α-chlordane	endrin aldehyde
γ-chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (isomer B)
4,4'-DDT	methoxychlor

200µg/mL each in hexane:toluene (1:1), 1mL/ampul

cat. # 32291 (ea.)

Organochlorine Pesticide Mix AB #2 (20 components)

aldrin	8µg/mL	dieldrin	16
α-BHC	8	endosulfan I	8
β-BHC	8	endosulfan II	16
δ-BHC	8	endosulfan sulfate	16
γ-BHC (lindane)	8	endrin	16
α-chlordane	8	endrin aldehyde	16
γ-chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (isomer B)	8
4,4'-DDT	16	methoxychlor	80

In hexane:toluene (1:1), 1mL/ampul

cat. # 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin	dieldrin
α-BHC	endosulfan I
β-BHC	endosulfan II
δ-BHC	endosulfan sulfate
γ-BHC (lindane)	endrin
α-chlordane	endrin aldehyde
γ-chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (isomer B)
4,4'-DDT	methoxychlor

2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul

cat. # 32415 (ea.)

Pesticides Calibration Mixtures

Components of these products are at 16x the Contract Required Quantitation Level (CRQL) and can be used to prepare calibration mixes at 4x CRQL and at 1x CRQL by serial dilution.

Pesticide Standard Mix A w/Surrogates (11 components)

	8µg/mL		
α-BHC	8	endosulfan I	8
γ-BHC (lindane)	8	endrin	16
4,4'-DDD	16	heptachlor	8
4,4'-DDT	16	methoxychlor	80
decachlorobiphenyl (SS)	16	2,4,5,6-tetrachloro-*m*-xylene (SS)	8
dieldrin	16		

In hexane, 1mL/ampul

cat. # 32003 (ea.)

Pesticide Standard Mix B w/Surrogates (13 components)

	8µg/mL		
aldrin	8	endosulfan II	16
β-BHC	8	endosulfan sulfate	16
δ-BHC	8	endrin aldehyde	16
α-chlordane	8	endrin ketone	16
γ-chlordane	8	heptachlor epoxide (isomer B)	8
4,4'-DDE	16	2,4,5,6-tetrachloro-*m*-xylene (SS)	8
decachlorobiphenyl (SS)	16		

In hexane, 1mL/ampul

cat. # 32004 (ea.)

Pesticide Kit #3

Calibration mixes only for CLP 04.1. Includes pesticide standard mixes A & B at 16x CRQL with surrogates.

32003: Pesticide Standard Mix A w/Surrogates
32004: Pesticide Standard Mix B w/Surrogates
32005: Toxaphene
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

kit

Contains 1mL each of these mixtures.

cat. # 32404 (kit)

Technical Chlordane, Toxaphene Solutions

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
chlordane (technical)	H	1,000	32021	
chlordane (technical)	I	5,000	32072	
chlordane (technical)	M	2,000	32016	
toxaphene	H	1,000	32005	
toxaphene	I	5,000	32071	
toxaphene	M	2,000	32015	

H = hexane
I = isooctane
M = methanol



also available

See **pages 80-81** for Rtx®-CLPesticides and Rtx®-CLPesticide2 capillary columns for pesticides analysis.

See **page 452** for our complete listing of PCBs and congeners.

Aroclor Solutions

Volume is 1mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	Solvent	Conc.	cat.# (ea.)	price
Aroclor 1016	H	1,000	32006	
Aroclor 1016	I	200	32064	
Aroclor 1016	TO	50mg/kg	32075	
Aroclor 1016	TO	500mg/kg	32076	
Aroclor 1221	H	1,000	32007	
Aroclor 1221	I	200	32065	
Aroclor 1221	TO	50mg/kg	32077	
Aroclor 1221	TO	500mg/kg	32078	
Aroclor 1232	H	1,000	32008	
Aroclor 1232	I	200	32066	
Aroclor 1232	TO	50mg/kg	32079	
Aroclor 1232	TO	500mg/kg	32080	
Aroclor 1242	H	1,000	32009	
Aroclor 1242	I	200	32067	
Aroclor 1242	TO	50mg/kg	32081	
Aroclor 1242	TO	500mg/kg	32082	
Aroclor 1248	H	1,000	32010	
Aroclor 1248	I	200	32068	
Aroclor 1248	TO	50mg/kg	32083	
Aroclor 1248	TO	500mg/kg	32084	
Aroclor 1254	H	1,000	32011	
Aroclor 1254	I	200	32069	
Aroclor 1254	TO	50mg/kg	32085	
Aroclor 1254	TO	500mg/kg	32086	
Aroclor 1260	H	1,000	32012	
Aroclor 1260	I	200	32070	
Aroclor 1260	TO	50mg/kg	32087	
Aroclor 1260	TO	500mg/kg	32088	
Aroclor 1262	H	1,000	32409	
Aroclor 1268	H	1,000	32410	
Aroclor 1016/1260	H	1,000	32039	
Aroclor 1016/1260	I	200	32299	
Aroclor 1016/1260	A	400	32456	

A = acetone
H = hexane
I = isooctane
TO = transformer oil (PCB-free)

please note

We test our transformer oil solvent to ensure that it is PCB-free.

tech tip

Achieving the Best Results from Gas Standards

In order to achieve the best results from gas standards, proper handling and storage of gas solutions is of vital importance. Use the following tips to help ensure trouble-free performance:

- Before opening the sealed ampul, warm it to room temperature and invert ampul several times. This will redissolve any gases that may have migrated into the headspace of the ampul.
- When diluting a gas standard, always add it to a solvent. Adding the gas standard to an empty vessel prior to adding solvent will result in the loss of gas compounds.
- When diluting a gas standard in solvent, make sure the pipette or needle tip is directly above, or immersed below, the solvent surface.
- We recommend that any unused portion of gas standard be disposed of after it has been removed from the sealed ampul. If it is necessary to store the unused portion, place it into a tightly capped vial and store it in the freezer.
- We recommend that any gas solutions that have been stored outside of a sealed ampul be disposed of after 7 days.

PCB Kits

PCB Kit #1

32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260

1,000µg/mL each in hexane, 1mL/ampul
cat. # 32089 (kit)

PCB Kit #2

32064: Aroclor 1016
32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32070: Aroclor 1260

200µg/mL each in isooctane, 1mL/ampul
cat. # 32090 (kit)

PCB Kit #3

32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

1,000µg/mL each in hexane, 1mL/ampul
cat. # 32400 (kit)

PCB Kit #4

32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32299: Aroclor 1016/1260

200µg/mL each in isooctane, 1mL/ampul
cat. # 32401 (kit)

PCB Congeners

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
2,4,4'-trichlorobiphenyl (BZ #28)	I	10	32283	
2,2',5,5'-tetrachlorobiphenyl (BZ #52)	I	10	32284	
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)	I	10	32285	
2,3',4,4',5-pentachlorobiphenyl (BZ #118)	I	10	32293	
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)	I	10	32286	
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)	I	10	32287	
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)	I	10	32288	
decachlorobiphenyl (BZ #209)	I	10	32289	

I = isooctane

PCB Congeners *cont'd*

PCB Congener Standard #1

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10µg/mL each in isooctane, 1mL/ampul
cat. # 32290 (ea.)

PCB Congener Standard #2

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3',4,4',5-pentachlorobiphenyl (BZ #118)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10µg/mL each in isooctane, 1mL/ampul
cat. # 32294 (ea.)

also **available**

Additional PCB congener mixes:

See EPA Method 8082: cat.# 32416 **page 429.**

See EPA Method 525: cat.# 32420 **page 414**.

Organotin Mixes

Butyltin Chloride Calibration Mixture

butyltin trichloride
dibutyltin dichloride
tetrabutyltin
tributyltin chloride

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31472 (ea.)

Tributyltin Chloride Calibration Mixture

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31478 (ea.)

Phenyltin Chloride Calibration Mixture

diphenyltin dichloride
phenyltin trichloride
tetraphenyltin
triphenyltin chloride

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31473 (ea.)

Tri-*n*-propyltin Chloride Surrogate

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31476 (ea.)

Tripentyltin Chloride Surrogate

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31477 (ea.)

Tetra-*n*-propyltin Internal Standard

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31474 (ea.)

Tetrapentyltin Internal Standard

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31475 (ea.)

Minnesota Department of Agriculture List 1 Pesticides

Minnesota Ag List 1 Pesticides Mix A (16 components)

acetochlor
alachlor
atrazine
cyanazine
desethylatrazine
desisopropylatrazine
dimethenamid*
ethalfluralin
metolachlor
metribuzin
pendimethalin
prometon
propachlor
propazine
simazine
trifluralin

200ppm each in acetone, 1mL/ampul
cat. # 32406 (ea.)

*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.[1] CAS # 87674-68-8 manufactured by several companies under various trade names.
[1]Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their web site at: www.mda.state.mn.us

Minnesota Ag List 1 Pesticides Mix B

chlorpyrifos
EPTC
fonofos
phorate
terbufos
triallate

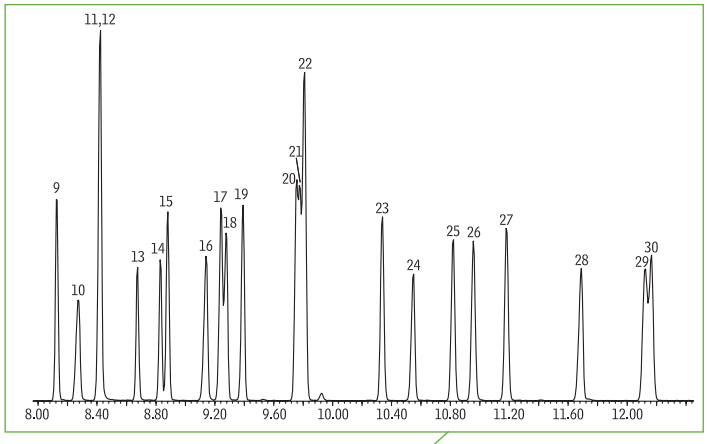
200ppm each in acetone, 1mL/ampul
cat. # 32407 (ea.)

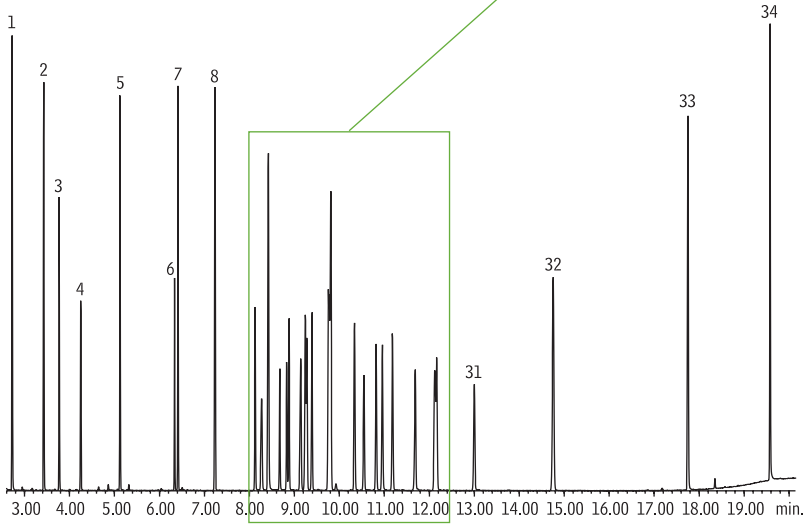
Minnesota Ag List 1 Pesticide Kit

32406: Minnesota Ag List Pesticides Mix A
32407: Minnesota Ag List Pesticides Mix B
Contains 1mL each of these mixtures.
cat. # 32408 (kit)

Minnesota Dept. of Agriculture List 1 Pesticides on an Rxi®-1ms column.

1. 2-fluorophenol (SS)
2. phenol-d6 (SS)
3. 1,4-dichlorobenzene-d4 (IS)
4. nitrobenzene-d5 (SS)
5. naphthalene-d8 (IS)
6. EPTC
7. 2-fluorobiphenyl (SS)
8. acenaphthene-d10 (IS)
9. propachlor
10. desisopropyl atrazine
11. desethyl atrazine
12. 2,4,6-tribromophenol (SS)
13. ethalfluralin
14. trifluralin
15. phorate
16. simazine
17. prometon
18. atrazine
19. propazine
20. terbufos
21. fonofos
22. phenanthrene-d10 (IS)
23. triallate
24. metribuzin
25. dimethenamid
26. acetochlor
27. alachlor
28. cyanazine
29. metolachlor
30. chlorpyrifos
31. pendimethalin
32. *p*-terphenyl-d14 (SS)
33. chrysene-d12 (IS)
34. perylene-d12 (IS)





GC_EV00837

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	Minnesota Ag List 1 Pesticides Mix A (cat.# 32406), Minnesota Ag List 1 Pesticides Mix B (cat.# 32407), SV Internal Standard Mix (cat.# 31206), B/N Surrogate Mix (4/89 SOW) (cat.# 31024), Acid Surrogate Mix (4/89 SOW) (cat.# 31025)
Inj.:	1.0µL, 10µg/mL each analyte (internal standards 25µg/mL), split (10:1) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	70°C (hold 1 min.) to 180°C @ 20°C/min., to 230°C @ 5°C/min., to 325°C @ 40°C/min. (hold 3.5 min.)
Det.:	Agilent 5973 MSD
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	2.50 min.
Tune:	DFTPP
Ionization:	EI

International Mixes

International Environmental Mixes

Country/Miscellaneous	Compound Class
Canada: CCME	Alkanes; PAHs
Canada: Drinking Water	Volatiles; Pesticides
Canada: RBCA - Atlantic Provinces	Aromatics; Aliphatics; PAHs
European Union	Pesticides
Japan	Odor Compounds
Korea	Volatiles; Pesticides
ISO/DIS-9377 Water Quality Testing	Hydrocarbons

Canada

C50 in Toluene

n-pentacontane (C50)

10µg/mL in toluene, 1mL/ampul

cat. # 31685 (ea.)

CCME F1 Surrogate Standard

n-undecane (C11)

1,000µg/mL in methylene chloride, 1mL/ampul

cat. # 30612 (ea.)

CCME F2 Surrogate Standard

2-methylnonane

1,000µg/mL in methylene chloride, 1mL/ampul

cat. # 31870 (ea.)

CCME F1 Retention Time Marker

n-decane (C10)
n-hexane (C6)
toluene

2,000µg/mL each in methanol, 1mL/ampul

cat. # 30611 (ea.)

CCME PAH Calibration Mix (10 components)

benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
dibenzo(a,h)anthracene
fluoranthene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000µg/mL each in methylene chloride, 1mL/ampul

cat. # 31869 (ea.)

CCME PHC Calibration Mix

n-decane (C10)
n-hexadecane (C16)
n-tetratriacontane (C34)

5,000µg/mL each in toluene, 1mL/ampul

cat. # 31684 (ea.)

Canada *cont'd*

Canadian Drinking Water Volatiles Mix (19 components)

benzene
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
ethylbenzene
methylene chloride
tetrachloroethene
toluene
trichloroethene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

cat. # 30610 (ea.)

Canadian Drinking Water Triazine Herbicides Mix

(7 components)

alachlor
atrazine
cyanazine (Bladex)
metolachlor
metribuzin
prometryne
simazine

500µg/mL each in acetone, 1mL/ampul

cat. # 31864 (ea.)

Canadian Drinking Water Phenoxyacid Herbicides Mix

(11 components)

bromoxynil
2,4-D
dicamba
2,4-dichlorophenol
diclofop methyl
dinoseb
pentachlorophenol
picloram
2,4,5-T
2,3,4,6-tetrachlorophenol
2,4,6-trichlorophenol

1,000µg/mL each in acetone, 1mL/ampul

cat. # 31868 (ea.)

Canadian Drinking Water Carbamates Mix

aldicarb
bendiocarb
carbaryl (Sevin)
carbofuran
triallate

100µg/mL each in acetonitrile, 1mL/ampul

cat. # 31865 (ea.)

Canadian Drinking Water Chlorinated Pesticides Mix

(14 components)

aldrin
γ-BHC (lindane)
α-chlordane
γ-chlordane
2,4'-DDE
4,4'-DDE
2,4'-DDT
4,4'-DDT
dieldrin
heptachlor
heptachlor epoxide (isomer B)
methoxychlor
oxychlordane
trifluralin

200µg/mL each in hexane:toluene, 1mL/ampul

cat. # 31866 (ea.)

Canadian Drinking Water OP Pesticides Mix (9 components)

azinphos methyl (Guthion)
chlorpyrifos (Dursban)
Diazinon
dimethoate
malathion
parathion (ethyl)
phorate
temephos (Abate)
terbufos

1,000µg/mL each in acetonitrile, 1mL/ampul

cat. # 31867 (ea.)

also **available**

Petroleum Standards & Sulfur Standards!

See pages 472-475 for more information.

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs

For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Canada - Atlantic Provinces

Atlantic RBCA EPH Mix (11 components)

acenaphthene
anthracene
benzo(a)pyrene
chrysene
n-decane (C10)
n-dodecane (C12)
n-dotriacontane (C32)
n-heneicosane (C21)
n-hexadecane (C16)
n-octacosane (C28)
naphthalene

1,000µg/mL each in hexane:methylene chloride, 1mL/ampul
cat. # 31872 (ea.)

Atlantic RBCA EPH Surrogate Standard

n-dotriacontane (C32)
isobutylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31873 (ea.)

Atlantic RBCA VPH Mix (12 components)

benzene
n-decane (C10)
ethylbenzene
n-heptane (C7)
n-hexane (C6)
1-methyl-3-ethylbenzene
n-octane (C8)
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 31871 (ea.)

Atlantic RBCA VPH Surrogate Standard

isobutylbenzene

1,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30613 (ea.)

Europe

Organophosphorus Pesticide Mix, European Formulation

(16 components)

acephate	200µg/mL	methamidophos	500
azinphos methyl (Guthion)	400	methidathion	200
chlorpyrifos	100	omethoate	1,000
demeton-s-methyl	200	pirimiphos methyl	100
dichlorvos (DDVP)	500	profenfos	200
dimethoate	200	pyrazophos	500
ethion	200	tokuthion (prothiofos)	200
malathion	200	tolclofos-methyl	100

In acetone, 1mL/ampul
cat. # 32418 (ea.)

PCB Congener Standard #1

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10µg/mL each in isooctane, 1mL/ampul
cat. # 32290 (ea.)

PCB Congener Standard #2

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3',4,4',5-pentachlorobiphenyl (BZ #118)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10µg/mL each in isooctane, 1mL/ampul
cat. # 32294 (ea.)

Europe *cont'd*

Desethyl-atrazine

1,000µg/mL in acetone, 1mL/ampul
cat. # 32445 (ea.)

Desisopropylatrazine

1,000µg/mL in acetone, 1mL/ampul
cat. # 32446 (ea.)

Terbuthylazine

1,000µg/mL in acetone, 1mL/ampul
cat. # 32447 (ea.)

Propazine

1,000µg/mL in acetone, 1mL/ampul
cat. # 32448 (ea.)

Prometryne

1,000µg/mL in acetone, 1mL/ampul
cat. # 32449 (ea.)

Japan

Japan Calibration Mix (9 components)

acrylonitrile
benzene
1,3-butadiene
chloroform
1,2-dichloroethane
dichloromethane
tetrachloroethene
trichloroethene
vinyl chloride

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra 104L Cylinders:

Size: 8 x 24 cm.
Volume/Pressure:
104 liters of gas
@ 1,800psi
Weight: 1.5 lbs./0.7 kg



Scotty 110L Cylinders (Pi-marked Cylinders for EU Regulations):

Size: 8.3 x 29.5 cm.
Volume/Pressure:
110 liters of gas
@ 1,800psi
Weight: 2.2 lbs./1 kg
US DOT Specs: 3AL2216



1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34418 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34418-PI (ea.)

Requires a high-purity VOC single-stage regulator. See page 386.
No data pack available.

Drinking Water Odor Standard

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10ppt) and purge and trap analyses usually are used to quantify them.

(+/-)-geosmin
2-methylisoborneol

100µg/mL in P&T methanol, 1mL/ampul
cat. # 30608 (ea.)

Korea

Korean Drinking Water—Pesticides Mix

carbaryl (Sevin)
diazinon
fenitrothion
malathion
parathion, ethyl

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 32411 (ea.) enquire

No data pack available.

Korean Drinking Water—VOC Mix A (17 components)

benzene
bromodichloromethane
bromoform
carbon tetrachloride
chloroform
dibromochloromethane
1,1-dichloroethene
ethylbenzene
methylene chloride
phenol
tetrachloroethene
toluene
1,1,1-trichloroethane
trichloroethene
m-xylene
o-xylene
p-xylene

100µg/mL each in P&T methanol, 1mL/ampul
cat. # 30480 (ea.) enquire

No data pack available.

ISO/DIS 9377 Water Quality Testing

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as Diesel #2/ motor oil and Diesel #2/mineral oil.

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography/flame ionization detection (GC/FID) method.

Diesel #2/Motor Oil

diesel fuel #2 composite
motor oil

5,000µg/mL each in hexane, 1mL/ampul
cat. # 31682 (ea.)

Diesel #2/Mineral Oil

diesel fuel #2 composite
mineral oil

5,000µg/mL each in hexane, 1mL/ampul
cat. # 31676 (ea.)

Standard Mixture Stock Solution

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 325-460 or C18-C32 retention time range)

5,000µg/mL each in cyclohexane, 1mL/ampul
(prepares 8mL of 1.25µg/µL calibration curve high point)
Total hydrocarbon concentration 10,000µg/mL
cat. # 31630 (ea.)

Quality Control Standard Mixture, Revised

diesel #2 (additive-free)
motor oil (additive-free bp 325–460 or C18–C32 retention time range)

500µg/mL each in acetone, 1mL/ampul
(1mL is enough mix to spike one 900mL quality control sample).
Total hydrocarbon concentration 1,000µg/mL
cat. # 31641 (ea.)

ISO/DIS 9377 Water Quality Testing *cont'd*

Quality Control Standard Mixture

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range)

500µg/mL each in acetone, 1mL/ampul
(1mL is enough mix to spike one quality control sample).
Total hydrocarbon concentration 1,000µg/mL
cat. # 31631 (ea.)

System Performance Test Standard Mixture of *n*-Alkanes

(16 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

50µg/mL each in hexane, 1mL/ampul
cat. # 31678 (ea.)

Extraction Solvent Stock Solution #1

n-decane (C10) 20µL/L *n*-tetracontane (C40) 20mg/L
In hexane, 5mL/ampul
cat. # 31679 (ea.)

Extraction Solvent Stock Solution #2

n-decane (C10) 20µL/L *n*-tetracontane (C40) 20mg/L
In hexane, 20mL/ampul
cat. # 31680 (ea.)

Stearyl Stearate Test Solution

stearyl stearate
2,000µg/mL in hexane, 10mL/ampul
cat. # 31681 (ea.)
2,000µg/mL in cyclohexane, 10mL/ampul (enough to check one Florisil cartridge)
cat. # 31636 (ea.)

Florisil® Cartridge Quality Control Standard Mixture, Rev.3

diesel fuel #2 composite
motor oil

1,000µg/mL each in hexane, 10mL/ampul
cat. # 31683 (ea.)

Florisil® Cartridge Quality Control Standard Mixture, Rev.2

diesel fuel #2 composite
mineral oil

1,000µg/mL each in hexane, 10mL/ampul
cat. # 31677 (ea.)

n-Tetracontane (C40)

Neat, 100mg
cat. # 31859 (ea.)

n-Decane (C10)

Neat, 1mL/ampul
cat. # 31858 (ea.)

Stearyl Stearate

Neat, 100mg
cat. # 31860 (ea.)

Underground Storage Tank Monitoring (UST): General

Category	Compound Class
Retention Time Standards	Hydrocarbons
Fuel Composite Standards	Hydrocarbons
Motor Oil Composite Standards	Hydrocarbons
Single Source Fuel Standards	Hydrocarbons
Military Fuels (Jet Propellant)	Hydrocarbons
Fuel Oil Degradation Test	Hydrocarbons
Mineral Spirits	Hydrocarbons
PVOC, GRO and BTEX	Hydrocarbons
Gasoline Surrogate and Internal Standards	Volatiles
Diesel Surrogate and Internal Standards	Hydrocarbons
Diesel/Biodiesel Blend	Hydrocarbons

Retention Time Standards

Used during initial sample screening, to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

Leaking Underground Storage Tank Retention Time Standard

(7 components)

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)
n-tetracosane (C24)
n-octacosane (C28)
n-triacontane (C30)
n-tetracontane (C40)

25µg/mL each in 1mL methylene chloride, 1mL/ampul
cat. # 31200 (ea.)

Retention Time Marker Standard

n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000µg/mL each in hexane, 1mL/ampul
cat. # 31637 (ea.)

Retention Time Marker

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30483 (ea.)

TNRCC 1005 Retention Time Markers Mix

n-hexane (C6)
n-dodecane (C12)
n-octacosane (C28)
n-pentatriacontane (C35)

200µg/mL each in pentane, 1mL/ampul
cat. # 31698 (ea.)

Retention Time Marker - Alaska

n-hexane (C6)
n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31819 (ea.)

Fuel Composite Standards

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30081 (ea.)

50,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30205 (ea.)

50,000µg/mL in P&T methanol, 5mL/ampul
cat. # 30206 (ea.)

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31093 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31258 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31259 (ea.)

Kerosene Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31094 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31256 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31257 (ea.)

Motor Oil Composite Standards

Motor Oil Composite Standard

Prepared from an equal volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31464 (ea.)

Used Motor Oil Composite Standard

Prepared from an equal volume blend from five gasoline powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31465 (ea.)



free literature

EPA Office of Underground Storage Tanks (OUST) Recommended Methods

Download your free copy from **www.restek.com**

Fast Facts
lit. cat.# 59397

See **pages 461-467** for information on UST technical literature for individual states.

also available

Other fuels, oils and lubricant oils available on request as custom products.

Single Source Fuels

Unleaded Gasoline Standard
Prepared from a single source (one refinery) product.

5,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30096 (ea.)

Kerosene Standard
Prepared from a single source (one refinery) product.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31229 (ea.)

Diesel Fuel #2 Standard
Prepared from a single source (one refinery) product.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31233 (ea.)

Fuel Oil #4 Standard
Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. Fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31216 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31244 (ea.)

Fuel Oil #5 Standard
Fuel oil #5 is typically used in applications in which there is little or no preheating of the fuel prior to burning. A blend of distillate (fuel oil #2) and residual (fuel oil #6), the fuel oil #5 used to prepare this mixture has a kinematic viscosity of 106.5 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31217 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31246 (ea.)

Fuel Oil #6 Standard
This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31218 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31248 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31249 (ea.)

Diesel/Biodiesel 80:20 Blend Standard
The biodiesel component is methyl soyate.

diesel/biodiesel 80:20
5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31880 (ea.)

Single Source Fuels *cont'd*

Aviation Gas Standard
100-octane low-lead fuel currently used in piston-type aircraft.

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30094 (ea.)

50,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30207 (ea.)

50,000µg/mL in P&T methanol, 5mL/ampul
cat. # 30208 (ea.)

Jet Fuel A Standard
Commercial jet fuel A.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31215 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31242 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31243 (ea.)

Creosote Oil Standard
Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene). We offer this high concentration standard.

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31838 (ea.)

Hydraulic Oil Standard
50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31839 (ea.)

Military Fuels (Jet Propellant)

JP-4 Military Fuel Standard
5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31219 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31250 (ea.)

50,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30472 (ea.)

JP-5 Military Fuel Standard
5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31220 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31252 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31253 (ea.)

JP-8 Military Fuel Standard
5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31262 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31254 (ea.)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Fuel Oil Degradation Test

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.[1] To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

Fuel Oil Degradation Mix

heptadecane (C17)
octadecane (C18)
pristane (2,6,10,14-tetramethylpentadecane)
phytane (2,6,10,14-tetramethylhexadecane)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31240 (ea.)

[1]Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182°C
- Type II (high flash point) BPR 177–196°C
- Type III (odorless) BPR 149–196°C
- Type IV (low dry point) BPR 149–174°C

We prepare our solutions from an equal volume blend of Type I, II, and III mineral spirits.

Mineral Spirits Standards

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31225 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31260 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31261 (ea.)

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge and trap.

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30487 (ea.)



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EPA Office of Underground Storage Tanks (OUST) Recommended Methods

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Fast Facts
lit. cat.# 59397

See **pages 461-467** for information on UST technical literature for individual states.

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO), & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30231 (ea.)

PVOC/GRO Mix (Wisconsin) (10 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30095 (ea.)

GRO Mix (9 components)

benzene
ethylbenzene
3-methylpentane
naphthalene
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30069 (ea.)

GRO Mix (EPA) (9 components)

benzene	500µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500		

In P&T methanol, 1mL/ampul
cat. # 30065 (ea.)

BTEX Standard

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul
cat. # 30051 (ea.)

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30213 (ea.)

2,000µg/mL each in P&T methanol (*m*-xylene and *p*-xylene at 1,000µg/mL), 1mL/ampul
cat. # 30488 (ea.)

BTEX Gas Mix

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34414 (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi
cat. # 34428 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34414-PI (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)
cat. # 34428-PI (ea.)

Requires a high-purity VOC single-stage regulator. See page 386.
No data pack available.

cylinder **design**



Spectra 104L Cylinders:
Aluminum construction.
Size: 8 x 24 cm.
Volume/Pressure:
104 liters of gas @ 1,800psi
CGA-180 outlet fitting.
Weight: 1.5 lbs./0.7 kg



Scotty 110L Cylinders:
Aluminum construction.
Size: 8.3 x 29.5 cm.
Volume/Pressure:
110 liters of gas @ 1,800psi
CGA-180 outlet fitting.
Weight: 2.2 lbs./1 kg
US DOT Specs: 3AL2216

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO), & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX) *cont'd*

Gasoline Component Standard (10 components)

benzene	500µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000µg/mL total in P&T methanol, 1mL/ampul
cat. # 30486 (ea.)

Certified BTEX in Unleaded Gas Composite Standard
(9 components)

Certified for:

benzene*
ethylbenzene*
isopropyl benzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
toluene*
m-xylene*
o-xylene*
p-xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul
cat. # 30237 (ea.)

*Concentration differs lot-to-lot. See on-line Certificate of Analysis for certified concentrations.

Certified Aromatics in Gasoline (16 components)

Certified for:

benzene*
ethylbenzene*
m-ethyltoluene*
o-ethyltoluene*
p-ethyltoluene*
isopropylbenzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
n-propylbenzene*
toluene*
1,2,3-trimethylbenzene*
1,2,4-trimethylbenzene*
1,3,5-trimethylbenzene*
m-xylene*
o-xylene*
p-xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul
cat. # 30485 (ea.)

*Concentration differs lot-to-lot. See on-line Certificate of Analysis for certified concentrations.

Certified PAHs in Diesel (7 components)

Certified PAHs

acenaphthene*
acenaphthylene*
fluorene*
1-methylnaphthalene*
2-methylnaphthalene*
naphthalene*
phenanthrene*

50,000ppm diesel #2 in methylene chloride, 1mL/ampul
cat. # 31673 (ea.)

*Concentration differs lot-to-lot. See on-line Certificate of Analysis for certified concentrations.

Gasoline Surrogate and Internal Standards

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
4-bromofluorobenzene	PTM	2,500	30067	
4-bromofluorobenzene	PTM	10,000	30082	
1-chlorooctane	PTM	10,000	30084	
α,α,α-trifluorotoluene	PTM	2,500	30068	
α,α,α-trifluorotoluene	PTM	10,000	30083	

Recommended Internal Standard (PID) for EPA GRO Method

Compound	Solvent	Conc.	cat.# (ea.)	price
1-chloro-4-fluorobenzene	PTM	2,500	30066	

PTM = Purge & trap grade methanol

Diesel Surrogate and Internal Standards

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
1-chlorooctadecane	D	10,000	31098	
2-fluorobiphenyl	D	10,000	31096	
o-terphenyl	D	10,000	31097	
p-terphenyl	D	10,000	31095	

Recommended Internal Standards

Compound	Solvent	Conc.	cat.# (ea.)	price
5-α-androstane	D	2,000	31065	
o-terphenyl	A	2,000	31066	

A = acetone
D = methylene chloride

Diesel/Biodiesel Standard

Diesel/Biodiesel 80:20 Blend Standard

The biodiesel component is methyl soyate.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31880 (ea.)

also **available**

ASTM Method D6584-00 and EN14105 Biodiesel Standards. See **page 471**.



Underground Storage Tank Monitoring (UST): State Specific Methods

State	Compound Class
Alaska	Hydrocarbons
Arizona	Hydrocarbons
California/Los Angeles	Hydrocarbons
Connecticut	Hydrocarbons
Florida	Hydrocarbons
Massachusetts	Hydrocarbons
Michigan	Hydrocarbons
Mississippi	Hydrocarbons
Northwest (Oregon & Washington)	Hydrocarbons
Pennsylvania	Hydrocarbons
Tennessee/Mississippi	Hydrocarbons
Texas	Hydrocarbons
Washington	Hydrocarbons
Wisconsin	Hydrocarbons

Alaska

Alaska Department of Environmental Conservation (ADEC) regulations indicate which products and indicator compounds are to be tested for each petroleum range. The analyst must use the following Alaska Series Methods or appropriate SW-846 method for the indicator compounds. The Alaska UST procedurals manual indicates which products are to be tested for each petroleum range.

AK101

Method for determination of aromatic and aliphatic hydrocarbons in gasoline range organics.

Retention Time Marker - Alaska

n-hexane (C6)
n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31819 (ea.)

Alaska *cont'd*

Alaska UST Method AK101AA (14 components)

benzene
ethylbenzene
1-ethyl-2-methylbenzene
1-ethyl-3-methylbenzene
1-ethyl-4-methylbenzene
isopropylbenzene
n-propylbenzene
toluene
1,2,3-trimethylbenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30461 (ea.)

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30081 (ea.)

50,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30205 (ea.)

50,000µg/mL in P&T methanol, 5mL/ampul
cat. # 30206 (ea.)

1-Chloro-4-fluorobenzene Mix

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30066 (ea.)

4-Bromofluorobenzene Mix

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30026 (ea.)

α,α,α-Trifluorotoluene

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30048 (ea.)

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30068 (ea.)

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30083 (ea.)



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Fast Facts
lit. cat.# 59503

for more info

State of Alaska
Method and regulatory information is available from:

Alaska Department of Environmental Conservation
410 Willoughby Avenue
Juneau, AK 99801-1795
Phone: (907)465-5203
Fax: (907)465-5218

www.dec.state.ak.us/regulations/index.htm

did you know?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Alaska *cont'd*

AK102

Method for determination of aromatic and aliphatic hydrocarbons in diesel range organics.

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tridecane (C13)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tricosane (C23)
n-tetracosane (C24)
n-pentacosane (C25)

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31214 (ea.)

Kerosene Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31094 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31256 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31257 (ea.)

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31093 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31258 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31259 (ea.)

***o*-Terphenyl**

2,000µg/mL in acetone, 1mL/ampul
cat. # 31066 (ea.)

10,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31097 (ea.)

5-α-androstane

2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31065 (ea.)

AK103

Method for determination of aromatic and aliphatic hydrocarbons in residual range organics.

Residual Range Calibration Standard (RCS)

SAE30 motor oil:SAE40 motor oil (1:1)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31817 (ea.)

Residual Range Calibration Verification Standard (CVS)

SAE30 motor oil:SAE40 motor oil (1:1)

25,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31818 (ea.)

Motor Oil Composite Standard

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31464 (ea.)

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31218 (ea.)

50,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31248 (ea.)

50,000µg/mL in methylene chloride, 5mL/ampul
cat. # 31249 (ea.)

***n*-Triacontane-d62**

500µg/mL in methylene chloride, 1mL/ampul
cat. # 31816 (ea.)

Surrogate Standard Mixture

squalane
o-terphenyl
tetrahydronaphthol

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31638 (ea.)



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Arizona

Extraction Retention Time Standard

n-hexane (C6)
n-decane (C10)
n-docosane (C22)
n-dotriacontane (C32)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31830 (ea.)

DRO/GRO Calibration Standard

10W30 motor oil:diesel fuel #2 (1:1 blend)

25,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31831 (ea.)

DRO/GRO Range Calibration Standard (12 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31832 (ea.)

GRO P&T Retention Time Standard

benzene
naphthalene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30496 (ea.)

o-Terphenyl

2,000µg/mL in acetone, 1mL/ampul
cat. # 31066 (ea.)

10,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31097 (ea.)

California

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30231 (ea.)

California Oxygenates Mix

diisopropyl ether (DIPE)	2,000µg/mL
ethyl-*tert*-butyl ether (ETBE)	2,000
tert-amyl methyl ether (TAME)	2,000
tert-butyl alcohol	10,000
methyl *tert*-butyl ether (MTBE)	2,000

In P&T methanol, 1mL/ampul
cat. # 30465 (ea.)

Methanol

10,000µg/mL in DI Water, 1mL/ampul
cat. # 30467 (ea.)

Ethanol

10,000µg/mL in DI Water, 1mL/ampul
cat. # 30466 (ea.)

Glycols Standard

ethylene glycol
propylene glycol

50,000µg/mL each in DI water, 1mL/ampul
cat. # 30471 (ea.)

Los Angeles County, CA
Well Investigation Program (WIP)*

CA WIP VOA Standard (11 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30236 (ea.)

*For samples suspected of gasoline contamination, Los Angeles County requires laboratories to calibrate and report these compounds.



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Fast Facts
lit. cat.# 59433

Connecticut

Connecticut ETPH Calibration Mixture (15 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31614 (ea.)

Florida

Florida TRPH Standard (17 components)

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

500µg/mL each in hexane, 1mL/ampul
cat. # 31266 (ea.)

2,000µg/mL each in carbon disulfide, 1mL/ampul*
cat. # 31878 (ea.)

*Ground transportation shipments only.

Florida TRPH Surrogate Mix

n-nonatriacontane (C39)

3,000µg/mL in carbon disulfide, 1mL/ampul*
cat. # 31456 (ea.)

3,000µg/mL in carbon disulfide, 10mL/ampul*
cat. # 31877 (ea.)

*Ground transportation shipments only.



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Fast Facts
lit. cat.# 59395

Massachusetts

MA VPH Standard with Surrogate Rev. 1.1 (July 2004)
(16 components)

benzene
n-butylcyclohexane
n-decane (C10)
2,5-dibromotoluene (SS)
ethylbenzene
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
n-nonane (C9)
n-pentane (C5)
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene
p-xylene

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30604 (ea.)

MA VPH Matrix Spike Mix with Surrogate Rev. 1.1 (July 2004)
(16 components)

benzene
n-butylcyclohexane
n-decane (C10)
2,5-dibromotoluene (SS)
ethylbenzene
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
n-nonane (C9)
n-pentane (C5)
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene
p-xylene

50µg/mL in P&T methanol, 1mL/ampul
cat. # 30605 (ea.)

MA Volatile Petroleum Hydrocarbon (VPH) Standard
(13 components)

n-pentane (C5)	1,000µg/mL	naphthalene	1,000
n-nonane (C9)	1,000	toluene	1,500
benzene	500	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	*m*-xylene	1,000
isooctane	1,500	*o*-xylene	1,000
2-methylpentane	1,500	*p*-xylene	1,000
methyl *tert*-butyl ether (MTBE)	1,500		

In P&T methanol, 1mL/ampul
cat. # 30434 (ea.)

MA VPH Standard with Surrogate (14 components)

n-pentane (C5)	1,000µg/mL	methyl *tert*-butyl ether (MTBE)	1,500
n-nonane (C9)	1,000	naphthalene	1,000
benzene	500	toluene	1,500
2,5-dibromotoluene (SS)	1,000	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	*m*-xylene	1,000
isooctane	1,500	*o*-xylene	1,000
2-methylpentane	1,500	*p*-xylene	1,000

In P&T methanol, 1mL/ampul
cat. # 30452 (ea.)

MA VPH Matrix Spike Mix with Surrogate (14 components)

n-pentane (C5)
n-nonane (C9)
benzene
2,5-dibromotoluene (SS)
ethylbenzene
isooctane
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,500µg/mL each in P&T methanol, 1mL/ampul
cat. # 30454 (ea.)



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Massachusetts UST Monitoring

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Fast Facts
lit. cat.# 59391

MA VPH Surrogate Standard

2,5-dibromotoluene

1,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30435 (ea.)

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30453 (ea.)

Massachusetts APH Mix (26 components)

benzene
1,3-butadiene
butylcyclohexane
cyclohexane
n-decane (C10)
2,3-dimethylheptane
2,3-dimethylpentane
n-dodecane (C12)
ethylbenzene
n-heptane (C7)
n-hexane (C6)
isopentane
isopropylbenzene
4-isopropyltoluene
methyl *tert*-butyl ether (MTBE)
1-methyl-3-ethylbenzene
n-nonane (C9)
n-octane (C8)
toluene
toluene-d8 (IS)
1,2,3-trimethylbenzene
1,3,5-trimethylbenzene
n-undecane (C11)
m-xylene
o-xylene
p-xylene

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34540 (ea.)

1ppm in nitrogen, 21 liters @ 350psig (Pi-marked Cylinder)
cat. # 34540-PI (ea.)

Requires a high-purity VOC single-stage regulator. See page 386.
No data pack available.

MA EPH Aromatic Hydrocarbon Standard (17 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31458 (ea.)

MA EPH Aliphatic Hydrocarbon Standard (14 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-hexatriacontane (C36)

1,000µg/mL each in hexane, 1mL/ampul
cat. # 31459 (ea.)

MA EPH Matrix Spike Mix (10 components)

n-nonane (C9)
n-tetradecane (C14)
n-nonadecane (C19)
n-eicosane (C20)
n-octacosane (C28)
acenaphthene
anthracene
chrysene
naphthalene
pyrene

250µg/mL each in acetone, 1mL/ampul
cat. # 31460 (ea.)

Massachusetts *cont'd*

MA EPH Internal Standard
5-α-androstane
2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31065 (ea.)

MA EPH Surrogate Spike Mix
1-chlorooctadecane
o-terphenyl
4,000µg/mL each in acetone, 1mL/ampul
cat. # 31479 (ea.)

1-Chlorooctadecane Mix
1-chlorooctadecane
10,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31098 (ea.)

Naphthalene-d8
2,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31043 (ea.)

MA Fractionation Surrogate Spike Mix
2-bromonaphthalene
2-fluorobiphenyl
4,000µg/mL each in hexane, 1mL/ampul
cat. # 31480 (ea.)

MA Fractionation Check Mix (31 components)

PAHs:	Hydrocarbons:
acenaphthene	*n*-nonane (C9)
acenaphthylene	*n*-decane (C10)
anthracene	*n*-dodecane (C12)
benzo(a)anthracene	*n*-tetradecane (C14)
benzo(a)pyrene	*n*-hexadecane (C16)
benzo(b)fluoranthene	*n*-octadecane (C18)
benzo(k)fluoranthene	*n*-nonadecane (C19)
benzo(ghi)perylene	*n*-eicosane (C20)
chrysene	*n*-docosane (C22)
dibenzo(a,h)anthracene	*n*-tetracosane (C24)
fluoranthene	*n*-hexacosane (C26)
fluorene	*n*-octacosane (C28)
indeno(1,2,3-cd)pyrene	*n*-triacontane (C30)
2-methylnaphthalene	*n*-hexatriacontane (C36)
naphthalene	
phenanthrene	
pyrene	

25µg/mL each in hexane, 1mL/ampul
cat. # 31481 (ea.)

Michigan

Michigan GRO Mix (14 components)

benzene	naphthalene
1,2-dibromoethane	toluene
1,2-dichloroethane	1,2,4-trimethylbenzene
ethylbenzene	1,3,5-trimethylbenzene
isopropylbenzene	*m*-xylene
2-methylnaphthalene	*o*-xylene
methyl *tert*-butyl-ether (MTBE)	*p*-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30468 (ea.)

Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)	*n*-octadecane (C18)
n-undecane (C11)	*n*-nonadecane (C19)
n-dodecane (C12)	*n*-eicosane (C20)
n-tridecane (C13)	*n*-heneicosane (C21)
n-tetradecane (C14)	*n*-docosane (C22)
n-pentadecane (C15)	*n*-tricosane (C23)
n-hexadecane (C16)	*n*-tetracosane (C24)
n-heptadecane (C17)	*n*-pentacosane (C25)

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31214 (ea.)

Gasoline Component Standard (10 components)

benzene	500µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000µg/mL total in P&T methanol, 1mL/ampul
cat. # 30486 (ea.)

Northwest USA Regional Method (Oregon & Washington)

also see Washington, page 467

NW TPH-HCID Retention Time Mix
n-dodecane (C12)
toluene
n-tetracosane (C24)
2,500µg/mL each in methylene chloride, 1mL/ampul
cat. # 31485 (ea.)

NW TPH-HCID Surrogate Mix
n-pentacosane (C25)
4-bromofluorobenzene
5,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31486 (ea.)

Glycols Standard
ethylene glycol
propylene glycol
50,000µg/mL each in DI water, 1mL/ampul
cat. # 30471 (ea.)

NW TPH-Dx Surrogate Mix Standards
Volume is 1mL/ampul. Concentration is µg/mL

Compound	Solvent	Conc.	cat.# (ea.)	price
2-fluorobiphenyl	D	10,000	31096	
o-terphenyl	D	10,000	31097	
p-terphenyl	D	10,000	31095	
pentacosane (C25)	D	10,000	31487	

D = methylene choride



also **available**

See the GC Applications section for glycols application chromatograms - **pages 602-603**.

Pennsylvania

PA DEP UST Standard (11 components)

benzene
1,2-dibromoethane
1,2-dichloroethane
ethylbenzene
isopropyl benzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30433 (ea.)

Tennessee/Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tridecane (C13)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tricosane (C23)
n-tetracosane (C24)
n-pentacosane (C25)

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31214 (ea.)

Gasoline Component Standard (10 components)

benzene	500µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000µg/mL total in P&T methanol, 1mL/ampul
cat. # 30486 (ea.)



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Texas UST Monitoring

Download your free copy from **www.restek.com**.

Fast Facts
lit. cat.# 59394



Don't see the UST mix you need? We can custom blend a UST mix to meet the requirements of your method. Visit our web site at **www.restek.com/solutions**.

Texas

Texas TNRCC Method 1006

TNRCC 1006 Retention Time Marker Mix (9 components)

n-hexane (C6)
n-heptane (C7)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)

200µg/mL in pentane, 1mL/ampul
cat. # 31814 (ea.)

Texas TNRCC Method 1005

TNRCC 1005 Retention Time Markers Mix

n-hexane (C6)
n-dodecane (C12)
n-octacosane (C28)
n-pentatriacontane (C35)

200µg/mL each in pentane, 1mL/ampul
cat. # 31698 (ea.)

TX TPH Locator Mix

n-hexane (C6)
n-decane (C10)
n-octacosane (C28)

200µg/mL each in pentane, 1mL/ampul
cat. # 31482 (ea.)

TX TPH Calibration Mix

diesel fuel #2 composite
unleaded gasoline composite

10,000µg/mL each in pentane, 1mL/ampul
cat. # 31483 (ea.)

TX TPH Matrix Spike Mix

diesel fuel #2 composite
unleaded gasoline composite

10,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 31484 (ea.)

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)
n-hexatriacontane (C36)

200µg/mL each in pentane, 1mL/ampul
cat. # 31639 (ea.)

α,α,α-Trifluorotoluene

2,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30048 (ea.)

2,500µg/mL in P&T methanol, 1mL/ampul
cat. # 30068 (ea.)

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30083 (ea.)

1-Chlorooctane

10,000µg/mL in P&T methanol, 1mL/ampul
cat. # 30084 (ea.)

1-Chlorooctadecane Mix

1-chlorooctadecane
10,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31098 (ea.)

Washington

WA VPH Marker Standard (9 components)

n-pentane (C5)
n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
1-methylnaphthalene
naphthalene
toluene
1,2,3-trimethylbenzene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30450 (ea.)

WA VPH Standard (15 components)

n-pentane (C5)
n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
benzene
ethylbenzene
1-methylnaphthalene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,3-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30451 (ea.)

WA EPH Aromatic Hydrocarbon Mix

acenaphthene
benzo(ghi)perylene
naphthalene
pyrene
toluene
1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31488 (ea.)

WA EPH Aliphatic Hydrocarbon Mix

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-tetratriacontane (C34)

1,000µg/mL each in hexane, 1mL/ampul
cat. # 31489 (ea.)

WA EPH Aromatic Hydrocarbon Standard (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31469 (ea.)

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.

Washington *cont'd*

WA EPH Matrix Spike Mix (10 components)

n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
acenaphthene
anthracene
benzo(a)pyrene
benzo(ghi)perylene
naphthalene
pyrene

250µg/mL each in acetone, 1mL/ampul
cat. # 31490 (ea.)

WA EPH Fractionation Check Mix (22 components)

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-tetratriacontane (C34)
acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

25µg/mL each in hexane, 1mL/ampul
cat. # 31491 (ea.)



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Northwest Regional/Washington UST Monitoring

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Fast Facts
lit. cat.# 59396

Wisconsin

PVOC/GRO Mix (Wisconsin) (10 components)

benzene
ethylbenzene
methyl *tert*-butyl ether
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul
cat. # 30095 (ea.)

DRO Mix (EPA/Wisconsin) (10 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31064 (ea.)



free literature

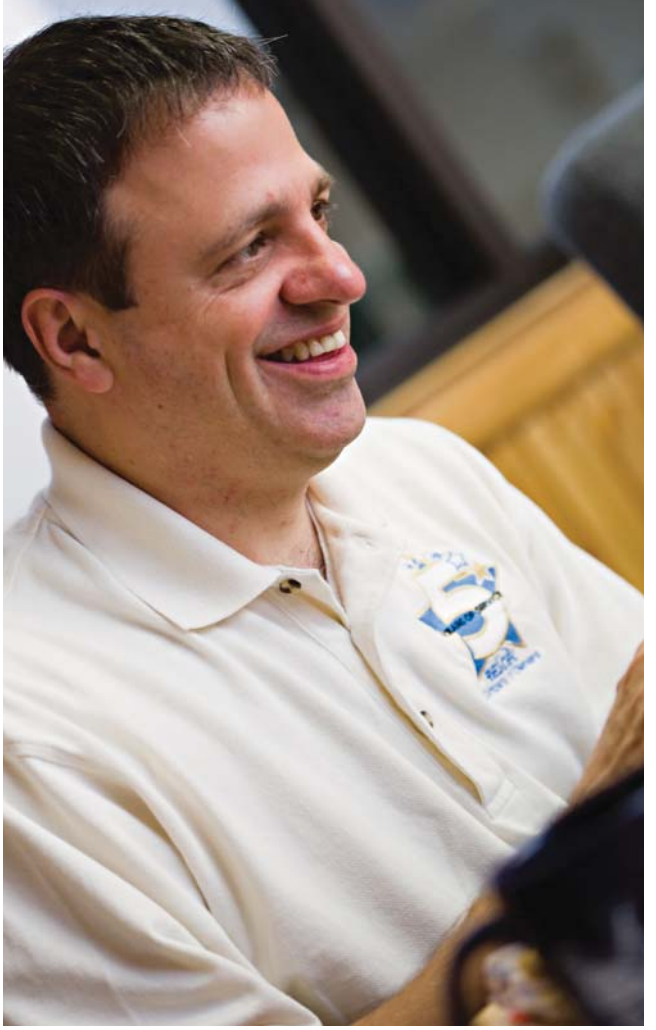
Wisconsin UST Monitoring

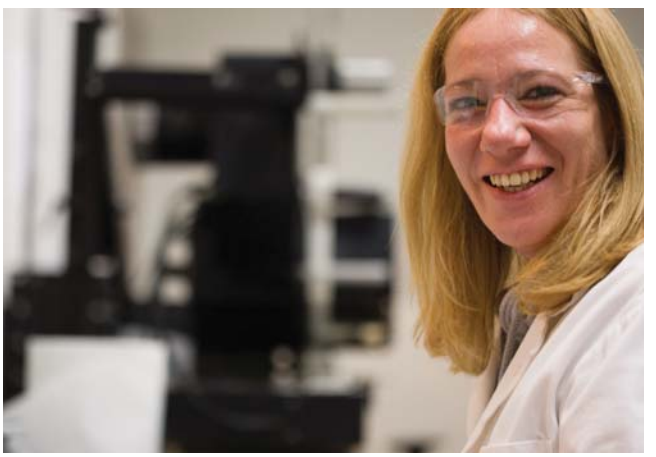
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Fast Facts
lit. cat.# 59392

ANALYTICAL REFERENCE MATERIALS OTHER MATERIALS

ASTM Methods 469-471
Petroleum Standards 472-475
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Organic Acids 481
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Derivatization Reagents 484
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Test Mixes, GC & HPLC 486-487





Top: Dave Krantz, Vice President of Operations
Bottom: Ann Glace, Manufacturing Technician

What's **NEW?** look for this circle

ASTM Methods

Method	Type
E1387	Fire Debris
E1618	Fire Debris
D2887-01	Simulated Distillation Petrochemical
D2887	Simulated Distillation Petrochemical
D3710-95	Simulated Distillation Petrochemical
D4059-96	PCB Standards in Oil
D5197	Formaldehyde and Other Carbonyl Compounds in Air
D5836-03	Air: Isocyanates & Oxazoladines
D6042-96	Plastic Container Testing
D6352-98	Polywax® Standards
D6584-00	Biodiesel
D6730-01 NEW!	Determination of Individual Components in Spark Ignition Engine Fuels

ASTM E1387 and E1618 (Fire Debris Analysis)

These materials also can be used for underground storage tank monitoring.

E1387 Column Resolution Check Mix (13 components)

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
2-ethyltoluene
3-ethyltoluene
toluene
1,2,4-trimethylbenzene
p-xylene

2,000µg/mL each in methylene chloride, 1mL/ampul
cat. # 31224 (ea.)

E1618 Test Mix (13 components)

Components in this mix (0.5µL/mL or 0.05% volume/volume each) are at 10X the concentration of the final test solution specified in ASTM 1618 and ASTM 1387.

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
2-ethyltoluene
3-ethyltoluene
toluene
1,2,4-trimethylbenzene
p-xylene

0.05% volume/volume each in methylene chloride, 1mL/ampul
cat. # 31613 (ea.)

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

ASTM Simulated Distillation Petrochemical Mixtures

American Society for Testing and Materials (ASTM International) Method D2887-01 is used to determine the boiling range distribution of petroleum products and fractions having a final boiling point of 538°C (1,000°F) or lower; a boiling range greater than 55°C (131°F) and a vapor pressure sufficiently low to permit sampling at ambient temperature.

ASTM D2887-01 Calibration Mix (20 components)

n-pentane (C5)
n-hexane (C6)
n-heptane (C7)
n-octane (C8)
n-nonane (C9)
n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-eicosane (C20)
n-tetracosane (C24)
n-octacosane (C28)
n-dotriacontane (C32)
n-hexatriacontane (C36)
n-tetracontane (C40)
n-tetratetracontane (C44)

1% weight each in carbon disulfide, 1g solution/ampul*
cat. # 31674 (ea.)

5% w/w in carbon disulfide, 1g /ampul**
cat. # 31675 (ea.)

No data pack available.
*This standard may only be shipped by FedEx ground, and only within the US.
**The 5% w/w blend of neat hydrocarbons can be shipped in the US (overnight) and to our international customers.

ASTM Methods D2887 and D3710-95

These calibration mixtures are made using pure, highly characterized neat material, prepared using NIST-traceable balance and weights. Each ampul is supplied with a data sheet indicating the exact concentration, and a sample chromatogram.

D2887 Calibration Mix (17 components)

Compound	Conc. (% w/w)	Compound	Conc. (% w/w)
n-hexane (C6)	6	*n*-octadecane (C18)	5
n-heptane (C7)	6	*n*-eicosane (C20)	2
n-octane (C8)	8	*n*-tetracosane (C24)	2
n-nonane (C9)	8	*n*-octacosane (C28)	1
n-decane (C10)	12	*n*-dotriacontane (C32)	1
n-undecane (C11)	12	*n*-hexatriacontane (C36)	1
n-dodecane (C12)	12	*n*-tetracontane (C40)	1
n-tetradecane (C14)	12	*n*-tetratetracontane (C44)	1
n-hexadecane (C16)	10		

Packaged 1mL/ampul
cat. # 31222 (ea.)

No data pack available.

D3710-95 Calibration Mix (16 components)

Compound	Conc. (% vol/vol)	Compound	Conc. (% vol/vol)
n-pentane (C5)	8	*n*-pentadecane (C15)	2
n-hexane (C6)	6	2-methylbutane	10
n-heptane (C7)	10	2-methylpentane	6
n-octane (C8)	5	2,4-dimethylpentane	6
n-decane (C10)	4	toluene	12
n-dodecane (C12)	4	*p*-xylene	14
n-tridecane (C13)	2	*n*-propylbenzene	5
n-tetradecane (C14)	2	*n*-butylbenzene	4

Packaged 1mL/ampul
cat. # 31223 (ea.)

No data pack available.

ASTM Methods

ASTM Method D4059-96 (PCB Standards in Oil)

ASTM Method D4059-96 is used for determining PCB concentrations in various types of transformer oil, using GC/ECD detection. The analyst must dilute transformer oil samples in a solvent prior to injection. The oil in the sample has been shown to quench the ECD. Calibration mixtures of PCBs in transformer oil must be prepared and diluted identically to eliminate the detector quenching bias resulting when samples are analyzed.

We prepare these solutions in a mineral oil-based transformer oil (Exxon® Univolt® N-61), which has been tested to ensure it is PCB-free.

PCB-Free Transformer Oil

Neat, 5mL cat. # 32424 (ea.)
Neat, 50mL cat. # 32425 (ea.)

No data pack available.

Aroclor Standards

Volume is 1mL/ampul.

Compound	Solvent	Conc.	cat.# (ea.)	price
Aroclor 1016	TO	50mg/kg	32075	
Aroclor 1016	TO	500mg/kg	32076	
Aroclor 1221	TO	50mg/kg	32077	
Aroclor 1221	TO	500mg/kg	32078	
Aroclor 1232	TO	50mg/kg	32079	
Aroclor 1232	TO	500mg/kg	32080	
Aroclor 1242	TO	50mg/kg	32081	
Aroclor 1242	TO	500mg/kg	32082	
Aroclor 1248	TO	50mg/kg	32083	
Aroclor 1248	TO	500mg/kg	32084	
Aroclor 1254	TO	50mg/kg	32085	
Aroclor 1254	TO	500mg/kg	32086	
Aroclor 1260	TO	50mg/kg	32087	
Aroclor 1260	TO	500mg/kg	32088	

TO = transformer oil (PCB-free)

ASTM Method D5197 (Formaldehyde and Other Carbonyl Compounds in Air)

CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard

(13 components)

acetaldehyde-2,4-DNPH
acetone-2,4-DNPH
acrolein-2,4-DNPH
benzaldehyde-2,4-DNPH
n-butyraldehyde-2,4-DNPH
crotonaldehyde-2,4-DNPH
formaldehyde-2,4-DNPH
hexaldehyde-2,4-DNPH
methacrolein-2,4-DNPH
methyl ethyl ketone-2,4-DNPH
propionaldehyde-2,4-DNPH
m-tolualdehyde-2,4-DNPH
valeraldehyde-2,4-DNPH

3µg/mL each in acetonitrile, 1mL/ampul
cat. # 33093 (ea.)

DNPH Reference Materials

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
acetaldehyde-2,4-DNPH	ACN	100	33074	
acetone-2,4-DNPH	ACN	100	33075	
acrolein-2,4-DNPH	ACN	100	33076	
benzaldehyde-2,4-DNPH	ACN	100	33077	
2-butanone-2,4-DNPH	ACN	100	33078	
n-butyraldehyde-2,4-DNPH	ACN	100	33079	
crotonaldehyde-2,4-DNPH	ACN	100	33080	
2,5-dimethylbenzaldehyde-2,4-DNPH	ACN	100	33081	
formaldehyde-2,4-DNPH	ACN	100	33082	
glycolaldehyde-2,4-DNPH	ACN	100	33091	
hexaldehyde-2,4-DNPH	ACN	100	33083	
isobutyraldehyde-2,4-DNPH	ACN	100	33084	
isovaleraldehyde-2,4-DNPH	ACN	100	33085	
methacrolein-2,4-DNPH	ACN	100	33095	
propionaldehyde-2,4-DNPH	ACN	100	33086	
m-tolualdehyde-2,4-DNPH	ACN	100	33088	
o-tolualdehyde-2,4-DNPH	ACN	100	33087	
p-tolualdehyde-2,4-DNPH	ACN	100	33089	
valeraldehyde-2,4-DNPH	ACN	100	33090	

ACN=acetonitrile

ASTM Method D5836-03 / OSHA 42, OSHA 47, NIOSH 5522 (Analysis of Isocyanates in Indoor Air by HPLC)

ASTM D5836 and OSHA 42 are test methods for determining 2,4-toluene diisocyanate (2,4-TDI) and 2,6-TDI in the workplace atmosphere. OSHA 47 is for 4,4'-methylenediphenyl isocyanate (4,4'-MDI) in indoor air, and NIOSH Method 5522 is an analysis for 2,4-TDI, 2,6-TDI, 4,4'-MDI, and 1,6-hexamethylene diisocyanate (1,6-HDI) in air. Restek offers the 1,-(2-pyridyl)piperzine (1-2pp) derivative.

Isocyanates Singles

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
2,6-TDIP	DMSO	1,000	33000	
2,4-TDIP	DMSO	1,000	33001	
1,6-HDIP	DMSO	1,000	33002	
4,4'-MDIP	DMSO	1,000	33003	

DMSO = dimethyl sulfoxide

Formaldehyde Oxazoladine

2,000µg/mL in toluene, 1mL/ampul
cat. # 33004 (ea.)

ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—*Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography*—is a "consensus" or "referee" method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product to their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, HPLC separation, and UV detection. Restek offers a variety of reversed phase HPLC columns suitable for these separations. Restek also designed an analytical reference material to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

ASTM D6042-96 Calibration Mix (7 components)

BHT
erucamide slip
vitamin E
Irgafos 168
Irganox 3114
Irganox 1010
Irganox 1076

50µg/mL each in isopropanol, 1mL/ampul
cat. # 31628 (ea.)

No data pack available.

ASTM D6042-96 Internal Standard Mix

Tinuvin P

51.8µg/mL in isopropanol, 1mL/ampul
cat. # 31629 (ea.)

No data pack available.

ASTM Method D6042-96 (Plastic Container Testing) *cont'd*

Other Additives—Available from Restek as Custom Formulations

Similar methods for extractables in plastic pharmaceutical containers are cited in the United States Pharmacopeia (USP), British Pharmacopoeia (BP), European Pharmacopoeia (EP), and Japanese Pharmacopoeia (JP). Customers may also have formulation-specific or product-specific test mixtures. Please contact us for a custom mixture. Our current inventory of raw materials includes these popular antioxidants. We have many more that are not listed and can obtain most compounds you may need.

- Ethanox 323
- Ethanox 330
- Ethanox 702
- Ethanox 703
- Irganox L06
- Irganox L57
- Irganox L64
- Irganox L109
- Irganox L134
- Irganox L135
- Irganox 1035
- Santanox R
- Ultranox 626
- Vanlube 81
- Vanlube 848
- Vanlube 7723
- Vanlube AZ
- Vanlube NA
- Vanlube PCX
- Vanlube SL
- Vanlube SS

ASTM Method D6352-98 (Polywax® Standards)

These high molecular weight hydrocarbon waxes are useful for simulated distillation and other high-temperature GC work.

Volume is 1mL/ampul.

Compound	qty.	cat.# (ea.)	price
Polywax 500	1g	36224	
Polywax 655	1g	36225	
Polywax 850	1g	36226	
Polywax 1000	1g	36227	

No data pack available.

ASTM Method D6584-00 and EN14105 (Biodiesel)

Determining Free and Total Glycerin in B-100 Biodiesel Methyl Esters by GC

In the manufacture of biodiesel fuel, triglycerides are split into their monoalkyl ester components via transesterification. The fatty acid monoalkyl esters can be used as fuel in diesel engines. Amounts of free glycerin and total glycerin indicate the quality of the conversion of the oil or fat to monoalkyl esters. D6584-00 is a test method for quantitative determination of free glycerin, total glycerin, and mono-, di-, and triglycerides in biodiesel fuel methyl esters by GC, after silylation of the sample with N-methyl-N-(trimethylsilyl) trifluoroacetamide (MSTFA).

(s)-(-)-1,2,4-Butanetriol

(s)-(-)-1,2,4-butanetriol
1,000µg/mL in pyridine, 1mL/ampul
cat. # 33024 (ea.)
1,000µg/mL in pyridine, 5mL/ampul
cat. # 33032 (ea.)

Diolein

diolein (1,3-di[*cis*-octadecenoyl]glycerol)
5,000µg/mL in pyridine, 1mL/ampul
cat. # 33022 (ea.)

Glycerin

glycerin
500µg/mL in pyridine, 1mL/ampul
cat. # 33020 (ea.)

ASTM Method D6584-00 and EN14105 (Biodiesel) *cont'd*

Monolein

monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)
5,000µg/mL in pyridine, 1mL/ampul
cat. # 33021 (ea.)

Monopalmitin

monopalmitin
5,000µg/mL in pyridine, 1mL/ampul
cat. # 33026 (ea.)

Tricaprin

tricaprin (1,2,3-tricaprinoylglycerol)
8,000µg/mL in pyridine, 1mL/ampul
cat. # 33025 (ea.)
8,000µg/mL in pyridine, 5mL/ampul
cat. # 33033 (ea.)

Triolein

triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol)
5,000µg/mL in pyridine, 1mL/ampul
cat. # 33023 (ea.)

ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels)

Oxy Set-Up Blend

NEW!

ASTM method D6730-01 is specifically designed for the determination of the individual hydrocarbons present in spark ignition fuels, as well as fuel blends containing oxygenates such as methyl *tert*-butyl ether, ethyl *tert*-butyl ether, *tert*-butanol, ethanol, etc.

Gravimetrically prepared and NIST-traceable.

benzene	1.00%	1-methylcyclopentane	0.50%
tert-butanol	0.50%	1-methyl-2-ethylbenzene	0.50%
cyclohexane	28.9%	1-methylnaphthalene	0.25%
n-decane	1.00%	5-methylnonane	0.20%
2,3-dimethylbutane	0.50%	naphthalene	0.50%
trans-1,2-dimethyl cyclopentane	0.50%	*n*-nonane	2.00%
2,3-dimethylheptane	0.20%	*n*-octane	2.00%
dodecane	0.25%	*n*-pentane	2.00%
ethanol	8.00%	1,2,3,5-tetramethyl benzene	0.25%
ethylbenzene	25.0%	toluene	7.00%
3-ethylpentane	0.20%	tridecane	0.25%
n-heptane	2.00%	2,2,3-trimethylpentane	2.00%
n-hexane	2.00%	2,3,3-trimethylpentane	0.50%
2-methyl-2-butene	2.50%	undecane	0.50%
methyl *tert*-butyl ether	10.0%	*p*-xylene	1.00%

2mL prescored ampul
cat. # 33034 (ea.) enquire

Diesel/Biodiesel 80:20 Blend Standard

The biodiesel component is methyl soyate.

diesel/biodiesel 80:20
5,000µg/mL in methylene chloride, 1mL/ampul
cat. # 31880 (ea.)

also **available**

Restek offers a full range of derivatization reagents in 10 x 1g and 25g package sizes. See **page 484**.



Petroleum Standards

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and verified by one or more analytical methods.

Sulfur Simulated Distillation Standard

SSDS

30 ppm total sulfur by weight from ethanethiol
60 ppm total sulfur by weight from 1-propanethiol
30 ppm total sulfur by weight from 1-butanethiol
60 ppm total sulfur by weight from 1-pentanethiol
30 ppm total sulfur by weight from 1-hexanethiol
60 ppm total sulfur by weight from 1-heptanethiol
30 ppm total sulfur by weight from 3,5-dimethlybenzenethiol
60 ppm total sulfur by weight from 1-octanethiol
30 ppm total sulfur by weight from 1-nonanethiol
60 ppm total sulfur by weight from 1-decanethiol
30 ppm total sulfur by weight from 1-pentadecanethiolol
60 ppm total sulfur by weight from 1-hexadecanethiol
30 ppm total sulfur by weight from 1-octadecanethiol
Balance: toluene/isooctane 1/15

1mL pre-scored amber ampul.

cat. # 33049 (ea.) enquire

Speciated Sulfur System Suitability Checkout Standard

SSSSCS

0.50 ppm total sulfur by weight from dimethylsulfide
35.0 ppm total sulfur by weight from tertiary butyl mercaptan
50.0 ppm total sulfur by weight from thiopene
15.0 ppm total sulfur by weight from dimethyl disulfide
25.0 ppm total sulfur by weight from benzothiopene
Balance: isooctane

1mL pre-scored amber ampul.

cat. # 33050 (ea.) enquire

also **available**

Custom ULSD and LSD calibration standards are also available in 100mL, 200mL, 500mL, and 1 liter bottles.

Call our Analytical Reference Department at 800-356-1688 or 814-353-1300, or your Restek representative for details.

EPA Ultra Low & Low Sulfur Diesel Standards and Samples in Diesel Fuel to Meet EPA Requirements for Lab Qualification

EPA Ultra Low Sulfur Diesel Precision Sample # 1

EPA Section 80.580-80.585 Title 40, Chapter 1, Part 80

Homogenous commercially available diesel fuel with sulfur content of 5-15 ppm.
1 x 200mL amber bottle.

cat. # 33051 (ea.) enquire

EPA Low Sulfur Diesel Precision Sample # 2

EPA Section 80.580-80.585 Title 40, Chapter 1, Part 80

Homogenous commercially available diesel fuel with sulfur content of 200-500 ppm.
1 x 200mL amber bottle.

cat. # 33052 (ea.) enquire

EPA Ultra Low Sulfur Diesel Accuracy Standard # 1

EPA Section 80.520(a)(1) and 80.510(b)

1-10 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard.
1 x 200mL amber bottle.

cat. # 33053 (ea.) enquire

EPA Ultra Low Sulfur Diesel Accuracy Standard # 2

EPA Section 80.520(a)(1) and 80.510(b)

10-20 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard.
1 x 200mL amber bottle.

cat. # 33054 (ea.) enquire

EPA Low Sulfur Diesel Accuracy Standard # 3

EPA Section 80.520(c) and 80.510(c)

100-200 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard.
1 x 200mL amber bottle.

cat. # 33055 (ea.) enquire

EPA Low Sulfur Diesel Accuracy Standard # 4

EPA Section 80.520(c) and 80.510(c)

400-500 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard.
1 x 200mL amber bottle.

cat. # 33056 (ea.) enquire

Ultra Low & Low Sulfur in Diesel Fuel Calibration Kits

EPA Section 80.580-80.585 Title 40, Chapter 1, Part 80

Cal Kit ULSD 1 - 20

Blank
1.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
2.5 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
5.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
10.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
15.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
20.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel

Set of seven 20mL bottles.

cat. # 33060 (kit) enquire

Cal Kit ULSD 20 - 100

Blank
20.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
35.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
50.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
75.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
100 ppm total sulfur from di-*n*-butylsulfide in diesel fuel

Set of six 20mL bottles.

cat. # 33061 (kit) enquire

Cal Kit LSD 100 - 500

Blank
100 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
200 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
300 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
400 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
500 ppm total sulfur from di-*n*-butylsulfide in diesel fuel

Set of six 20mL bottles.

cat. # 33062 (kit) enquire

Low Sulfur in Gasoline Calibration Standards

EPA Section 80.190-80.415 Title 40, Chapter 1, Part 80

Cal Kit SG 10 - 50

Blank
10 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
20 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
30 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
40 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
50 ppm sulfur from di-*n*-butylsulfide in gasoline by weight

Set of six 5mL amber bottles.

cat. # 33043 (kit) enquire

Check Standard SG 25

25 ppm sulfur from di-*n*-butylsulfide in gasoline by weight.
Set of five 5mL amber bottles.

cat. # 33044 (ea.) enquire

also **available**

Custom ULSD and LSD calibration standards are also available in 100mL, 200mL, 500mL, and 1 liter bottles.

Call our Analytical Reference Department at 800-356-1688 or 814-353-1300, or your Restek representative for details.

Low Sulfur in Gasoline Calibration Standards *cont'd*

Cal Kit SG 50 - 125

Blank
50 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
65 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
80 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
95 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
110 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
125 ppm sulfur from di-*n*-butylsulfide in gasoline by weight

Set of seven 5mL amber bottles.

cat. # 33045 (kit) enquire

Check Standard SG 75

75 ppm sulfur from di-*n*-butylsulfide in gasoline by weight.
Set of five 5mL amber bottles.

cat. # 33046 (ea.) enquire

Cal Kit SG 110 - 500

Blank
110 ppm sulfur from di-*n*-butylsulfide
200 ppm sulfur from di-*n*-butylsulfide
300 ppm sulfur from di-*n*-butylsulfide
400 ppm sulfur from di-*n*-butylsulfide
500 ppm sulfur from di-*n*-butylsulfide

Set of six 5mL amber bottles.

cat. # 33047 (kit) enquire

Check Standard SG 175

175 ppm sulfur from di-*n*-butylsulfide in gasoline by weight.
Set of five 5mL amber bottles.

cat. # 33048 (ea.) enquire

Sulfur in Isooctane Calibration Kits and Check Standards

ASTM Methods D3120, D4045, D5453, D6920

Cal Kit SISO 0.125 - 2.5ppm

Blank
0.125 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
0.25 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
0.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
2.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane

Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane 0.125-2.5ppm range. Set of six 1mL pre-scored ampuls.

cat. # 33035 (kit) enquire

Check Standard SISO 0.75

0.75ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1mL pre-scored ampuls.

cat. # 33036 (ea.) enquire

please **note**

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and verified by one or more analytical methods.

Sulfur in Isooctane Calibration Kits and Check Standards *cont'd*

Cal Kit SISO 2.5 - 50 ppm

Blank
2.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
5.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
10.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
15.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
20.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
25.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
50.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane

Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane 2.5-50 ppm range. Set of eight 1mL pre-scored ampuls.

cat. # 33037 (kit) enquire

Check Standard SISO 30

30 ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1mL pre-scored ampuls.

cat. # 33038 (ea.) enquire

Cal Kit SISO 50 - 1000 ppm

Blank
50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
75 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
100 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
250 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
500 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane

Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane 50-100 ppm range. Set of seven 1mL pre-scored ampuls.

cat. # 33039 (kit) enquire

Check Standard SISO 300

300 ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1mL pre-scored ampuls.

cat. # 33040 (ea.) enquire

Cal Kit SISO 1000 - 6000

Blank
1000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1500 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
2000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
4000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
6000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane

Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane 1000 - 6000 ppm range. Set of six 1mL pre-scored ampuls.

cat. # 33041 (kit) enquire

Check Standard SISO 3000

3000 pm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1mL pre-scored ampuls.

cat. # 33042 (ea.) enquire

also **available**

Custom total sulfur & total nitrogen in isooctane check standards also available.

Call our Analytical Reference Department at 800-356-1688 or 814-353-1300, or your Restek representative for details.

Total Sulfur & Total Nitrogen in Isooctane Calibration Kits

ASTM Methods D3120, D4045, D4629, D5453, D5762, D6069, D6920

Cal Kit SNISO 0.125 - 5.0

Blank
0.125 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
0.25 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
0.50 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
1.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
2.50 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
5.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane

Set of seven 1mL pre-scored amber ampuls.

cat. # 33057 (kit) enquire

Cal Kit SNISO 5.0 - 50.0

Blank
5.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
10.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
25.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
50.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane

Set of five 1mL pre-scored amber ampuls.

cat. # 33058 (kit) enquire

Cal Kit SNISO 50.0 - 1000

Blank
50.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
75.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
100 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
250 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
500 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
1000 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane

Set of seven 1mL pre-scored amber ampuls.

cat. # 33059 (kit) enquire

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

Sulfur in Mineral Oil Calibration Kits and Check Standards

ASTM Methods D2622, D3120, D4045, D4294, D5453, D6212, D6313, D6428, D6445, D7039

Cal Kit SMO 2 - 20

kit

Blank
2.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
5.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
7.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
10.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
15.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
20.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil

Set of seven 100mL bottles.

cat. # 33063 (kit) enquire

Check Standard SMO 11

11.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil.
1 liter bottle.

cat. # 33064 (ea.) enquire

Cal Kit SMO 10 - 100

kit

Blank
10.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
25.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
50.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
100 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil

Set of five 100mL bottles.

cat. # 33065 (kit) enquire

Check Standard SMO 30

30.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil.
1 liter bottle.

cat. # 33066 (ea.) enquire

Cal Kit SMO 100 - 1000

kit

Blank
100 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
200 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
300 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
400 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
500 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
600 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
750 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
1000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil

Set of nine 100mL bottles.

cat. # 33067 (kit) enquire

Check Standard SMO 350

350 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil.
1 liter bottle.

cat. # 33068 (ea.) enquire

Cal Kit SMO 1000 - 25000

kit

Blank
1000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
2500 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
5000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
1.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
1.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
2.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
2.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil

Set of eight 100mL bottles.

cat. # 33069 (kit) enquire

Check Standard SMO 3000

3000 w/w ppm total sulfur from di-*n*-butylsulfide. 1 liter bottle.

cat. # 33070 (ea.) enquire

Cal Kit SMO 25000 - 50000

kit

Blank
2.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
3.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
3.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
4.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
4.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
5.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil

Set of seven 100mL bottles.

cat. # 33071 (kit) enquire

Check Standard SMO 37000

3.70% total sulfur by weight from di-*n*-butylsulfide in mineral oil.
1 liter bottle.

cat. # 33072 (ea.) enquire

please **note**

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and verified by one or more analytical methods.

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Forensic: Fire Debris, Blood Alcohol



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USP 467 Standards	Residual Solvents
European Pharmacopoeia Standards	Residual Solvents

Weathered Petrochemical Standards

These solutions are prepared from a single source (one refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular and premium grade unleaded gasoline were blended in equal volumes.

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182°C
- Type II (high flash point) BPR 177–196°C
- Type III (odorless) BPR 149–196°C
- Type IV (low dry point) BPR 149–174°C

Stoddard Solvent Standard

10,000µg/mL in P&T methanol, 1mL/ampul

cat. # 30487 (ea.)

We prepare our mineral spirits solutions from an equal volume blend of Type I, II, and III mineral spirits.

Volume is 1mL/ampul unless otherwise noted. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
unleaded gasoline: unweathered	PTM	5,000	30096	
unleaded gasoline: 25% weathered	PTM	5,000	30097	
unleaded gasoline: 50% weathered	PTM	5,000	30098	
unleaded gasoline: 75% weathered	PTM	5,000	30099	
unleaded gasoline: 99% weathered	PTM	5,000	30436	
Compound	**Solvent**	**Conc.**	**cat.# (ea.)**	price
kerosene: unweathered	D	5,000	31229	
kerosene: 25% weathered	D	5,000	31230	
kerosene: 50% weathered	D	5,000	31231	
kerosene: 75% weathered	D	5,000	31232	
Compound	**Solvent**	**Conc.**	**cat.# (ea.)**	price
diesel fuel #2: unweathered	D	5,000	31233	
diesel fuel #2: 25% weathered	D	5,000	31234	
diesel fuel #2: 50% weathered	D	5,000	31235	
diesel fuel #2: 75% weathered	D	5,000	31236	
Compound	**Solvent**	**Conc.**	**cat.# (ea.)**	price
mineral spirits: unweathered	D	5,000	31225	
mineral spirits: unweathered	D	50,000	31260	
mineral spirits: unweathered (5mL)	D	50,000	31261	
mineral spirits: 25% weathered	D	5,000	31226	
mineral spirits: 50% weathered	D	5,000	31227	
mineral spirits: 75% weathered	D	5,000	31228	

D = methylene chloride
PTM = P&T methanol

please **note**

We can custom prepare weathered accelerants for fire debris analysis.

Please complete the custom reference material request form at **www.restek.com/solutions**.

We'll be glad to work with you!

Weathered Petrochemical Standards *cont'd*

Weathered Gasoline Kit

30096: Unleaded Gasoline Standard
30097: Unleaded Gas Standard: 25% Weathered
30098: Unleaded Gas Standard: 50% Weathered
30099: Unleaded Gas Standard: 75% Weathered

Contains 1mL each of these mixtures.

cat. # 30100 (kit)

Weathered Gasoline Kit #2

30096: Unleaded Gasoline Standard
30097: Unleaded Gas Standard: 25% Weathered
30098: Unleaded Gas Standard: 50% Weathered
30099: Unleaded Gas Standard: 75% Weathered
30436: Unleaded Gas Standard: 99% Weathered

Contains 1mL each of these mixtures.

cat. # 30437 (kit)

Weathered Kerosene Kit

31229: Kerosene Standard
31230: Kerosene Standard: 25% Weathered
31231: Kerosene Standard: 50% Weathered
31232: Kerosene Standard: 75% Weathered

Contains 1mL each of these mixtures.

cat. # 31238 (kit)

Weathered Diesel Fuel #2 Kit

31233: Diesel Fuel #2 Standard
31234: Diesel Fuel #2 Standard: 25% Weathered
31235: Diesel Fuel #2 Standard: 50% Weathered
31236: Diesel Fuel #2 Standard: 75% Weathered

Contains 1mL each of these mixtures.

cat. # 31239 (kit)

Weathered Mineral Spirits Kit

31225: Mineral Spirits Standard
31226: Mineral Spirits Standard: 25% Weathered
31227: Mineral Spirits Standard: 50% Weathered
31228: Mineral Spirits Standard: 75% Weathered

Contains 1mL each of these mixtures.

cat. # 31237 (kit)

Blood Alcohol Standards

Blood Alcohol Mix Resolution Control Standard (8 components)

Use to verify the retention time for each compound normally included in a blood alcohol test, and to verify that the compounds are resolved from and do not interfere with one another. Concentration of ethanol is NIST-traceable.

acetaldehyde
acetone
acetonitrile
ethanol (NIST certified value)
ethyl acetate
isopropanol
methanol
methyl ethyl ketone

0.100g/dL each in water, 1mL/ampul

cat. # 36256 (ea.)

Blood Alcohol Standards *cont'd*

We have developed calibration mixtures for performing multi-point instrument calibrations so that laboratories can construct calibration curves. The data pack (which can be downloaded from our website at **www.restek.com/datapacks**) includes a Certificate of Analysis, raw material testing results, statistical QA results, analytical balance printout, and gravimetric weight of each analyte. Ethanol in these mixes is National Institute of Standards and Technology (NIST)-traceable.

Compound	qty.	cat.#	price
0.010g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36276	
1mL/ampul	10-pk.	36278	
5mL/ampul	ea.	36277	
0.015g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36232	
1mL/ampul	10-pk.	36332	
5mL/ampul	ea.	36240	enquire
20mL/ampul	ea.	36248	
0.02g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36233	
1mL/ampul	10-pk.	36333	
5mL/ampul	ea.	36241	enquire
20mL/ampul	ea.	36249	
0.025g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36234	
1mL/ampul	10-pk.	36334	
5mL/ampul	ea.	36242	
20mL/ampul	ea.	36250	enquire
0.04g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36235	
1mL/ampul	10-pk.	36335	
5mL/ampul	ea.	36243	
20mL/ampul	ea.	36251	
0.05g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36257	
1mL/ampul	10-pk.	36259	
5mL/ampul	ea.	36258	
20mL/ampul	ea.	36260	
0.08g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36262	
1mL/ampul	10-pk.	36264	
5mL/ampul	ea.	36263	
20mL/ampul	ea.	36265	
0.1g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36236	
1mL/ampul	10-pk.	36336	
5mL/ampul	ea.	36244	
20mL/ampul	ea.	36252	
0.15g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36237	
1mL/ampul	10-pk.	36337	
5mL/ampul	ea.	36245	
20mL/ampul	ea.	36253	
0.16g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36417	
1mL/ampul	10-pk.	36418	
5mL/ampul	ea.	36419	
20mL/ampul	ea.	36420	
0.2g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36238	
1mL/ampul	10-pk.	36338	
5mL/ampul	ea.	36246	
20mL/ampul	ea.	36254	

NEW!

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Resolve blood alcohol samples in less than 3 minutes with our Rtx®-BAC1 and Rtx®-BAC2 columns. For more information on these columns or to find out what's new for clinical/forensic analyses, visit **www.restek.com/CFT**.

Blood Alcohol Standards *cont'd*

Compound	qty.	cat.#	price
0.3g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36239	
1mL/ampul	10-pk.	36339	
5mL/ampul	ea.	36247	
20mL/ampul	ea.	36255	
0.4g/dL forensic ethanol solution			
1mL/ampul	5-pk.	36266	
1mL/ampul	10-pk.	36268	
5mL/ampul	ea.	36267	
20mL/ampul	ea.	36269	

Bank Dye Standard (MAAQ)

Restek offers this qualitative standard to help investigators in municipal police stations and criminal laboratories fight crime.

1-N-(methylamino)anthraquinone (MAAQ)

100µg/mL in methylene chloride, 1mL/ampul
cat. # 31823 (ea.)

No data pack available.

Explosives Solutions

Single-Component Explosives Solutions

These materials support nitroaromatic, nitramine, and nitroester analyses by GC/ECD (Method 8095).[1,2] Compounds listed are explosives, manufacturing intermediates or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	Solvent	Conc.	cat.# (ea.)	price
2-amino-4,6-dinitrotoluene	ACN	1,000	31670	enquire
4-amino-2,6-dinitrotoluene	ACN	1,000	31671	enquire
ammonium picrate	ACN	2,000	31890	enquire
3,5-dinitroaniline	ACN	1,000	31661	enquire
1,3-dinitrobenzene	ACN	1,000	31662	enquire
1,4-dinitrobenzene	ACN	2,000	33205	enquire
2,4-dinitrotoluene	ACN	1,000	31663	enquire
2,6-dinitrotoluene	ACN	1,000	31664	enquire
EGDN	M	1,000	31601	enquire
HMX	ACN	1,000	31665	enquire
nitrobenzene	ACN	1,000	31657	enquire
nitroglycerin	M	1,000	31498	enquire
nitroguanidine	M	1,000	31602	enquire
2-nitrotoluene	ACN	1,000	31659	enquire
3-nitrotoluene	ACN	1,000	31660	enquire
4-nitrotoluene	ACN	1,000	31658	enquire
PETN (pentaerythritol tetranitrate)	M	1,000	31600	enquire
picric acid	M	1,000	31499	enquire
propylene glycol dinitrate (PGDN)	M	1,000	31821	enquire
RDX	ACN	1,000	31666	enquire
tetryl	ACN	1,000	31667	enquire
1,3,5-trinitrobenzene	ACN	1,000	31668	enquire
2,4,6-trinitrotoluene	ACN	1,000	31669	enquire

ACN=acetonitrile
M = methanol

References (Not available from Restek.)

[1]US Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.
[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406-416, August 1998.



Exempted Drug of Abuse Reference Materials

Volume is 1mL/ampul. Concentration is µg/mL.

Compound	CAS#	Solvent	Conc.	cat.# (ea.)	price
Benzodiazepines					
alprazolam	28981-97-7	PTM	1,000	34042	enquire
bromazepam	1812-30-2	PTM	1,000	34043	enquire
chlordiazepoxide	438-41-5	PTM	1,000	34044	enquire
clobazam	22316-47-8	PTM	1,000	34045	enquire
clonazepam	1622-61-3	PTM	1,000	34046	enquire
diazepam	439-14-5	PTM	1,000	34047	enquire
flunitrazepam	1622-62-4	PTM	1,000	34049	enquire
flurazepam	1172-18-5	PTM	1,000	34050	enquire
lorazepam	846-49-1	PTM	1,000	34051	enquire
nitrazepam	146-22-5	PTM	1,000	34053	enquire
oxazepam	604-75-1	PTM	1,000	34054	enquire
prazepam	2955-38-6	PTM	1,000	34055	enquire
temazepam	896-50-4	PTM	1,000	34056	enquire
triazolam	28911-01-5	PTM	1,000	34057	enquire
Cocaine & Metabolites					
cocaethylene	529-38-4	ACN	1,000	34066	enquire
cocaine	53-21-4	PTM	1,000	34015	enquire
benzoylecgonine	519-09-5	PTM	1,000	34016	enquire
ecgonine	5796-31-6	PTM	1,000	34017	enquire
ecgonine methyl ester	38969-40-3	PTM	1,000	34018	enquire
Methadone & Metabolites					
EDDP perchlorate	66729-78-0	M	1,000	34069	enquire
methadone	1095-90-5	PTM	1,000	34005	enquire
Amphetamines & Metabolites					
d-amphetamine	51-63-8	PTM	1,000	34020	enquire
(+)methamphetamine	51-57-0	PTM	1,000	34021	enquire
3,4-MDA HCl	4764-17-4	M	1,000	34070	enquire
3,4-MDEA HCl	82801-81-8	M	1,000	34072	enquire
3,4-MDMA HCl	42542-10-9	M	1,000	34071	enquire
phenylpropanolamine HCl	154-41-6	M	1,000	34073	enquire
Opiates & Metabolites					
codeine	76-57-3	PTM	1,000	34000	enquire
dextromethorphan HBr monohydrate	125-69-9	M	1,000	34081	enquire
hydrocodone	34195-34-1	PTM	1,000	34002	enquire
hydromorphone	71-68-1	PTM	1,000	34063	enquire
morphine	6211-15-0	PTM	1,000	34006	enquire
oxycodone	124-90-3	PTM	1,000	34007	enquire
oxymorphone	76-41-5	PTM	1,000	34065	enquire
Cannabinoid & Metabolites					
cannabidiol	13956-24-1	PTM	1,000	34011	enquire
cannabinol	521-35-7	PTM	1,000	34010	enquire
Δ^9-THC	1972-08-3	M	1,000	34067	enquire
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068	enquire
Barbiturates					
amobarbital	64-43-7	PTM	1,000	34028	enquire
aprobarbital	77-02-1	PTM	1,000	34029	enquire
barbital	57-44-3	PTM	1,000	34030	enquire
butabarbital	125-40-6	PTM	1,000	34031	enquire
butalbital	77-26-9	PTM	1,000	34032	enquire
DL-glutethimide	18389-24-7	PTM	1,000	34058	enquire
hexobarbital	56-29-1	PTM	1,000	34033	enquire
mephobarbital	115-38-8	PTM	1,000	34034	enquire
methohexital	151-83-7	PTM	1,000	34035	enquire
pentobarbital	76-74-4	PTM	1,000	34036	enquire
phenobarbital	50-06-6	PTM	1,000	34037	enquire
secobarbital	29071-21-4	PTM	1,000	34038	enquire
talbutal	115-44-6	PTM	1,000	34039	enquire
thiamylal	337-47-3	PTM	1,000	34040	enquire
thiopental	71-73-8	PTM	1,000	34041	enquire

Compound	CAS#	Solvent	Conc.	cat.# (ea.)	price
GHB					
1,4-butanediol	110-63-4	M	1,000	34078	enquire
γ-butyrolactone (GBL)	96-48-0	ACN	1,000	34077	enquire
α-methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079	enquire
γ-valerolactone	108-29-2	ACN	1,000	34080	enquire
LSD					
LAMPA	40158-98-3	ACN	1,000	34075	enquire
LSD	50-37-3	ACN	25	34089	enquire
LSD	50-37-3	ACN	100	34088	enquire
Other					
benzphetamine	5411-22-3	PTM	1,000	34022	enquire
caffeine	58-08-2	M	1,000	34084	enquire
continine	486-56-6	M	1,000	34086	enquire
fenfluramine	16105-77-4	PTM	1,000	34023	enquire
fentanyl	437-38-7	M	1,000	34082	enquire
nor-fentanyl oxalate	1609-66-1	M	1,000	34083	enquire
levorphanol	5985-38-6	PTM	1,000	34003	enquire
meperidine	50-13-5	PTM	1,000	34004	enquire
meprobamate	57-53-4	PTM	1,000	34059	enquire
methaqualone	340-56-7	PTM	1,000	34064	enquire
methyprylon	125-64-4	PTM	1,000	34060	enquire
nicotine	54-11-5	M	1,000	34085	enquire
pentazocine	64024-15-3	PTM	1,000	34062	enquire
phencyclidine	956-90-1	PTM	1,000	34027	enquire
phendimetrazine	50-58-8	PTM	1,000	34025	enquire
phenmetrazine	1707-14-8	PTM	1,000	34026	enquire
phentermine	1197-21-3	PTM	1,000	34024	enquire
dextro-propoxyphene	1639-60-7	PTM	1,000	34008	enquire
thebaine	115-37-7	PTM	1,000	34009	enquire

ACN = acetonitrile
M = methanol
PTM = purge & trap grade methanol

Forensic Drug Screen Test Mixture

NEW!

amiodarone	10µg/mL	diazepam	10
amphetamine	10	doxepine	10
caffeine	10	haloperidol	1
codeine	10	morphine	10

In P&T methanol, 1mL/ampul

cat. # 36340 (ea.)

Forensic Drug Screen Internal Standard

NEW!

D5-diazepam D5-doxepine

10µg/mL each in P&T methanol, 10mL/ampul

cat. # 36341 (ea.)

free data

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USP <467>

The United States Pharmacopeia (USP) general chapter <467> Residual Solvents is a widely used compendial method intended for identifying and quantifying residual solvents in drug substances, drug products, and excipients. In an attempt to better mirror the International Conference on Harmonization (ICH) guidelines, the USP has adopted a more comprehensive methodology in residual solvent testing—the current USP30/NF25. The ICH publishes a guideline (Q3C) listing the acceptable amounts of solvent residues that can be present. In the ICH guideline, residual solvents are summarized by class, according to their toxicity. Class 1 compounds are carcinogenic compounds that pose a risk to both the consumer and the environment. The use of these solvents is to be avoided, but if they are used, they must be tightly controlled. Class 2 compounds are nongenotoxic animal carcinogens, and concentrations of these compounds should be limited. Chromatographic analysis is needed for both the Class 1 and Class 2 residual solvents.

USP <467> Singles

Volume is 1mL/ampul.

Compound	Solvent	Conc.	cat.# (ea.)	price
acetonitrile	DMSO	2.05mg/mL	36281	
benzene	DMSO	10mg/mL	36282	
carbon tetrachloride	DMSO	20mg/mL	36283	
chlorobenzene	DMSO	1.8mg/mL	36284	
chloroform	DMSO	0.3mg/mL	36285	
cyclohexane	DMSO	19.4mg/mL	36286	
1,1-dichloroethene	DMSO	40mg/mL	36287	
1,2-dichloroethane	DMSO	25mg/mL	36288	
cis-1,2-dichloroethylene	DMSO	4.67mg/mL	36289	
trans-1,2-dichloroethylene	DMSO	4.67mg/mL	36290	
1,2-dimethoxyethane	DMSO	0.5mg/mL	36291	
N,N-dimethylacetamide	DMSO	5.45mg/mL	36292	
N,N-dimethylformamide	DMSO	4.4mg/mL	36293	
1,4-dioxane	DMSO	1.9mg/mL	36294	
2-ethoxyethanol	DMSO	0.8mg/mL	36295	
ethylbenzene	DMSO	1.84mg/mL	36296	
ethylene glycol	DMSO	3.1mg/mL	36297	
formamide	DMSO	1.1mg/mL	36298	
hexane	DMSO	1.45mg/mL	36299	
methanol	DMSO	15mg/mL	36401	
2-methoxyethanol	DMSO	0.25mg/mL	36402	
methylbutylketone	DMSO	0.25mg/mL	36400	
methylcyclohexane	DMSO	5.9mg/mL	36403	enquire
methylene chloride	DMSO	3mg/mL	36404	
N-methylpyrrolidone	DMSO	2.65mg/mL	36405	
nitromethane	DMSO	0.25mg/mL	36406	
pyridine	DMSO	1mg/mL	36407	
sulfolane	DMSO	0.8mg/mL	36413	
tetrahydrofuran (THF)	DMSO	3.6mg/mL	36408	
tetralin	DMSO	0.5mg/mL	36409	
toluene	DMSO	4.45mg/mL	36410	
1,1,1-trichloroethane	DMSO	50mg/mL	36411	
trichloroethene	DMSO	0.4mg/mL	36412	
m-xylene	DMSO	6.51mg/mL	36414	
o-xylene	DMSO	0.97mg/mL	36415	
p-xylene	DMSO	1.52mg/mL	36416	

DMSO = dimethyl sulfoxide

These mixtures reflect the changes made in USP30/NF25 effective July 1, 2008.

Residual Solvents - Class 1

benzene	10mg/mL	1,1-dichloroethene	40
carbon tetrachloride	20	1,1,1-trichloroethane	50
1,2-dichloroethane	25		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36279 (ea.)

Residual Solvents Class 2 - Mix A (15 components)

acetonitrile	2.05mg/mL	methylcyclohexane	5.90
chlorobenzene	1.80	methylene chloride	3.00
cyclohexane	19.40	tetrahydrofuran	3.45
cis-1,2-dichloroethene	4.70	toluene	4.45
trans-1,2-dichloroethene	4.70	*m*-xylene	6.51
1,4-dioxane	1.90	*o*-xylene	0.98
ethylbenzene	1.84	*p*-xylene	1.52
methanol	15.00		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36271 (ea.)

Residual Solvents Class 2 - Mix B (8 components)

chloroform	60µg/mL	nitromethane	50
1,2-dimethoxyethane	100	pyridine	200
n-hexane (C6)	290	tetralin	100
2-hexanone	50	trichloroethene	80

In dimethyl sulfoxide, 1mL/ampul

cat. # 36280 (ea.)

Residual Solvents Class 2 - Mix C (8 components)

2-ethoxyethanol	800µg/mL	2-methoxyethanol (methyl Cellosolve)	250
ethylene glycol	3,100	N-methylpyrrolidone	2,650
formamide	1,100	sulfolane	800
N,N-dimethylacetamide	5,450		
N,N-dimethylformamide	4,400		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36273 (ea.)



free literature

Residual Solvent Analysis

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lit. cat.# PHFL1018

also available

For other reference mixes for USP <467> and European Pharmacopoeia, see **page 480**. Class III solvents are available as custom mixes. Visit **www.restek.com/solutions** for our custom reference material request form.

OVI Retention Index

For a list of OVI retention times, see **page 691**.

USP OVI Solvents, European Pharmacopoeia/ICH Solvents

USP <467> *cont'd*

These Class 1 mixtures reflect the changes made in USP24/NF19 effective January 1, 2000, and USP23/NF18 effective January 1, 1995 to December 31, 1999. While these mixtures do not meet the current USP guidelines, many labs still use these mixtures to obtain a detectable benzene peak for the direct injection methods, Method I and Method V.

USP <467> Calibration Mix #7

chloroform	60µg/mL	methylene chloride	600
1,4-dioxane	380	trichloroethene	80

In dimethyl sulfoxide, 1mL/ampul

cat. # 36009 (ea.)

USP <467> Calibration Mix #6

chloroform	60µg/mL	methylene chloride	600
1,4-dioxane	380	trichloroethene	80

In methanol, 1mL/ampul

cat. # 36008 (ea.)

USP <467> Calibration Mixture #5

benzene	2µg/mL	methylene chloride	600
chloroform	60	trichloroethene	80
1,4-dioxane	380		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36007 (ea.)

USP <467> Calibration Mixture #4

benzene	2µg/mL	methylene chloride	600
chloroform	60	trichloroethene	80
1,4-dioxane	380		

In methanol, 1mL/ampul

cat. # 36006 (ea.)

USP <467> Calibration Mixture #2

benzene	100µg/mL	methylene chloride	500
chloroform	50	trichloroethene	100
1,4-dioxane	100		

In methanol, 1mL/ampul

cat. # 36002 (ea.)

USP <467> Calibration Mixture #3

benzene	100µg/mL	methylene chloride	500
chloroform	50	trichloroethene	100
1,4-dioxane	100		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36004 (ea.)

Ethylene Oxide

500µg/mL in dimethyl sulfoxide, 1mL/ampul

cat. # 36005 (ea.)

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European Pharmacopoeia Method

The analysis of residual solvents in pharmaceutical products has changed, particularly for products being sold into Europe. The International Conference on Harmonization (ICH) Guidelines for Residual Solvents is becoming the international standard and is being adopted by more pharmacopoeias, including the United States Pharmacopeia, every year. The ICH method and compound list is more extensive than any method previously used and poses new challenges. Compounds in Class 1 are solvents considered to be of highest risk and to be avoided in pharmaceutical manufacturing. Use of Class 2 compounds is to be limited, as they pose a lower, but present, threat to health. Compounds in Class 3 pose the lowest toxic potential and may be used routinely in manufacturing.

European Pharmacopoeia/ICH Class 1 Mix

benzene	2µg/mL	1,1-dichloroethene	8
carbon tetrachloride	4	1,1,1-trichloroethane	1500
1,2-dichloroethane	5		

Prepared in water:dimethyl sulfoxide (90:10), 1mL/ampul

cat. # 36228 (ea.)

European Pharmacopoeia/ICH Class 1 Mix (revised)

benzene	2µg/mL	1,1-dichloroethene	8
carbon tetrachloride	4	1,1,1-trichloroethane	10
1,2-dichloroethane	5		

In water:dimethyl sulfoxide (90:10), 1mL/ampul

cat. # 36261 (ea.)

European Pharmacopoeia/ICH Q3C(M) Class 2 Mix C, Revised

2-ethoxyethanol	160µg/mL	N-methylpyrrolidone	530
ethylene glycol	620	sulfolane	160
formamide	220		
2-methoxyethanol (methyl Cellosolve)	50		

In dimethyl sulfoxide, 1mL/ampul

cat. # 36275 (ea.)

European Pharmacopoeia/ICH Class 2 Mix B (10 components)

acetonitrile	410µg/mL	methanol	3,000
chloroform	60	nitromethane	50
1,2-dimethoxyethane	100	pyridine	200
N,N-dimethylacetamide	1,090	1,2,3,4-tetrahydronaphthalene (tetraline)	100
1,4-dioxane	380		
2-hexanone	50		

Prepared in water:dimethyl sulfoxide (90:10), 1mL/ampul

cat. # 36230 (ea.)

European Pharmacopoeia/ICH Q3C(M) Class 2 Mix A, Revised

(14 components)

chlorobenzene	360µg/mL	methylene chloride	600
cyclohexane	3,880	tetrahydrofuran	720
cis-1,2-dichloroethene	1,870	toluene	890
N,N-dimethylformamide	880	trichloroethene	80
ethylbenzene	369	*m*-xylene	1,302
n-hexane (C6)	290	*o*-xylene	195
methylcyclohexane	1,180	*p*-xylene	304

In dimethyl sulfoxide, 1mL/ampul

cat. # 36274 (ea.)

did you **know**?

We prepare Rtx®-1301 (cat.# 16085) and Stabilwax® (cat.# 10640) capillary columns and the analytical reference materials to meet the requirements for European Pharmacopoeia. Download lit. cat.# 59107, *European Pharmacopoeia Analysis of Residual Solvents* from our website for more information.

Organic Acids

Fruit Juice Organic Acid Standard

citric acid	2,000µg/ml	quinic acid	2,000
fumaric acid	10*	tartaric acid	2,000
malic acid	2,000		

In water, 1mL/ampul
cat. # 35080 (ea.)

In water, 5mL/ampul
cat. # 35081 (ea.)

*Fumaric acid is a trace impurity in malic acid, as well as an added component of the mix. The amount of fumaric acid in malic acid will not affect the stated concentration of malic acid, but can represent a significant and variable deviation from the low concentration of fumaric acid stated to be in the mix. All other components of the mix are at the specified concentration.

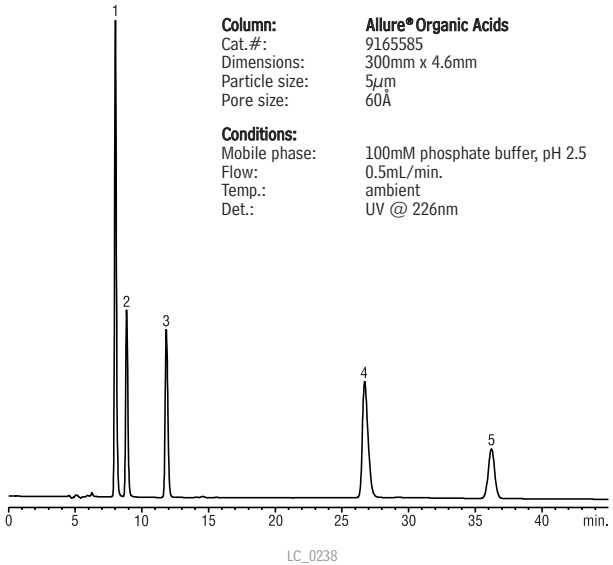
Organic acids on an Allure® Organic Acids HPLC column.

Peak List:	Conc. (mg/mL)
1. tartaric acid	1
2. quinic acid	1
3. malic acid	1
4. citric acid	1
5. fumaric acid	0.005

Sample:
Inj.: 10µL standard solution
Solvent: water

Column: **Allure® Organic Acids**
Cat.#: 9165585
Dimensions: 300mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 100mM phosphate buffer, pH 2.5
Flow: 0.5mL/min.
Temp.: ambient
Det.: UV @ 226nm



LC_0238

Fatty Acid Methyl Esters

Marine Oil FAME Mix (20 components)

Chain	Description	% by Weight
C14:0	methyl myristate	6.0
C14:1	methyl myristoleate	1.0
C16:0	methyl palmitate	16.0
C16:1	methyl palmitoleate	5.0
C18:0	methyl stearate	8.0
C18:1	methyl oleate	13.0
C18:1	methyl vaccenate	4.0
C18:2	methyl linoleate	2.0
C18:3	methyl linolenate	2.0
C20:0	methyl arachidate	1.0
C20:1	methyl 11-eicosenoate	9.0
C20:2	methyl 11-14-eicosadienoate	1.0
C20:4	methyl arachidonate	3.0
C20:3	methyl 11-14-17-eicosatrienoate	1.0
C20:5	methyl eicosapentaenoate	10.0
C22:0	methyl behenate	1.0
C22:1	methyl erucate	3.0
C22:6	methyl docosahexaenoate	12.0
C24:0	methyl lingnocerate	1.0
C24:1	methyl nervonate	1.0

cat. # 35066 (100mg)

No data pack available.

cis/*trans* FAME Mix (8 components)

Description	% by Weight
methyl elaidate (C18:1 *trans*-9)	10.0
methyl linoleate (C18:2 *cis*-9,12)	20.0
methyl oleate (C18:1 *cis*-9)	10.0
methyl petroselinate (C18:1*cis*-6)	8.0
methyl petroselaidate (C18:1*trans*-6)	8.0
methyl stearate (C18:0)	20.0
methyl transvaccenate (C18:1 *trans*-11)	12.0
methyl vaccenate (C18:1 *cis*-11)	12.0

10mg/mL total in methylene chloride, 1mL/ampul
cat. # 35079 (ea.)

No data pack available.

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

free literature



Single-Column Method for HPLC Analysis of Organic Acids in Fruit Juices, Using an Allure® Organics Acids Column
A highly aqueous mobile phase is needed to force interaction between polar organic acids and the stationary phase in an HPLC column, but conventional C18 phases collapse in 100% aqueous mobile phases. A 300mm Allure® Organic Acids column resolves key organic acids, such as tartaric and quinic acids, using the conditions specified for a two-column analysis in AOAC Method 986.13. Example chromatograms are included in this 2-page note.

Download your free copy from **www.restek.com**.

Applications Note
lit. cat.# 59530

Fatty Acid Methyl Esters *cont'd*

NLEA FAME Mix (28 components)

Chain	% by Weight	Chain	% by Weight
C4:0	1.5	C18:1(*trans*-9)	2.5
C6:0	1.5	C18:1(*cis*-9)	15.0
C8:0	2.0	C18:2(all-*trans*-9,12)	2.5
C10:0	2.5	C18:2(all-*cis*-9,12)	10.0
C11:0	2.5	C18:3(all-*cis*-9,12,15)	5.0
C12:0	5.0	C20:0	2.5
C13:	2.5	C20:1(*cis*-11)	1.5
C14:0	2.5	C20:5(all-*cis*-5,8,11,14,17)	2.5
C14:1(*cis*-9)	1.5	C22:0	2.5
C15:0	1.5	C22:1(*cis*-13)	1.5
C16:0	10.0	C22:6(all-*cis*-4,7,10,13,16,19)	2.5
C16:1(*cis*-9)	5.0	C23:0	1.5
C17:0	2.5	C24:0	2.5
C18:0	5.0	C24:1(*cis*-15)	2.5

30mg/mL total in methylene chloride, 1mL/ampul
cat. # 35078 (ea.)

No data pack available.

Food Industry FAME Mix (37 components)

Chain	% by Weight	Chain	% by Weight
C4:0	4.0	C18:2(all-*cis*-9,12)	2.0
C6:0	4.0	C18:3(all-*cis*-6,9,12)	2.0
C8:0	4.0	C18:3(all-*cis*-9,12,15)	2.0
C10:0	4.0	C20:0	4.0
C11:0	2.0	C20:1(*cis*-11)	2.0
C12:0	4.0	C20:2(all-*cis*-11,14,)	2.0
C13:	2.0	C20:3(all-*cis*-8,11,14)	2.0
C14:0	4.0	C20:3(all-*cis*-11,14,17)	2.0
C14:1(*cis*-9)	2.0	C20:4(all-*cis*-5,8,11,14)	2.0
C15:0	2.0	C20:5(all-*cis*-5,8,11,14,17)	2.0
C15:1(*cis*-10)	2.0	C21:0	2.0
C16:0	6.0	C22:0	4.0
C16;1(*cis*-9)	2.0	C22:1(*cis*-13)	2.0
C17:0	2.0	C22:2(all-*cis*-13,16)	2.0
C17:1(*cis*-10)	2.0	22:6 (all-*cis*-4,7,10,13,16,19)	2.0
C18:0	4.0	C23:0	2.0
C18:1(*trans*-9)	2.0	C24:0	4.0
C18:1(*cis*-9)	4.0	C24:1(*cis*-15)	2.0
C18:2(all-*trans*-9,12)	2.0		

30mg/mL total in methylene chloride, 1mL/ampul
cat. # 35077 (ea.)

No data pack available.

Neat Fatty Acid Methyl Esters

Chain	Description	CAS #	qty.	cat.#	price
C6:0	methyl caproate	106-70-7	100mg	35037	
C7:0	methyl heptanoate	106-73-0	100mg	35038	
C8:0	methyl caprylate	111-11-5	100mg	35039	
C9:0	methyl nonanoate	1731-84-6	100mg	35040	
C10:0	methyl caprate	110-42-9	100mg	35041	
C11:0	methyl undecanoate	1731-86-8	100mg	35042	
C12:0	methyl laurate	111-82-0	100mg	35043	
C13:0	methyl tridecanoate	1731-88-0	100mg	35044	
C14:0	methyl myristate	124-10-7	100mg	35045	
C14:1 Δ 9 *cis*	methyl myristoleate	56219-06-8	100mg	35046	
C15:0	methyl pentadecanoate	7162-64-1	100mg	35047	
C16:0	methyl palmitate	112-39-0	100mg	35048	
C16:1 Δ 9 *cis*	methyl palmitoleate	1120-25-8	100mg	35049	
C17:0	methyl heptadecanoate	1731-92-6	100mg	35050	
C18:0	methyl stearate	112-61-8	100mg	35051	
C18:1 Δ 9 *cis*	methyl oleate	112-62-9	100mg	35052	
C18:2 Δ 9,12 *cis*	methyl linoleate	112-63-0	100mg	35053	
C18:3 Δ 9,12,15 *cis*	methyl linolenate	301-00-8	100mg	35054	
C19:0	methyl nonadecanoate	1731-94-8	100mg	35055	
C20:0	methyl arachidate	1120-28-1	100mg	35056	
C20:1 Δ 11 *cis*	methyl eicosenoate	2390-09-2	100mg	35057	
C20:2 Δ 11,14 *cis*	methyl eicosadienoate	2463-02-7	100mg	35058	
C20:3 Δ 11,14,17 *cis*	methyl eicosatrienoate	55682-88-7	100mg	35059	
C20:4 Δ 5,8,11,14 *cis*	methyl arachidonate	2566-89-4	100mg	35060	
C21:0	methyl heneicosanoate	6064-90-0	100mg	35061	
C22:0	methyl behenate	929-77-1	100mg	35062	
C22:1 Δ 13 *cis*	methyl erucate	1120-34-9	100mg	35063	
C24:0	methyl lignocerate	2442-49-1	100mg	35064	
C24:1 Δ 15 *cis*	methyl nervonate	2733-88-2	100mg	35065	

No data pack available.



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Foods, Flavors, and Fragrances
Includes important analysis tips, and chromatograms for analysis of fats and oils, carbohydrates, vitamins, amino acids, organic acids, preservatives, flavors and fragrances, essential oils, and chiral separations. Retention time indices and product listings for all relevant GC and HPLC products also are included.

Download your free copy from **www.restek.com**.

Minicatalog
lit. cat.# 59260A

Quantitative Fatty Acid Methyl Ester (FAME) Mixtures

These mixtures can be used for quantification (AOCS Method CE 1-62) and approximate the compositions of the following types of oils:

AOCS #1: corn, poppy seed, cotton seed, soybean, walnut, safflower, sunflower, rice, bran, and sesame oil
AOCS #2: linseed, perilla, hempseed, and rubberseed oil
AOCS #3: peanut, rapeseed, and mustard seed oil
AOCS #4: olive, teaseed, and neatsfoot oil
AOCS #5: coconut, palm kernel, babassu, and ouri-curi oil
AOCS #6: lard, beef or mutton tallow, and palm oil
FAME #1: oils of mid-range chain lengths (C16 - C18)
FAME #2: oils of short to mid-range chain lengths (C6 - C14)
FAME #3: oils of short to mid-range chain lengths (C8 - C16)
FAME #4: oils of mid-range to long chain lengths (C16 - C24)
FAME #5: oils of mid-range to long chain lengths (C16 - C24)
FAME #6: oils of long chain lengths (C20 - C21)
FAME #7: oils of short chain lengths (C6 - C10)
FAME #8: oils of short to mid-range chain lengths (C11 - C15)
FAME #9: oils of mid-range to long chain lengths (C16 - C20)
FAME #12: oils of mid-range to long chain lengths (C13 - C21)
FAME #13: mustard seed oil
FAME #14: cocoa butter
FAME #15: peanut oil

ordering **note**

Custom fatty acid methyl ester mixtures also are available. Call **800-356-1688** or **814-353-1300**, or contact your Restek representative for details.

Mix	cat. #	price	methyl caproate (6:0)	methyl heptanoate (7:0)	methyl caprylate (8:0)	methyl nonanoate (9:0)	methyl caprate (10:0)	methyl undecanoate (11:0)	methyl laurate (12:0)	methyl tridecanoate (13:0)	methyl myristate (14:0)	methyl pentadecanoate (15:0)	methyl palmitate (16:0)	methyl palmitoleate (16:1)	methyl heptadecanoate (17:0)	methyl stearate (18:0)	methyl oleate (18:1)	methyl linoleate (18:2)	methyl linolenate (18:3)	methyl nonadecanoate (19:0)	methyl arachidate (20:0)	methyl eicosenoate (20:1)	methyl eicosadienoate (20:2)	methyl homo γ linolenate (20:3)	methyl arachidonate (20:4)	methyl heneicosanoate (21:0)	methyl behenate (22:0)	methyl erucate (22:1)	methyl docosadienoate (22:2)	methyl lignocerate (24:0)	methyl nervonate (24:1)
			Composition of each mixture listed as a weight/weight % basis (minimum 50mg/ampul)																												
AOCS #1	35022												6.0			3.0	35.0	50.0	3.0		3.0										
AOCS #2	35023												7.0			5.0	18.0	36.0	34.0												
AOCS #3	35024											1.0	4.0			3.0	45.0	15.0	3.0		3.0							3.0	20.0		3.0	
AOCS #4	35025												11.0			3.0	80.0	6.0													
AOCS #5	35026				7.0		5.0		48.0		15.0		7.0			3.0	12.0	3.0													
AOCS #6	35027										2.0		30.0	3.0		14.0	41.0	7.0	3.0												
FAME #1	35010												20.0			20.0	20.0	20.0	20.0												
FAME #2	35011		20.0		20.0		20.0		20.0		20.0																				
FAME #3	35012				20.0		20.0		20.0		20.0		20.0																		
FAME #4	35013												20.0			20.0					20.0							20.0		20.0	
FAME #5	35014													20.0			20.0					20.0							20.0		20.0
FAME #6	35015																				20.0	20.0	20.0	20.0	20.0						
FAME #7	35016		20.0	20.0	20.0	20.0	20.0																								
FAME #8	35017							20.0	20.0	20.0	20.0	20.0																			
FAME #9	35018												20.0		20.0	20.0				20.0	20.0										
FAME #12	35021									20.0		20.0			20.0					20.0							20.0				
FAME #13	35034												3.0	1.0		2.0	20.0	15.0	10.0		1.0	10.0	2.0				1.0	30.0	2.0	1.0	2.0
FAME #14	35035										0.1		26.3	0.4	0.3	33.7	34.3	3.1	0.2		1.3	0.1					0.2				
FAME #15	35036												10.0			3.0	50.0	30.0			1.5	1.5					3.0			1.0	

Important Information About FAME Mixtures:
We certify that all raw materials used in these mixes have a minimum purity of 99%. The exact composition of each mixture is determined by precise gravimetric techniques, based on a weight/weight % basis, and is confirmed using high resolution capillary gas chromatography. A Certificate of Analysis, supplied with each product, lists mixture composition and analysis conditions and includes a sample chromatogram. Products are packaged by volume and are guaranteed to contain a minimum amount of 50mg/ampul. The FAMEs in these are *trans* isomer.

Improper storage or handling after opening may result in accelerated degradation of the unsaturated compounds. All materials must be stored under nitrogen at -18°C to prevent degradation.

Derivatization Reagents

Silylation Derivatization Reagents

- Replaces active hydrogen, reducing polarity and making the compounds more volatile.
- Increases stability of derivatives.

Silylation is the most widely used derivatization procedure for sample analysis by GC. In silylation, an active hydrogen is replaced by an alkylsilyl group such as trimethylsilyl (TMS) or *tert*-butyldimethylsilyl (*tert*-BDMS). Silyl derivatives are more volatile, less polar, and more thermally stable. As a result, GC separation is improved and detection is enhanced.

Both TMS and *tert*-BDMS reagents are suitable for a wide variety of compounds and can be used for many GC applications. Note that silylation reagents are generally moisture sensitive and must be sealed to prevent deactivation.

Compound	CAS#	cat.#	price
MSTFA (N-methyl-N-trimethylsilytrifluoroacetamide)			
10-pk. (10x1g)	24589-78-4	35600	
25g vial	24589-78-4	35601	
MSTFA w/1% TMCS (N-methyl-N-trimethylsilytrifluoroacetamide w/1% trimethylchlorosilane)			
10-pk. (10x1g)	24589-78-4	35602	
25g vial	24589-78-4	35603	
BSTFA (N,O-bis[trimethylsilyl]trifluoroacetamide)			
10-pk. (10x1g)	25561-30-2	35604	
25g vial	25561-30-2	35605	
BSTFA w/1% TMCS (N,O-bis[trimethylsilyltrifluoroacetamide] w/1% trimethylchlorosilane)			
10-pk. (10x1g)	25561-30-2	35606	
25g vial	25561-30-2	35607	
MTBSTFA w/1% TBDMCS (N-methyl-N[*tert*-butyldimethylsilyl trifluoroacetamide] w/1% *tert*-butyldimethylchlorosilane)			
10-pk. (10x1g)	77377-52-7	35608	
25g vial	77377-52-7	35610	
TMCS (trimethylchlorosilane)			
10-pk. (10x1g)	75-77-4	35611	
25g vial	75-77-4	35612	



Derivatization Reagents

- Reagents available for acylation, alkylation, and silylation.
- Packaged in 10 x 1g vials or 25g vials.
- High purity for accurate results.

Acylation Derivatization Reagents

- Most commonly used for Electron Capture Detection.
- React with alcohols, amines and phenols.
- Frequently used for drugs of abuse confirmation.

Acylation reagents offer the same types of advantages available from silylation reagents: creating less polar, more volatile derivatives. In comparison to silylating reagents, the acylating reagents can more readily target highly polar multi-functional compounds, such as carbohydrates and amino acids. In addition, acylating reagents offer the distinct advantage of introducing electron-capturing groups, thus enhancing detectability during analysis.

Compound	CAS#	cat.#	price
MBTFA (N-methyl-bis-trifluoroacetamide)			
10-pk. (10x1g)	685-27-8	35616	
25g vial	685-27-8	35617	
TFAA (trifluoroacetic acid anydride)			
10-pk. (10x1g)	407-25-0	35618	
25g vial	407-25-0	35619	
PFAA (pentafluoropropionic acid anhydride)			
10-pk. (10x1g)	356-42-3	35620	
25g vial	356-42-3	35621	
HFAA (heptafluorobutyric acid anydride)			
10-pk. (10x1g)	336-59-4	35622	
25g vial	336-59-4	35623	
PFPOH (pentafluoropropanol)			
10-pk. (10x1g)	422-05-9	35624	
25g vial	422-05-9	35625	

Alkylation Derivatization Reagents

- Adds alkyl groups to functional hydrogens (H).
- Decreases polarity on compounds containing acidic hydrogens, i.e., phenols, carboxylic acids.
- Forms an ester.

Alkylation reagents reduce molecular polarity by replacing active hydrogens, such as carboxylic acids and phenols. Alkylation reagents can be used alone to form esters and amides or they can be used in conjunction with acylation or silylation reagents. A two-step approach is commonly used in the derivatization of amino acids, where multiple functional groups of these compounds may necessitate protection during derivatization.

Esterification is the reaction of an acid with an alcohol in the presence of a catalyst. It is the most popular method of alkylation due to the availability of reagents and ease of use. Alkyl esters are stable, and can be formed quickly and quantitatively. Retention of the derivative can be varied by altering the length of the substituted alkyl group. In addition to the formation of simple esters, alkylation reagents can be used in extraction procedures where biological matrices are present.

Compound	CAS#	cat.#	price
TMPAH			
10-pk. (10x1g)	1899-02-1	35614	
25g vial	1899-02-1	35615	

FAPAS® Food Testing Program*

- External check of quality for laboratories performing food testing.
- Ensures accurate proficiency testing.

Laboratories testing food quality and safety are encouraged to routinely perform proficiency tests. Proficiency testing is an external check of quality. It provides an independent and unbiased assessment of the performance of all aspects of the laboratory, both human and hardware. Each participating laboratory is encouraged to use its normal analytical method, thereby simulating the testing of a routine laboratory sample as closely as possible. While the outcome of the analysis may depend on the choice of method, it also could be affected by the performance of the laboratory equipment or the competence of the analyst. Using proficiency testing, those laboratories performing well can ensure high standards are maintained and those performing unsatisfactorily can implement corrective action rapidly. In an environment in which analytical laboratories compete intensively for work, proficiency testing provides the means by which external customers can compare competence in carrying out specific tests. Together with laboratory accreditation and the use of validated methods, proficiency tests are an important requirement of the EU Additional Measures Directive 93/99/EEC applying to laboratories entrusted with the official control of food.

*Use of Restek calibration mixtures by laboratories participating in the FAPAS program is voluntary and no endorsement of any Restek product has been made by the Central Science Laboratory. To obtain further information regarding the FAPAS program, or to participate, contact fapas@csl.gov.uk.

FAPAS® Series 5 OC Pesticide Mix 1 (19 components)

Equal concentration of all compounds. Suitable for GC/MS analysis.

aldrin	dieldrin
α-BHC	α-endosulfan (I)
β-BHC	β-endosulfan (II)
γ-BHC (lindane)	endosulfan sulfate
α-chlordane (*cis*)	endrin
γ-chlordane (*trans*)	heptachlor
4,4'-DDD	heptachlor epoxide (isomer B)
4,4'-DDE	hexachlorobenzene
2,4'-DDT	oxychlordane
4,4'-DDT	

100µg/mL each in acetone, 1mL/ampul

cat. # 32412 (ea.)

FAPAS® Series 9 OP Pesticide Mix 1 (10 components)

Equal concentration of all compounds. Suitable for GC/FPD, GC/NPD, & GC/MS analysis.

chlorpyriphos	fenitrothion
chlorpyriphos-methyl	malathion
diazinon	methacriphos
dichlorvos	phosphamidon
etrimphos	pirimiphos-methyl

100µg/mL each in acetone, 1mL/ampul

cat. # 32413 (ea.)

FAPAS® Series 5 OC Pesticide Mix 2 (19 components)

Varied concentrations. Suitable for GC/ECD analysis.

aldrin	10µg/mL	dieldrin	20
α-BHC	10	α-endosulfan (I)	10
β-BHC	10	β-endosulfan (II)	20
γ-BHC (lindane)	10	endosulfan sulfate	20
α-chlordane (*cis*)	10	endrin	20
γ-chlordane (*trans*)	10	heptachlor	10
4,4'-DDD	20	heptachlor epoxide (isomer B)	10
4,4'-DDE	20	hexachlorobenzene	10
2,4'-DDT	20	oxychlordane	10
4,4'-DDT	20		

In acetone, 1mL/ampul

cat. # 32414 (ea.)

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FAPAS-registered trademark of Central Science Laboratory, Sand Hutton, York, YO41, UK.

also available

Plastic Container Testing Reference Materials.
See page 470.

Dimethyldichlorosilane (DMDCS) Deactivating Agent

Restek offers dimethyldichlorosilane (DMDCS), for deactivating liners and other glassware. Simply dilute the neat material to a 5% solution in toluene, soak the glass item(s) in the solution for 15 minutes, and rinse with toluene and methanol. DMDCS reacts with active hydroxyl groups on the glass surface to produce a deactivated surface. A detailed procedure is included with the product.

dimethyldichlorosilane (DMDCS)
Neat, 20mL/ampul
cat. # 31840 (ea.)

Fragrance Materials Test Mix

The Fragrance Materials Association (FMA) has proposed a method for analyzing essential oils on polar and nonpolar capillary GC columns. A performance evaluation mixture should be used to aid in detecting inlet problems, stationary phase degradation, loss of resolution, changes in sensitivity, and the presence of reactive sites in the sample pathway. Our test mix is consistent with the mixture proposed by the FMA. The required 5% test solution is made by diluting the 0.5mL of neat mixture to 10mL with acetone. The working solution will be stable for up to one week if transferred to a dark container and stored refrigerated.

benzoic acid	1.0%	geraniol	0.6%
benzyl salicylate	36.2%	hydroxycitronellal (3,7-dimethyl-7-hydroxyoctanal)	5.0%
1,8-cineole (eucalyptol)	0.5%	d-limonene	20.0%
trans cinnamaldehyde	0.5%	thymol	0.3%
cinnamyl acetate	0.3%	vanillin	0.1%
cinnamyl alcohol	0.3%		
ethyl butyrate	36.2%		

Neat, 0.5mL in an amber ampul
cat. # 31807 (ea.)
No data pack available.

also **available**

See **pages 627-637** for chromatograms of flavors and fragrances analysis.

Grob Test Mix (Capillary GC)

For use with temperature programmed conditions.

*n*C10-FAME	0.42mg/mL	2,6-dimethylphenol	0.32
*n*C11-FAME	0.42	2-ethylhexanoic acid	0.38
*n*C12-FAME	0.41	nonanal	0.40
2,3-butanediol	0.53	1-octanol	0.36
dicyclohexylamine	0.31	undecane (C11)	0.29
2,6-dimethylaniline	0.32	decane (C10)	0.28

In methylene chloride, 1mL/ampul
cat. # 35000 (ea.)
No data pack available.

Amine Column Test Mix (GC)

For Stabilwax®-DB, Rtx®-5Amine, and Rtx®-35Amine columns.

1,2-butanediol	0.60mg/mL	diethanolamine	1.20
pyridine	0.60	2-nonanol	0.60
decane (C10)	0.60	2,6-dimethylaniline	0.60
diethylenetriamine	1.20	dodecane (C12)	0.60

In methylene chloride:methanol (1:1), 1mL/ampul
cat. # 35002 (ea.)
No data pack available.

Isothermal Column Test Mix (GC)

1,2-hexanediol	0.46mg/mL	1-octanol	0.36
decane (C10)	0.29	nonanal	0.40
undecane (C11)	0.29	2,6-dimethylaniline	0.32
dodecane (C12)	0.29	2,6-dichlorophenol	0.57
tridecane	0.29	naphthalene	0.32

In methylene chloride, 1mL/ampul
cat. # 35003 (ea.)
No data pack available.

HPLC Normal Phase Test Mix #1

benzene	1.00mg/mL	benzyl alcohol	3.00
benzaldehyde	0.04	4-methoxybenzyl alcohol	2.00

In hexane, 1mL/ampul
cat. # 35004 (ea.)
No data pack available.

HPLC Reversed Phase Test Mix #1

benzene	3.00mg/mL	naphthalene	0.50
uracil	0.02	biphenyl	0.06

In methanol:water (75:25), 1mL/ampul
cat. # 35005 (ea.)
No data pack available.

free data

Available on Our Website: Lot Certificates, Data Packs, and MSDSs
For complete information detailing manufacturing and testing for Restek inventoried reference standards, visit our website at **www.restek.com/datapacks**. To view certificates and/or an MSDS, enter the catalog number of the product in the Search feature. For a free data pack (Adobe® PDF file), enter the catalog number and lot number of the product.

HPLC OQ Linearity Test Mix Kit

Linear detector responses to concentration variations are an important part of operation qualification (OQ) for HPLC instruments. Our kit of five aqueous solutions of caffeine can be used to generate simple plots of UV response versus concentration. Certificate of Analysis includes caffeine concentration, calculated variance in preparing each mixture, a linearity plot, and coefficient of determination (r^2) for the linear plot.

Caffeine at 5.0, 25.0, 125.0, 250.0, 500.0µg/mL in water in a five ampul kit.

1mL each of these mixtures.

cat. # 31805 (kit)

No data pack available.

also **available**

Individual ampuls of caffeine are available on **page 400**.

Carbohydrate HPLC Performance Check Mix

Performance qualification (PQ) determines the precision of the HPLC system. Our performance check mix for HPLC/RI consists of five simple sugars in varied concentrations. We prepare the reference material in water, lyophilize it, and pack it dry for enhanced stability.

glucose	2.0mg	maltose	4.5
fructose	2.1	sucrose	4.0
lactose	4.4		

Dry components in 4mL screw-cap vial. Reconstitute in 1mL acetonitrile:water (75:25) to 2.0, 2.1, 4.4, 4.5, 4.0mg/mL, respectively.

cat. # 31809 (ea.)

No data pack available.

HPLC Performance Test Mix

The National Institute of Standards and Technology (NIST) has formulated a mixture that is highly effective for characterizing HPLC columns for efficiency, void volume, methylene selectivity, retentiveness, and activity toward chelators and organic bases. Results can be used for column classification, for column selection, for monitoring column performance over time, or for quality control. We test our material against the NIST 870 standard.

amitriptyline hydrochloride	2,800µg/mL	quinizarin	94
ethylbenzene	1,700	toluene	1,400
		uracil	28

In methanol, 1mL/ampul

cat. # 31699 (ea.)

OQ Response Linearity Test Standard

n-heptadecane (C17)	1.5µg/mL	*n*-docosane (C22)	1,000
n-octadecane (C18)	10	*n*-tetracosane (C24)	10,000
n-nonadecane (C19)	2		
n-eicosane (C20)	100		

In isooctane, 1mL/ampul

cat. # 33906 (ea.)

NPD Performance Evaluation Standard

azobenzene	6.5µg/mL	*n*-octadecane	100
malathion	10		

In isooctane, 1mL/ampul

cat. # 33907 (ea.)

FID Performance Evaluation Standard

n-tetradecane (C14)	*n*-hexadecane (C16)
n-pentadecane (C15)	

0.03 w/w% each in hexane, 1mL/ampul

cat. # 33908 (ea.)

OQ/PV Headspace Standard

1,2-dichlorobenzene	*tert*-butyl disulfide
nitrobenzene	

2,000µg/mL each in ethanol, 1mL/ampul

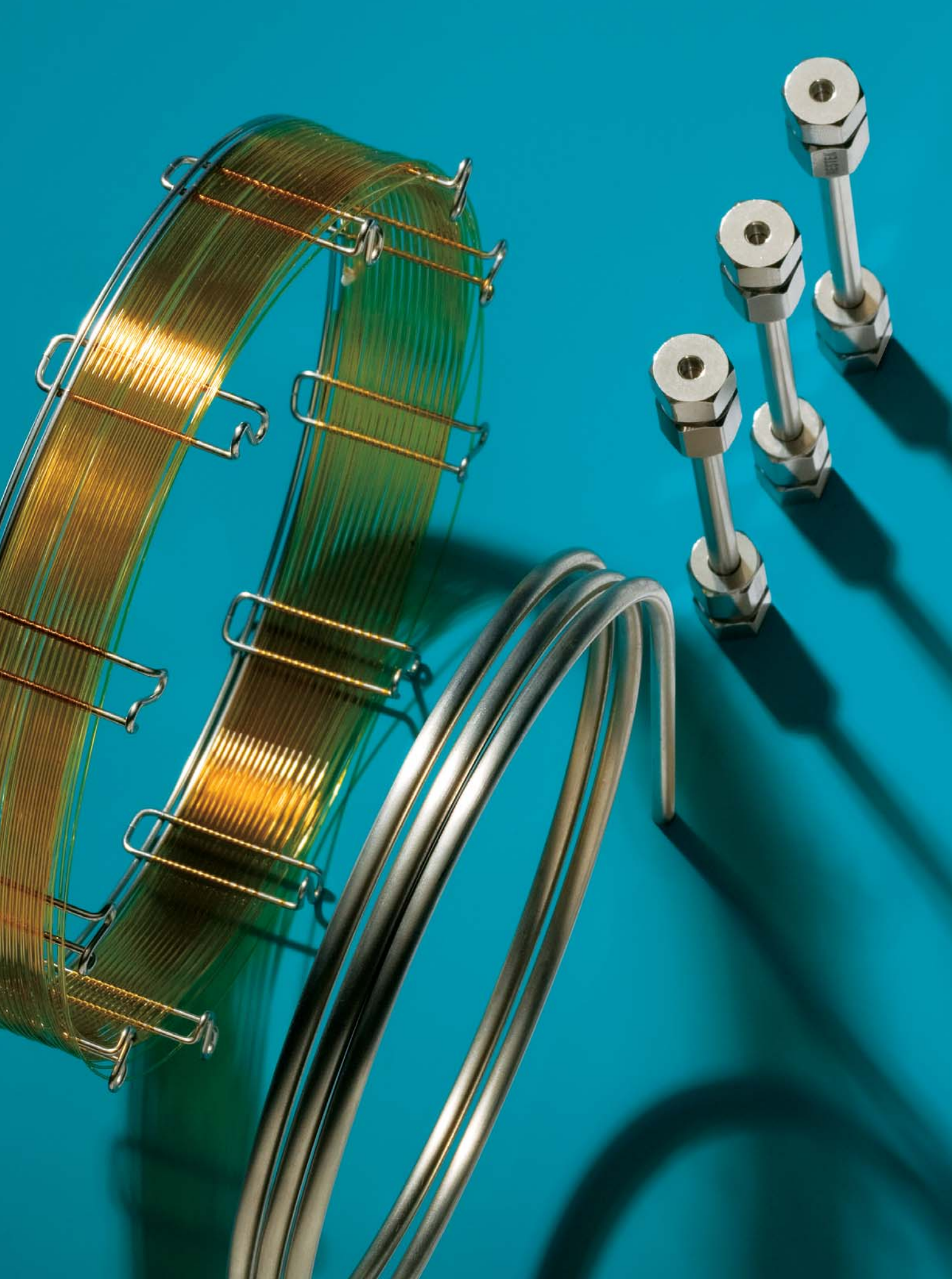
cat. # 33909 (ea.)



For Restek's complete line of column test mixes, visit our website at:
www.restek.com/testmixes

did you **know**?

We have more than 2,000 pure, characterized, neat compounds in our inventory! If you do not see the EXACT mixture you need listed on any of these pages, contact us for a custom standard.



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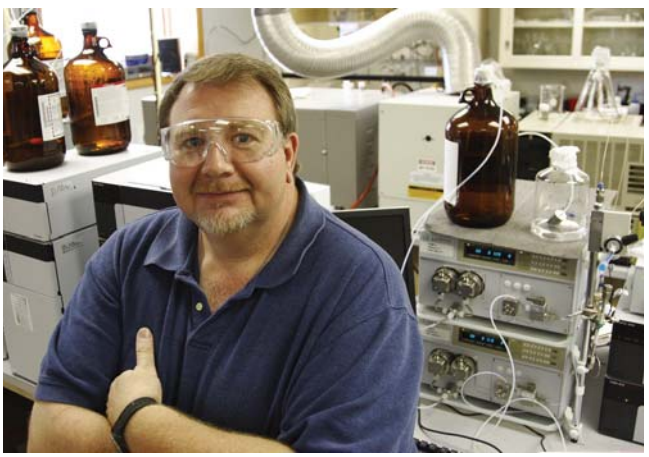
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Top: Michelle Misselwitz, Applications Chemist
Bottom: Vern Bartlett, Product Development Chemist

What's NEW? look for this circle

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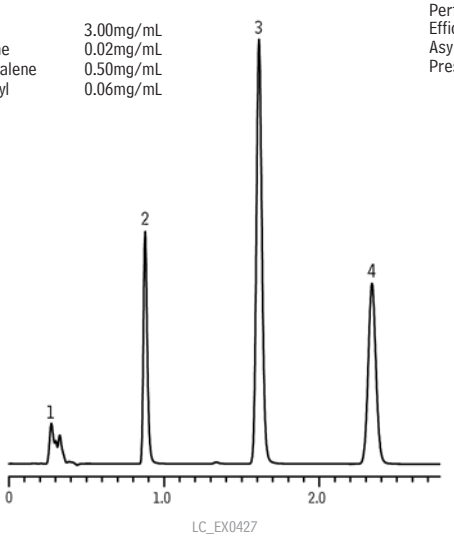
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UHPLC Column Analyses

Reversed Phase Test Mix on Pinnacle® DB C18 (1.9µm)

Peak List:

1. uracil	3.00mg/mL
2. benzene	0.02mg/mL
3. naphthalene	0.50mg/mL
4. biphenyl	0.06mg/mL



Performance: (Calculations for Biphenyl)
Efficiency: 217,619 n/m
Asymmetry: 1.10
Pressure: 4,500 psi

Sample:
Inj.: 2µL HPLC Reversed Phase Test Mix #1 (cat.# 35005)
Sample diluent: water:methanol (25:75)
Sample temp.: ambient

Column: **Pinnacle® DB C18**
Cat.#: 9414252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

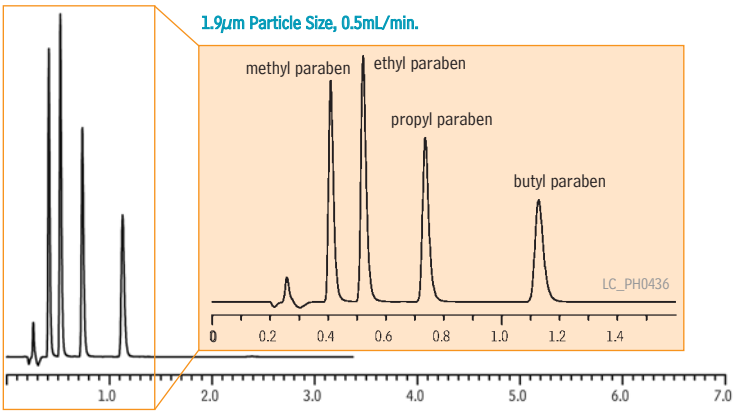
Conditions:
Mobile phase: water:acetonitrile (45:55)
Flow: 0.4mL/min.
Temp.: 25°C
Det.: UV @ 254nm

Excellent peak symmetry and efficiency!

please **note**

See **page 298** for **1.9µm Pinnacle® DB UHPLC Columns** ordering information.

Parabens on Pinnacle® DB C18 (1.9µm)



Peak List:
1. methyl paraben
2. ethyl paraben
3. propyl paraben
4. butyl paraben

Column: **Pinnacle® DB C18**
Cat.#: 9414252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Sample:
Inj.: 2µL
Conc.: ~ 100µg/mL each component
Sample diluent: mobile phase

Conditions:
Mobile phase: 0.1% acetic acid: acetonitrile (50:50) isocratic
Flow: 0.5mL/min.
Temp.: ambient
Det.: UV @ 254nm

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UHPLC Related Articles Online

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please **note**

See **pages 508, 509, and 530** for more applications on 1.9µm Pinnacle® DB UHPLC Columns.

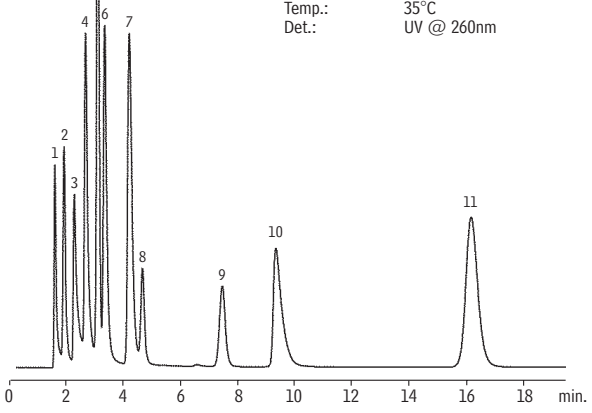
Nucleotides, Nucleosides, and Nitrogenous Bases on Ultra IBD

Peak List:	Conc. (µg/mL)
1. CDP	146
2. CMP	113
3. ATP	117
4. ADP	145
5. cytidine	155
6. TMP	157
7. AMP	125
8. guanine	36
9. guanosine	103
10. adenine	38
11. adenosine	115

Sample:
Inj.: 20µL
Solvent: 20mM ammonium acetate, pH 5.8

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 5.8:methanol (97.5:2.5)
Flow: 1.0mL/min.
Temp.: 35°C
Det.: UV @ 260nm



LC_0128

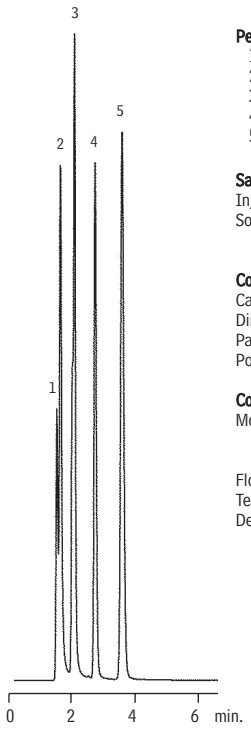
Uracil, Uridine, UTP, UDP, and UMP on Ultra IBD

Peak List:	Conc. (µg/mL)
1. UTP	360
2. UDP	360
3. UMP	284
4. uracil	90
5. uridine	230

Sample:
Inj.: 20µL
Solvent: 20mM ammonium acetate, pH 5.8

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 5.8: methanol (97.5:2.5)
Flow: 1.0mL/min.
Temp.: 35°C
Det.: UV @ 260nm



LC_0133

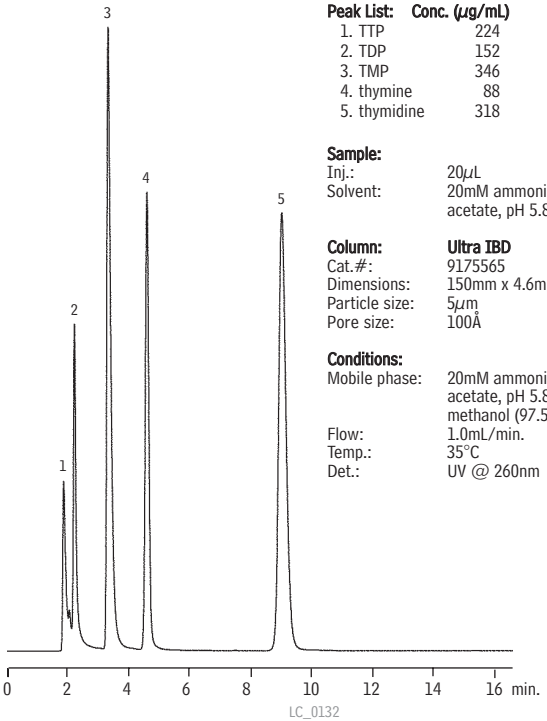
Thymine, Thymidine, TTP, TDP, and TMP on Ultra IBD

Peak List:	Conc. (µg/mL)
1. TTP	224
2. TDP	152
3. TMP	346
4. thymine	88
5. thymidine	318

Sample:
Inj.: 20µL
Solvent: 20mM ammonium acetate, pH 5.8

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 5.8: methanol (97.5:2.5)
Flow: 1.0mL/min.
Temp.: 35°C
Det.: UV @ 260nm



LC_0132

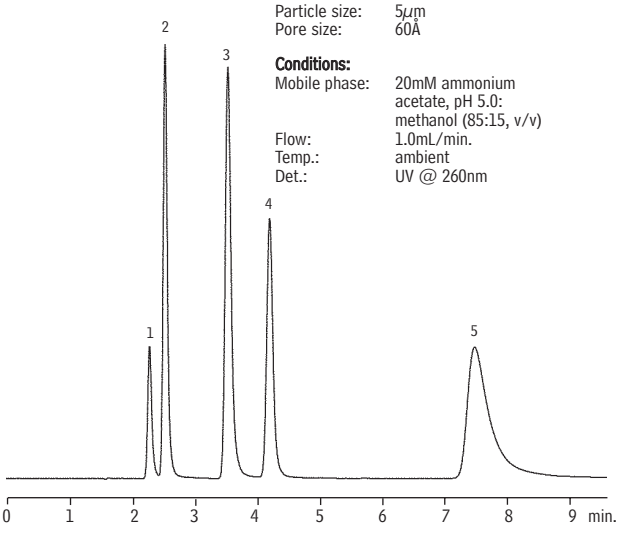
Nucleic Acid Bases on Allure® PFP Propyl

Peak List:
1. cytosine
2. uracil
3. guanine
4. thymine
5. adenine

Sample:
Inj.: 1.0µL
Conc. 100µg/mL each
Solvent: 20 mM ammonium acetate, pH 5.0
Note: 1-3 drops of ammonium hydroxide added to keep guanine in solution

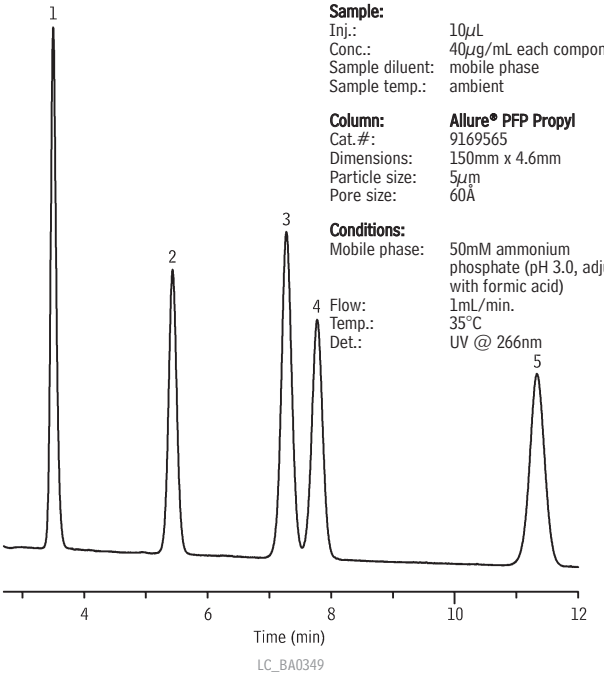
Column: **Allure® PFP Propyl**
Cat.#: 9169565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 5.0: methanol (85:15, v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 260nm



LC_0137

Catecholamines on Allure® PFP Propyl



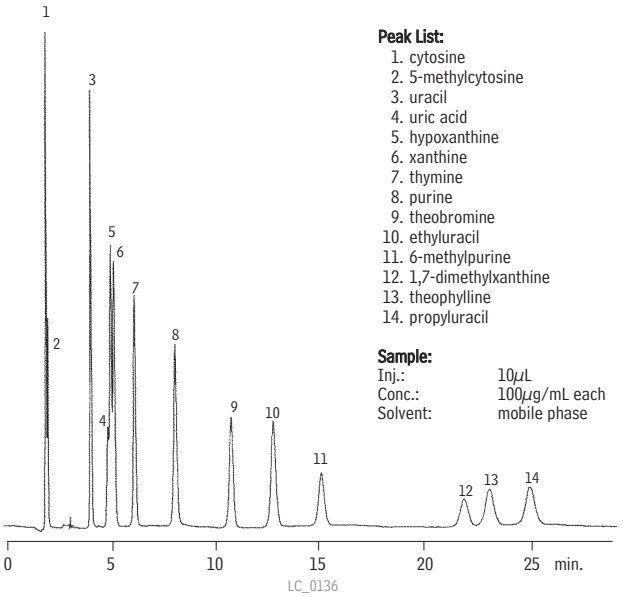
Peak List	Retention Time (min.)
1. norepinephrine	3.50
2. levodopa	5.43
3. epinephrine	7.27
4. tyrosine	7.77
5. dopamine	11.3

Sample:
Inj.: 10µL
Conc.: 40µg/mL each component
Sample diluent: mobile phase
Sample temp.: ambient

Column: **Allure® PFP Propyl**
Cat.#: 9169565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 50mM ammonium phosphate (pH 3.0, adjusted with formic acid)
Flow: 1mL/min.
Temp.: 35°C
Det.: UV @ 266nm

Purines/Pyrimidines on Ultra PFP



Peak List:
1. cytosine
2. 5-methylcytosine
3. uracil
4. uric acid
5. hypoxanthine
6. xanthine
7. thymine
8. purine
9. theobromine
10. ethyluracil
11. 6-methylpurine
12. 1,7-dimethylxanthine
13. theophylline
14. propyluracil

Sample:
Inj.: 10µL
Conc.: 100µg/mL each
Solvent: mobile phase

Column: **Ultra PFP**
Cat.#: 9176575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 0.001% formic acid in water: methanol (50:50, v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 260nm

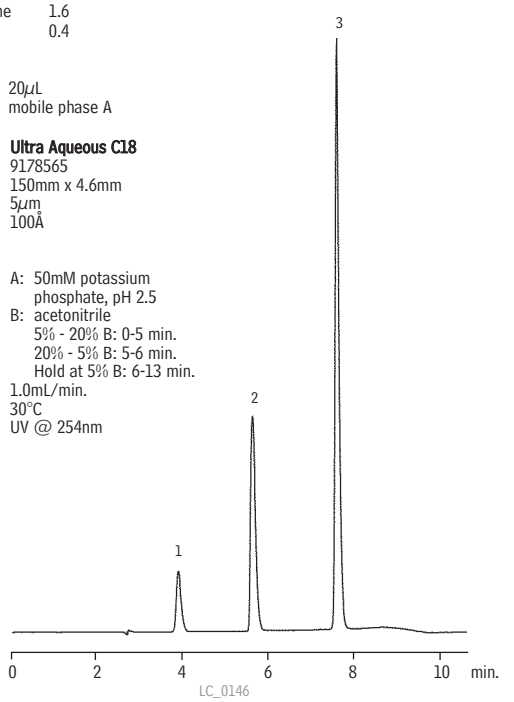
Aromatic Amino Acids on Ultra Aqueous C18

Peak List:	Conc. (mg/mL)
1. tyrosine	0.2
2. phenylalanine	1.6
3. tryptophan	0.4

Sample:
Inj.: 20µL
Solvent: mobile phase A

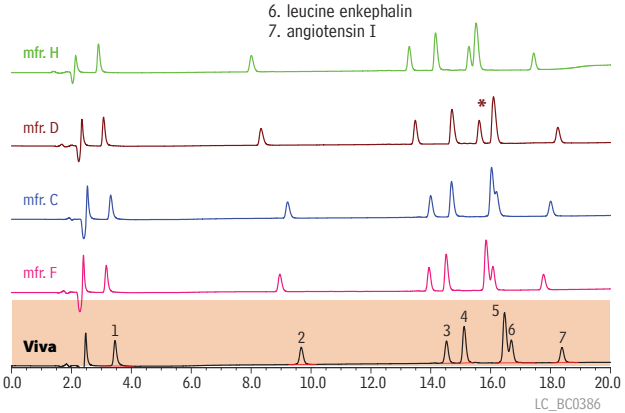
Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phases: A: 50mM potassium phosphate, pH 2.5
B: acetonitrile
5% - 20% B: 0-5 min.
20% - 5% B: 5-6 min.
Hold at 5% B: 6-13 min.
Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 254nm



Peptide Mix on Viva C18

1. val-tyr
2. val-tyr-val
3. meth enkephalin
4. val-4-angiotensin III
5. angiotensin II, III
6. leucine enkephalin
7. angiotensin I



Sample:
Inj.: 20µL peptide test mix

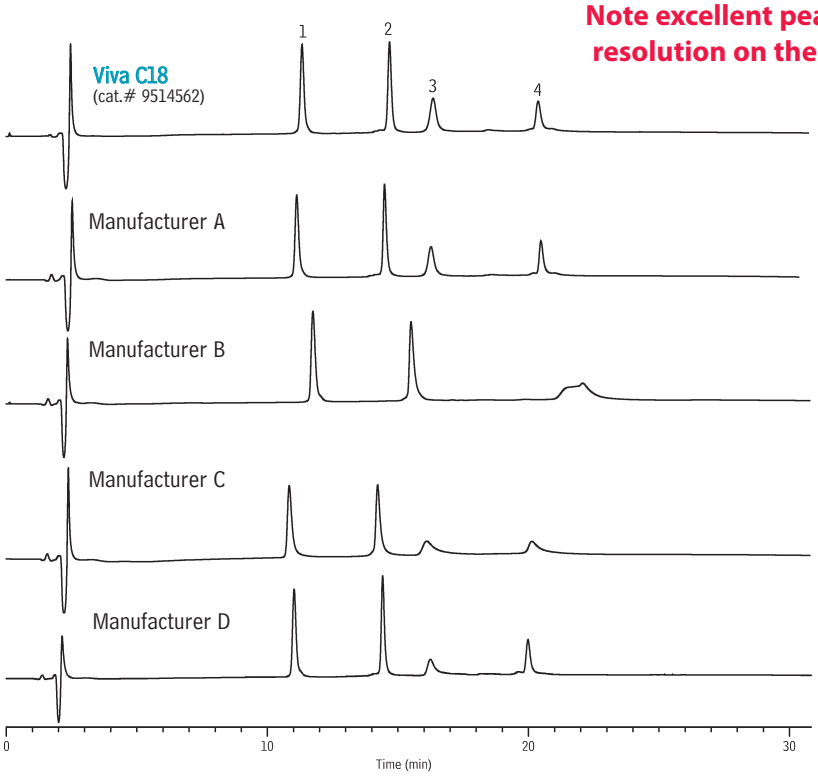
Column: **Viva C18**
Cat.#: 9514562
Dimensions: 150mm x 2.1mm
Particle size: 5µm
Pore size: 300Å

Conditions:
Mobile phase: A: 0.08% trifluoroacetic acid in water (pH 2.0)
B: 0.08% TFA in acetonitrile, 10% B to 40% B in 20 min.
Flow: 0.2mL/min.
Det.: UV @ 214nm

* High levels of trace metals (~100ppm) in the silica enhance this separation.

Protein Mix on Viva C18

Note excellent peak shapes and resolution on the Viva column!



LC_0324

Peak List	Ret. Time (min.)
1. ribonuclease A	11.31
2. cytochrome c	14.65
3. holo-transferrin	16.32
4. apomyoglobin	20.34

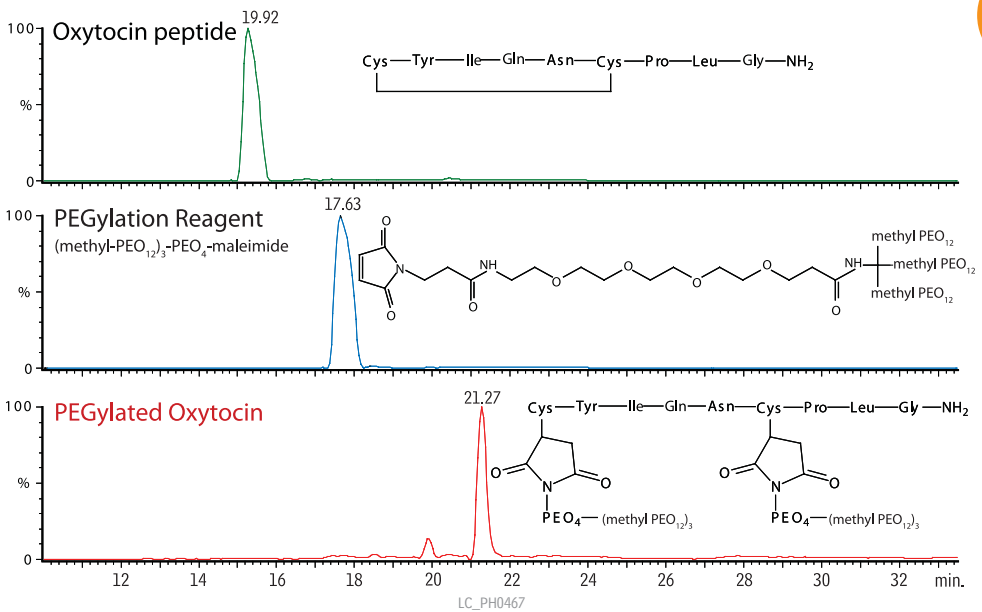
Sample:
Inj.: 20µL
Conc.: 0.08mg/mL each protein
Sample diluent: 0.10% TFA in water / 0.10% TFA in acetonitrile, 80:20, v/v
Sample temp.: 25°C

Columns: **Wide Pore C18**
Dimensions: 150mm x 2.1mm
Particle size: 5µm
Pore size: 300Å

Conditions:
Mobile phase: A: 0.10% TFA in water, B: 0.10% TFA in acetonitrile, 20% B to 70% B in 30 min.
Flow: 0.20mL/min.
Temp.: 25°C (or ambient)
Det.: UV @ 214nm

PEGylated Oxytocin on Viva C18

NEW!



LC_PH0467

Sample: **oxytocin PEGylation reaction products**
Inj.: 20µL
Conc.: 300pmoles/µL
Sample diluent: 0.1% formic acid in water (v:v)

Column: **Viva C18**
Cat.#: 9514561
Dimensions: 150mm x 1.0mm
Particle size: 5µm
Pore size: 300Å

Conditions:
Mobile phase: 0.1% formic acid in water:0.1%formic acid in acetonitrile, 60:40
Flow: 0.1mL/min.
Temp.: ambient
Det.: Micromass Quattro II
Interface: ESI
Ion mode: positive
Temp.: 200°C
Capillary: 2.25kV
Cone: 40V



free
literature

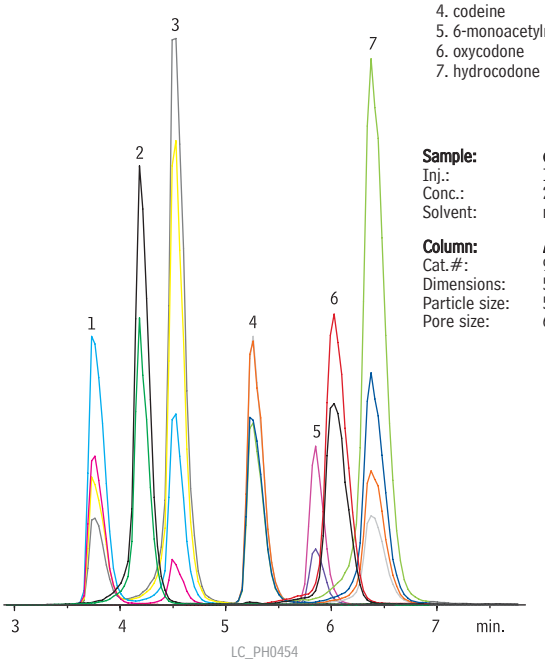
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Opiates on Allure® PFP Propyl



1. morphine
2. oxymorphone
3. hydromorphone
4. codeine
5. 6-monoacetylmorphine
6. oxycodone
7. hydrocodone

Sample: opiates
Inj.: 10µL
Conc.: 25ug/mL
Solvent: methanol

Column: Allure® PFP Propyl
Cat.#: 9169552
Dimensions: 50mm x 2.1mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: 0.1% formic acid in water
B: 0.1% formic acid in 80:20, methanol:acetonitrile

Time:	%B
0.0	10
3.00	50
6.00	50
6.10	10
8.10	Stop pumps

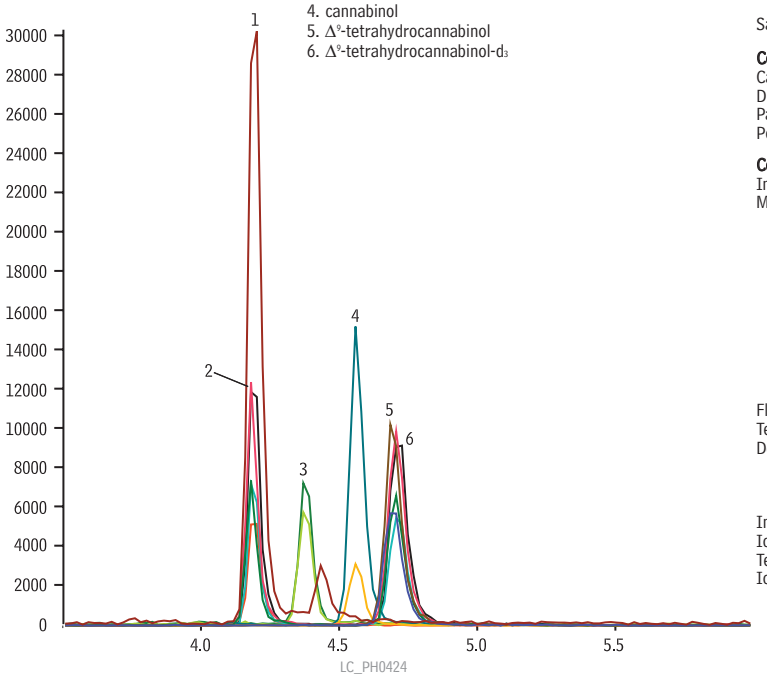
Flow: 0.40mL/min.
Temp.: 30°C

Det.: Applied Biosystems/MDS Sciex API 3200™ MS/MS system
Ion source: Electrospray, positive
IonSpray voltage: 5,500
Gas 1: 65psi (448kPa)
Gas 2: 45psi (310kPa)
Source temp.: 600°C

Mass Spectrometer Experiments:

Compound	Q1	Q3	Declustering Potential (V)	Collision Energy (V)
morphine	286	152	46	79
morphine	286	165	46	51
hydromorphone	286	185	46	41
hydromorphone	286	157	46	55
oxymorphone	302	227	36	37
oxymorphone	302	198	36	55
codeine	300	152	46	85
codeine	300	115	46	89
hydrocodone	300	199	46	39
hydrocodone	300	128	46	69
oxycodone	316	240	31	39
oxycodone	316	256	31	33
6-monoacetylmorphine	328	211	51	55
6-monoacetylmorphine	328	193	51	35

Cannabinoids by LC/MS/MS on Allure® Biphenyl (extracted ions)



1. 11-hydroxy-Δ⁹-tetrahydrocannabinol
2. cannabidiol
3. 11-nor-9-carboxy-Δ⁹-tetrahydrocannabinol
4. cannabinol
5. Δ⁹-tetrahydrocannabinol
6. Δ⁹-tetrahydrocannabinol-d_3

Sample:
Inj.: 10µL
Conc.: 100ng/mL each component
Sample diluent: mobile phase

Column: Allure® Biphenyl
Cat.#: 9166332
Dimensions: 30mm x 2.1mm
Particle size: 3µm
Pore size: 60Å

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: 0.1% formic acid in water
B: 0.1% formic acid in methanol

Time (min.)	%B
0.5	50
2.5	90
5.0	90
6.0	50
6.1	—

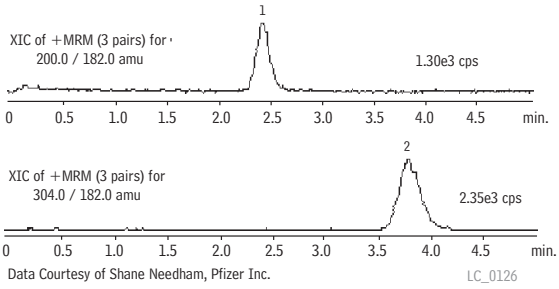
Flow: 0.5mL/min.
Temp.: ambient
Det.: Applied Biosystems/MDS SCIEX API 3200™ MS/MS system
Interface: ESI
Ion mode: positive
Temp.: 500°C
Ion source: 5,500V

Cocaine and Ecgonine Methyl Ester on Allure® PFP Propyl

Peak List:
1. EME (ecgonine methyl ester)
2. COC (cocaine)

Sample:
Inj.: 10µL
Conc.: 1µg/mL
Solvent: water
Temp.: 4°C

Column: **Allure® PFP Propyl**
Cat.#: 9169532
Dimensions: 30mm x 2.1mm
Particle size: 5µm
Pore size: 60Å



Data Courtesy of Shane Needham, Pfizer Inc.

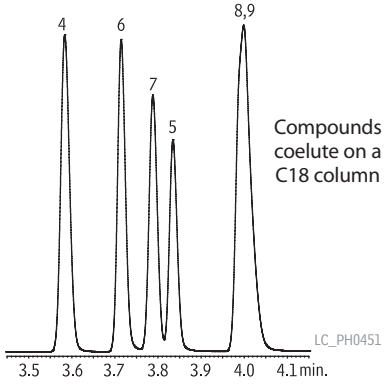
LC_0126

Conditions:

Mobile phase:	5mM ammonium formate, pH 3.0: acetonitrile (10:90, v/v)
Flow:	0.6mL/min.
Column temp.:	ambient
Det.:	Applied Biosystems/MDS SCIEX API 3200™ MS/MS system
Interface:	turbo ion spray, ESI
Interface temp.:	150°C
Ion mode:	positive
ESI probe voltage:	5,000V
Orifice:	+ 71V
Ring:	+ 265V
Collision gas:	nitrogen
Collision gas pressure:	2.2 mTorr
Collision gas energy:	28 eV (COC) 26 eV (EME)
Electron multiplier:	2,100 volts
Auxilary gas flow:	7,000cc/min.
Nebulizer gas setting:	15lb/in.²
Curtain gas setting:	12lb/in.²

Benzodiazepines on 1.9µm Pinnacle® DB PFP Propyl

A) 1.9µm C18



B) 1.9µm Pinnacle® DB PFP Propyl

Peak List:	**Conc (µg/ml)**
1. 7-amino clonazepam*	20
2. 7-amino flunitrazepam*	20
3. bromazepam	100
4. oxazepam	100
5. lorazepam	100
6. clonazepam	100
7. nitrazepam	100
8. nordiazepam	100
9. flunitrazepam	100
10. diazepam	100

* metabolite

Sample:
Inj.: 1µL
Conc.: as listed
Sample diluent: starting mobile phase (80:20 A:B)

Column: **A. 1.9µm C18**
B. 1.9µm Pinnacle® DB PFP Propyl
Cat.#: A. 9414212
B. 9419212
Dimensions: 100mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Conditions:
Mobile phase: A: 0.1% formic acid in water
B: 0.1% formic acid in acetonitrile

Time (min.)	**%B**
0	20
1	20
6	80

Flow: 0.6mL/min.
Temp.: 40°C
Det.: UV @ 254nm

Benzodiazepines on Allure® PFP Propyl

NEW!

Sample: benzodiazepines
Inj.: 20µL
Conc.: NA
Solvent: NA

Column: Allure® PFP Propyl
Cat.#: 9169552
Dimensions: 50mm x 2.1mm
Particle size: 5µm
Pore size: 60Å

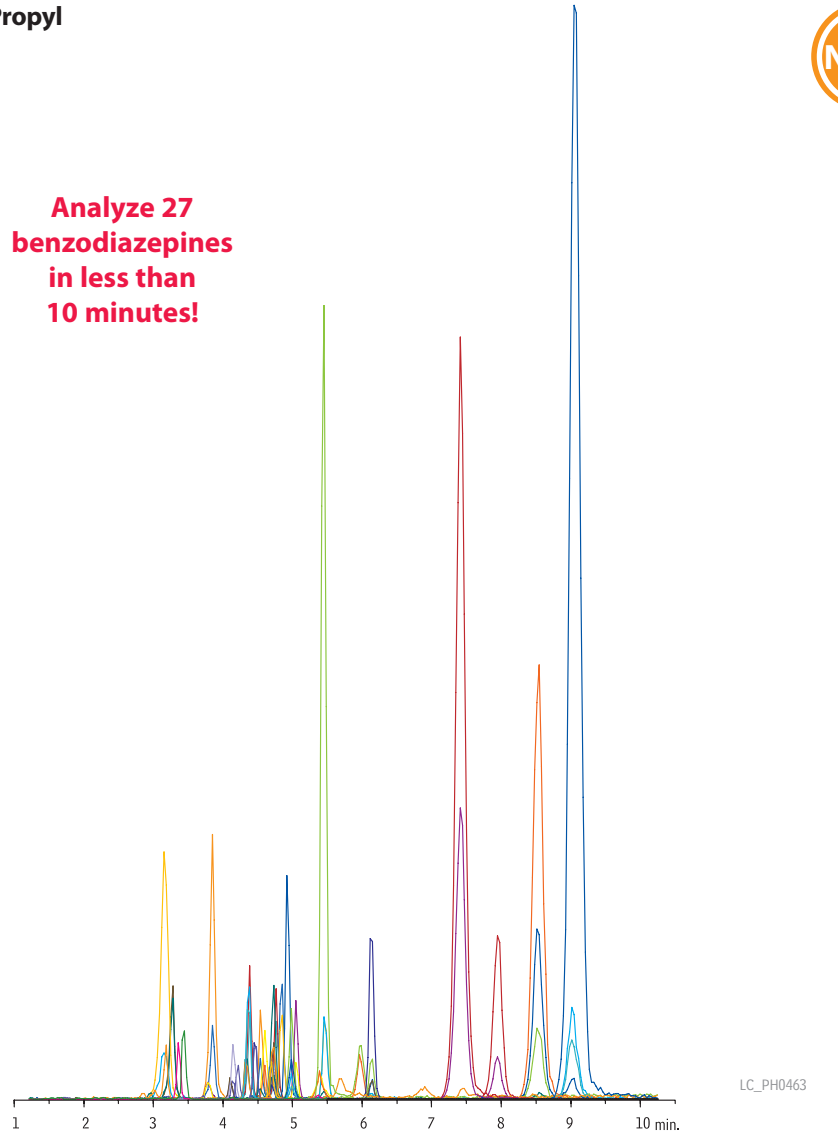
Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: 0.1% formic acid and 1mM ammonium formate in water
B: 0.1% formic acid and 1mM ammonium formate in acetonitrile

Time (min.)	Flow (µL/min.)	%B
0.0	500	10
10.00	1000	90
15.00	1000	90
15.50	500	10
17.50	500	10

Flow: see gradient table
Temp.: 40°C
Det.: Applied Biosystems/MDS Sciex API 3200™ MS/MS system
Ion Source: Electrospray, positive
IonSpray Voltage: NA
Gas 1: NA
Gas 2: NA
Source Temp.: 500°C

Data courtesy of: Applied Biosystems MDS Sciex

Analyze 27 benzodiazepines in less than 10 minutes!



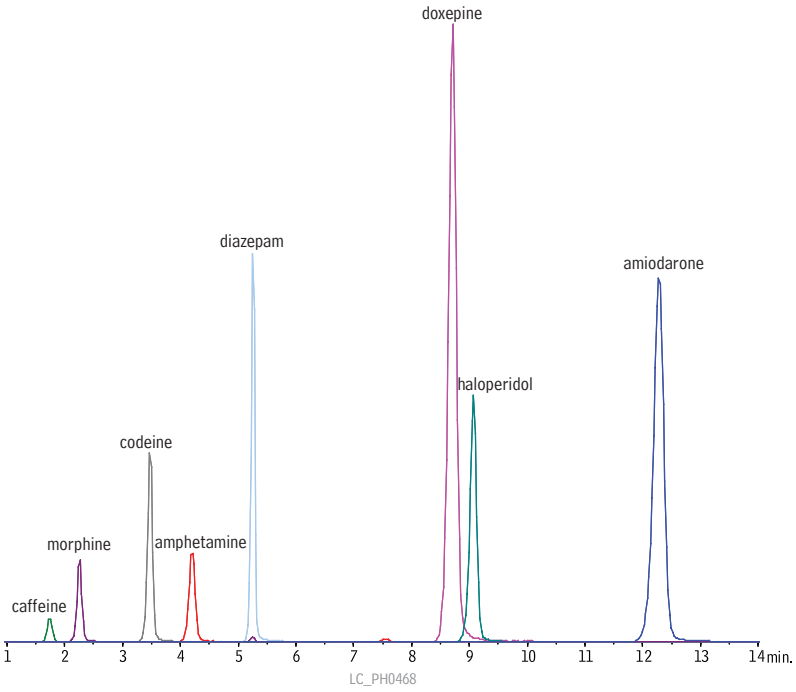
MRM Transitions, retention times, and LOQ values.

Compound Name	Retention Time (min.)	Precursor Ion (amu)	MRM 1 (amu)	MRM 2 (amu)	DP	CE (MRM 1)	CE (MRM 2)	LOQ (ng/mL)
7-aminonitrazepam	3.2	252.1	121.1	94.0	51	35	53	1.0
7-aminoclonazepam	3.3	286.1	121.0	222.2	46	41	35	0.5
7-aminoflunitrazepam	3.8	284.1	135.1	226.0	51	39	49	0.5
Bromazepam	3.8	316.0/318.0	182.1	182.1	51	45	45	5.0
α-hydroxyalprazolam	4.1	325.1	297.2	204.9	51	31	59	2.0
α-hydroxytriazolam	4.1	359.0	239.2	176.0	61	63	37	5.0
Oxazepam	4.2	287.0	241.1	268.9	41	27	19	10.0
Lorazepam	4.3	321.0/323.1	275.0	277.0	41	31	27	5.0
Estazolam	4.4	295.0	205.0	267.1	51	53	31	2.0
Zaleplon	4.4	306.2	236.3	264.2	56	35	27	0.5
2-hydroxyethylflurazepam	4.5	333.1	211.2	109.0	56	51	41	1.0
Desmethylflunitrazepam	4.5	300.1	254.2	198.2	56	35	51	2.0
Nitrazepam	4.6	282.0	236.1	180.2	71	35	51	2.0
Clonazepam	4.7	316.0	270.2	214.0	56	41	51	2.0
Desalkylflurazepam	4.7	289.1	140.1	226.1	71	41	39	2.0
Temazepam	4.7	301.1/303.1	255.1	257.2	35	30	30	5.0
Triazolam	4.7	343.0	238.9	314.9	61	53	37	1.0
Alprazolam	4.8	309.1	205.1	281.1	56	53	35	1.0
Lormetazepam	4.8	335.0/337.1	289.0	291.1	41	29	29	2.0
Clobazam	4.9	301.1	259.1	224.3	46	29	47	1.0
Flunitrazepam	5.0	314.0	268.1	239.1	56	35	49	1.0
Nordiazepam	5.0	271.1	140.2	164.9	46	37	35	2.0
Zolpiclone	5.4	389.1	244.8	217.0	16	25	41	1.0
D5-Diazepam	5.4	290.1	198.2	-	55	41	-	
Diazepam	5.5	285.0	193.2	154.1	55	41	37	1.0
Chlordiazepoxide	6.0	300.1	227.1	283.2	36	31	21	5.0
Prazepam	6.1	325.1	271.1	140.0	81	31	53	2.0
Zolpidem	7.4	308.1	235.1	236.1	56	39	35	0.2
Midazolam	7.9	326.1	291.3	222.0	56	33	63	0.5
Flurazepam	8.5	388.2	315.1	317.1	36	27	27	0.1
Medazepam	9.0	271.0	91.1	207.3	46	41	39	2.0
D3-Doxepine	9.1	283.0	107.1	-	41	35	-	

Bar color indicates shared precursor ions. Note compounds with shared precursor ions are baseline resolved on the Allure® PFP Propyl column, as shown by retention time comparison.
Data courtesy of Applied Biosystems MDS Sciex.

System Suitability Mix on Allure® PFP Propyl

NEW!



Mass Spectrometer Conditions:

Analyte	MW	RT (min)	Q1	Q3
Amiodarone	645	12.30	646.0	58.0
Amphetamine	135	4.21	136.1	91.1
Caffeine	194	1.72	195.1	122.9
Codeine	299	3.47	300.2	165.2
Diazepam	284	5.25	285.1	193.2
Doxepin	279	8.72	280.2	107.1
Haloperidol	375	9.08	376.1	123.0
Morphine	285	2.24	286.1	165.1

Sample: **system suitability mix**
Inj.: 30µL
Conc.:

amiodarone	10µg/mL
amphetamine	10
caffeine	10
codeine	10
diazepam	10
doxepine	10
haloperidol	1
morphine	10

Sample diluent: methanol

Column: **Allure® PFP Propyl**
Cat.#: 9169552
Dimensions: 50mm x 2.1mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: 0.2% formic acid and 2mM ammonium formate in water
B: 0.2% formic acid and 2mM ammonium formate in acetonitrile

Time (min.):	Flow (mL/min.)	%B
0.0	0.5	10
10.00	1.0	90
15.00	1.0	90
15.50	0.5	10
17.50	0.5	10

Flow: see gradient table
Temp.: 40°C
Det.: Applied Biosystems/MDS Sciex API 3200™ MS/MS system
Ion source: electrospray, positive
Ion spray voltage: 4000
Gas 1: 40psi
Gas 2: 70psi
Source Temp.: 500°C

Data courtesy of Applied Biosystems MDS Sciex.

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Carbonyls by CARB Method 1004 on Allure® AK

Sample:
Inj.: 10µL
Conc.: 3µg/mL each analyte, as aldehyde/ketone
Sample diluent: acetonitrile

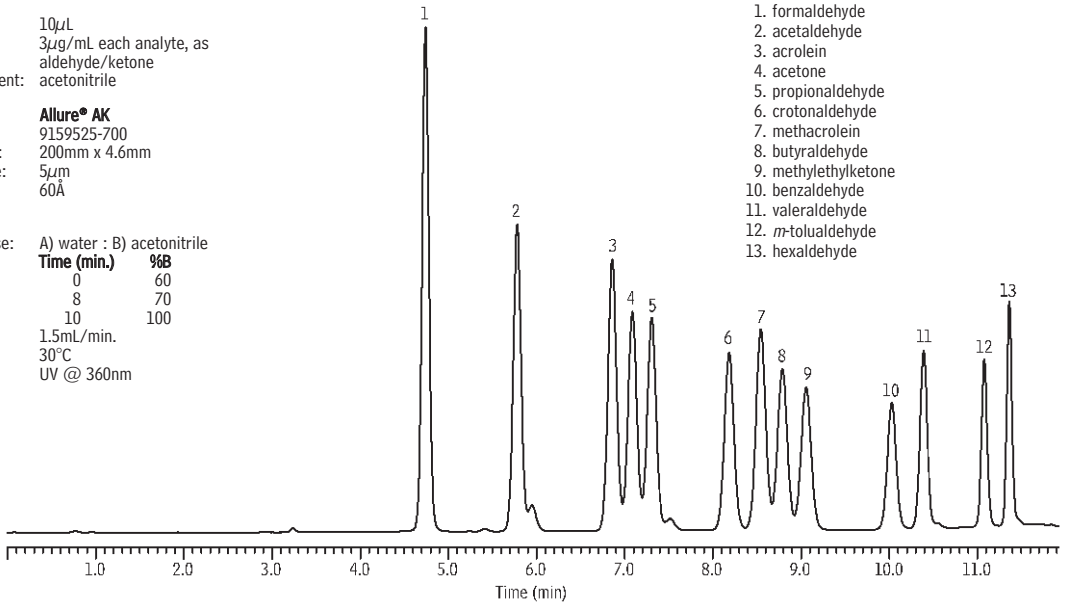
Column: **Allure® AK**
Cat.#: 9159525-700
Dimensions: 200mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: A) water : B) acetonitrile

Time (min.)	%B
0	60
8	70
10	100

Flow: 1.5mL/min.
Temp.: 30°C
Det.: UV @ 360nm

Peak DNPH derivatives of:	Ret. Time (min.)
1. formaldehyde	4.74
2. acetaldehyde	5.78
3. acrolein	6.86
4. acetone	7.09
5. propionaldehyde	7.31
6. crotonaldehyde	8.19
7. methacrolein	8.55
8. butyraldehyde	8.79
9. methylethylketone	9.06
10. benzaldehyde	10.03
11. valeraldehyde	10.39
12. *m*-tolualdehyde	11.08
13. hexaldehyde	11.36



LC_EV0393

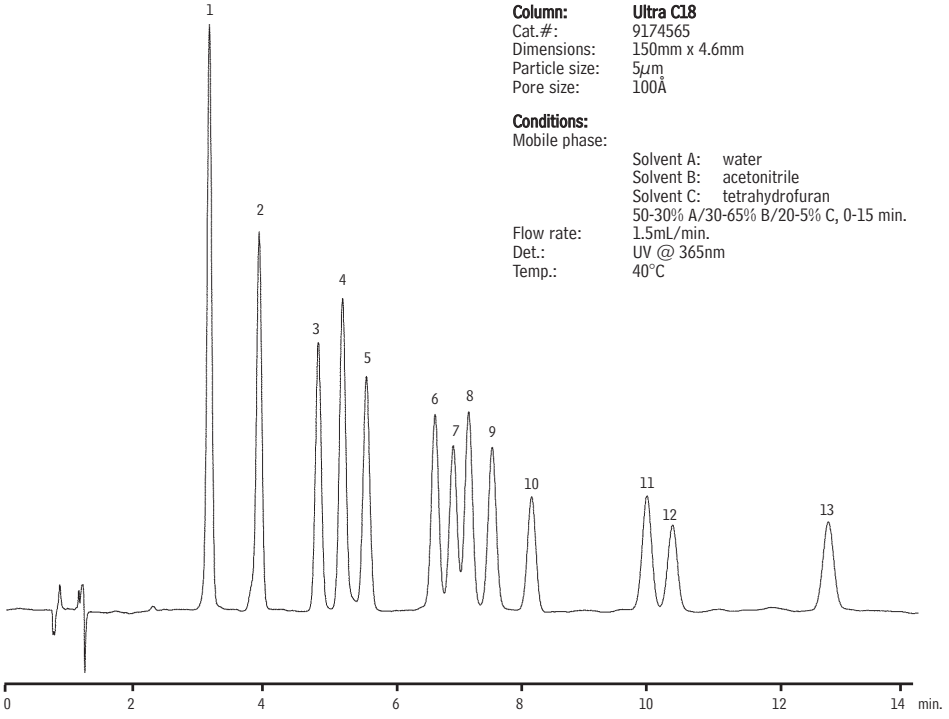
Aldehydes and Ketones (DNPH derivatives) on Ultra C18 (40°C)

Peak List:
DNPH derivatives of:
1. formaldehyde
2. acetaldehyde
3. acetone
4. acrolein
5. propionaldehyde
6. crotonaldehyde
7. MEK
8. methacrolein
9. butyraldehyde
10. benzaldehyde
11. valeraldehyde
12. *m*-tolualdehyde
13. hexanaldehyde

Sample:
Inj.: 10µL
Conc.: 3.0µg/mL each derivative

Column: **Ultra C18**
Cat.#: 9174565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

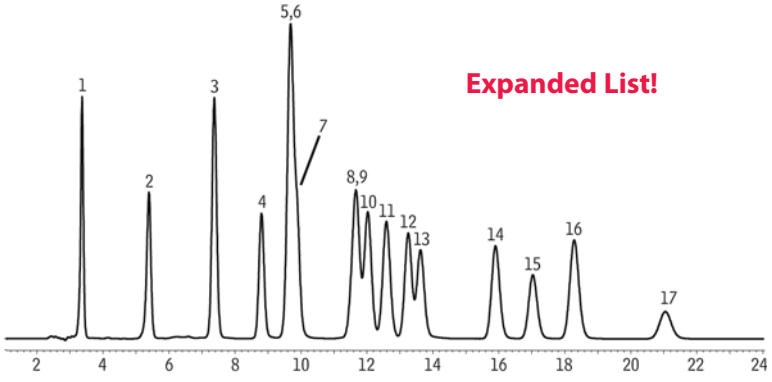
Conditions:
Mobile phase:
Solvent A: water
Solvent B: acetonitrile
Solvent C: tetrahydrofuran
50-30% A/30-65% B/20-5% C, 0-15 min.
Flow rate: 1.5mL/min.
Det.: UV @ 365nm
Temp.: 40°C



LC_0036

Explosives by EPA Method 8330B on Ultra C18

Peak List	Ret. Time (min.)
1. HMX	3.38
2. RDX	5.41
3. 1,3,5-TNB	7.39
4. 1,3-DNB	8.82
5. 3,5-DNA	9.71
6. NB	9.71
7. tetryl	9.88
8. 2,4,6-TNT	11.69
9. NG	11.69
10. 2-A-4,6-DNT	12.05
11. 4-A-2,6-DNT	12.61
12. 2,4-DNT	13.27
13. 2,6-DNT	13.64
14. 2-NT	15.92
15. 4-NT	17.05
16. 3-NT	18.32
17. PETN	21.08



LC_EV0428

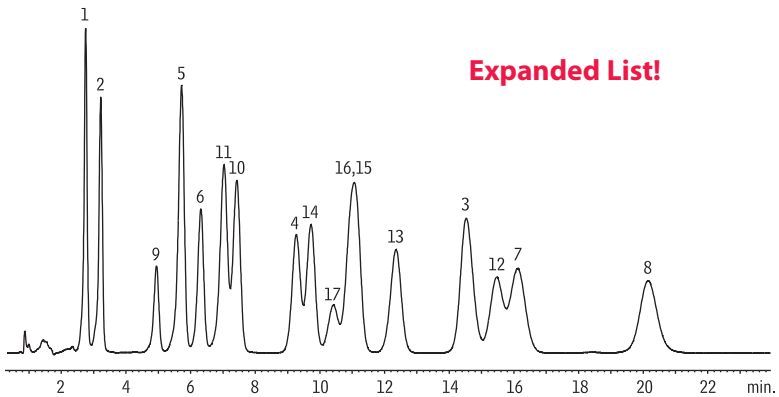
Column: Ultra C18
Cat.#: 9174575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Sample: 50µg/mL each compound diluted in acetonitrile
8330 Calibration Mix #1 (cat.# 31450)
8330 Calibration Mix #2 (cat.# 31451)
PETN Standard(cat.# 31600)
3,5-dinitroaniline Reference Mix (cat.# 31661)
Nitroglycerin Standard (cat.# 31498)
Inj.: 10µL

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: water:methanol (44:56 v/v)
Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV detection @ 210nm

Explosives by EPA Method 8330B on Pinnacle® II Biphenyl

Peak List	Ret. Time (min.)
1. HMX	2.76
2. RDX	3.22
3. 1,3,5-TNB	4.94
4. 1,3-DNB	5.73
5. 3,5-DNA	6.31
6. NB	7.02
7. tetryl	7.43
8. 2,4,6-TNT	9.26
9. NG	9.73
10. 2-A-4,6-DNT	10.43
11. 4-A-2,6-DNT	11.07
12. 2,4-DNT	11.07
13. 2,6-DNT	12.36
14. 2-NT	14.54
15. 4-NT	15.46
16. 3-NT	16.12
17. PETN	20.17



LC_EV0429

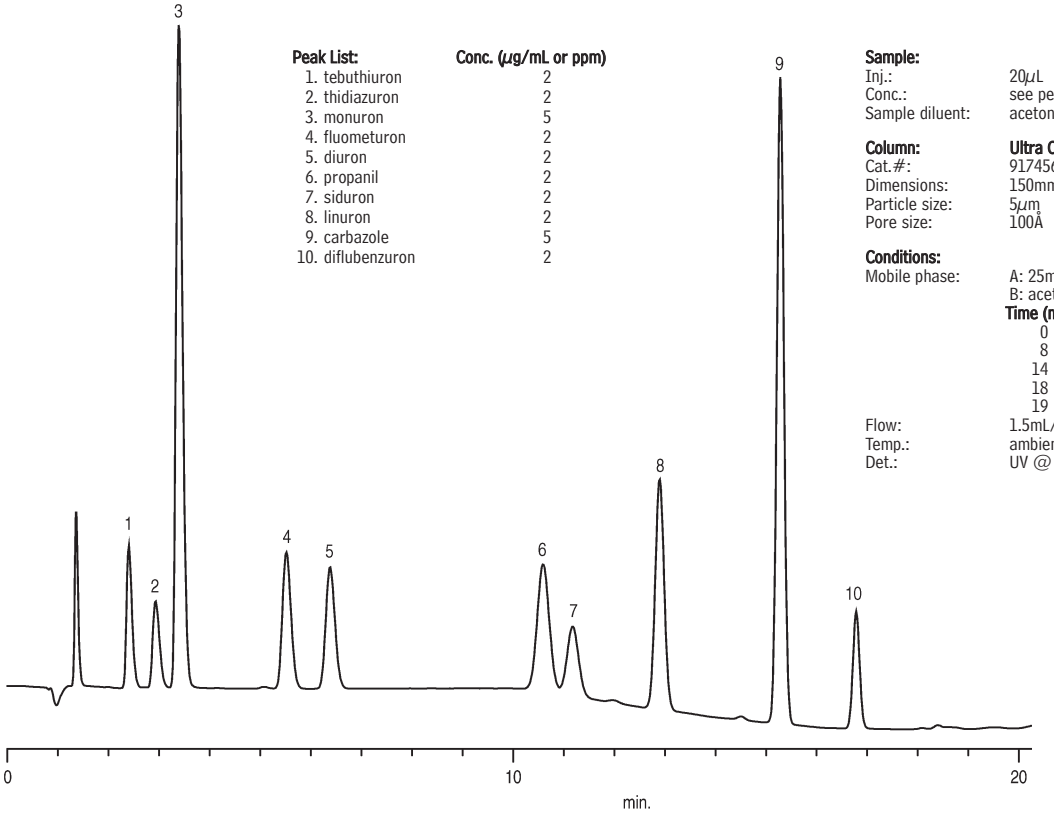
Column: Pinnacle® II Biphenyl
Cat.#: 9209565-700
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Sample: 50µg/mL each compound diluted in acetonitrile
8330 Calibration Mix #1 (cat.# 31450)
8330 Calibration Mix #2 (cat.# 31451)
PETN Standard (cat.# 31600)
3,5-dinitroaniline Standard (cat.# 31661)
Nitroglycerin Standard (cat.# 31498)
Inj.: 10µL

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: water:methanol (45:55 v/v)
Flow: 1.2mL/min.
Temp.: 30°C
Det.: UV detection @ 210nm

Herbicides

Herbicides (Phenylurea) on Ultra C18



LC_0319

Peak List:	Conc. (µg/mL or ppm)
1. tebuthiuron	2
2. thidiazuron	2
3. monuron	5
4. fluometuron	2
5. diuron	2
6. propanil	2
7. siduron	2
8. linuron	2
9. carbazole	5
10. diflubenzuron	2

Sample:
Inj.: 20µL
Conc.: see peak list
Sample diluent: acetonitrile

Column: **Ultra C18**
Cat.#: 9174565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A: 25mM phosphate buffer, pH 2.5
B: acetonitrile

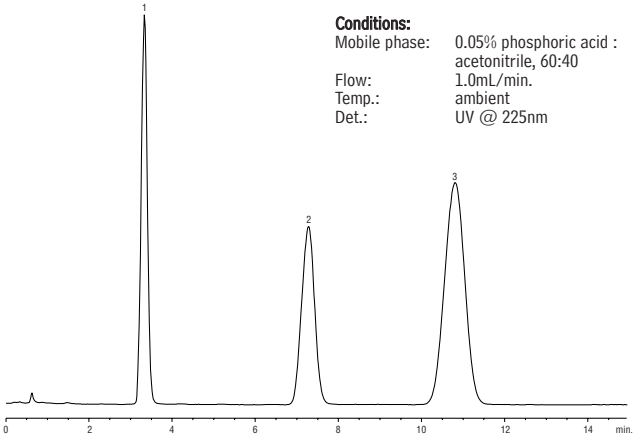
Time (min.)	%B
0	40
8	40
14	55
18	55
19	40

Flow: 1.5mL/min.
Temp.: ambient
Det.: UV @ 245nm

Herbicides on Ultra Aqueous C18

Peak List:
1. 2,4-D
2. Silvex (2,4,5-TP)
3. 1,4-dichlorobenzene (IS)

Fast isocratic analysis!



LC_0304

Sample:
Inj.: 10µL
Conc.: 10ppm each
Solvent: 0.05% phosphoric acid : acetonitrile, 50:50

Column: **Ultra Aqueous C18**
Cat.#: 9178355
Dimensions: 50mm x 4.6mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: 0.05% phosphoric acid : acetonitrile, 60:40
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 225nm

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Phenoxyacid Herbicides on Ultra Aqueous C18

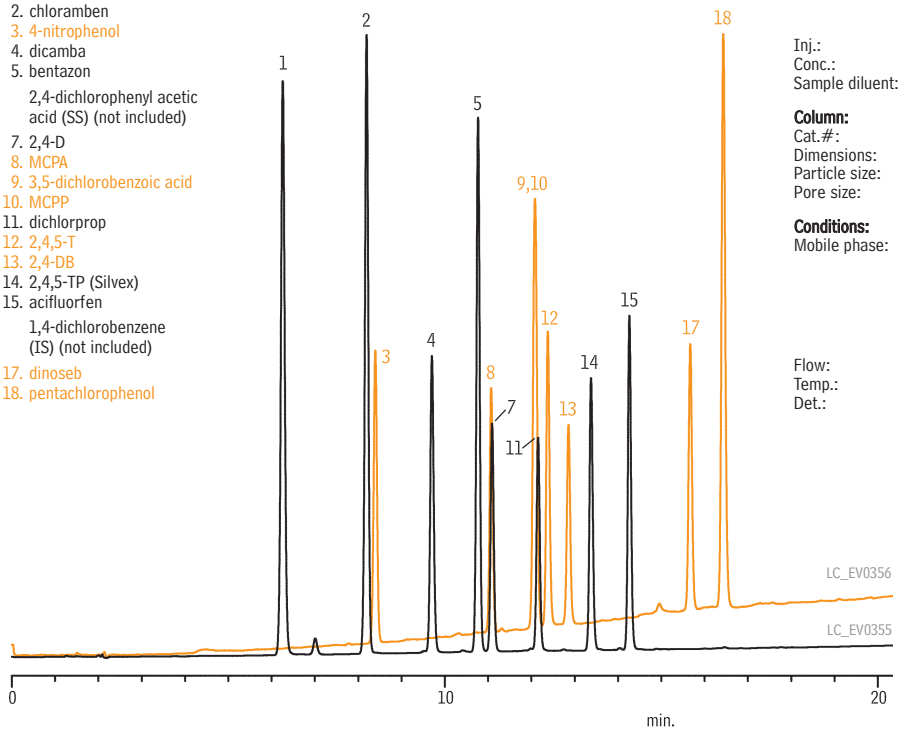
Mix A and Mix B
1. picloram
2. chloramben
3. 4-nitrophenol
4. dicamba
5. bentazon

2,4-dichlorophenyl acetic acid (SS) (not included)

7. 2,4-D
8. MCPA
9. 3,5-dichlorobenzoic acid
10. MCPP
11. dichlorprop
12. 2,4,5-T
13. 2,4-DB
14. 2,4,5-TP (Silvex)
15. acifluorfen

1,4-dichlorobenzene (IS) (not included)

17. dinoseb
18. pentachlorophenol



Sample:
Sample: Chlorinated Acids by HPLC, Mix A (cat.# 32431), or Chlorinated Acids by HPLC, Mix B (cat.# 32430) 1,000µg/mL each component in acetonitrile
Inj.: 10µL
Conc.: 10ppm each analyte
Sample diluent: acetonitrile

Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A) 0.05% H_3PO_4 B) acetonitrile

Time (min.)	%B
0	20.0
28	80.0
33	90.0
34	20.0

Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 225nm

Phenoxyacid Herbicides on Allure® Basix

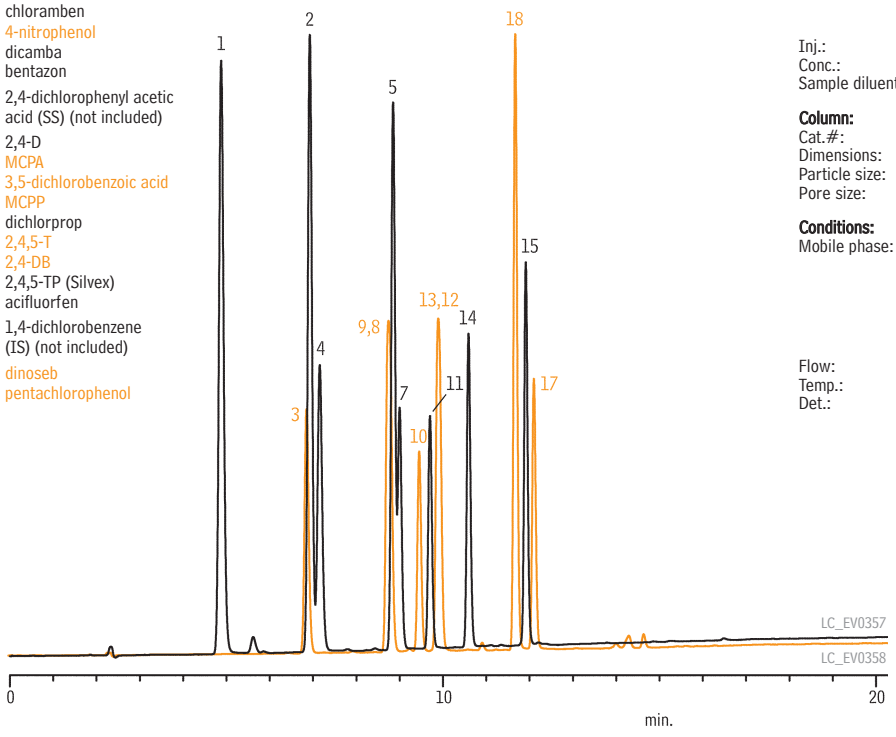
Mix A and Mix B
1. picloram
2. chloramben
3. 4-nitrophenol
4. dicamba
5. bentazon

2,4-dichlorophenyl acetic acid (SS) (not included)

7. 2,4-D
8. MCPA
9. 3,5-dichlorobenzoic acid
10. MCPP
11. dichlorprop
12. 2,4,5-T
13. 2,4-DB
14. 2,4,5-TP (Silvex)
15. acifluorfen

1,4-dichlorobenzene (IS) (not included)

17. dinoseb
18. pentachlorophenol



Sample:
Sample: Chlorinated Acids by HPLC, Mix A (cat.# 32431), or Chlorinated Acids by HPLC, Mix B (cat.# 32430) 1,000µg/mL each component in acetonitrile
Inj.: 10µL
Conc.: 10ppm each analyte
Sample diluent: acetonitrile

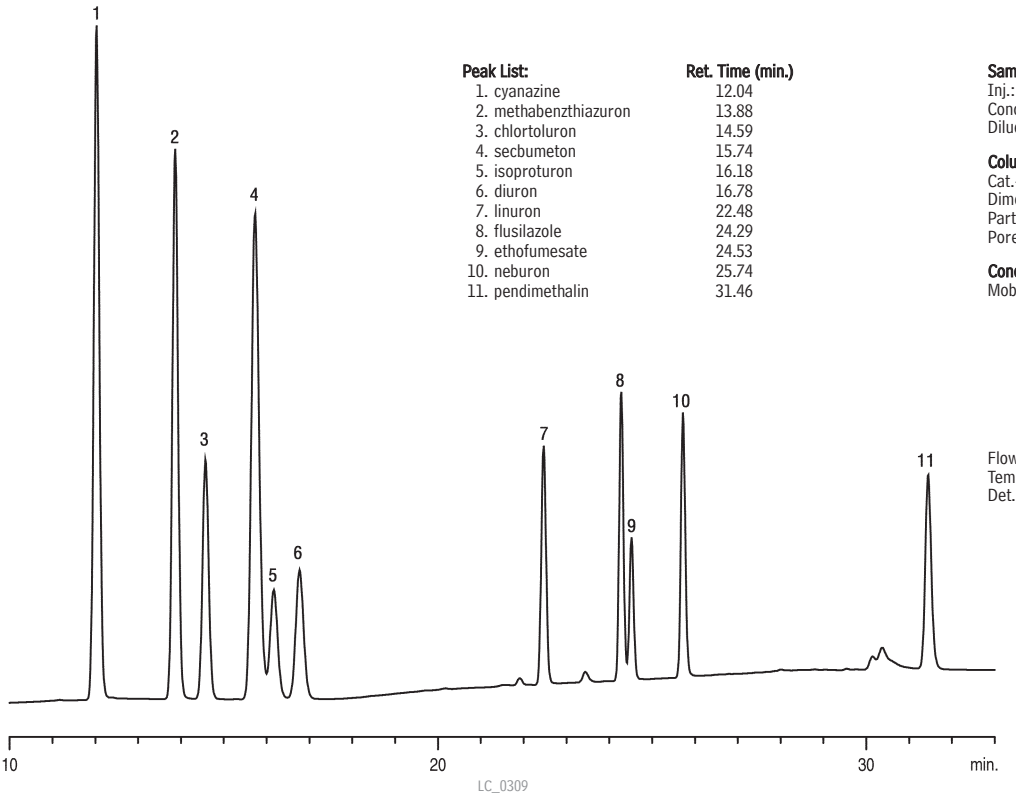
Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: A) 0.05% H_3PO4 B) acetonitrile

Time (min.)	%B
0	20.0
28	80.0
33	90.0
34	20.0

Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 225nm

Herbicides on Allure® C18



Peak List:	Ret. Time (min.)
1. cyanazine	12.04
2. methabenzthiazuron	13.88
3. chlortoluron	14.59
4. secbumeton	15.74
5. isoproturon	16.18
6. diuron	16.78
7. linuron	22.48
8. flusilazole	24.29
9. ethofumesate	24.53
10. neburon	25.74
11. pendimethalin	31.46

Sample:
Inj.: 5µL custom mix
Conc.: approx. 20µg/mL each
Diluent: acetonitrile

Column: **Allure® C18**
Cat.#: 9164565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

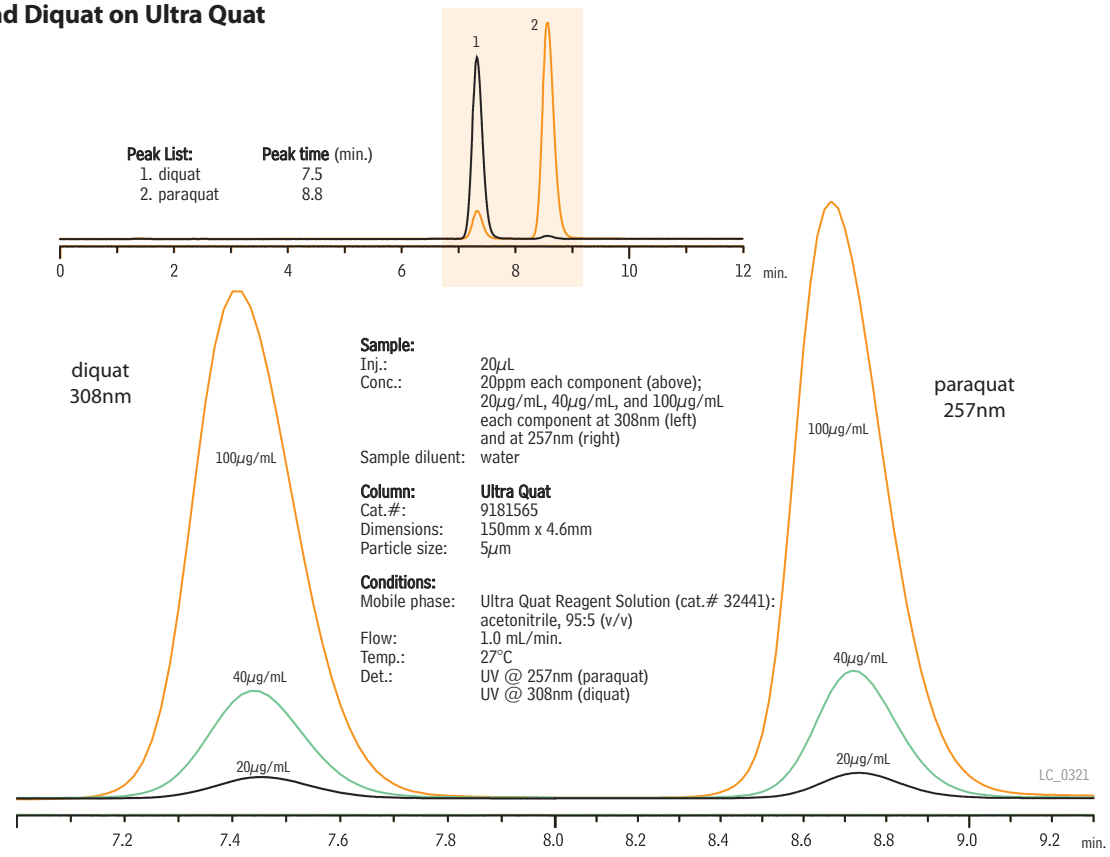
Conditions:
Mobile phase: A: water
B: acetonitrile

Time (min.)	%B
0	20
10	40
15	40
26	80
34	80
34.1	20

Flow: 1.2mL/min.
Temp.: ambient
Det.: UV @ 220nm

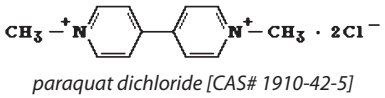


Paraquat and Diquat on Ultra Quat

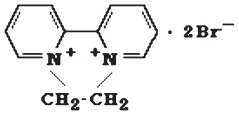


Paraquat and Diquat on Ultra Quat

Fast, sensitive LC/MS/MS analysis!



paraquat dichloride [CAS# 1910-42-5]



diquat dibromide [CAS # 85-00-7]

*Data courtesy of Houssain El Aribi, Ph.D., LC/MS Product and Application Specialist, MDS SCIEX, 71 Four Valley Drive, Concord, Ontario, Canada, L4K 4V8

Sample:
Inj.: 10µL
Conc.: 5µg/mL each component
Sample diluent: DI water
Sample temp.: ambient

Column: **Ultra Quat**
Cat.#: 5181352
Dimensions: 50mm x 2.1mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM heptafluorobutyric acid:acetonitrile, 95:5 (v/v)
Flow: 0.3mL/min.
Temp.: ambient
Det.: Applied Biosystems/MDS SCIEX API 3200™ MS/MS system
Interface: electrospray
Ion Mode: positive
Temp.: 600°C
Ion Spray voltage: 5,500V
Collision exit potential: 3V
Curtain Gas: 15psi (103kPa)
Gas supply 1: 70psi (483kPa)
Gas supply 2: 60psi (414kPa)
Quantitation: (MRM)
Q1/Q3: unit resolution
Dwell time: 200 ms

Precursor Ion (amu)	Fragment Ion (amu)	DP (V)	Collision Energy (eV)
diquat, 183+	157+	30	30
paraquat, 93 (2+)	171+	20	20

Pesticides on Allure® C18

Peak List:
1. desisopropyl atrazine
2. desethyl atrazine
3. simazine
4. terbuthylazine desethyl
5. cyanazine
6. methabenzthiazuron
7. chlortoluron
8. atrazine
9. secbumeton
10. isoproturon
11. diuron
12. terbumeton
13. terbuthylazine
14. linuron
15. flusilazole
16. ethofumesate
17. neburon

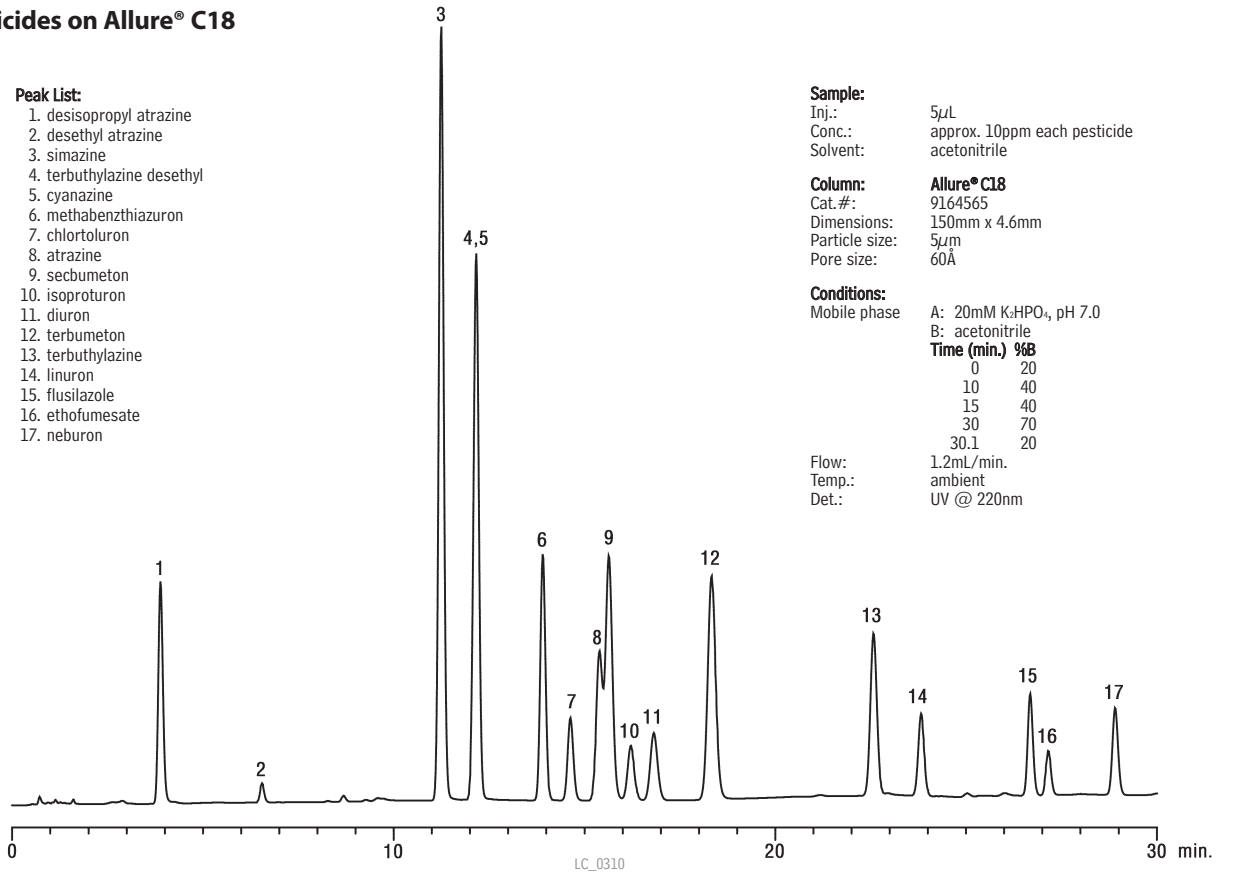
Sample:
Inj.: 5µL
Conc.: approx. 10ppm each pesticide
Solvent: acetonitrile

Column: **Allure® C18**
Cat.#: 9164565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: A: 20mM K_2HPO_4, pH 7.0
B: acetonitrile

Time (min.)	%B
0	20
10	40
15	40
30	70
30.1	20

Flow: 1.2mL/min.
Temp.: ambient
Det.: UV @ 220nm



LC_0310

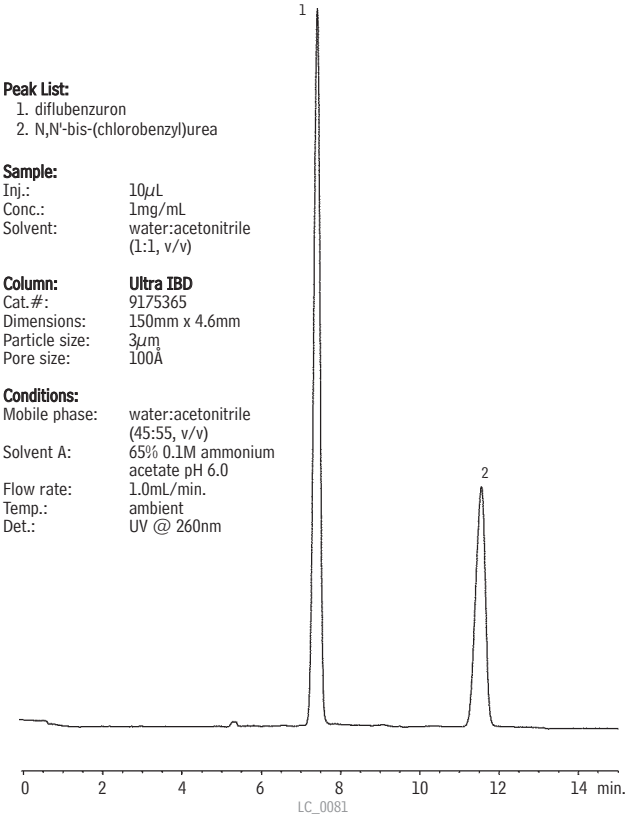
Diflubenzuron (Pesticide) on Ultra IBD

Peak List:
1. diflubenzuron
2. N,N'-bis-(chlorobenzyl)urea

Sample:
Inj.: 10µL
Conc.: 1mg/mL
Solvent: water:acetonitrile (1:1, v/v)

Column: **Ultra IBD**
Cat.#: 9175365
Dimensions: 150mm x 4.6mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: water:acetonitrile (45:55, v/v)
Solvent A: 65% 0.1M ammonium acetate pH 6.0
Flow rate: 1.0mL/min.
Temp.: ambient
Det.: UV @ 260nm



LC_0081



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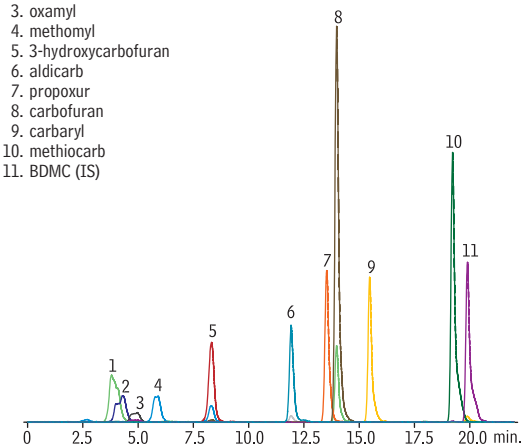
In the U.S.
Phone: 1-800-356-1688, ext. 4
Fax: 814-353-1568
e-mail: support@restek.com

Outside the U.S.
Contact your Restek representative.

Carbamates on Ultra Carbamate

NEW!

Peak List:
1. aldicarb sulfone
2. aldicarb sulfoxide
3. oxamyl
4. methomyl
5. 3-hydroxycarbofuran
6. aldicarb
7. propoxur
8. carbofuran
9. carbaryl
10. methiocarb
11. BDMC (IS)



LC_FF0473

Sample: 531.1 Carbamate Pesticide Calibration Mix (cat.# 32273) and Internal Standard 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (cat.# 32274), 50:50
Inj.: 1µL
Conc.: 50µg/mL
Sample diluent: methanol

Column: **Ultra Carbamate**
Cat. #: 9177352
Dimensions: 50mm x 2.1mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: A: 2mM ammonium acetate:methanol, 90:10
B: 2mM ammonium acetate:methanol, 10:90

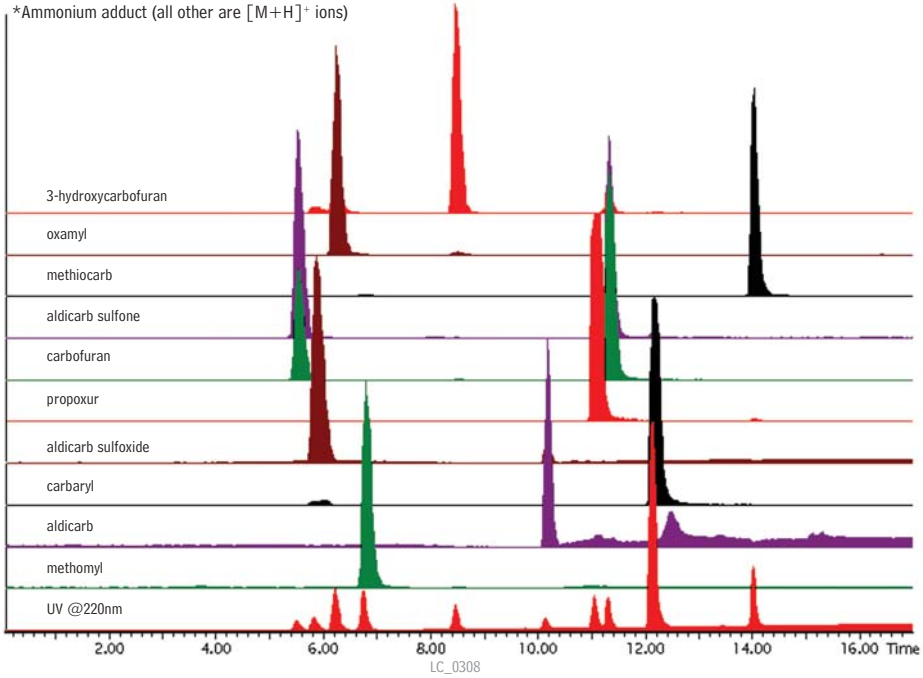
Time (min.)	%B
0	20
20	100
25	100

Flow: 200µL/min.
Temp.: ambient
Det.: Leco Unique® LC/TOFMS
Interface: ESI
Ion mode: Positive
Temp.: 130°C
Nebulizer pressure: 100kPa
Desolvation gas (N2): 4,000cc/min.
Interface temperature: 120°C
Nozzle: (+) 62V
Capillary: (+) 2.75kV

Pesticides (Carbamates) on Ultra Carbamate

Compound	Ion	Cone V	Compound	Ion	Cone V
1. aldicarb sulfone	223.3	25V	6. aldicarb	191.2	8V
2. aldicarb sulfoxide	207.3	18V	7. propoxur	210.2	18V
3. oxamyl	237.2*	10V	8. carbofuran	222.3	22V
4. methomyl	163.2	15V	9. carbaryl	202.2	18V
5. 3-hydroxycarbofuran	238.3	15V	10. methiocarb	226.3	19V

*Ammonium adduct (all other are $[M+H]^+$ ions)



LC_0308

Sample:
Inj.: 10µL
Conc.: 100µg/mL each component

Column: **Ultra Carbamate**
Cat.#: 9177315
Dimensions: 100mm x 4.6mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: A: 90% water: 10% methanol with 10mM ammonium formate
B: 90% acetonitrile: 10% methanol with 10 mM ammonium formate

Time (min.)	%B
0.0	10%
15	90%
20	90%

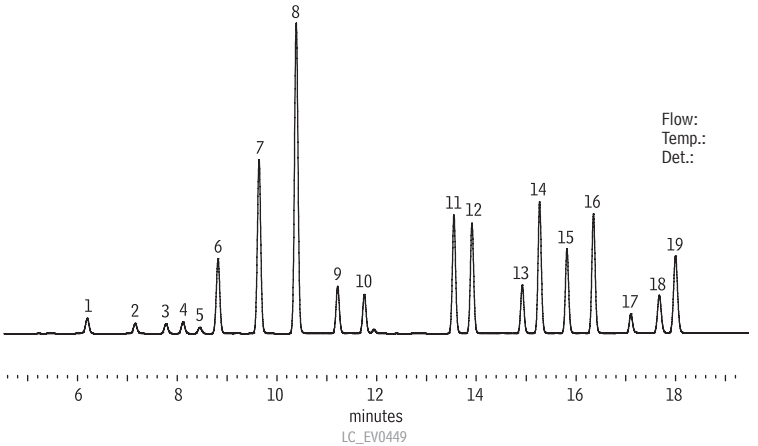
Flow: 1.0mL/min. (approx. 0.75mL/min. to UV detector, 0.25mL/min. to MSD)
Temp.: ambient
Det.: UV @ 220nm; MSD

MSD Conditions:
Detector: Micromass ZMD
Mode: ESI+
Capillary V: 3.50
Extractor: 4.0
Ion energy: 0.4
Multiplier: 650
Source temp: 100°C
Desolv. temp: 250°C
Gas flow: 490 L/hr.

Polycyclic Aromatic Hydrocarbons on Pinnacle® II PAH
EPA 8310 – 18 component standard + benzo(j)fluoranthene

NEW!

Peak List:	Retention Time
1. naphthalene	6.19
2. acenaphthylene	7.16
3. 1-methylnaphthalene	7.78
4. 2-methylnaphthalene	8.17
5. acenaphthene	8.46
6. fluorene	8.82
7. phenanthrene	9.64
8. anthracene	10.39
9. fluoranthene	11.22
10. pyrene	11.75
11. benzo(a)anthracene	13.55
12. chrysene	13.91
13. benzo(j)fluoranthene	14.92
14. benzo(b)fluoranthene	15.27
15. benzo(k)fluoranthene	15.82
16. benzo(a)pyrene	16.35
17. dibenzo(a,h)anthracene	17.10
18. benzo(ghi)perylene	17.67
19. indeno(1,2,3-cd)pyrene	17.99



LC_EV0449

Sample:
Inj.: 10µL
Conc.: 20µg/mL each component
Sample diluent: acetonitrile

Column: **Pinnacle® II PAH**
Cat.#: 9219463
Dimensions: 150mm x 3.2mm
Particle size: 4µm
Pore size: 110Å

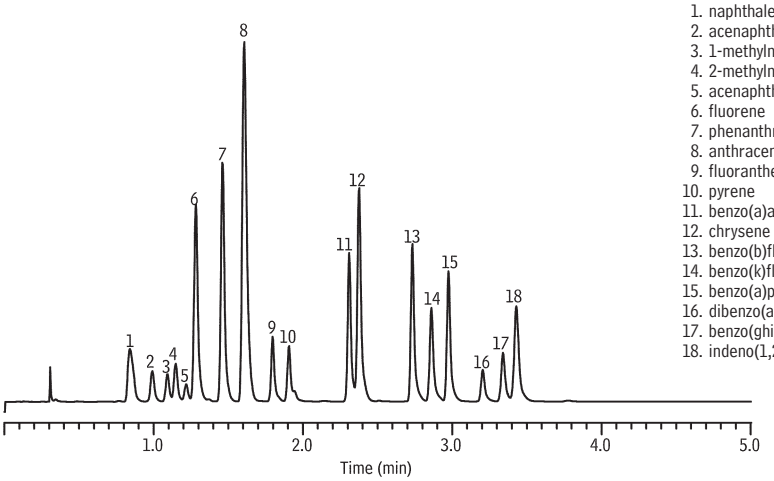
Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: purified water
B: acetonitrile

Time (min.)	%B
0	40
7	60
16	100
18.9	100
19	40

Flow: 1.2mL/min.
Temp.: 30°C
Det.: UV @ 254nm

EPA Method 610 Polycyclic Aromatic Hydrocarbons on Pinnacle® DB PAH

NEW!



LC_EV0469

Peak List:
1. naphthalene
2. acenaphthylene
3. 1-methylnaphthalene
4. 2-methylnaphthalene
5. acenaphthene
6. fluorene
7. phenanthrene
8. anthracene
9. fluoranthene
10. pyrene
11. benzo(a)anthracene
12. chrysene
13. benzo(b)fluoranthene
14. benzo(k)fluoranthene
15. benzo(a)pyrene
16. dibenzo(a,h)anthracene
17. benzo(ghi)perylene
18. indeno(1,2,3-cd)pyrene

Sample:
Inj.: 2µL
Conc.: 20µg/mL each component
Sample diluent: acetonitrile

Column: **Pinnacle® DB PAH**
Cat.#: 9470252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Conditions:
Mobile phase: A: water
B: acetonitrile

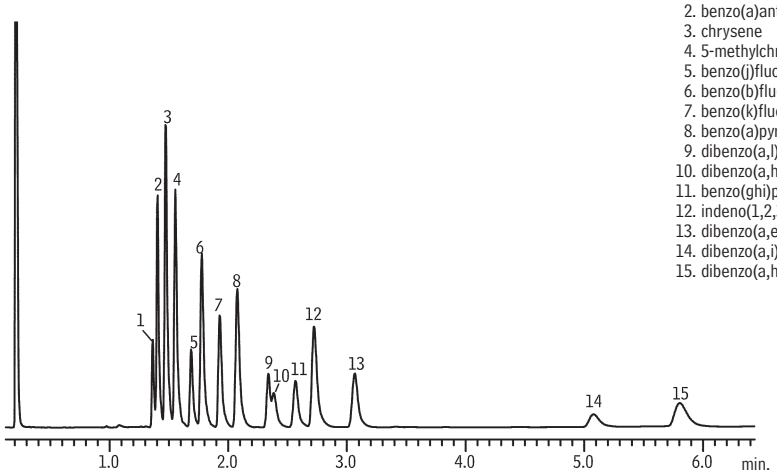
Time (min.)	%B
0	50
1	60
3	100
5	100

Flow: 0.6mL/min.
Temp.: 30°C
Det.: UV @ 254nm

EU 256/2005 Polycyclic Aromatic Hydrocarbons on Pinnacle® DB PAH

NEW!

Peak List:
1. cyclopenta(c,d)pyrene
2. benzo(a)anthracene
3. chrysene
4. 5-methylchrysene
5. benzo(j)fluoranthene
6. benzo(b)fluoranthene
7. benzo(k)fluoranthene
8. benzo(a)pyrene
9. dibenzo(a,l)pyrene
10. dibenzo(a,h)anthracene
11. benzo(ghi)perylene
12. indeno(1,2,3-cd)pyrene
13. dibenzo(a,e)pyrene
14. dibenzo(a,i)pyrene
15. dibenzo(a,h)pyrene



LC_EV0470

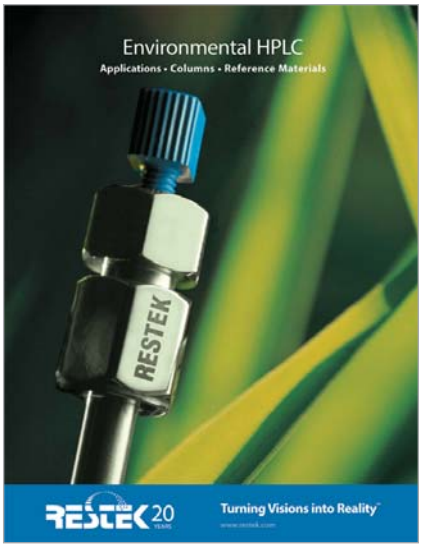
Sample:
Inj.: 2µL
Conc.: 20µg/mL each component
Sample diluent: acetonitrile

Column: **Pinnacle® DB PAH**
Cat.#: 9470252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Conditions:
Mobile phase: A: water
B: acetonitrile

Time (min.)	%B
0	50
1	90
2	95
5	100
7	100

Flow: 0.6mL/min.
Temp.: 30°C
Det.: UV @ 254nm



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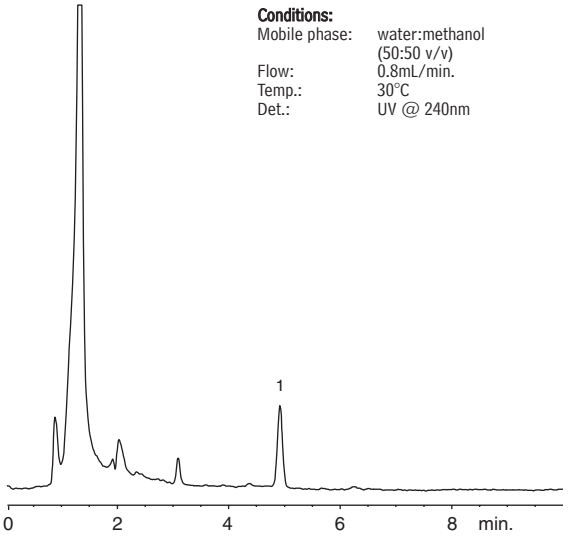
Allicin in Garlic Tablets on Pinnacle® II C18

Peak List:
1. allicin

Sample:
Inj.: 20µL
Conc.: 1.2mg/mL garlic tablet in water
Solvent: deionized water

Column: Pinnacle® II C18
Cat.#: 9214565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: water:methanol (50:50 v/v)
Flow: 0.8mL/min.
Temp.: 30°C
Det.: UV @ 240nm



LC_0174

Phenethyl Glucosinolate on Ultra Aqueous C18

Peak List:
1. phenethyl glucosinolate

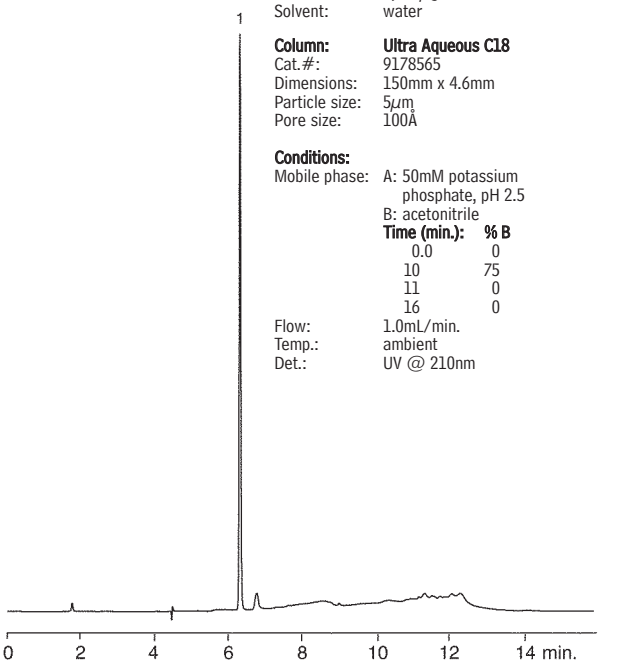
Sample:
Inj.: 10µL
Conc.: 1,000µg/mL
Solvent: water

Column: Ultra Aqueous C18
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A: 50mM potassium phosphate, pH 2.5
B: acetonitrile

Time (min.):	% B
0.0	0
10	75
11	0
16	0

Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 210nm



LC_0166

Phenolics in Echinacea on Pinnacle® II C18

Sample:
Inj.: 10µL
Conc.: 6.7mg/mL *Echinacea* capsule contents in sample diluent
Solvent: ethanol:water (70:30, v/v)
Sample temp.: 25°C

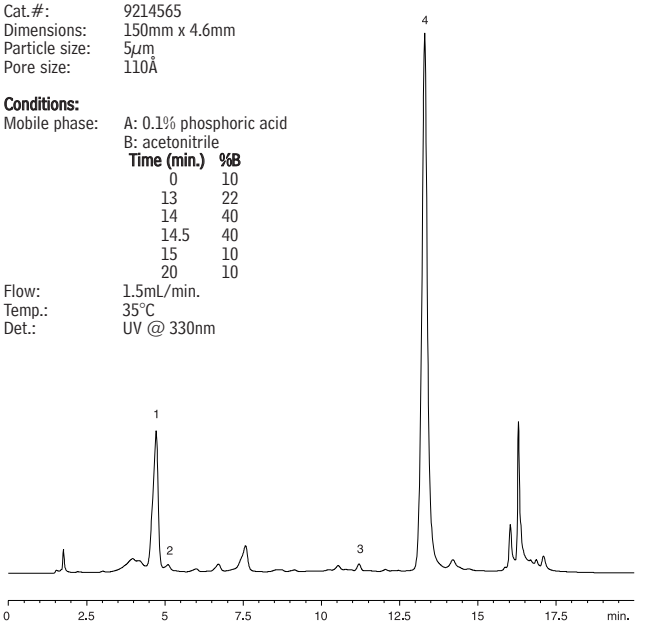
Column: Pinnacle® II C18
Cat.#: 9214565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: A: 0.1% phosphoric acid
B: acetonitrile

Time (min.)	%B
0	10
13	22
14	40
14.5	40
15	10
20	10

Flow: 1.5mL/min.
Temp.: 35°C
Det.: UV @ 330nm

Peak List:
1. caftaric acid
2. chlorogenic acid
3. echinacoside
4. cichoric acid



LC_0195

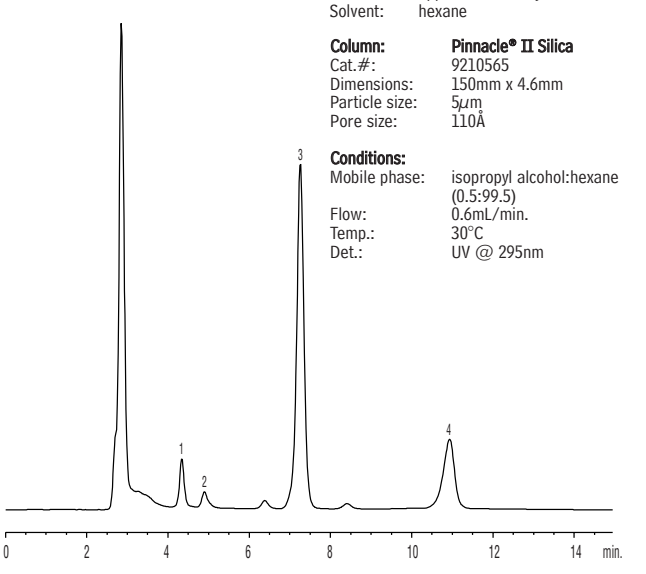
Tocopherols in Soy Oil on Pinnacle® II Silica

Peak List:
1. α-tocopherol
2. β-tocopherol
3. γ-tocopherol
4. δ-tocopherol

Sample:
Inj.: 10µL
Conc.: approx. 1.25% soy oil
Solvent: hexane

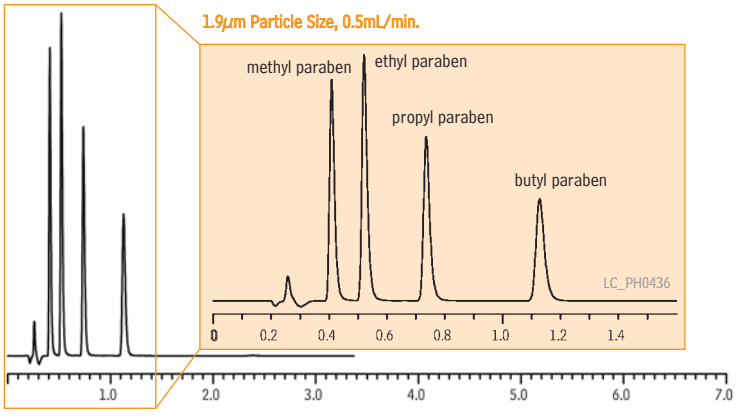
Column: Pinnacle® II Silica
Cat.#: 9210565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: isopropyl alcohol:hexane (0.5:99.5)
Flow: 0.6mL/min.
Temp.: 30°C
Det.: UV @ 295nm



LC_0197

Parabens on Pinnacle® DB C18 (1.9µm)



Peak List:
1. methyl paraben
2. ethyl paraben
3. propyl paraben
4. butyl paraben

Column:	**Pinnacle® DB C18**
Cat.#:	9414252
Dimensions:	50mm x 2.1mm
Particle size:	1.9µm
Pore size:	140Å

Sample:

Inj.:	2µL
Conc.:	~ 100µg/mL each component
Sample diluent:	mobile phase

Conditions:

Mobile phase:	0.1% acetic acid: acetonitrile (50:50) isocratic
Flow:	0.5mL/min.
Temp.:	ambient
Det.:	UV @ 254nm



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literature

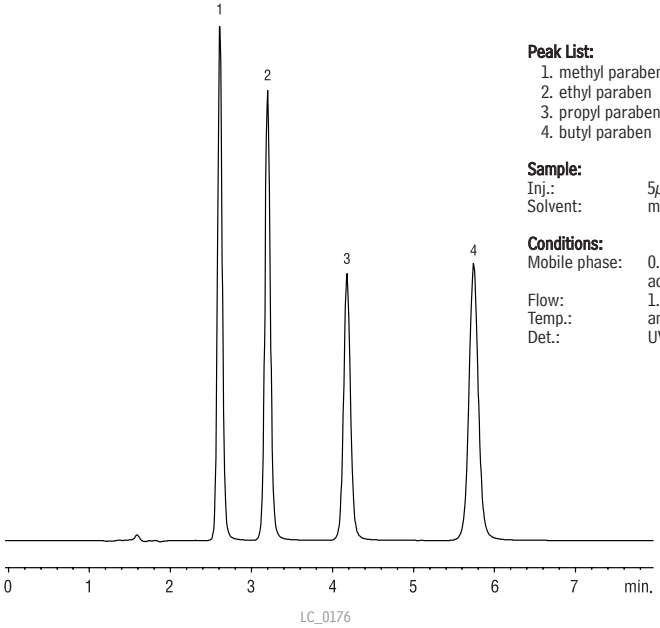
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Applications Note
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Parabens on Pinnacle® II C8

Column:	**Pinnacle® II C8**
Cat.#:	9213565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	110Å



Peak List:

	Conc. (µg/mL)
1. methyl paraben	10
2. ethyl paraben	20
3. propyl paraben	30
4. butyl paraben	40

Sample:

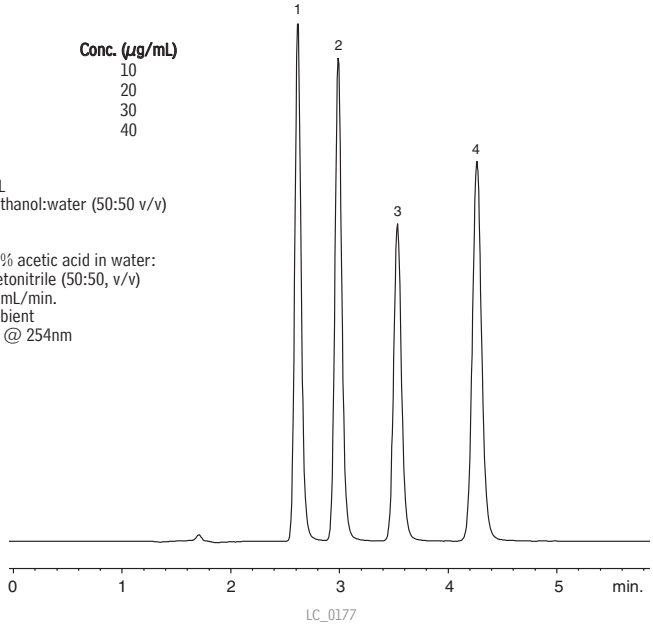
Inj.:	5µL
Solvent:	methanol:water (50:50 v/v)

Conditions:

Mobile phase:	0.1% acetic acid in water: acetonitrile (50:50, v/v)
Flow:	1.0mL/min.
Temp.:	ambient
Det.:	UV @ 254nm

Parabens on Pinnacle® II Phenyl

Column:	**Pinnacle® II Phenyl**
Cat.#:	9215565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	110Å



Vitamins (Fat Soluble) on Ultra C18

Peak List:	Conc. (mg/mL)
1. solvent front	n/a
2. menadione (vitamin K3)	0.45
3. all-*trans*-retinol (vitamin A)	0.34
4. vitamin D3	0.4
5. unknown	n/a
6. α tocopherol (vitamin E)	2.4
7. α tocopherol acetate (vitamin E acetate)	2.4
8. unknown	n/a
9. phylloquinone (vitamin K1)	0.84

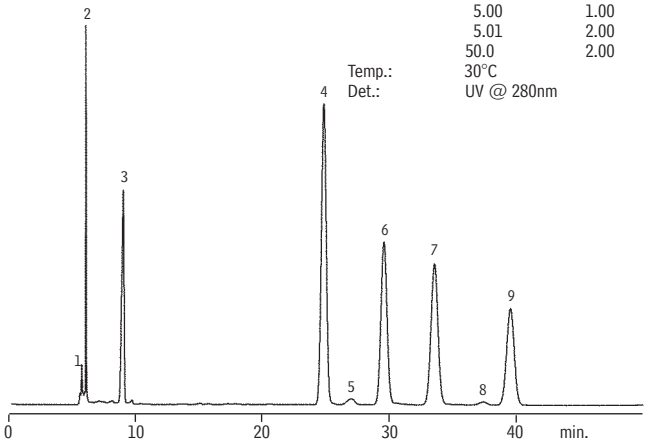
Sample:
Solvent: diethyl ether

Column: **Ultra C18**
Cat.#: 9174575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: acetonitrile:methanol (90:10, v/v)

Time (min.)	Flow (mL/min.)
1.00	1.00
5.00	1.00
5.01	2.00
50.0	2.00

Temp.: 30°C
Det.: UV @ 280nm



LC_0144

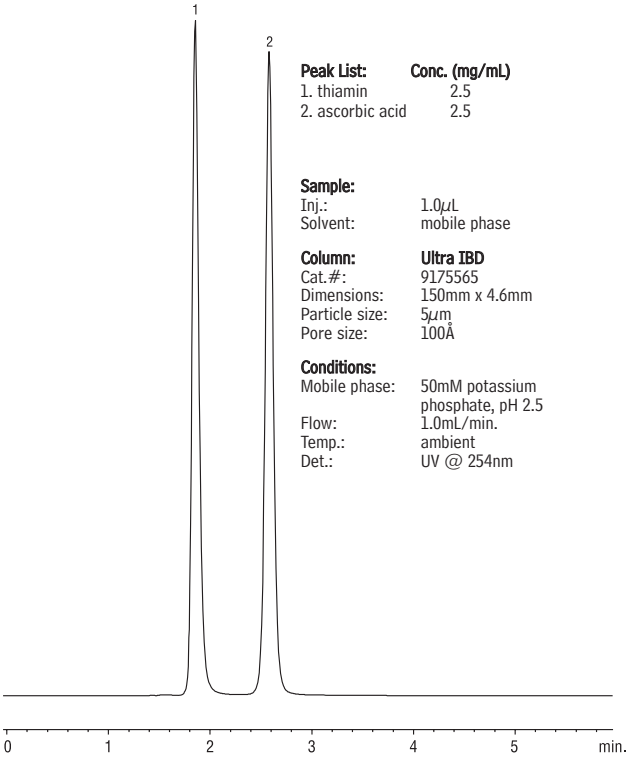
Vitamins Thiamin (Vitamin B1) and Ascorbic Acid (Vitamin C) on Ultra IBD

Peak List:	Conc. (mg/mL)
1. thiamin	2.5
2. ascorbic acid	2.5

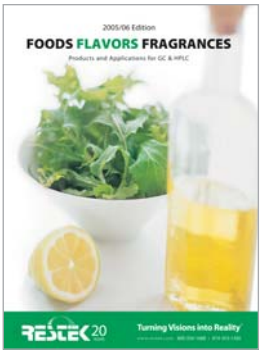
Sample:
Inj.: 1.0µL
Solvent: mobile phase

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 50mM potassium phosphate, pH 2.5
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 254nm



LC_0227



free literature

Foods, Flavors, & Fragrances

A brief summary of many applications and chromatography products

This 64-page guide is a good overview of the foods-flavors-fragrances applications for which Restek GC columns, HPLC columns, and analytical reference mixes have been used.

Download your free copy from **www.restek.com**.

Catalog
lit. cat.# 59260A

Phenolic Antioxidants on Pinnacle® II C18

Peak List:	Conc. (ppm)
1. propyl gallate	168
2. TBHQ	182
3. 2-BHA + 3-BHA	197
4. BHT	193

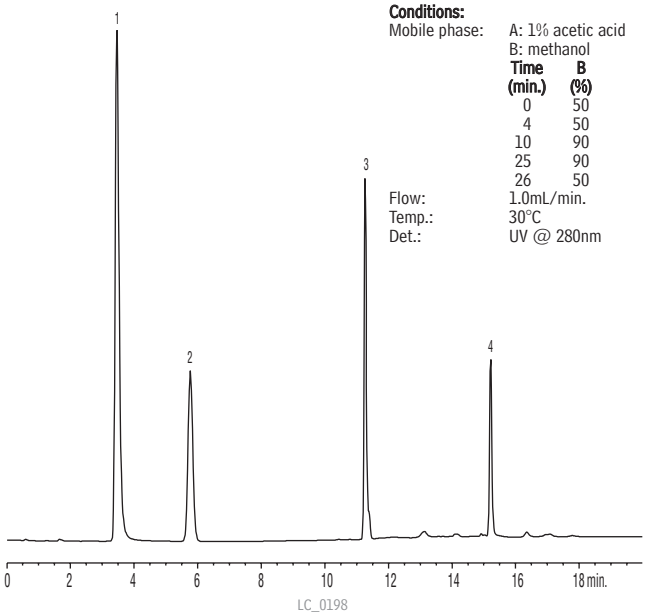
Sample:
Inj.: 10µL
Solvent: methanol

Column: **Pinnacle® II C18**
Cat.#: 9214565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: A: 1% acetic acid
B: methanol

Time (min.)	B (%)
0	50
4	50
10	90
25	90
26	50

Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 280nm



LC_0198

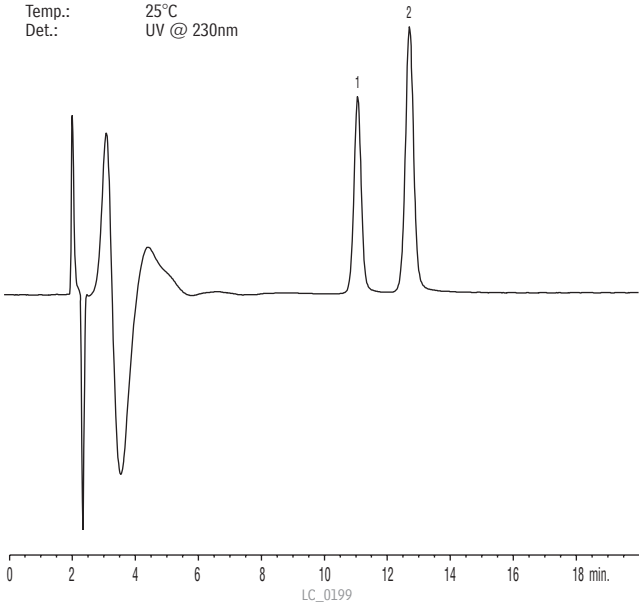
Sorbic and Benzoic Acids on Pinnacle® II Phenyl

Column: **Pinnacle® II Phenyl**
Cat.#: 9215565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: 1% acetic acid:methanol (80:20)
Flow: 1.0mL/min.
Temp.: 25°C
Det.: UV @ 230nm

Peak List:
1. sorbic acid
2. benzoic acid

Sample:
Inj.: 10µL
Conc.: 100ppm each
Solvent: methanol



LC_0199

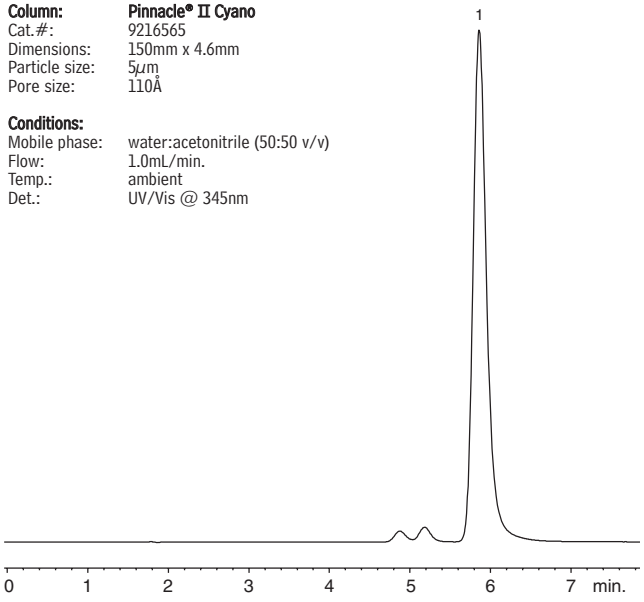
Black Pepper: Piperine on Pinnacle® II Cyano

Peak List:
1. piperine

Sample:
Inj.: 5µL
Conc.: 100µg/mL
Solvent: methanol

Column: **Pinnacle® II Cyano**
Cat.#: 9216565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: water:acetonitrile (50:50 v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV/Vis @ 345nm



LC_0181

Capsaicinoids: Heat Level Assay for Habeñero Nuggets on Pinnacle® II C18

Peak List:
1. ethanol
2. unknown
3. capsaicin
4. dihydrocapsaicin

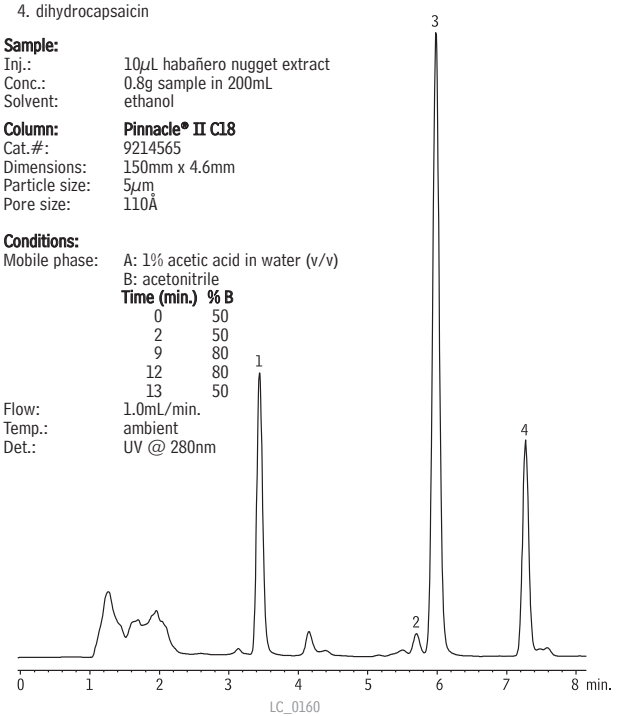
Sample:
Inj.: 10µL habañero nugget extract
Conc.: 0.8g sample in 200mL
Solvent: ethanol

Column: **Pinnacle® II C18**
Cat.#: 9214565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: A: 1% acetic acid in water (v/v)
B: acetonitrile

Time (min.)	% B
0	50
2	50
9	80
12	80
13	50

Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 280nm



LC_0160

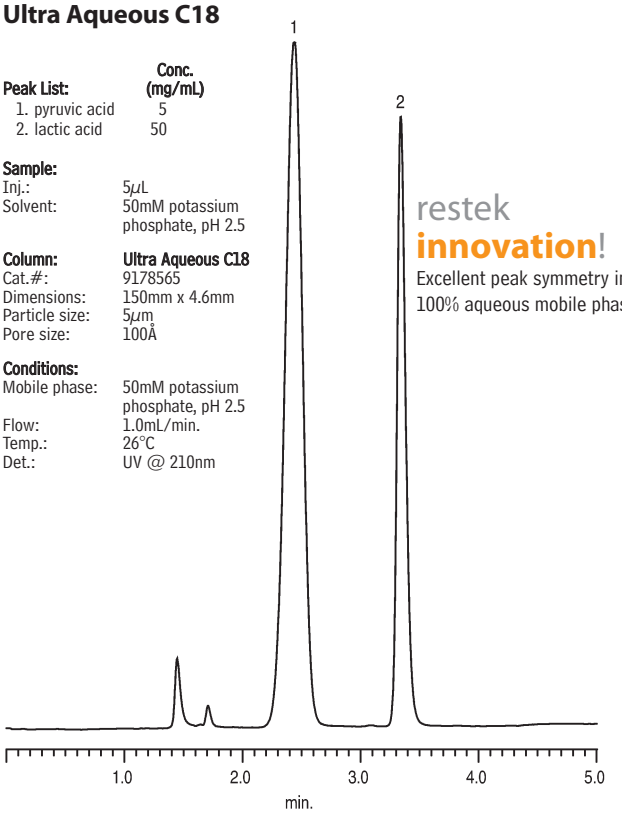
Carboxylic Acids (Pyruvic and Lactic) on Ultra Aqueous C18

Peak List:	Conc. (mg/mL)
1. pyruvic acid	5
2. lactic acid	50

Sample:
Inj.: 5µL
Solvent: 50mM potassium phosphate, pH 2.5

Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 50mM potassium phosphate, pH 2.5
Flow: 1.0mL/min.
Temp.: 26°C
Det.: UV @ 210nm



LC_0297

restek
innovation!
Excellent peak symmetry in 100% aqueous mobile phase!

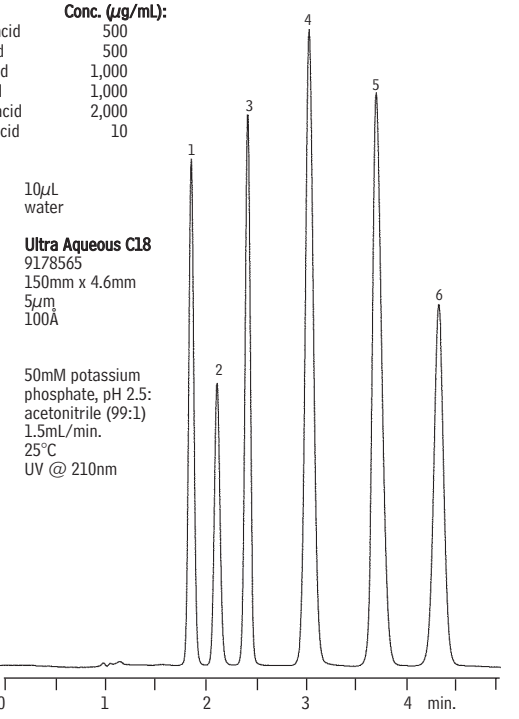
Carboxylic Acids on Ultra Aqueous C18

Peak List:	Conc. (µg/mL):
1. malonic acid	500
2. lactic acid	500
3. acetic acid	1,000
4. citric acid	1,000
5. succinic acid	2,000
6. fumaric acid	10

Sample:
Inj.: 10µL
Solvent: water

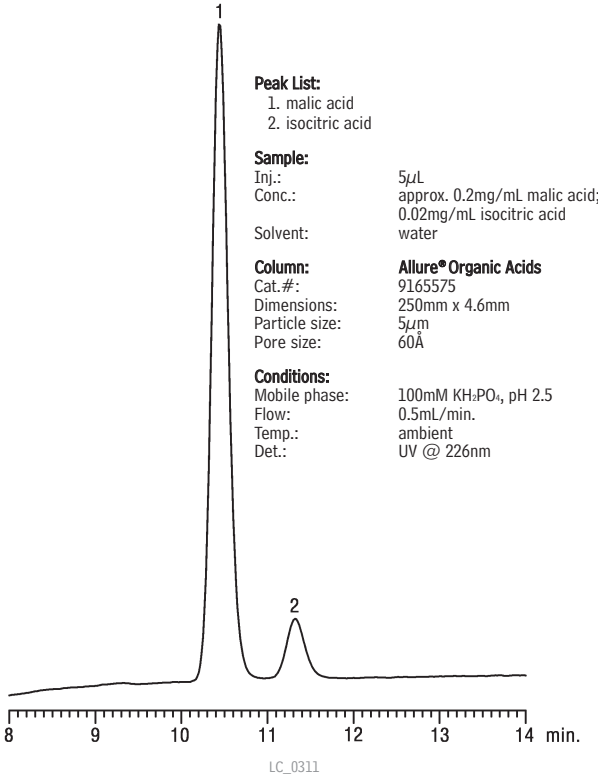
Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 50mM potassium phosphate, pH 2.5: acetonitrile (99:1)
Flow: 1.5mL/min.
Temp.: 25°C
Det.: UV @ 210nm



LC_0140

Organic Acids on Allure® Organic Acids



Peak List:
1. malic acid
2. isocitric acid

Sample:
Inj.: 5µL
Conc.: approx. 0.2mg/mL malic acid; 0.02mg/mL isocitric acid
Solvent: water

Column: **Allure® Organic Acids**
Cat.#: 9165575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 100mM KH_2PO_4, pH 2.5
Flow: 0.5mL/min.
Temp.: ambient
Det.: UV @ 226nm

LC_0311

Organic Acids on Allure® Organic Acids

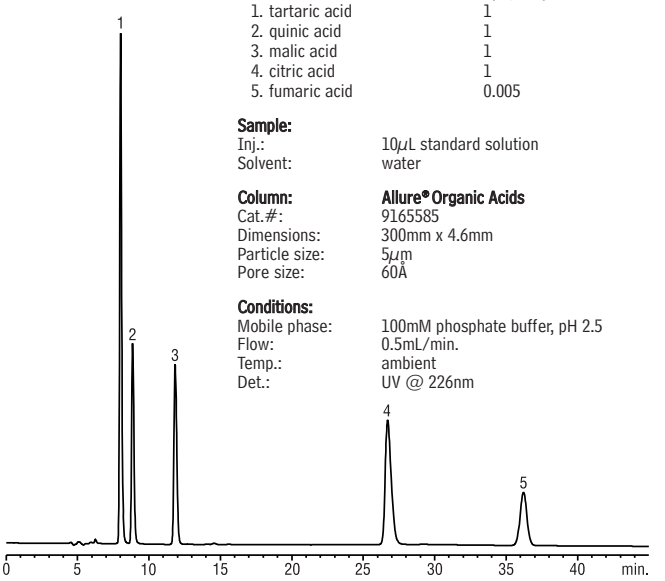
restek
innovation!
Baseline resolution of tartaric and quinic acids in 100% aqueous mobile phase!

Peak List:	Conc. (mg/mL)
1. tartaric acid	1
2. quinic acid	1
3. malic acid	1
4. citric acid	1
5. fumaric acid	0.005

Sample:
Inj.: 10µL standard solution
Solvent: water

Column: **Allure® Organic Acids**
Cat.#: 9165585
Dimensions: 300mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 100mM phosphate buffer, pH 2.5
Flow: 0.5mL/min.
Temp.: ambient
Det.: UV @ 226nm



LC_0238

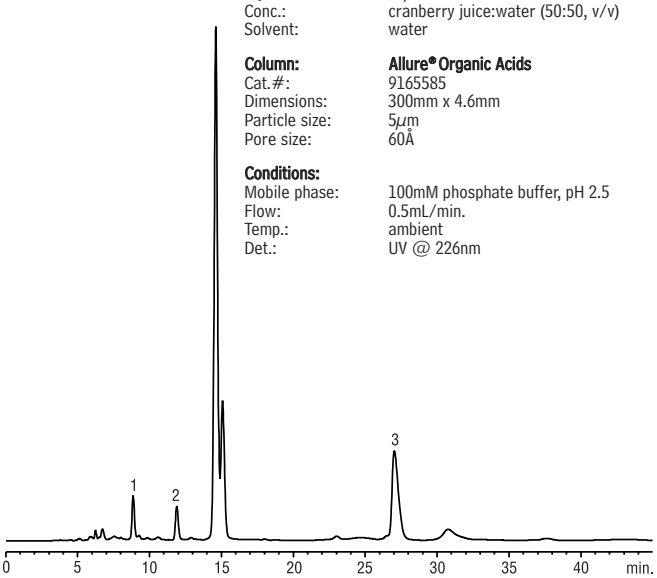
Organic Acids in Cranberry Juice on Allure® Organic Acids

Peak List:
1. quinic acid
2. malic acid
3. citric acid

Sample:
Inj.: 10µL
Conc.: cranberry juice:water (50:50, v/v)
Solvent: water

Column: **Allure® Organic Acids**
Cat.#: 9165585
Dimensions: 300mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 100mM phosphate buffer, pH 2.5
Flow: 0.5mL/min.
Temp.: ambient
Det.: UV @ 226nm



LC_0236

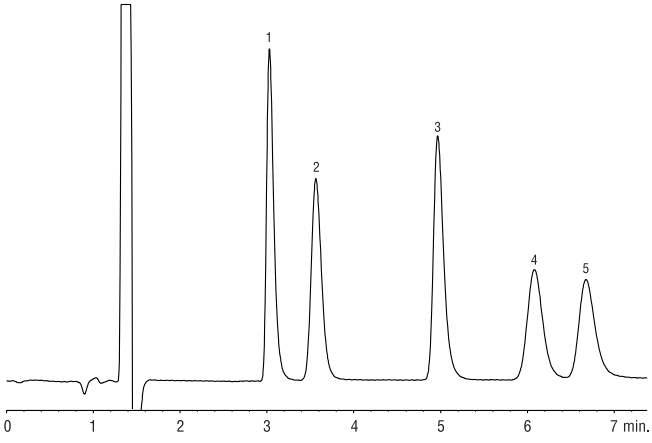
Sugars on Pinnacle® II Amino (3µm)

Peak List:	Conc. (mg/mL)
1. fructose	2.0
2. glucose	2.1
3. sucrose	4.0
4. maltose	4.5
5. lactose	4.4

Sample:
Inj.: 5µL
Solvent: mobile phase

Column: **Pinnacle® II Amino**
Cat.#: 9217365
Dimensions: 150mm x 4.6mm
Particle size: 3µm
Pore size: 110Å

Conditions:
Mobile phase: water:acetonitrile (25:75, v/v)
Flow: 1.5mL/min.
Temp.: 35°C
Det.: refractive index @ 35°C



LC_0223

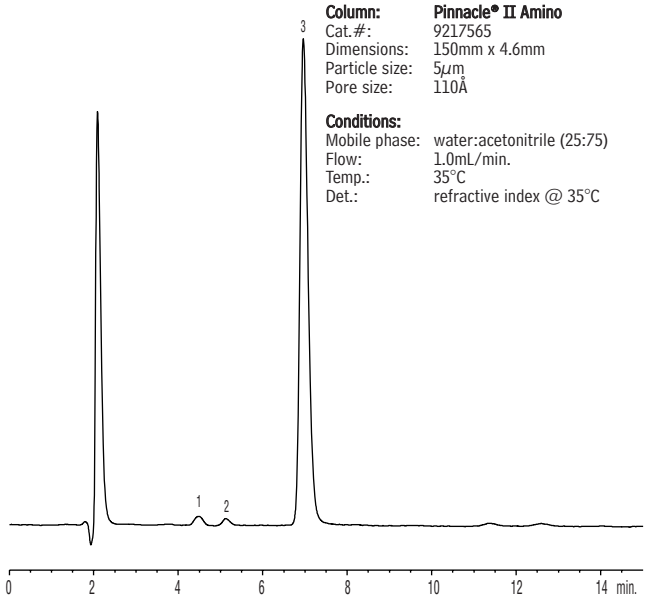
Sugars: Maple Syrup on Pinnacle® II Amino

Peak List:
1. fructose
2. glucose
3. sucrose

Sample:
Inj.: 50.0µL
Conc.: 1% maple syrup in solvent
Solvent: acetonitrile:water (70:30, v/v)

Column: **Pinnacle® II Amino**
Cat.#: 9217565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: water:acetonitrile (25:75)
Flow: 1.0mL/min.
Temp.: 35°C
Det.: refractive index @ 35°C



LC_0205

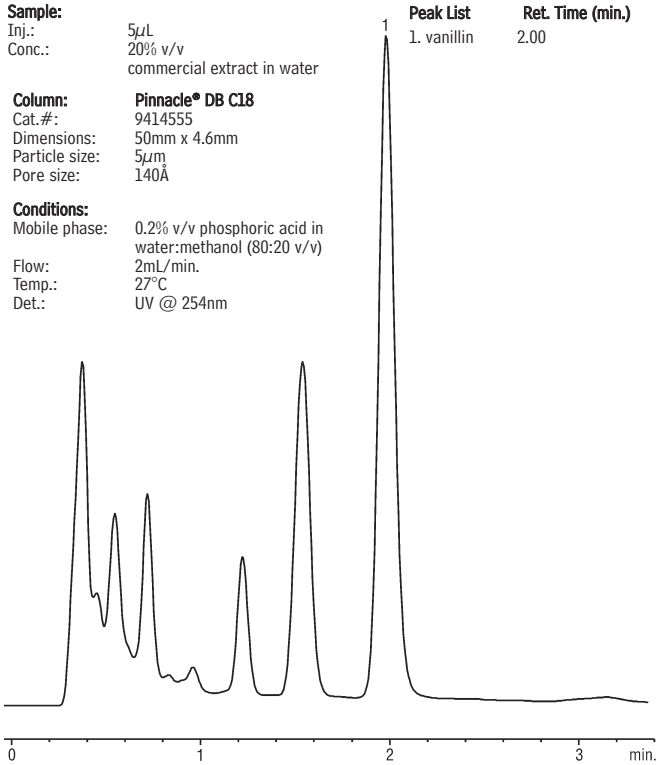
Vanilla Bean Extract on Pinnacle® DB C18 (Fast LC)

Sample:
Inj.: 5µL
Conc.: 20% v/v commercial extract in water

Column: **Pinnacle® DB C18**
Cat.#: 9414555
Dimensions: 50mm x 4.6mm
Particle size: 5µm
Pore size: 140Å

Conditions:
Mobile phase: 0.2% v/v phosphoric acid in water:methanol (80:20 v/v)
Flow: 2mL/min.
Temp.: 27°C
Det.: UV @ 254nm

Peak List	Ret. Time (min.)
1. vanillin	2.00



LC_0252

Vanillin on Ultra C8

Sample:
Inj.: 10mL
Conc.: 5% solution of vanilla extract
Solvent: 40% ethanol

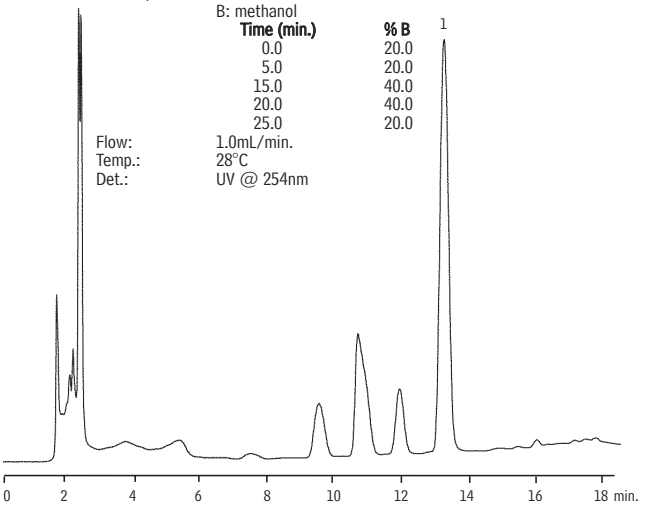
Peak List:
1. vanillin

Column: **Ultra C8**
Cat.#: 9103565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phases: A: 1.2% acetic acid in water
B: methanol

Time (min.)	% B
0.0	20.0
5.0	20.0
15.0	40.0
20.0	40.0
25.0	20.0

Flow: 1.0mL/min.
Temp.: 28°C
Det.: UV @ 254nm



LC_0149

Vanillin and Ethyl Vanillin on Ultra C8

Peak List:	Conc. (mg/mL)
1. vanillin	0.12
2. ethyl vanillin	0.04

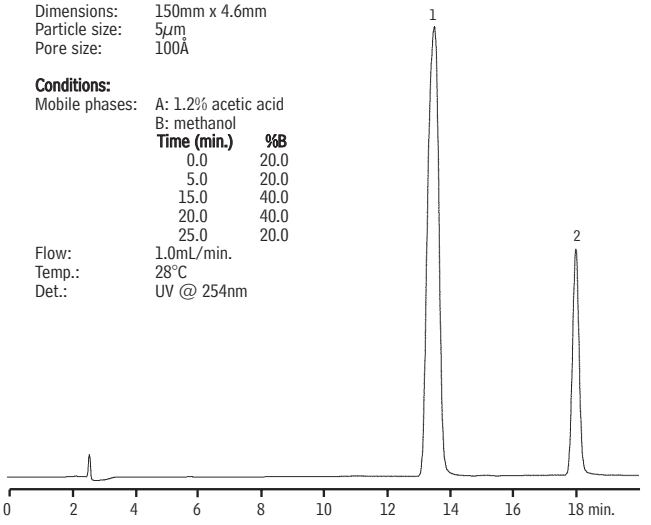
Sample:
Inj.: 10µL
Solvent: 40% ethanol

Column: **Ultra C8**
Cat.#: 9103565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phases: A: 1.2% acetic acid
B: methanol

Time (min.)	%B
0.0	20.0
5.0	20.0
15.0	40.0
20.0	40.0
25.0	20.0

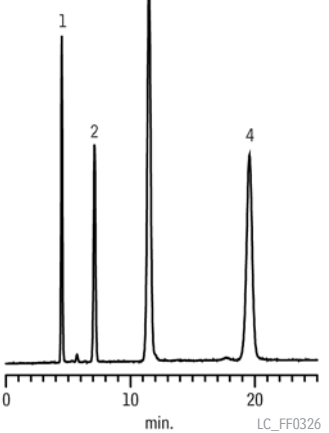
Flow: 1.0mL/min.
Temp.: 28°C
Det.: UV @ 254nm



LC_0148

Sudan Dyes on Ultra Aqueous C18

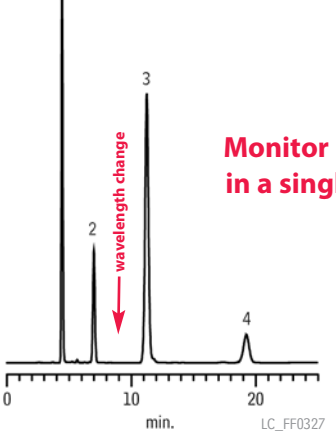
Photodiode Array Detector



LC_FF0326

1. Sudan I
2. Sudan II
3. Sudan III
4. Sudan IV

Fixed Dual Wavelength Detector



LC_FF0327

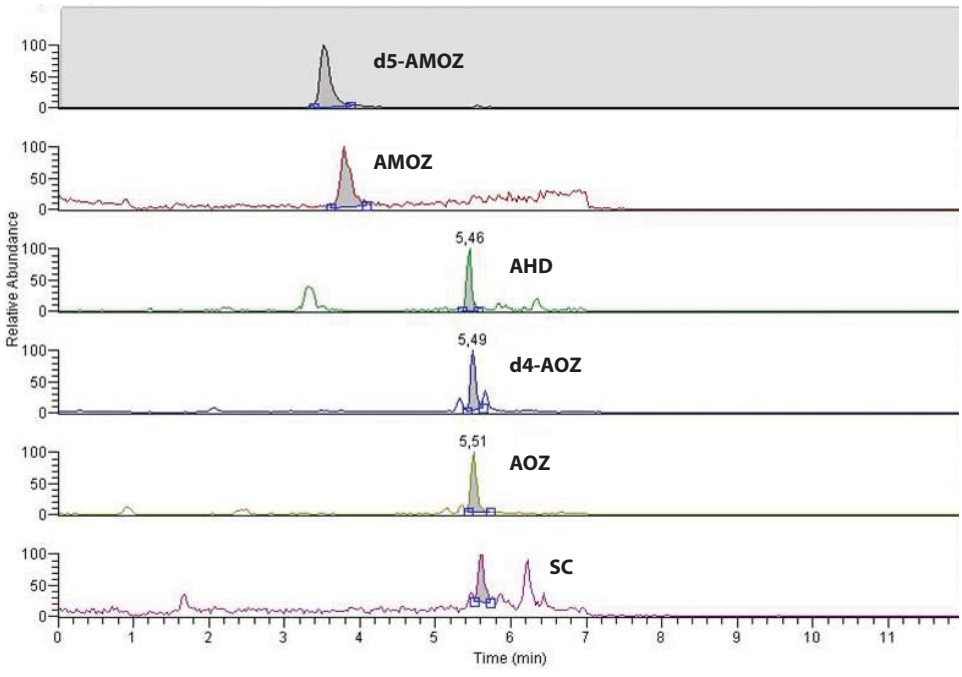
Monitor Sudan I, II, III, and IV in a single, isocratic analysis!

Sample:
Inj.: 20µL, mixture of Sudan I, Sudan II, Sudan III, Sudan IV
Conc.: 20µg/mL each component
Sample diluent: methanol

Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: methanol:water, 97:3
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 476/493/512/357nm (left) or UV @ 488/520nm (right)

Nitrofuran Metabolites by LC/MS/MS on Ultra C18



Peak List:	Conc. (ppb)	Time (min)
1. d5-AMOZ	0.3	3.7
2. AMOZ	0.3	3.8
3. AHD	0.3	5.46
4. d4-AOZ	0.3	5.49
5. AOZ	0.3	5.51
6. SC	0.3	5.6

Column: **Ultra C18**
Cat.#: 9174312
Dimensions: 100mm x 2.1mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: A: 0.05% formic acid in methanol
B: 0.05% formic acid – 5 mM NH_4 formate in water

Time (min)	%B
0	90
2.5	90
5	10
10	10
12	90
15	90

Flow: 200µL/min.
Temp.: 30°C
Det.: MS/MS triple quadrupoles (Thermo Scientific Discovery)

Analyzer Parameters:
Ion source: ESI (electrospray ionization)
Only segment: 15 min.
Polarity: positive
Data type: centroid
Scan mode: SRM product
Scan width (m/z): 0.7
Scan time (s): 0.25
Peak width: Q1: within 0.7
Q2: 0.7
Collision gas pressure (mTorr): 1.5 (argon)
Divert valve: active, with 3 positions
Positions-1° 2 min., 2° 8 min., 3° 5 min.

Analyte	Prec. Ion	Prod. Ion	Collision E	Tube Lens
AOZ	236	134	12 V	120
AMOZ	335	291	10 V	100
SC	209	166	12 V	80
AHD	249	134	12 V	110

AMOZ = 3-amino-5-morpholinomethyl-2-oxazolidinone
AHD = 1-aminohydantoin hydrochloride
AOZ = 3-amino-2-oxazolidinone
SC = semicarbazide

for **more** info

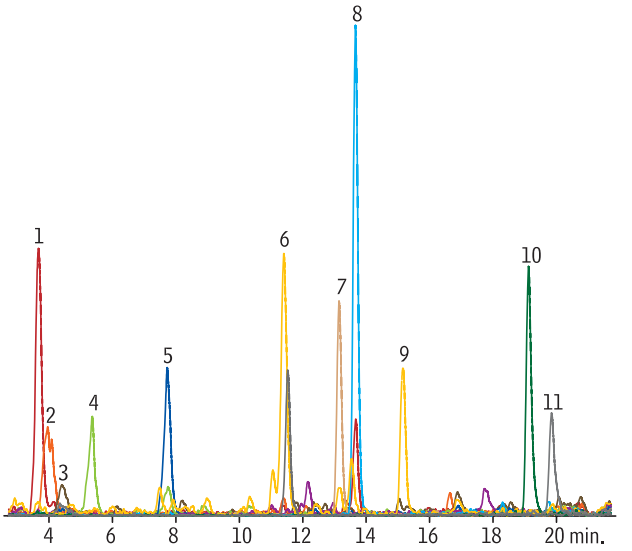
For more information, review Restek Advantage 2007 vol.3, page 11, on our website.

lit. cat.# 580135

Carbamates in Orange Oil on Ultra Carbamate

NEW!

Peak List:
1. aldicarb sulfone
2. aldicarb sulfoxide
3. oxamyl
4. methomyl
5. 3-hydroxycarbofuran
6. aldicarb
7. propoxur
8. carbofuran
9. carbaryl
10. methiocarb
11. BDMC (IS)



LC_FF0472

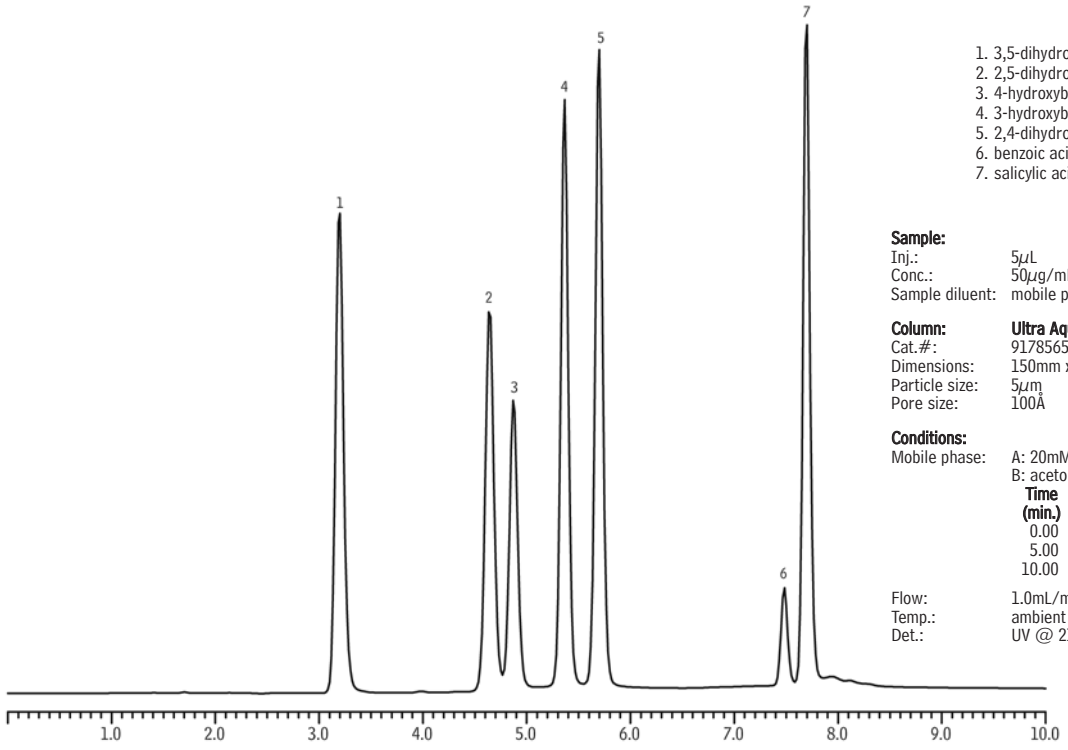
Sample:	531.1 Carbamate Pesticide Calibration Mix (cat.# 32273) and Internal Standard 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (cat.# 32274) 50:50 spiked into unprocessed orange oil at 10ppm
Inj.:	3µL
Conc.:	10ppm
Sample diluent:	methanol
Matrix:	orange oil
Column:	**Ultra Carbamate**
Cat. #:	9177352
Dimensions:	50mm x 2.1mm
Particle size:	3µm
Pore size:	100Å
Conditions:	
Mobile phase:	A: 2mM ammonium acetate:methanol, 90:10 B: 2mM ammonium acetate:methanol, 10:90

Time (min.)	**%B**
0	20
20	100
25	100

Flow:	200µL/min.
Temp.:	ambient
Det.:	Leco Unique® LC/TOFMS
Interface:	ESI
Ion mode:	Positive
Temp.:	130°C
Nebulizer pressure:	100kPa
Desolvation gas (N2):	4,000cc/min.
Interface temperature:	120°C
Nozzle:	(+) 62V
Capillary:	(+) 2.75kV



Hydroxybenzoic Acids on Ultra Aqueous C18



LC_PH0400

1. 3,5-dihydroxybenzoic acid
2. 2,5-dihydroxybenzoic acid
3. 4-hydroxybenzoic acid
4. 3-hydroxybenzoic acid
5. 2,4-dihydroxybenzoic acid
6. benzoic acid
7. salicylic acid

Sample:
Inj.: 5µL
Conc.: 50µg/mL each component
Sample diluent: mobile phase

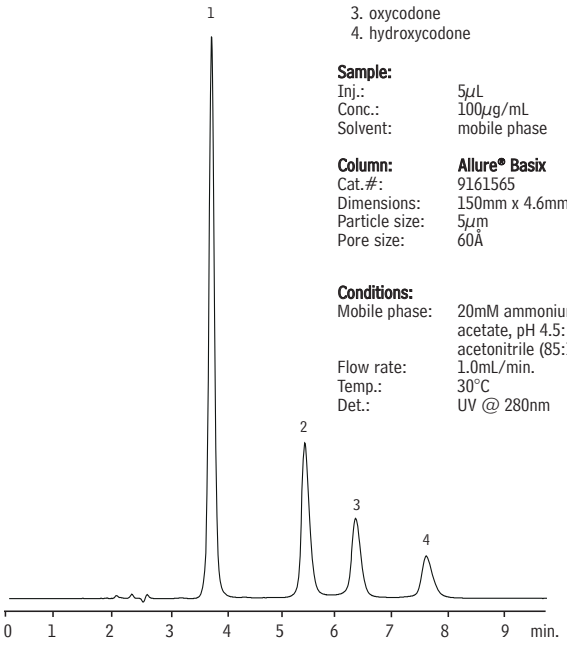
Column: **Ultra Aqueous C18**
Cat.#: 9178565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A: 20mM potassium phosphate (pH 2.5);
B: acetonitrile

Time (min.)	%B
0.00	20
5.00	50
10.00	50

Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 210nm

Analgesic Acetaminophen and Narcotic Analgesics on Allure® Basix



LC_0082

Peak List:
1. acetaminophen
2. codeine
3. oxycodone
4. hydroxycodone

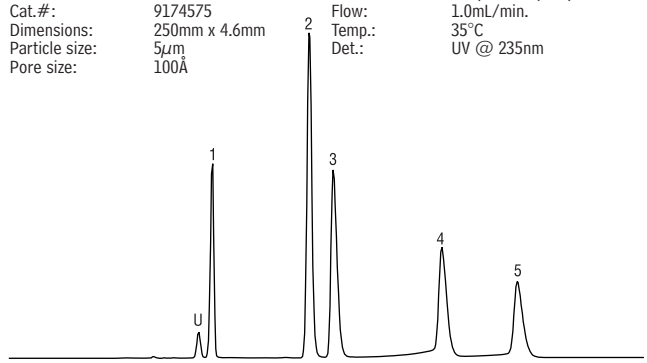
Sample:
Inj.: 5µL
Conc.: 100µg/mL
Solvent: mobile phase

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 4.5: acetonitrile (85:15, v/v)
Flow rate: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 280nm

Analgesic Acetaminophen and Narcotic Analgesics on Ultra C18

Peak List:	Conc. (µg/mL)
U. unknown	unknown
1. morphine sulfate	204
2. acetaminophen	92
3. codeine phosphate	216
4. oxycodone HCl	206
5. hydrocodone bitartrate	218



LC_0221

Sample:
Inj.: 4.0µL
Sample: raw material mix
Solvent: mobile phase

Column: **Ultra C18**
Cat.#: 9174575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A: 10mm potassium phosphate, pH 2.8
B: acetonitrile:methanol, (90:10, v/v)
(85A:15B, v/v)
Flow: 1.0mL/min.
Temp.: 35°C
Det.: UV @ 235nm

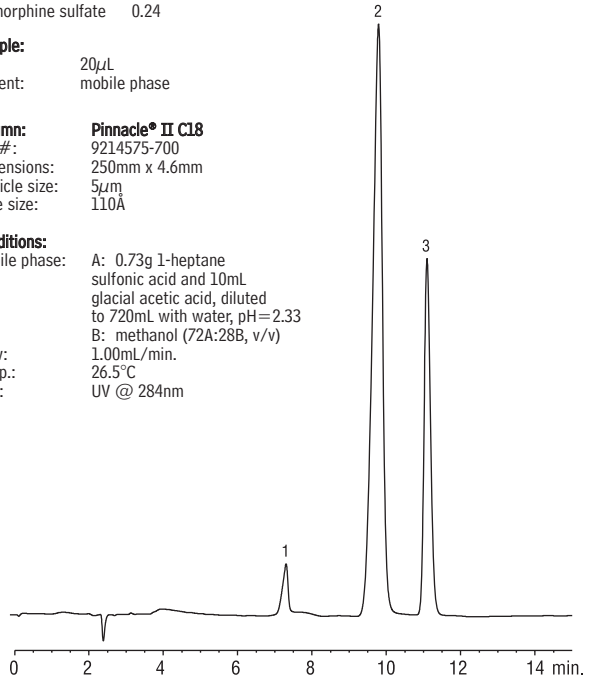
Narcotic Analgesic Morphine Sulfate Raw Material - USP 25: Resolution Solution on Pinnacle® II C18

Peak List:	Conc. (µg/mL)
1. unknown	unknown
2. phenol	0.15
3. morphine sulfate	0.24

Sample:
Inj.: 20µL
Solvent: mobile phase

Column: Pinnacle® II C18
Cat.#: 9214575-700
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: A: 0.73g 1-heptane sulfonic acid and 10mL glacial acetic acid, diluted to 720mL with water, pH=2.33
B: methanol (72A:28B, v/v)
Flow: 1.00mL/min.
Temp.: 26.5°C
Det.: UV @ 284nm



LC_0209

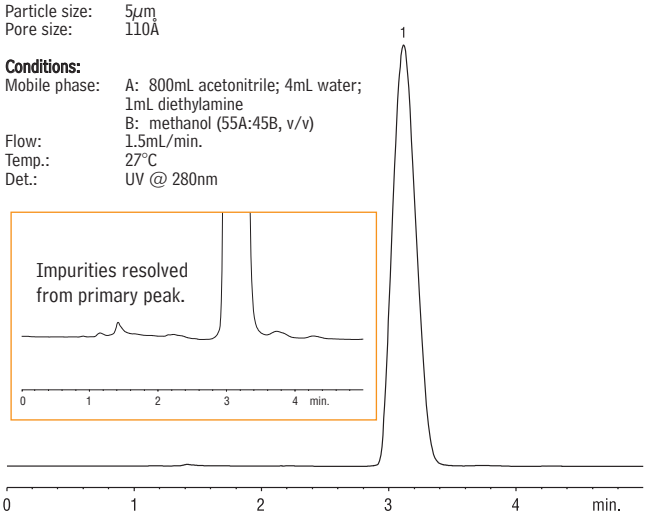
Narcotic Analgesic Hydrocodone Bitartrate by USP 25 on Pinnacle® II Silica

Peak List:	Ret. Time (min.)	Inj. % RSD (n=5)
1. hydrocodone bitartrate	3.1	0.37%

Sample:
Inj.: 20µL
Conc.: 1µg/mL
Sample: assay standard
Solvent: mobile phase

Column: Pinnacle® II Silica
Cat.#: 9210575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: A: 800mL acetonitrile; 4mL water; 1mL diethylamine
B: methanol (55A:45B, v/v)
Flow: 1.5mL/min.
Temp.: 27°C
Det.: UV @ 280nm



LC_0211

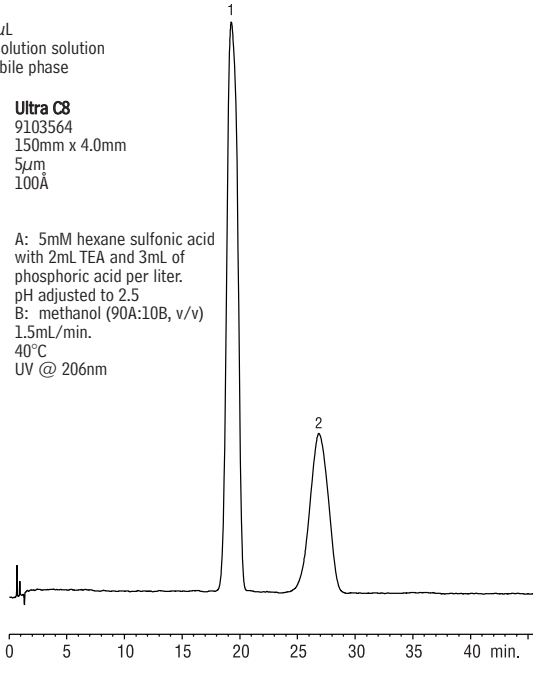
Narcotic Analgesic Oxycodone HCl Raw Material by USP 25: Resolution Solution on Ultra C8

Peak List:	Conc. (µg/mL)	Ret. Time (min.)	RRT	Tailing	Res.
1. codeine phosphate	13	19.3	0.7	1.1	—
2. oxycodone HCl	9	26.8	1.0	0.99	3.3

Sample:
Inj.: 10µL
Sample: resolution solution
Solvent: mobile phase

Column: Ultra C8
Cat.#: 9103564
Dimensions: 150mm x 4.0mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: A: 5mM hexane sulfonic acid with 2mL TEA and 3mL of phosphoric acid per liter. pH adjusted to 2.5
B: methanol (90A:10B, v/v)
Flow: 1.5mL/min.
Temp.: 40°C
Det.: UV @ 206nm



LC_0213

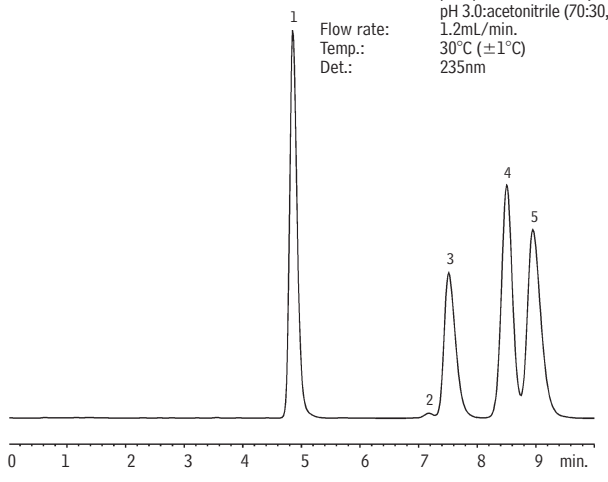
Antiarrhythmic Calcium Channel Blockers on Ultra Cyano

Peak List:
1. diltiazem
2. nifedipine impurity
3. verapamil
4. nifedipine
5. nicardipine

Sample:
Inj.: 5µL
Conc.: 100mg/mL
Solvent: acetonitrile:water (1:1)

Column: Ultra Cyano
Cat.#: 9106565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 20mM potassium phosphate monobasic, pH 3.0:acetonitrile (70:30, v/v)
Flow rate: 1.2mL/min.
Temp.: 30°C (±1°C)
Det.: 235nm



LC_0062

Digitalis Extracts/Derivatives on Ultra PFP Propyl Cartridge (Fast LC)

Peak List:	Conc.	Ret. Time (min.)
1. digoxigenin	100µg/mL	0.40
2. gitoxigenin	100µg/mL	0.80
3. digoxin	100µg/mL	1.10
4. gitoxin	~10µg/mL	2.20
5. digitoxin	100µg/mL	2.60

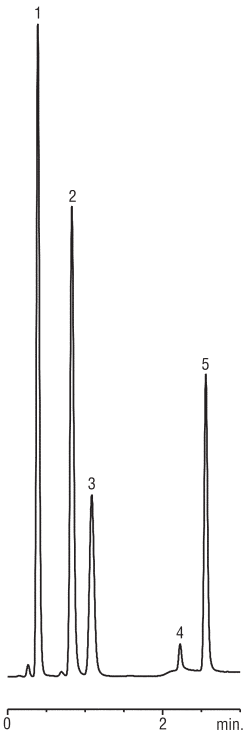
Sample:
Inj.: 10µL
Solvent: water:acetonitrile (80:20 v/v)

Column: **Ultra PFP Propyl Cartridge**
Dimensions: 30mm x 4.0mm
Particle size: 3µm
Pore size: 100Å

Conditions:
Mobile phase: A: water
B: acetonitrile

Time (min.)	%B
0.0	20
1.5	20
1.51	35
3.0	35
3.1	20

Flow: 2.0mL/min.
Temp.: 27°C
Det.: UV @ 230nm



LC_0250

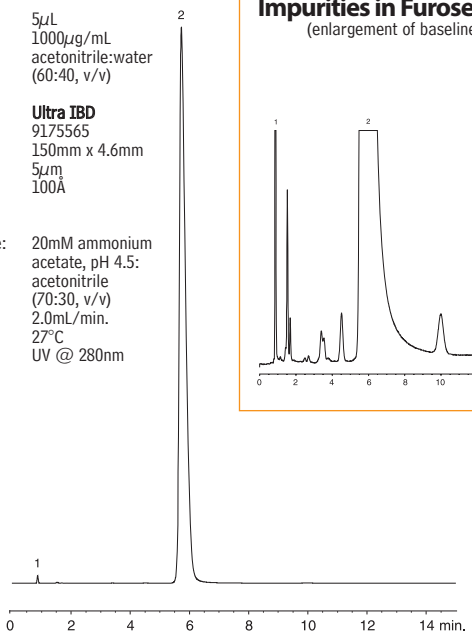
Antiarrhythmic Furosemide on Ultra IBD

Peak List:
1. uracil (marker)
2. furosemide

Sample:
Inj.: 5µL
Conc.: 1000µg/mL
Solvent: acetonitrile:water (60:40, v/v)

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 20mM ammonium acetate, pH 4.5: acetonitrile (70:30, v/v)
Flow rate: 2.0mL/min.
Temp.: 27°C
Det.: UV @ 280nm



Impurities in Furosemide
(enlargement of baseline)

LC_0071

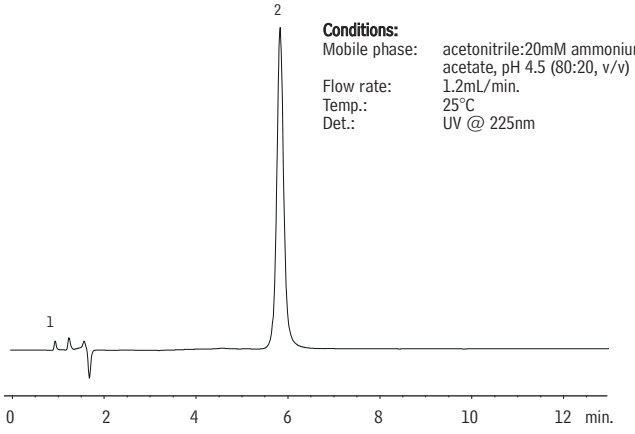
Antiarrhythmic Atenolol on Allure® Basix

Peak List:
1. uracil (marker)
2. atenolol

Sample:
Inj.: 1µL
Conc.: 1mg/mL
Solvent: water:methanol (7:3, v/v)

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: acetonitrile:20mM ammonium acetate, pH 4.5 (80:20, v/v)
Flow rate: 1.2mL/min.
Temp.: 25°C
Det.: UV @ 225nm



LC_0072

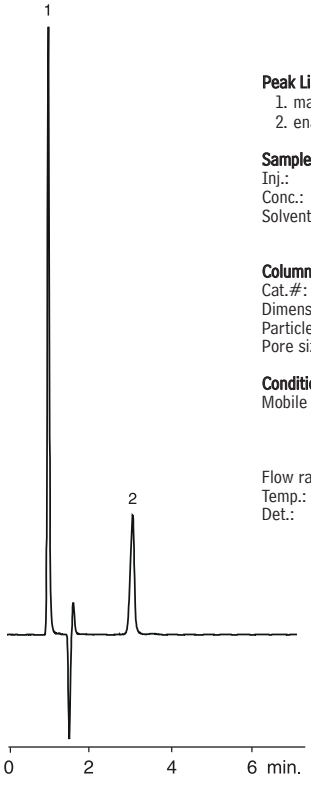
Antiarrhythmic Enalapril Maleate on Allure® Basix

Peak List:
1. maleate
2. enalapril

Sample:
Inj.: 2.5µL
Conc.: 1.1mg/mL
Solvent: methanol:water (30:70)

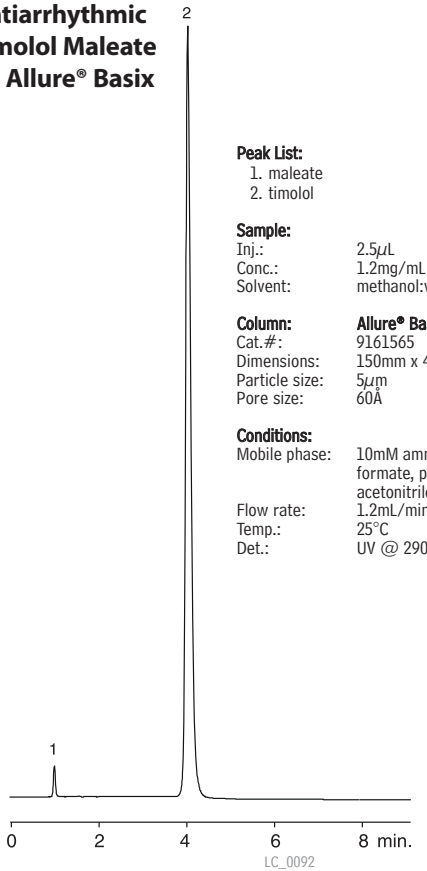
Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (20:80, v/v)
Flow rate: 1.2mL/min.
Temp.: 25°C
Det.: UV @ 225nm



LC_0091

Antiarrhythmic Timolol Maleate on Allure® Basix

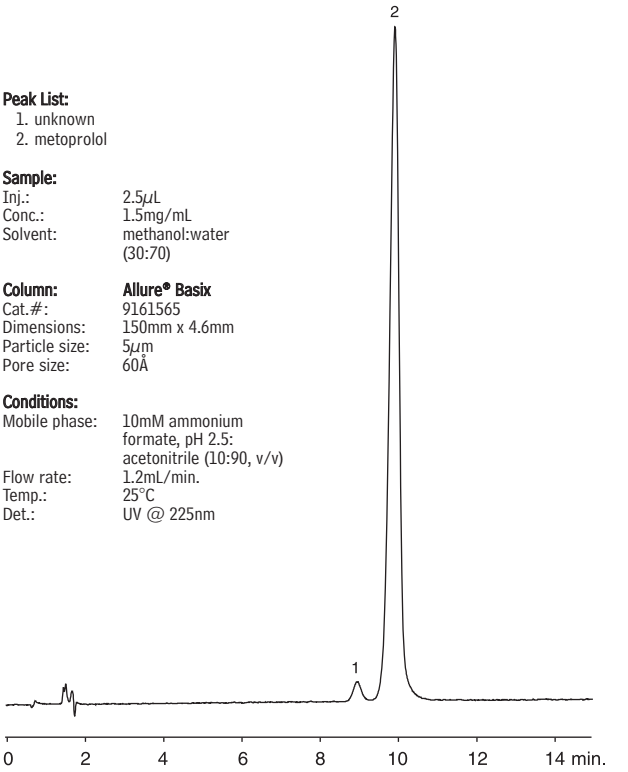


LC_0092

Peak List:
1. maleate
2. timolol

Sample:	
Inj.:	2.5µL
Conc.:	1.2mg/mL
Solvent:	methanol:water (30:70)
Column:	**Allure® Basix**
Cat.#:	9161565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	10mM ammonium formate, pH 2.5: acetonitrile (20:80, v/v)
Flow rate:	1.2mL/min.
Temp.:	25°C
Det.:	UV @ 290nm

Antiarrhythmic Metoprolol on Allure® Basix

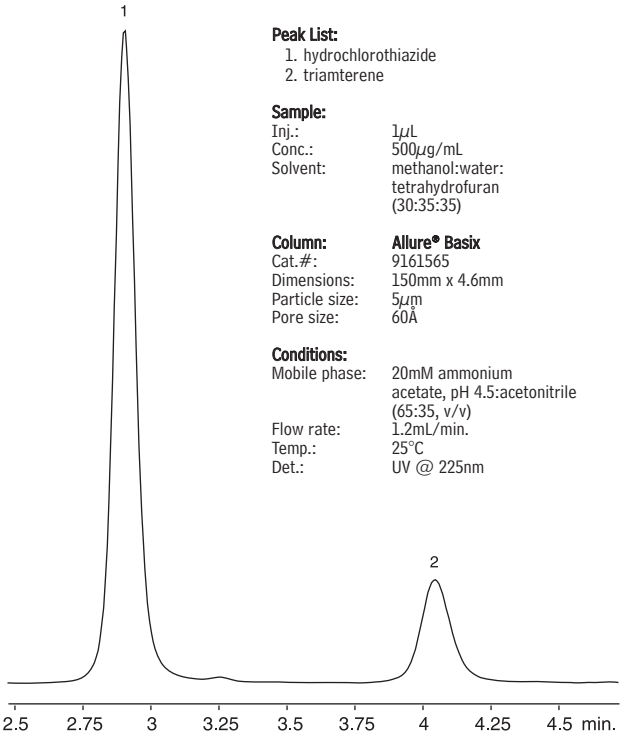


LC_0090

Peak List:
1. unknown
2. metoprolol

Sample:	
Inj.:	2.5µL
Conc.:	1.5mg/mL
Solvent:	methanol:water (30:70)
Column:	**Allure® Basix**
Cat.#:	9161565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	10mM ammonium formate, pH 2.5: acetonitrile (10:90, v/v)
Flow rate:	1.2mL/min.
Temp.:	25°C
Det.:	UV @ 225nm

Antiarrhythmic Triamterene and Hydrochlorothiazide on Allure® Basix

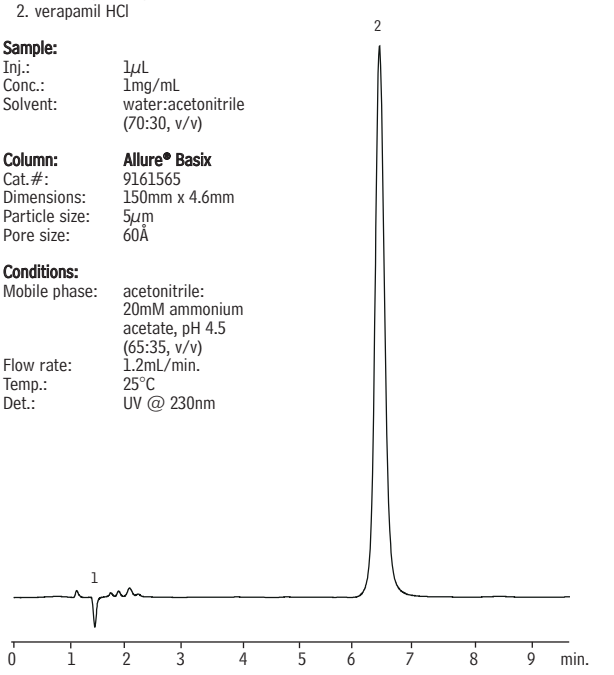


LC_0086

Peak List:
1. hydrochlorothiazide
2. triamterene

Sample:	
Inj.:	1µL
Conc.:	500µg/mL
Solvent:	methanol:water: tetrahydrofuran (30:35:35)
Column:	**Allure® Basix**
Cat.#:	9161565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	20mM ammonium acetate, pH 4.5:acetonitrile (65:35, v/v)
Flow rate:	1.2mL/min.
Temp.:	25°C
Det.:	UV @ 225nm

Antiarrhythmic Verapamil HCl on Allure® Basix



LC_0077

Peak List:
1. toluene (marker)
2. verapamil HCl

Sample:	
Inj.:	1µL
Conc.:	1mg/mL
Solvent:	water:acetonitrile (70:30, v/v)
Column:	**Allure® Basix**
Cat.#:	9161565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	acetonitrile: 20mM ammonium acetate, pH 4.5 (65:35, v/v)
Flow rate:	1.2mL/min.
Temp.:	25°C
Det.:	UV @ 230nm

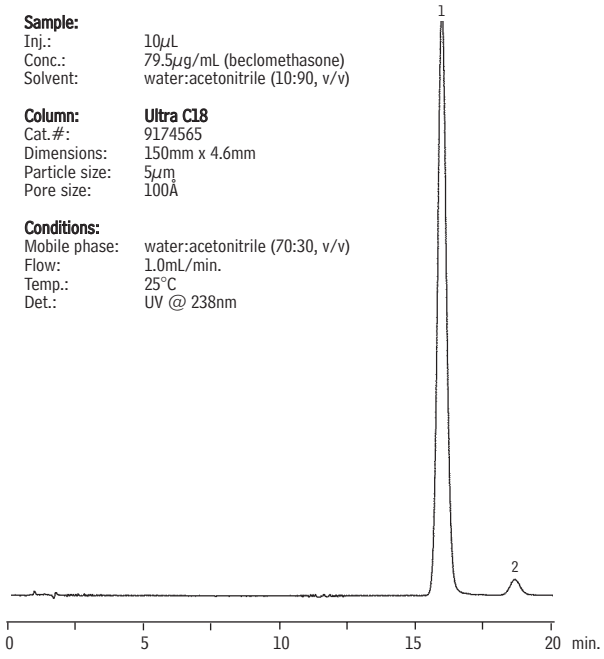
Antiasthmatic Beclomethasone on Ultra C18

Peak List:
1. beclomethasone
2. deschlorobeclomethasone

Sample:
Inj.: 10µL
Conc.: 79.5µg/mL (beclomethasone)
Solvent: water:acetonitrile (10:90, v/v)

Column: **Ultra C18**
Cat.#: 9174565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: water:acetonitrile (70:30, v/v)
Flow: 1.0mL/min.
Temp.: 25°C
Det.: UV @ 238nm



LC_0120

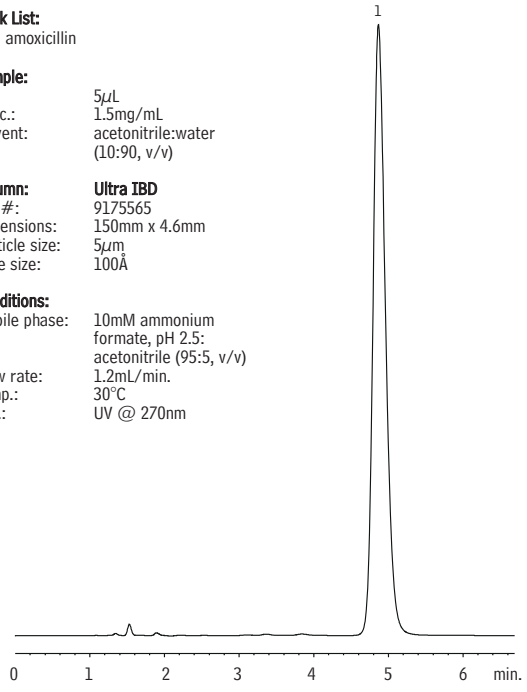
Antibiotic Amoxicillin on Ultra IBD

Peak List:
1. amoxicillin

Sample:
Inj.: 5µL
Conc.: 1.5mg/mL
Solvent: acetonitrile:water (10:90, v/v)

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (95:5, v/v)
Flow rate: 1.2mL/min.
Temp.: 30°C
Det.: UV @ 270nm



LC_0095

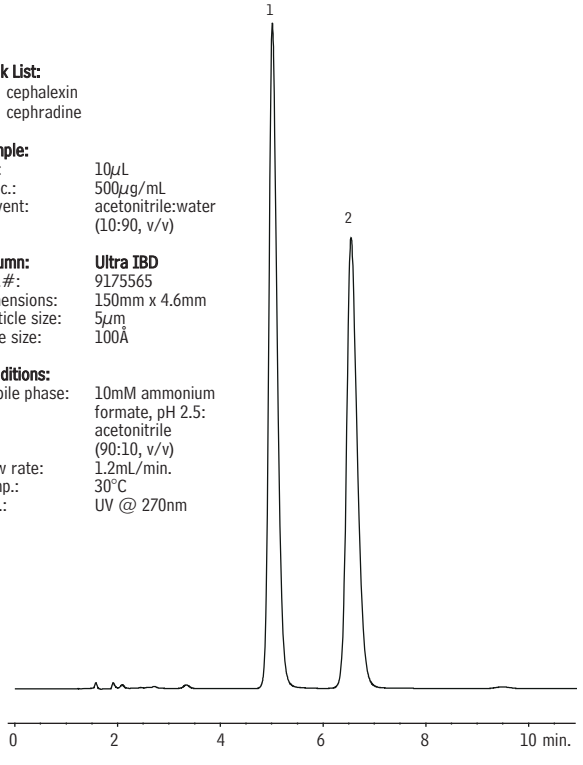
Antibiotic Cephalexin on Ultra IBD

Peak List:
1. cephalexin
2. cephradine

Sample:
Inj.: 10µL
Conc.: 500µg/mL
Solvent: acetonitrile:water (10:90, v/v)

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (90:10, v/v)
Flow rate: 1.2mL/min.
Temp.: 30°C
Det.: UV @ 270nm



LC_0094

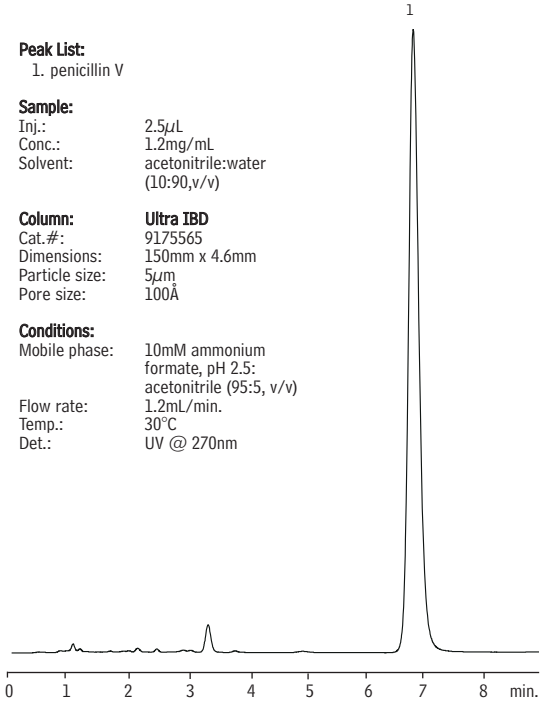
Antibiotic Penicillin V on Ultra IBD

Peak List:
1. penicillin V

Sample:
Inj.: 2.5µL
Conc.: 1.2mg/mL
Solvent: acetonitrile:water (10:90,v/v)

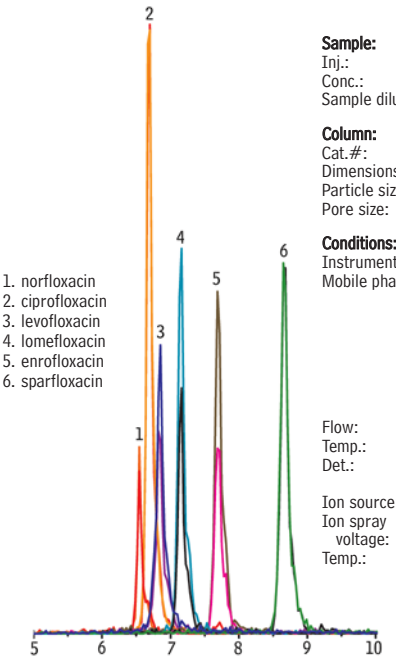
Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (95:5, v/v)
Flow rate: 1.2mL/min.
Temp.: 30°C
Det.: UV @ 270nm



LC_0096

Antibiotic Fluoroquinolones by LC/MS/MS on Allure® PFP Propyl



Sample:
Inj.: 5µL
Conc.: 50ng/mL
Sample diluent: mobile phase

Column: **Allure® PFP Propyl**
Cat.#: 9169352
Dimensions: 50mm x 2.1mm
Particle size: 3µm
Pore size: 60Å

Conditions:
Instrument: Shimadzu Prominence HPLC
Mobile phase: A: 0.1% formic acid in water
B: 0.1% formic acid in acetonitrile

Time (min.)	%B
0.00	10
10.00	90
10.10	10
15.00	10

Flow: 300µL/min.
Temp.: 30°C
Det.: Applied Biosystems/MDS SCIEX API 3200™ MS/MS system
Ion source: Electrospray/TurboIonSpray
Ion spray voltage: positive 4,000V
Temp.: 600°C

LC_PH0426

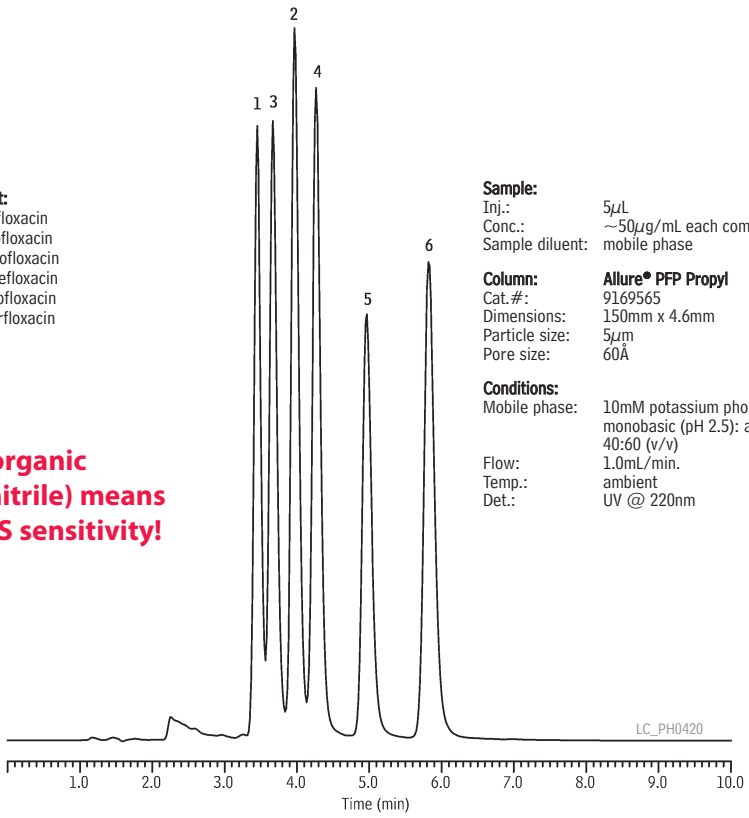
Compound	Precursor Ion	Fragment Ion	Declustering Potential (V)	Collision Energy (V)
1. norfloxacin	319.9	276.0	36.00	23.00
		233.1	36.00	35.00
2. ciprofloxacin	332.1	288.2	41.00	23.00
		244.9	41.00	31.00
3. levofloxacin	362.1	318.1	31.00	25.00
		261.0	31.00	41.00
4. lomefloxacin	351.9	265.1	41.00	29.00
		308.0	41.00	23.00
5. enrofloxacin	360.2	316.1	36.00	25.00
		245.3	36.00	37.00
6. sparfloxacin	393.1	349.4	36.00	25.00
		292.2	36.00	29.00

Instrument provided courtesy of Applied Biosystems (www.appliedbiosystems.com)

Antibiotic Fluoroquinolones on Allure® PFP Propyl

Peak List:
1. norfloxacin
2. levofloxacin
3. ciprofloxacin
4. lomefloxacin
5. enrofloxacin
6. sparfloxacin

High organic (60% acetonitrile) means better LC/MS sensitivity!



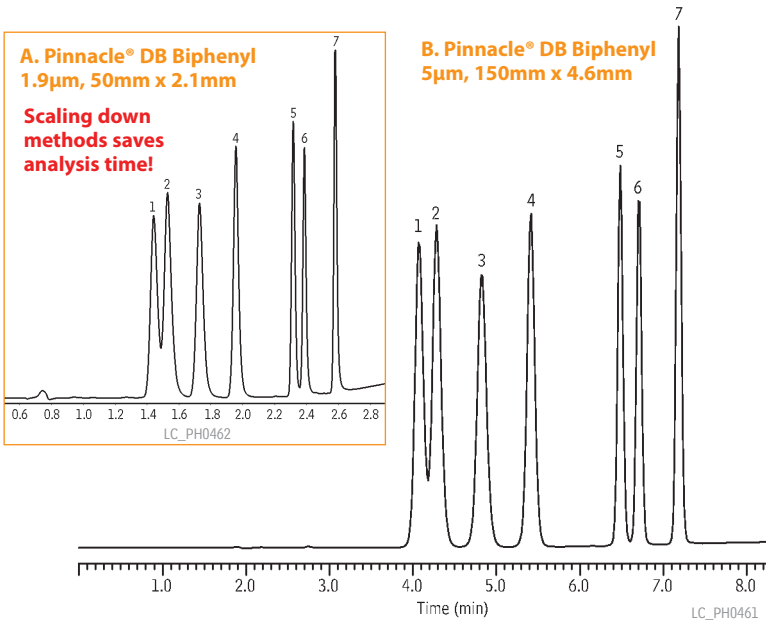
Sample:
Inj.: 5µL
Conc.: ~50µg/mL each component
Sample diluent: mobile phase

Column: **Allure® PFP Propyl**
Cat.#: 9169565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM potassium phosphate monobasic (pH 2.5): acetonitrile, 40:60 (v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 220nm

Sulfonamides
Pinnacle® DB Biphenyl, 1.9µm

NEW!



Peak List:
1. sulfadiazine
2. sulfathiazole
3. sulfamerazine
4. sulfamethazine
5. sulfachlorpyridazine
6. sulfamethoxazole
7. sulfamethoxine

Sample:
Inj.: 10µL
Conc.: 100µg/mL
Sample diluent: starting mobile phase (80:20 A:B)

Column: **A. 1.9µm Pinnacle® DB Biphenyl**
Cat.#: 9409252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm

Column: **B. Pinnacle® DB Biphenyl**
Cat.#: 9409565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 140Å

Conditions:
Mobile phase: A: 0.1% formic acid in water
B: 0.1% formic acid in acetonitrile

Time(min.)	%B
0.0	20
1.0	20
6.0	80
8.0	80

Flow: 1.0mL/min.
Temp.: 30ºC
Det.: UV @ 254nm



free literature

Systematic Transfer of HPLC Methods to UHPLC

Ultra High Pressure Liquid Chromatography (UHPLC) is a rapidly growing technique that can provide faster analysis times. Scaling conventional HPLC methods down to UHPLC can be an effective way to take advantage of shorter run times and increase sample throughput. Here we review the factors that must be considered when scaling down an existing method. A sulfonamides method transfer is used as an example; chromatograms and formulas for all required calculations are included.

Download your free copy from **www.restek.com**.

Applications Note
lit. cat.# GNAN1033

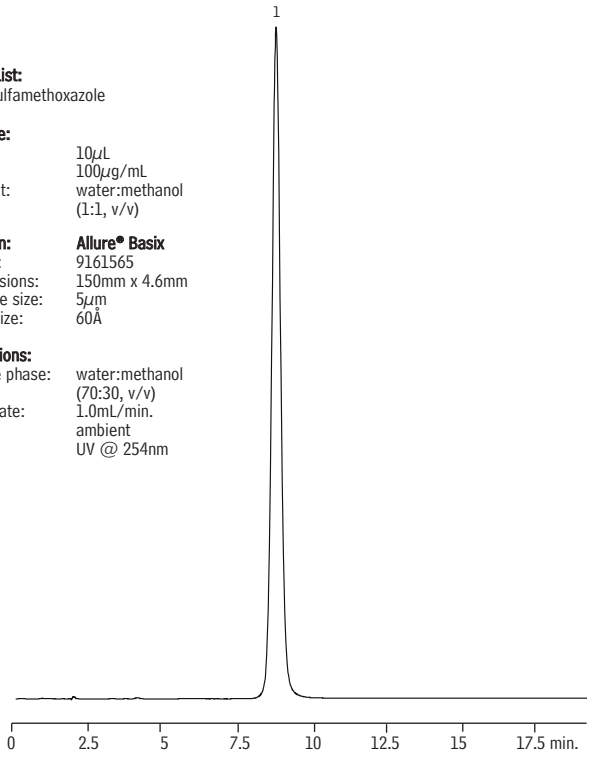
Antibiotic Sulfamethoxazole on Allure® Basix

Peak List:
1. sulfamethoxazole

Sample:
Inj.: 10µL
Conc.: 100µg/mL
Solvent: water:methanol (1:1, v/v)

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: water:methanol (70:30, v/v)
Flow rate: 1.0mL/min.
Temp.: ambient
Det.: UV @ 254nm



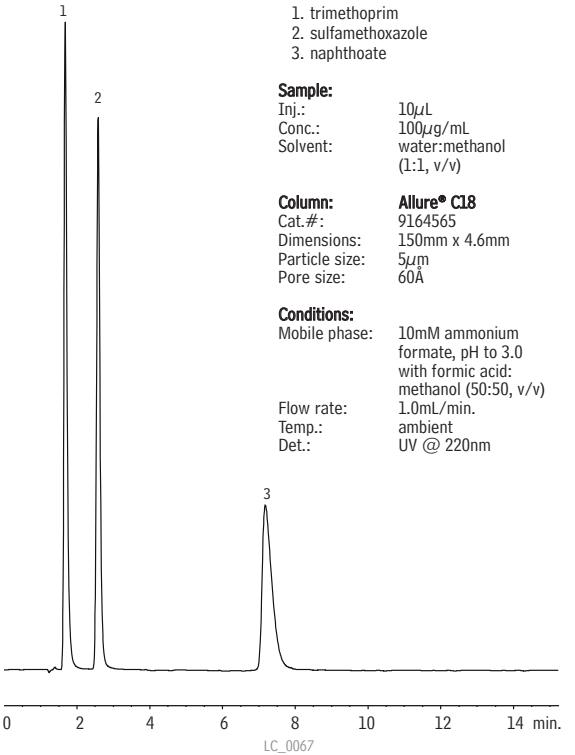
Antibiotic Sulfamethoxazole, Trimethoprim, and Naphthoate on Allure® C18

Peak List:
1. trimethoprim
2. sulfamethoxazole
3. naphthoate

Sample:
Inj.: 10µL
Conc.: 100µg/mL
Solvent: water:methanol (1:1, v/v)

Column: **Allure® C18**
Cat.#: 9164565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium formate, pH to 3.0 with formic acid: methanol (50:50, v/v)
Flow rate: 1.0mL/min.
Temp.: ambient
Det.: UV @ 220nm



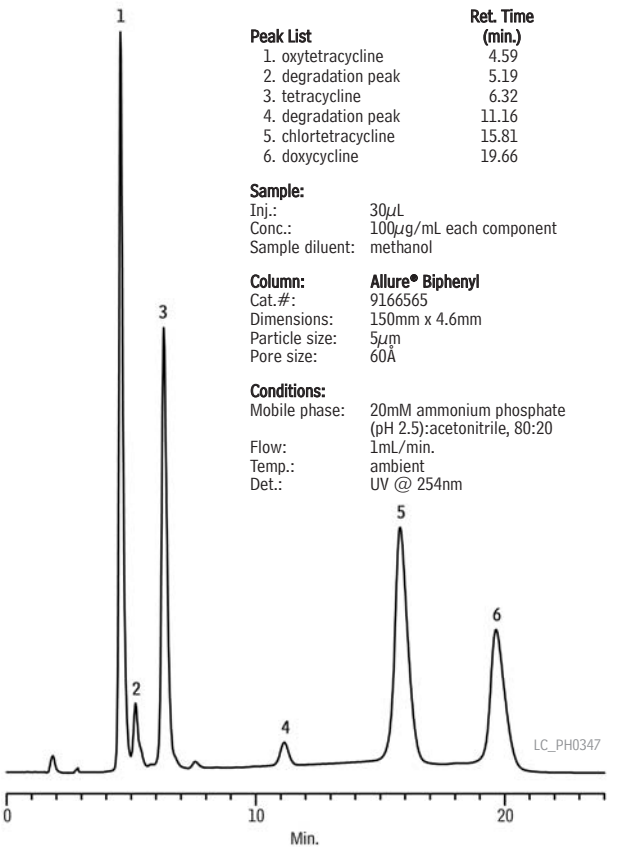
Tetracycline Mix on Allure® Biphenyl

Peak List	Ret. Time (min.)
1. oxytetracycline	4.59
2. degradation peak	5.19
3. tetracycline	6.32
4. degradation peak	11.16
5. chlortetracycline	15.81
6. doxycycline	19.66

Sample:
Inj.: 30µL
Conc.: 100µg/mL each component
Sample diluent: methanol

Column: **Allure® Biphenyl**
Cat.#: 9166565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 20mM ammonium phosphate (pH 2.5):acetonitrile, 80:20
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 254nm



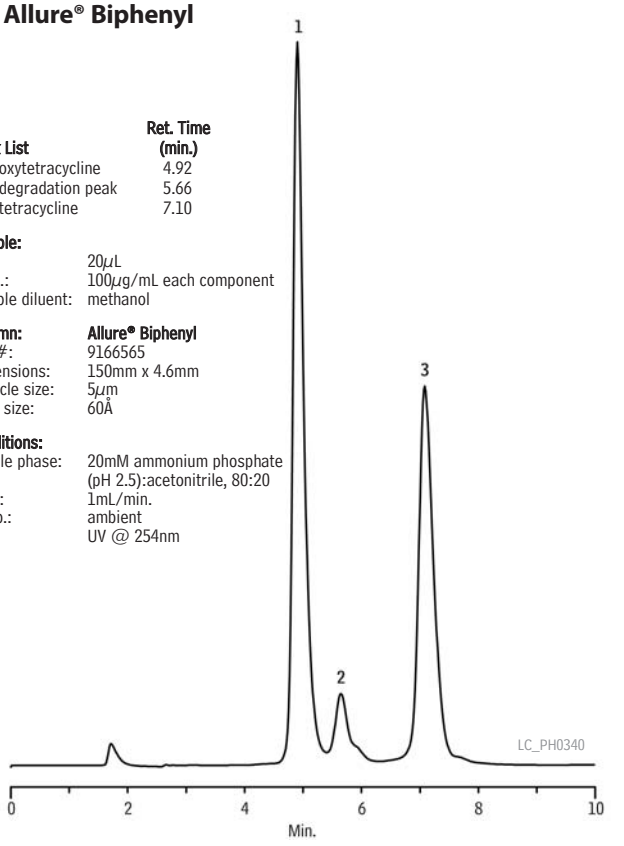
Oxytetracycline and Tetracycline on Allure® Biphenyl

Peak List	Ret. Time (min.)
1. oxytetracycline	4.92
2. degradation peak	5.66
3. tetracycline	7.10

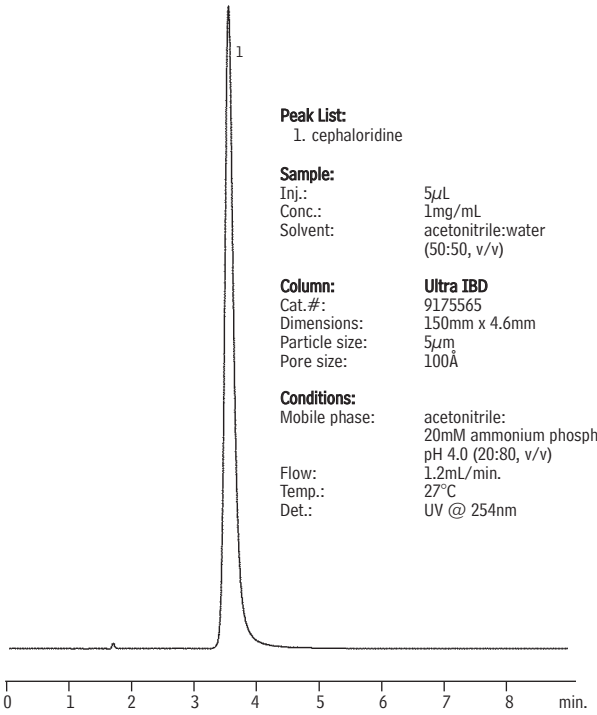
Sample:
Inj.: 20µL
Conc.: 100µg/mL each component
Sample diluent: methanol

Column: **Allure® Biphenyl**
Cat.#: 9166565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 20mM ammonium phosphate (pH 2.5):acetonitrile, 80:20
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 254nm



Antibiotic Cephaloridine on Ultra IBD (Reversed Phase)



LC_0102

Peak List:
1. cephaloridine

Sample:	
Inj.:	5µL
Conc.:	1mg/mL
Solvent:	acetonitrile:water (50:50, v/v)
Column:	**Ultra IBD**
Cat.#:	9175565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	100Å
Conditions:	
Mobile phase:	acetonitrile: 20mM ammonium phosphate, pH 4.0 (20:80, v/v)
Flow:	1.2mL/min.
Temp.:	27°C
Det.:	UV @ 254nm

Get More!

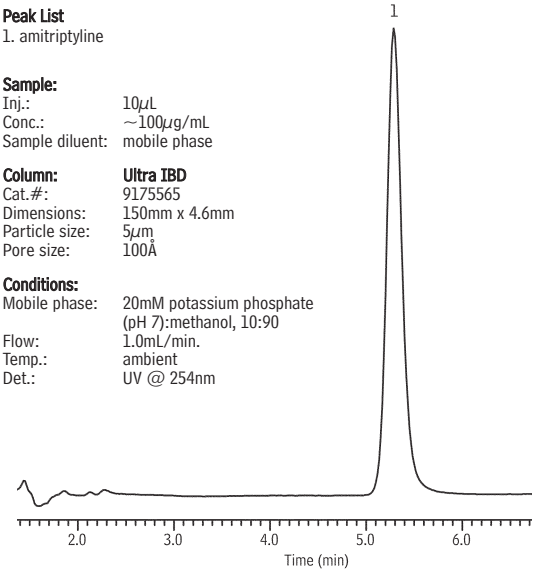
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Amitriptyline on Ultra IBD, pH 7

Peak List
1. amitriptyline

Sample:	
Inj.:	10µL
Conc.:	~100µg/mL
Sample diluent:	mobile phase
Column:	**Ultra IBD**
Cat.#:	9175565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	100Å
Conditions:	
Mobile phase:	20mM potassium phosphate (pH 7):methanol, 10:90
Flow:	1.0mL/min.
Temp.:	ambient
Det.:	UV @ 254nm

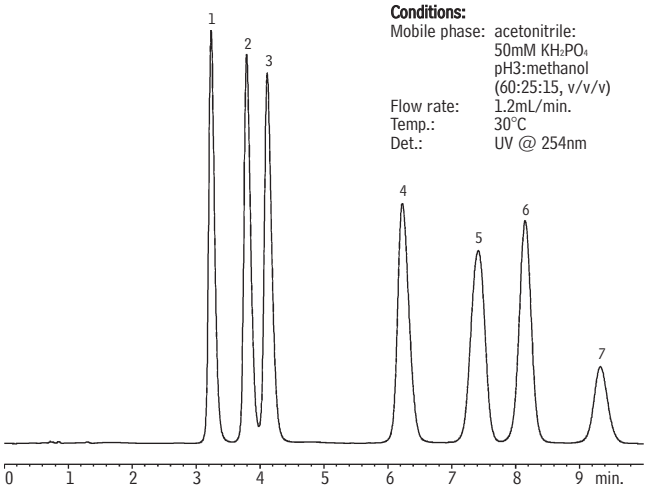


LC_PH0444

Antidepressants (Tricyclic) on Allure® Basix

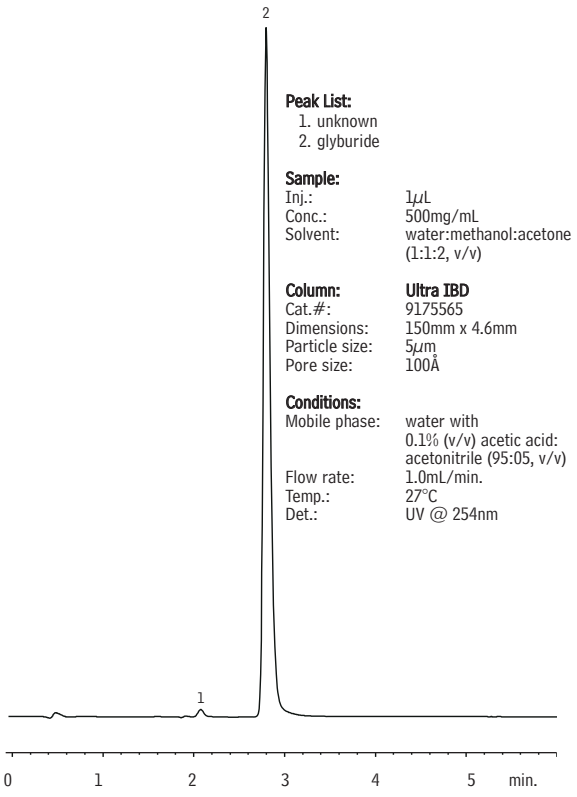
Peak List:
1. doxepin
2. nordoxepin
3. amitriptyline
4. imipramine
5. desimipramine
6. nortriptyline
7. protriptyline

Sample:	
Inj.:	10µL
Conc.:	100µg/mL each
Solvent:	mobile phase
Column:	**Allure® Basix**
Cat.#:	9161565
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å
Conditions:	
Mobile phase:	acetonitrile: 50mM KH_2PO_4 pH3:methanol (60:25:15, v/v/v)
Flow rate:	1.2mL/min.
Temp.:	30°C
Det.:	UV @ 254nm



LC_0053

Anti-Diabetic Glyburide (Glybenclamide) on Ultra IBD



Peak List:
1. unknown
2. glyburide

Sample:
Inj.: 1µL
Conc.: 500mg/mL
Solvent: water:methanol:acetone (1:1:2, v/v)

Column: **Ultra IBD**
Cat.#: 9175565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: water with 0.1% (v/v) acetic acid: acetonitrile (95:05, v/v)
Flow rate: 1.0mL/min.
Temp.: 27°C
Det.: UV @ 254nm

LC_0069

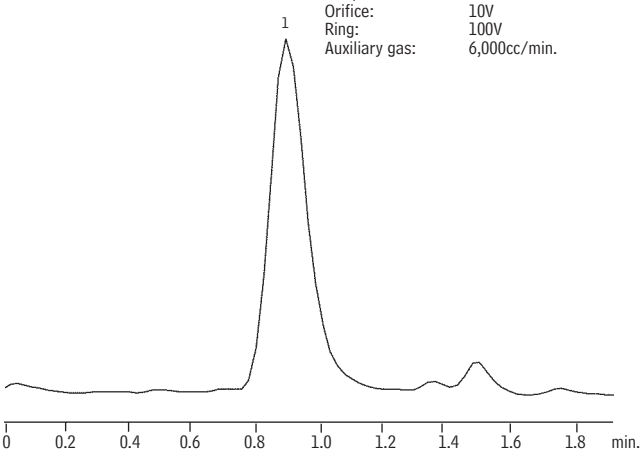
Anti-Ulcerative Cimetidine on Ultra IBD (LC/MS)

Peak List:
1. cimetidine

Sample:
Inj.: 5µL
Conc.: 10µg/mL
Solvent: mobile phase

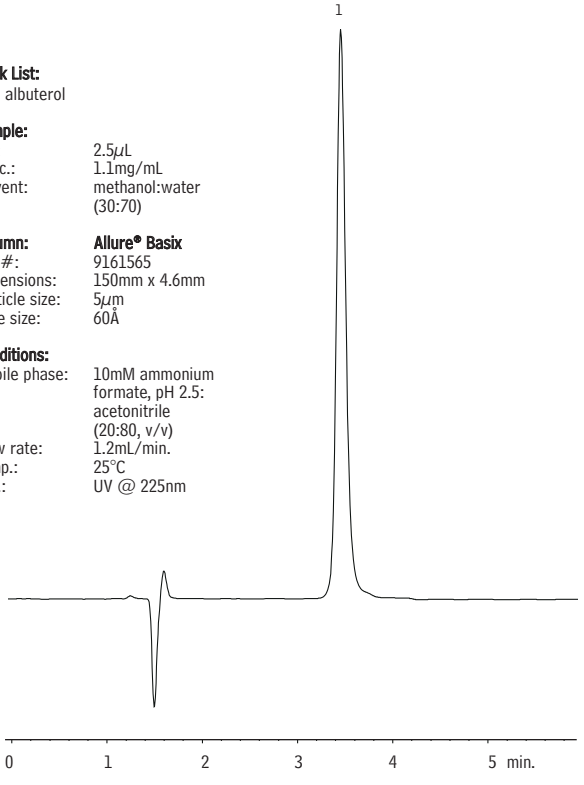
Column: **Ultra IBD**
Cat.#: 9175552
Dimensions: 50mm x 2.1mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: water:acetonitrile (20:80, v/v)
Flow: 0.2mL/min.
Column temp.: ambient
Det.: PE/Sciex API 150 EX
Interface: turbo ion spray
Ion mode: positive
Ion spray voltage: 4,800V
Temp.: 350°C
Orifice: 10V
Ring: 100V
Auxiliary gas: 6,000cc/min.



LC_0115

Bronchodilator Albuterol on Allure® Basix



Peak List:
1. albuterol

Sample:
Inj.: 2.5µL
Conc.: 1.1mg/mL
Solvent: methanol:water (30:70)

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (20:80, v/v)
Flow rate: 1.2mL/min.
Temp.: 25°C
Det.: UV @ 225nm

LC_0089

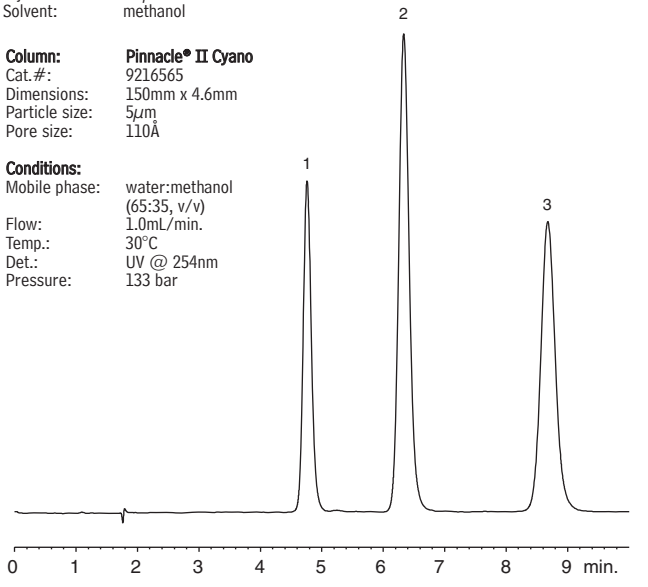
Corticosteroids on Pinnacle® II Cyano (Reversed Phase)

Peak List: **Conc. (mg/mL)**
1. cortisone 0.1
2. corticosterone 0.5
3. cortisone acetate 0.7

Sample:
Inj.: 5.0µL
Solvent: methanol

Column: **Pinnacle® II Cyano**
Cat.#: 9216565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 110Å

Conditions:
Mobile phase: water:methanol (65:35, v/v)
Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 254nm
Pressure: 133 bar



LC_0186

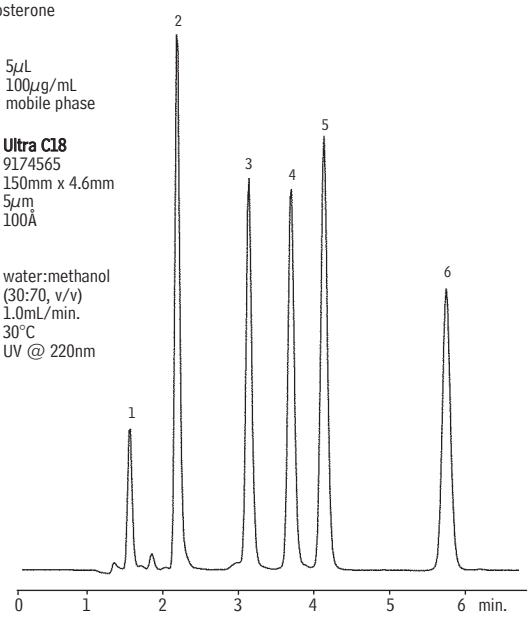
Corticosteroids on Ultra C18

Peak List:
1. uracil (void marker)
2. triamcinolone
3. hydrocortisone
4. dexamethasone
5. corticosterone
6. deoxycorticosterone

Sample:
Inj.: 5µL
Conc.: 100µg/mL
Solvent: mobile phase

Column: **Ultra C18**
Cat.#: 9174565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: water:methanol (30:70, v/v)
Flow: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 220nm



LC_0108

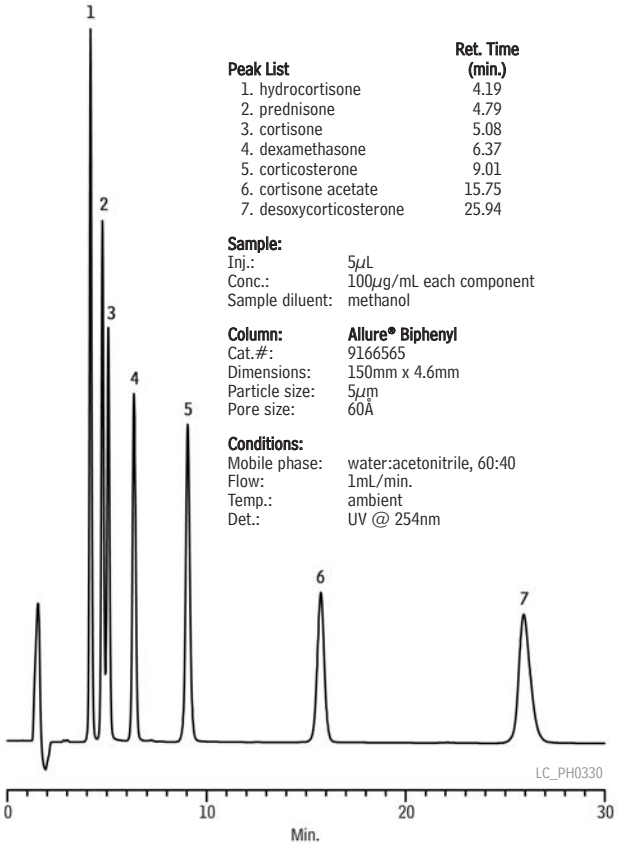
Corticosteroids on Allure® Biphenyl

Peak List	Ret. Time (min.)
1. hydrocortisone	4.19
2. prednisone	4.79
3. cortisone	5.08
4. dexamethasone	6.37
5. corticosterone	9.01
6. cortisone acetate	15.75
7. desoxycorticosterone	25.94

Sample:
Inj.: 5µL
Conc.: 100µg/mL each component
Sample diluent: methanol

Column: **Allure® Biphenyl**
Cat.#: 9166565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: water:acetonitrile, 60:40
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 254nm



LC_PH0330

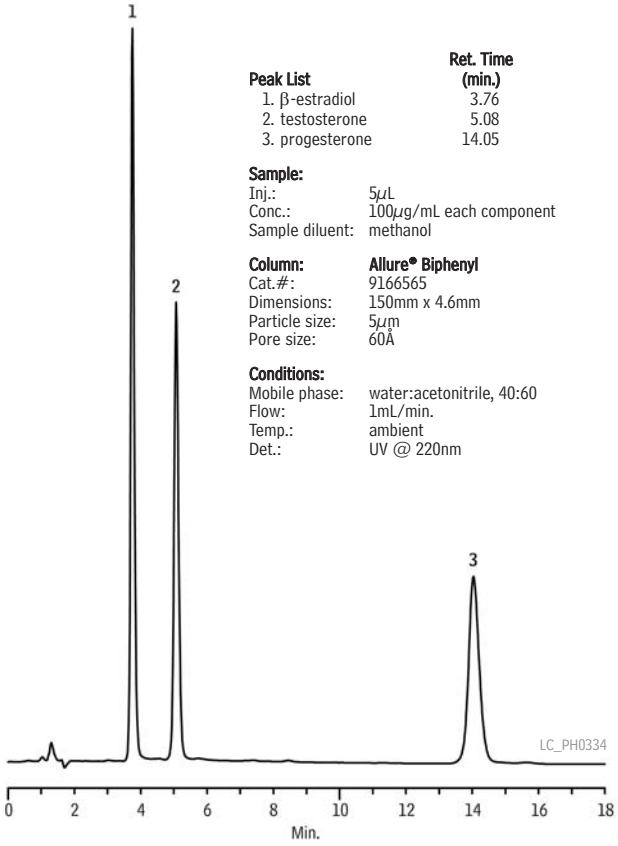
Endogenous Steroids on Allure® Biphenyl

Peak List	Ret. Time (min.)
1. β-estradiol	3.76
2. testosterone	5.08
3. progesterone	14.05

Sample:
Inj.: 5µL
Conc.: 100µg/mL each component
Sample diluent: methanol

Column: **Allure® Biphenyl**
Cat.#: 9166565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: water:acetonitrile, 40:60
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 220nm



LC_PH0334

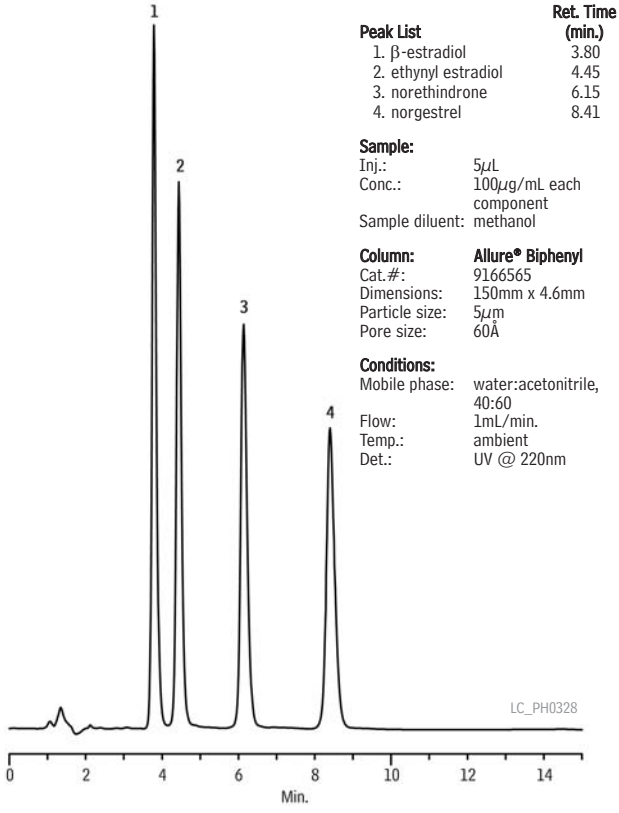
Contraceptive Hormones on Allure® Biphenyl

Peak List	Ret. Time (min.)
1. β-estradiol	3.80
2. ethynyl estradiol	4.45
3. norethindrone	6.15
4. norgestrel	8.41

Sample:
Inj.: 5µL
Conc.: 100µg/mL each component
Sample diluent: methanol

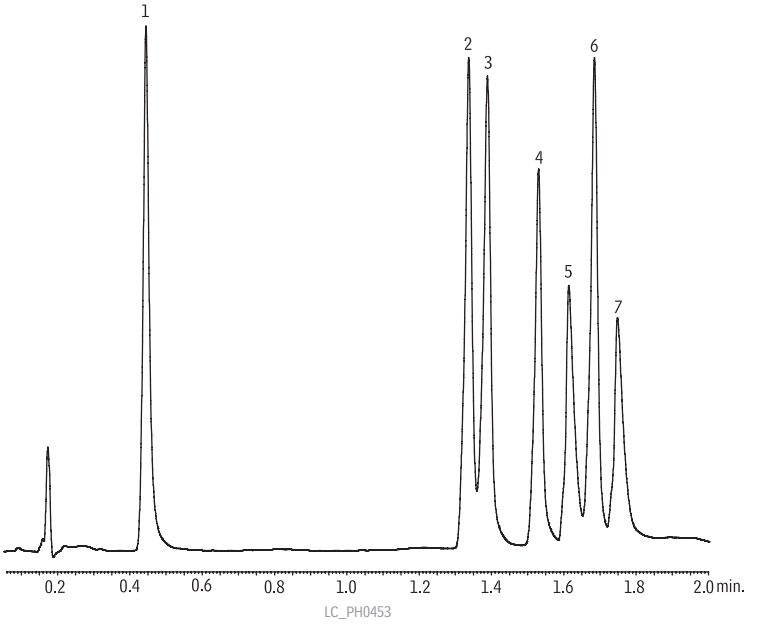
Column: **Allure® Biphenyl**
Cat.#: 9166565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: water:acetonitrile, 40:60
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 220nm



LC_PH0328

Hormones on 1.9µm Pinnacle® DB Biphenyl



Peak List:
1. estriol
2. 17β-estradiol
3. 17α-estradiol
4. ethynyl estradiol
5. testosterone
6. estrone
7. norethindrone

Sample:
Inj.: 1µL
Conc.: 100µg/mL each component
Sample diluent: water:methanol (50:50)

Column: **1.9µm Pinnacle® DB Biphenyl**
Cat.#: 9409252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Conditions:
Mobile phase: A: water
B: methanol

Time(min)	%B
0	30
1	30
3	70

Flow: 0.8 mL/min.
Temp.: 30ºC
Det.: UV @ 220nm

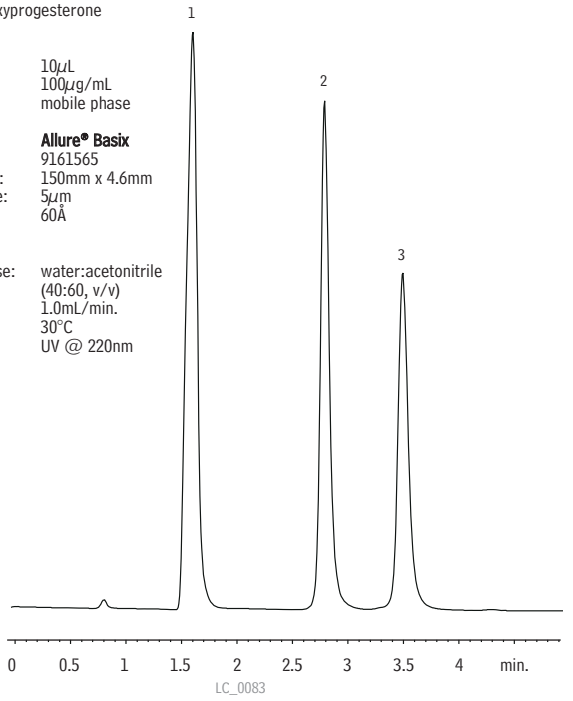
Contraceptive Hormones on Allure® Basix

Peak List:
1. uracil (marker)
2. norethindrone
3. medroxyprogesterone

Sample:
Inj.: 10µL
Conc.: 100µg/mL
Solvent: mobile phase

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: water:acetonitrile (40:60, v/v)
Flow rate: 1.0mL/min.
Temp.: 30°C
Det.: UV @ 220nm



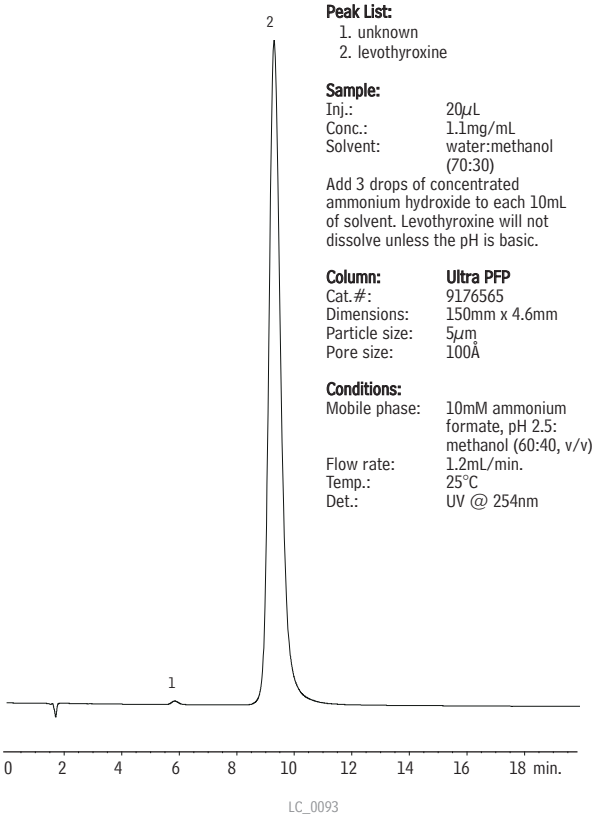
Hormone Levothyroxine on Ultra PFP

Peak List:
1. unknown
2. levothyroxine

Sample:
Inj.: 20µL
Conc.: 1.1mg/mL
Solvent: water:methanol (70:30)
Add 3 drops of concentrated ammonium hydroxide to each 10mL of solvent. Levothyroxine will not dissolve unless the pH is basic.

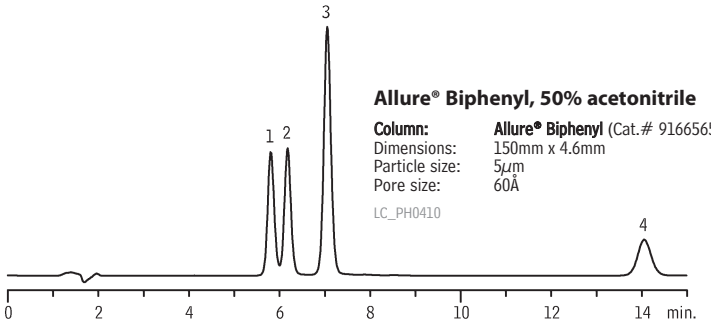
Column: **Ultra PFP**
Cat.#: 9176565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: methanol (60:40, v/v)
Flow rate: 1.2mL/min.
Temp.: 25°C
Det.: UV @ 254nm



Non-Steroidal Anti-inflammatory Drugs (NSAIDs) on Allure® Biphenyl

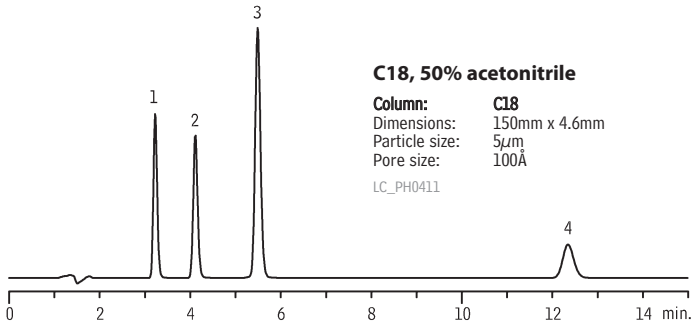
A. In acetonitrile, selectivity is C18-like—elution order is the same.



Allure® Biphenyl, 50% acetonitrile

Column:	**Allure® Biphenyl** (Cat.# 9166565)
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å

LC_PH0410



C18, 50% acetonitrile

Column:	**C18**
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	100Å

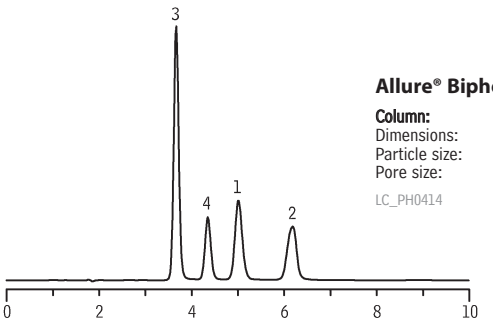
LC_PH0411

1. sulindac
2. piroxicam
3. ketoprofen
4. diclofenac

Sample:
Inj.: 5µL
Conc.: ~300µg/mL each component
Sample diluent: mobile phase

Conditions:
Mobile phase: 0.5% formic acid in water (pH 2.25):0.1% formic acid in acetonitrile, 50:50 (v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 254nm

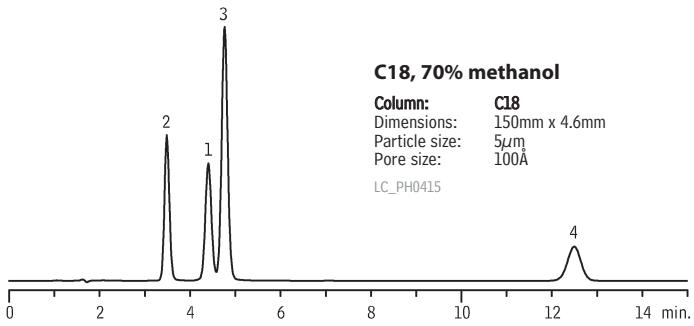
B. In methanol, selectivity is orthoganol to a C18—elution order changes.



Allure® Biphenyl, 90% methanol*

Column:	**Allure® Biphenyl** (Cat.# 9166565)
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	60Å

LC_PH0414



C18, 70% methanol

Column:	**C18**
Dimensions:	150mm x 4.6mm
Particle size:	5µm
Pore size:	100Å

LC_PH0415

1. sulindac
2. piroxicam
3. ketoprofen
4. diclofenac

Sample:
Inj.: 5µL
Conc.: ~300µg/mL each component
Sample diluent: mobile phase

Conditions:
Mobile phase: 0.5% formic acid in water (pH 2.25):0.1% formic acid in methanol, 30:70 or 10:90 (v/v)
Flow: 1.0mL/min.
Temp.: ambient
Det.: UV @ 254nm

*To maintain equivalent retention for comparison purposes, organic content was increased 20%. This has the added benefit of increasing desolvation efficiency for MS applications.

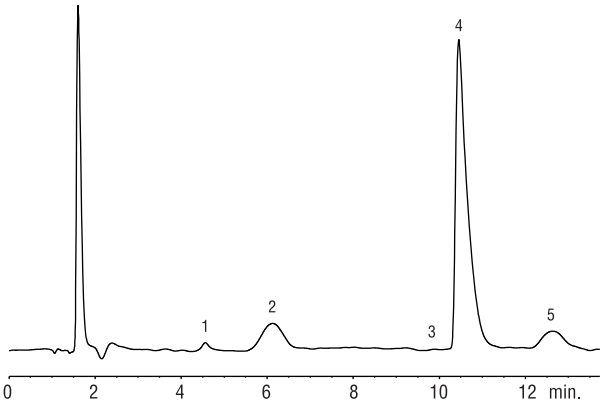
Laxative Lactulose Concentrate by USP 25: Resolution Solution on Pinnacle® II Amino

Peak List:	Conc. (mg/mL)	Ret. Time (min.)	RRT	Res. Inj. % RSD (n=5)	
1. fructose	0.4	4.6	0.44	—	—
2. galactose	6.4	6.1	0.58	—	—
3. epi-lactose	unknown	10.0	0.95	—	—
4. lactulose	40	10.5	1.00	1.1	0.3%
5. lactose	4.8	12.7	1.21	2.9	—

Sample:
Inj.: 20µL resolution standard
Solvent: acetonitrile:water (50:50)

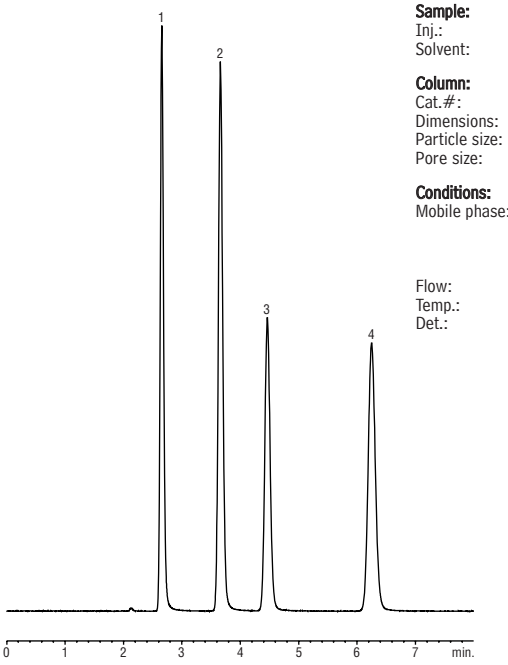
Column: **Pinnacle® II Amino**
Cat.#: 9217365
Dimensions: 150mm x 4.6mm
Particle size: 3µm
Pore size: 110Å

Conditions:
Mobile phase: 10mM sodium phosphate monobasic in water, pH 4.8: acetonitrile (22:78, v/v)
Flow: 1.3mL/min.
Temp.: 40°C
Det.: refractive index @ 40°C



LC_0222

Xanthines on Pinnacle® DB C18



LC_0241

Sample:
Inj.: 2µL
Solvent: mobile phase

Column: **Pinnacle® DB C18**
Cat.#: 9414565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 140Å

Conditions:
Mobile phase: 20mM KH_2PO_4, pH 3.0: acetonitrile (90:10 v/v)
Flow: 1.0mL/min.
Temp.: 27°C
Det.: UV @ 254nm

Peak List:	Conc. (µg/mL)
1. theobromine	225
2. theophylline	418
3. β-hydroxyethyltheophylline	418
4. caffeine	400

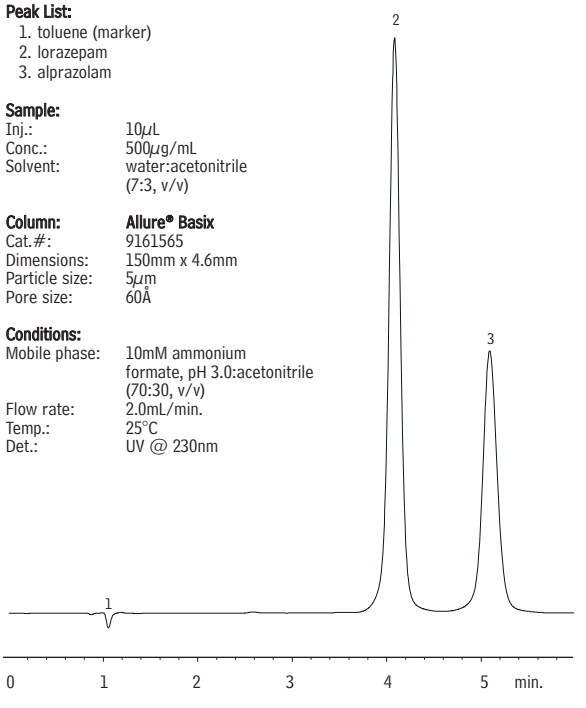
Sedatives Alprazolam and Lorazepam on Allure® Basix

Peak List:
1. toluene (marker)
2. lorazepam
3. alprazolam

Sample:
Inj.: 10µL
Conc.: 500µg/mL
Solvent: water:acetonitrile (7:3, v/v)

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 3.0:acetonitrile (70:30, v/v)
Flow rate: 2.0mL/min.
Temp.: 25°C
Det.: UV @ 230nm



LC_0078

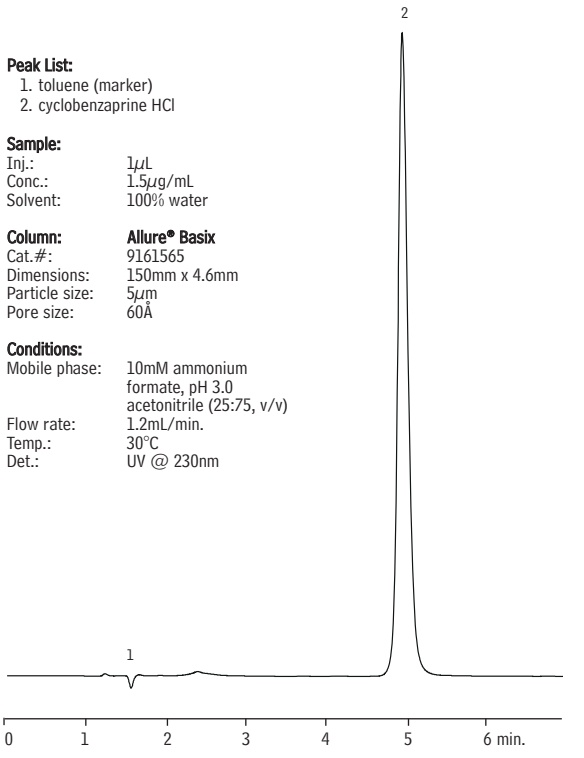
Sedative Cyclobenzaprine on Allure® Basix

Peak List:
1. toluene (marker)
2. cyclobenzaprine HCl

Sample:
Inj.: 1µL
Conc.: 1.5µg/mL
Solvent: 100% water

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 3.0 acetonitrile (25:75, v/v)
Flow rate: 1.2mL/min.
Temp.: 30°C
Det.: UV @ 230nm



LC_0087

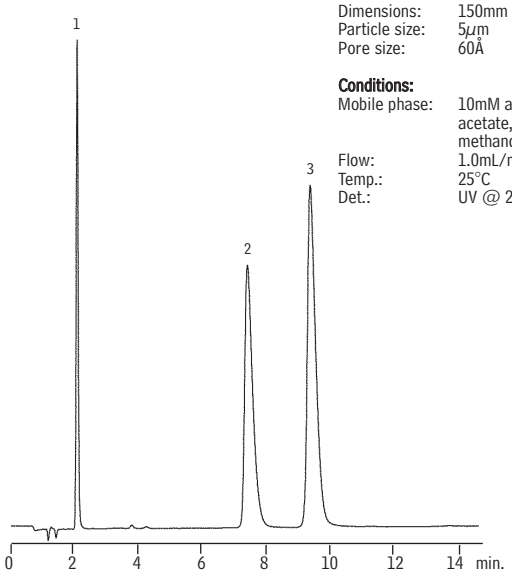
Admixtures: Analgesic Ibuprofen and Decongestant Pseudoephedrine on Allure® Basix

Peak List:
1. uracil
2. ibuprofen
3. pseudoephedrine

Sample:
Inj.: 5µL
Conc.: 200µg/mL
Solvent: mobile phase

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium acetate, pH 6.9: methanol (75:25, v/v)
Flow: 1.0mL/min.
Temp.: 25°C
Det.: UV @ 210nm



LC_0098

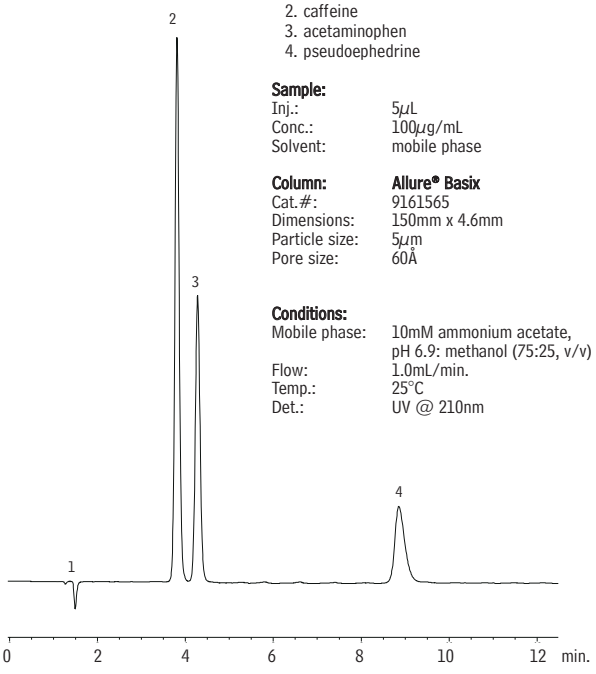
Admixtures: Analgesic Acetaminophen, Decongestant Pseudoephedrine and Stimulant Caffeine on Allure® Basix

Peak List:
1. sample solvent
2. caffeine
3. acetaminophen
4. pseudoephedrine

Sample:
Inj.: 5µL
Conc.: 100µg/mL
Solvent: mobile phase

Column: **Allure® Basix**
Cat.#: 9161565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: 10mM ammonium acetate, pH 6.9: methanol (75:25, v/v)
Flow: 1.0mL/min.
Temp.: 25°C
Det.: UV @ 210nm



LC_0097

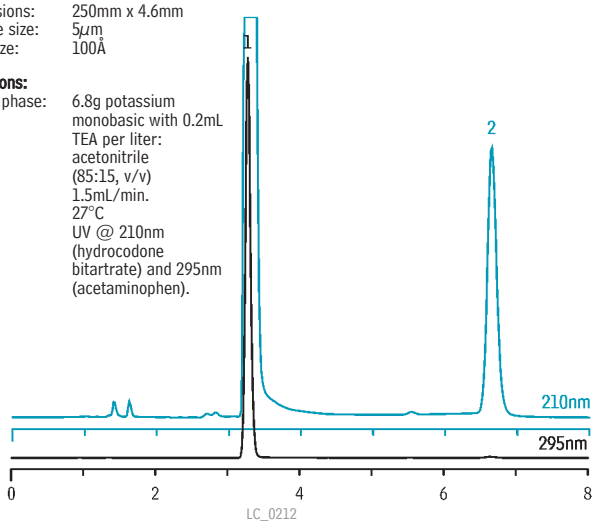
Admixtures: Hydrocodone Bitartrate/Acetaminophen by USP 25 on Ultra C18

Peak List:	Conc. (µg/mL)	Ret. Time (min.)	RRT	Tailing	Resolution	Inj. %RSD (n=5)
1. acetaminophen	0.76	3.304	1.0	1.1	—	1.1
2. hydrocodone bitartrate	0.0076	6.664	2.0	1.1	17.0	0.9

Sample:
Inj.: 25µL
Sample: 500mg acetaminophen with 5mg hydrocodone bitartrate (tablet)
Solvent: mobile phase

Column: **Ultra C18**
Cat.#: 9174575
Dimensions: 250mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 6.8g potassium monobasic with 0.2mL TEA per liter: acetonitrile (85:15, v/v)
Flow: 1.5mL/min.
Temp.: 27°C
Det.: UV @ 210nm (hydrocodone bitartrate) and 295nm (acetaminophen).



LC_0212

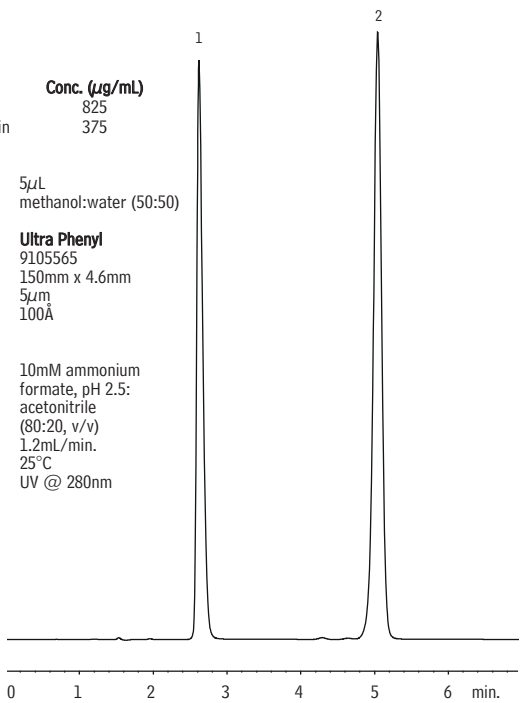
Admixtures: Expectorant/Antitussive Guaifenesin and Narcotic Analgesic Codeine on Ultra Phenyl

Peak List: **Conc. (µg/mL)**
1. codeine 825
2. guaifenesin 375

Sample:
Inj.: 5µL
Solvent: methanol:water (50:50)

Column: **Ultra Phenyl**
Cat.#: 9105565
Dimensions: 150mm x 4.6mm
Particle size: 5µm
Pore size: 100Å

Conditions:
Mobile phase: 10mM ammonium formate, pH 2.5: acetonitrile (80:20, v/v)
Flow rate: 1.2mL/min.
Temp.: 25°C
Det.: UV @ 280nm



LC_0088

APPLICATIONS
GC

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Top: Silivia Martinez, Applications Chemist
Bottom: Jason Thomas, Applications Chemist

What's NEW? look for this circle

GC Applications by Column Phase (Alphabetical Order) - see pages 704-705 for our Applications by Compound Class Index

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Searching for more chromatograms for EPA Methods?
www.restek.com

Choosing a Volatiles GC Column for PID/ELCD*

Restek Phase	Coelutions by Peak Numbers (*Coelutions by PID/ELCD* are indicated in BOLD)	Close Pairs by PID/ELCD	Suggested Confirmation Column	Poor Choice for Confirmation Column	Thick Phase Stable Temp. (°C)	Recomended High Temp. for VOA Work (°C)	Advantages	Page # for Chromatogram[2]
Rtx-502.2	***14/15, 33/34, 39/40***	4/5, 44/45, 56/57, 52/55, 64/65	Rtx-VMS, Rtx-VRX, Rtx-1	Rtx-Volatiles, Vocol, Rtx-35, Rtx-20	270	240	low bleed	no
Rtx-Volatiles	***14/15***, 21/22, ***38/40***, ***44/45***, ***53/55***	56/57, 68/69	Rtx-VMS, Rtx-1, Rtx-624	Rtx-502.2, Vocol, Rtx-20, Rtx-35	270	240	low bleed	no
Rtx-624	***7/8, 10/11, 52/53, 31/34, 53/55, 59/60***	32/33, 44/45, 51/54	Rtx-VMS, Rtx-502.2	Rtx-1701	280	240		no
Rtx-VRX	11/13, ***39/43***, ***46/50***, 40/44	8/9, 15/17, 24/27, 58/60	Rtx- VMS, Rtx-502.2	Rtx-1	260	230		539
Rtx-1	9/12, ***15/17***, ***25/26***, ***24/27***, ***33/36***, ***38/40***, 40/44, 45/50, ***56/57***	7/12, 49/55	Rtx-502	Rtx-VRX	320	260		no
Rtx-1701	***9/10***, ***18/19***, ***16/20***, 50/53, ***51/55***, 54/56	5/6, 29/30, 32/33	Rtx-502.2	Rtx-624	270	240		no
Rtx-200	***2/3, 5/6, 11/12, 14/16, 22/24, 28/35, 32/33/37, 43/44, 50/55/56, 57/58***	13/17,36/37	Rtx-VMS		320	240	*m/p* xylene separation	no
Rtx-35	***4/5***, ***16/19***, ***18/20***, 21/22, ***34/31***, ***39/38/41/42***/40, ***46/51***/49, 53/54, ***48/52/55***, 61/62, ***66/67***	2/3,	Rtx-VMS, Rtx-624	Rtx-502.2, Rtx-Volatiles, Rtx-20	270	240		no
Rtx-50	***4/5/6, 8/7/12, 25/28, 32/33,*** 37/41/42, ***38/40***, ***45/47***, ***46/54/52***, ***56/55/48, 57/58***	2/3, 20/18, 31/32, 39/41/42	Rtx-VMS, Rtx-624	Rtx-35	280	240		no
Rtx-DX1 (custom)	***4/5***, ***9/10***, ***25/27***, ***38/39***, 47/50, ***49/46/48, 52/54, 53/55***	27/28, 32/36/31, 65/67	Rtx-502.2	Rtx-VMS	220	200		no

[1] Can be resolved under different conditions. See application showing method 601/602 with the Rtx®-VGC column on www.restek.com/chromatograms (search: chromatogram number GC_EV00420).
[2] pages listed include GC/MS analyses.

Volatile Analytes:

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. 1,1-dichloroethene
8. Freon ®113
9. methylene chloride
10. *trans*-1,2-dichloroethene
11. methyl *tert*-butyl ether
12. *tert*-butyl alcohol
13. 1,1-dichloroethane
14. *cis*-1,2-dichloroethene
15. 2,2-dichloropropane
16. bromochloromethane
17. chloroform
18. carbon tetrachloride
19. 1,1,1-trichloroethane
20. 1,1-dichloropropene
21. benzene
22. 1,2-dichloroethane
23. fluorobenzene
24. trichloroethene
25. dibromomethane
26. 1,2-dichloropropane
27. bromodichloromethane
28. 2-chloroethyl vinyl ether
29. *cis*-1,3-dichloropropene
30. toluene
31. tetrachloroethene
32. *trans*-1,3-dichloropropene
33. 2-bromo-1-chloropropane
34. 1,1,2-trichloroethane
35. dibromochloromethane
36. 1,3-dichloropropane
37. 1,2-dibromoethane
38. chlorobenzene
39. ethyl benzene
40. 1,1,1,2-tetrachloroethane
41. *m*-xylene
42. *p*-xylene
43. 1-chloro-2-fluorobenzene
44. *o*-xylene
45. styrene
46. bromoform
47. isopropyl benzene
48. bromobenzene
49. *n*-propylbenzene
50. 1,4-dichlorobutane
51. 1,1,2,2-tetrachloroethane
52. 2-chlorotoluene
53. 1,3,5-trimethylbenzene
54. 1,2,3-trichloropropane
55. 4-chlorotoluene
56. *tert*-butylbenzene
57. 1,2,4-trimethylbenzene
58. *sec*-butylbenzene
59. *p*-isopropyl toluene
60. 1,3-dichlorobenzene
61. 1,4-dichlorobenzene
62. *n*-butylbenzene
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65. 1,2-bromo-3-chloropropane
66. hexachlorobutadiene
67. 1,2,4-trichlorobenzene
68. naphthalene
69. 1,2,3-trichlorobenzene

Conditions for Rtx®-502.2, Rtx®-Volatiles, Rtx®-VRX and Rtx®-1: optimum conditions on 75m, 0.45mm ID, 2.55µm columns.

Conditions for all other columns: 60m, 0.53mm ID, 3.0µm column, flow 10mL/min., temp. program: 35°C (hold 9 min.) to 220°C @ 11°C/min. (hold 10 min.)

Analytes identified using Agilent 5971a mass selective detector with splitless injection or using Finnigan PID/ELCD

Please see chromatograms on pages 539–546 for more details, or call technical service at 800-356-1688 (ext. 4), or your Restek representative.

for more info

*For GC/MS analyses, see Rtx®-VMS applications on pages **540–543**.

Compounds listed in US EPA Methods 502.2, 8021, 8010, 8020, 601 & 602, plus commonly added compounds.

***m/p* xylene** coelute on all phases listed above except Rtx®-200 in 60m, 0.25mm ID, 1.0µm under optimized conditions. See 8260 application, using the Rtx®-200 column, www.restek.com/chromatograms (search: chromatogram number GC_EV00429).

Volatile Organic Compounds Retention Time Index

Data collected using a 60m, 0.25mm ID, 1.4µm Rtx®-VMS column; Oven: 40°C (hold 6 min.) to 230°C @ 14°C/min. (hold 11 min.);
Carrier gas: helium; Regulation: constant pressure; Flow rate: 1mL/min.; Linear velocity: 21cm/sec.; Dead time: 4.90 min.

Component	Rtx®-VMS Ret. Time
dichlorodifluoromethane	5.52
chloromethane	6.26
vinyl chloride	6.54
water	6.70
bromomethane	7.61
methanol	7.93
2-methylbutane	7.96
chloroethane	8.00
trichlorofluoromethane	8.41
n-pentane	8.61
diethylether	9.59
1,1-dichloroethene	9.64
carbon disulfide	9.65
Freon® 113	9.70
ethanol	9.74
iodomethane	9.99
3-chlorotrifluoropropane	10.45
chloro-methyl-methylether	10.54
acrolein	10.57
2-methylpentane	10.59
allyl chloride	10.72
methylene chloride	10.98
3-methylpentane	11.09
acetone	11.24
trans-1,2-dichloroethene	11.24
methyl *tert*-butyl ether	11.42
2-propanol	11.52
tert-butyl alcohol	11.56
methyl acetate	11.63
hexane	11.64
acetonitrile	12.22
chloroprene	12.30
1,1-dichloroethane	12.42
acrylonitrile	12.60
diisopropyl ether	12.62
2,4-dimethylpentane	12.68
vinyl acetate	13.02
ethyl-*tert*-buyl ether	13.08
1-propanol	13.18
cis-1,2-dichloroethene	13.32
allyl alcohol	13.35
2,2-dichloropropane	13.48
bromochloromethane	13.62
chloroform	13.75
cyclohexane	13.84
methyl acrylate	13.87
carbon tetrachloride	13.94
tetrahydrofuran	14.03
1,1,1-trichloroethane	14.06
ethyl acetate	14.13
2-butanone	14.18
dibromofluoromethane	14.18
1,1-dichloropropene	14.20
propargyl alcohol	14.35
1-chlorobutane	14.51
2,2,4-trimethylpentane	14.53
propionitrile	14.59
benzene	14.60
n-heptane (C7)	14.62
methacrylonitrile	14.64
benzene-d6	14.72
pentafluorobenzene	14.75
1,2-dichloroethane-d4	14.79
1,2-dichloroethane	14.90
tert-amyl-methyl ether	15.00
isobutyl alcohol	15.06
fluorobenzene	15.16
isopropyl acetate	15.34
formic acid	15.37
trichloroethene	15.39
1,4-difluorobenzene	15.58
n-butanol	15.60
methyl cyclohexane	15.78
acetic acid	15.93
dibromomethane	16.05
1,2-dichloropropane	16.17
bromodichloromethane	16.23
methyl methacrylate	16.28
α,α,α-trifluorotoluene	16.45
1,4-dioxane	16.49
n-propyl acetate	16.70
2-chloroethyl-vinyl-ether	16.92
2-chloroethanol	16.93
cis-1,3-dichloropropene	17.04
1-bromo-2-chloroethane	17.05
n-octane	17.17
toluene-d8	17.28
toluene	17.36
propionic acid	17.61
chloroacetonitrile	17.64
4-methyl-2-pentanone	17.76
2-bromo-1-chloropropane	17.81
2-nitropropane	17.83
pyridine	17.86
1,1-dichloropropanone	17.88
trans-1,3-dichloropropene	17.88
tetrachloroethene	17.89
ethyl methacrylate	17.92
1,1,2-trichloroethane	18.11
dibromochloromethane	18.40
1,3-dichloropropane	18.49
isobutyric acid	18.55
1,2-dibromoethane	18.78
n-butyl acetate	18.80
2-hexanone	18.82
butyric acid	19.17
1-chloro-3-fluorobenzene	19.17
ethylbenzene	19.36
chlorobenzene	19.39
1-chloro-4-fluorobenzene	19.39
ethylbenzene-d10	19.40
1-chlorohexane	19.41
1,1,1,2-tetrachloroethane	19.44
m-xylene	19.53
p-xylene	19.54
chlorobenzene-d5	19.55
1-chloro-2-fluorobenzene	19.67
o-xylene	20.13
stryrene	20.17
isovaleric acid	20.18
bromoform	20.30
isopropylbenzene	20.51
1,2-butanediol	20.82
valeric acid	20.89
1,4-dichlorobutane	20.90
bromobenzene	20.91
4-bromo-1-fluorobenzene	20.95
cis-1,4-dichloro-2-butene	20.97
n-decane	21.04
n-propylbenzene	21.07
1,1,2,2-tetrachloroethane	21.10
1,3,5-trimethylbenzene	21.30
1-ethyl-4-methylbenzene	21.33
1-ethyl-3-methylbenzene	21.34
1,2,3-trichloropropane	21.39
trans-1,4-dichloro-2-butene	21.40
2-chlorotoluene	21.40
4-chlorotoluene	21.61
cyclohexane	21.78
tert-butylbenzene	21.81
1-ethyl-2-methylbenzene	21.82
1,2,4-trimethylbenzene	21.88
pentachloroethane	21.92
1,3-dichloro-2-propanol	22.05
sec-butylbenzene	22.06
isocaproic acid	22.09
p-isopropyltoluene	22.22
1,3-dichlorobenzene	22.53
caproic acid	22.55
1,4-dichlorobenzene	22.64
n-butylbenzene	22.88
malononitrile	22.89
benzyl chloride	23.23
1,2-dichlorobenzene-d4	23.36
1,2-dichlorobenzene	23.38
hexachloroethane	23.63
1-octanol	23.70
bis-(2-chloro-isopropyl) ether	24.06
4-bromo-1-chlorobenzene	24.09
benzyl alcohol	24.23
heptanoic acid	24.29
n-dodecane	24.54
3-bromochlorobenzene	24.61
1,2-dibromo-3-chloropropane	24.78
2-bromochlorobenzene	25.54
hexachlorobutadiene	25.99
nitrobenzene	26.02
1,2,4-trichlorobenzene	26.19
benzyl acetate	26.29
n-tridecane	26.51
naphthalene	27.01
1,2,3-trichlorobenzene	27.46
n-tetradecane	28.83
2-methylnaphthalene	30.36
1-methylnaphthalene	30.96
n-pentadecane	31.65
2-chloronaphthalene	33.36

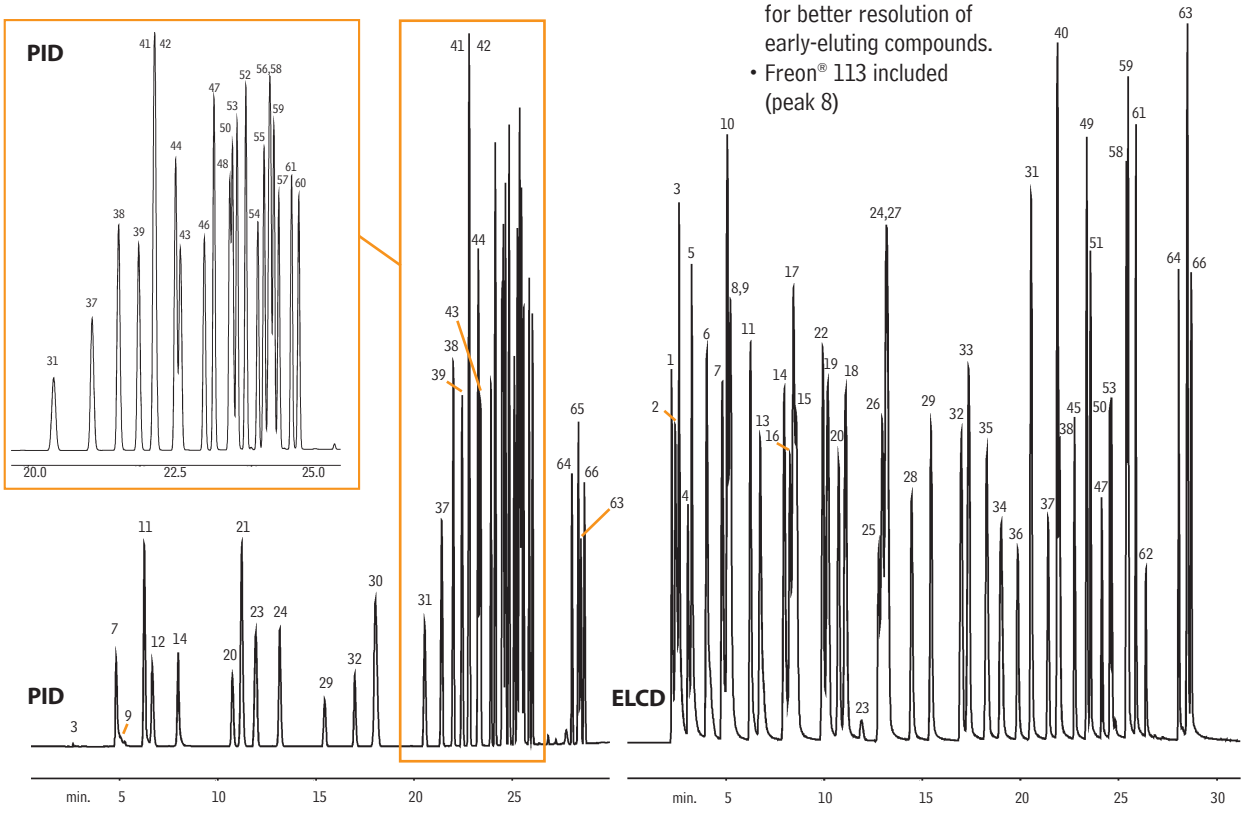
for **more** info

See pages **540–543** for Rtx®-VMS applications.

Volatile Organics
US EPA Method 8021
Rtx®-VRX

Rtx®-VRX
75m, 0.45mm ID, 2.55µm (cat.# 19309)

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- 35°C starting temperature for better resolution of early-eluting compounds.
- Freon® 113 included (peak 8)



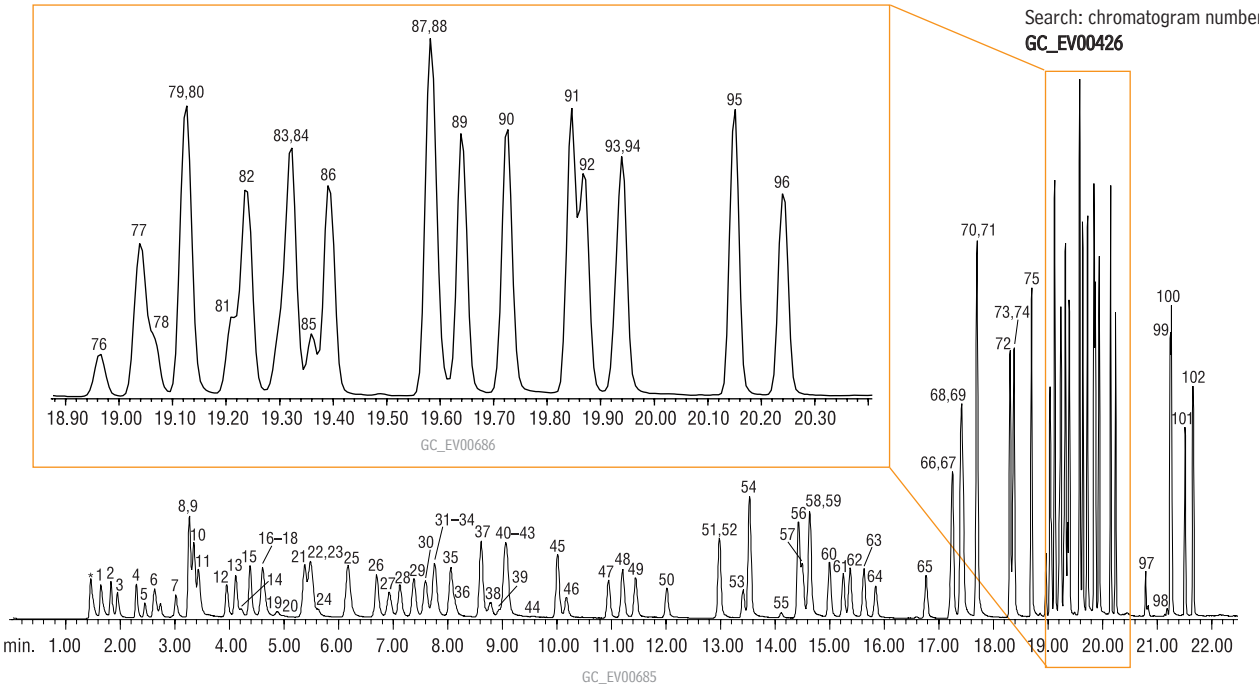
Column:	Rtx®-VRX, 75m, 0.45mm ID, 2.55µm (cat.# 19309)
Conc.	20ppb in 5mL of RO water.
Concentrator:	Tekmar LSC-3000 Purge and Trap
Trap:	Vocarb 3000
Purge:	11 min. @ 40mL/min.
Dry purge:	1 min. @ 40mL/min. (MCS by-passed with Silcosteel® tubing, cat.# 21035)
Desorb preheat:	245°C
Desorb:	250°C for 2 min.
Bake:	260°C for 8 min.
Interface:	direct
Transfer line:	0.32mm ID Siltek® tubing

GC:	Finnigan 9001
Oven temp.:	35°C (hold 4 min.) to 75°C @ 3°C/min. (hold 2 min.) to 175°C @ 21°C/min. to 205°C @ 35°C/min. (hold 5 min.)
Carrier:	helium 11mL/min., constant pressure Adjust dichlorodifluoromethane to a retention time of 2.28 min. @ 35°C on the Rtx®-VGC column.
Detectors:	µGold Tandem PID/HALL 2000 PID: makeup 7mL/min., purge 7mL/min., set @ 0.35mV, base temp. 200°C. ELCD HALL 2000: RxnGas 25mL/min., RxnTemp. 940°C, propanol flow 470µL/min.

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. 1,1-dichloroethene
8. Freon® 113
9. allyl chloride
10. methylene chloride
11. *trans*-1,2-dichloroethene
12. methyl *tert*-butyl ether
13. 1,1-dichloroethane
14. *cis*-1,2-dichloroethene
15. 2,2-dichloropropane
16. bromochloromethane
17. chloroform
18. carbon tetrachloride
19. 1,1,1-trichloroethane
20. 1,1-dichloropropene
21. benzene
22. 1,2-dichloroethane
23. fluorobenzene (SS)
24. trichloroethene
25. dibromomethane
26. 1,2-dichloropropane
27. bromodichloromethane
28. 1-bromo-2-chloroethane (SS)
29. *cis*-1,3-dichloropropene
30. toluene
31. tetrachloroethene
32. *trans*-1,3-dichloropropene
33. 1,1,2-trichloroethane
34. dibromochloromethane
35. 1,3-dichloropropane
36. 1,2-dibromoethane
37. 1-chloro-3-fluorobenzene (SS)
38. chlorobenzene
39. ethylbenzene
40. 1,1,1,2-tetrachloroethane
41. *m*-xylene
42. *p*-xylene
43. *o*-xylene
44. styrene
45. bromoform
46. isopropylbenzene
47. bromobenzene
48. *n*-propylbenzene
49. 1,1,2,2-tetrachloroethane
50. 2-chlorotoluene
51. 1,2,3-trichloropropane
52. 1,3,5-trimethylbenzene
53. 4-chlorotoluene
54. *tert*-butylbenzene
55. 1,2,4-trimethylbenzene
56. *sec*-butylbenzene
57. *p*-isopropyltoluene
58. 1,3-dichlorobenzene
59. 1,4-dichlorobenzene
60. *n*-butylbenzene
61. 1,2-dichlorobenzene
62. 1,2-dibromo-3-chloropropane
63. hexachlorobutadiene
64. 1,2,4-trichlorobenzene
65. naphthalene
66. 1,2,3-trichlorobenzene

Acknowledgement: Finnigan 9001 GC, µGold Tandem Photoionization/HALL 2000 Electrolytic Conductivity Detector provided courtesy of Thermo Scientific GC & GC/MS Division, 2215 Grand Avenue Pkwy, Austin, Texas 78728

Volatile Organics
US EPA Method 8260 (80ppb Standard)
Rtx®-VMS



Column: Rtx®-VMS, 30m, 0.25mm ID, 1.4µm (cat.# 19915)
Sample: Calibration, internal standard, surrogate standard mixes (cat.# 30475B, 30465, 30006, 30240, 30074)

Purge and trap conditions:
O.I. Analytical 4560 with 4551A Autosampler

Trap:	#10 (Tenax®/silica gel/carbon molecular sieve)
Purge time:	11 min.
Purge flow rate:	38mL/min.
Desorb flow rate:	32mL/min.
Desorb time:	1.0 min.
Bake time:	10 min.
Sample size:	10mL
Water management:	110°C purge, 0°C desorb, 240°C bake
Split ratio:	1:25

Temperatures:

Sample:	40°C
Trap:	20°C purge, 190°C desorb, 210°C bake
6-Port valve:	110°C
Transfer line:	110°C
Sparge mount:	45°C
Desorb preheat:	150°C
Valve manifold:	50°C
Other conditions:	pre-purge, pre-heat, dry purge OFF

Chromatography:

Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.3 mL/min.
Dead time:	1.47 min. @ 35°C
Oven temp.:	35°C (hold 7 min.) to 90°C @ 4°C/min.(no hold) to 220°C @ 45°C/min. (hold 1 min.).
Det.:	Agilent 5971A GC/MS
Transfer line temp.:	280°C
Scan range:	35-260amu
Tune:	PFTBA/BFB

*carbon dioxide
1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. diethylether
8. 1,1-dichloroethene
9. carbon disulfide
10. Freon® 113
11. iodomethane
12. allyl chloride
13. methylene chloride
14. acetone
15. *trans*-1,2-dichloroethene
16. methyl-d3-*tert*-butyl-ether
17. methyl acetate
18. methyl-*tert*-butyl-ether
19. *tert*-butyl alcohol
20. acetonitrile
21. diisopropyl ether
22. chloroprene
23. 1,1-dichloroethane
24. acrylonitrile
25. ethyl-*tert*-butyl ether
26. *cis*-1,2-dichloroethene
27. 2,2-dichloropropane
28. bromochloromethane
29. chloroform
30. carbon tetrachloride
31. tetrahydrofuran
32. methyl acrylate
33. 1,1,1-trichloroethane
34. dibromofluoromethane
35. 1,1-dichloropropene
36. 2-butanone
37. benzene
38. propionitrile
39. methacrylonitrile
40. 1,2-dichloroethane-d4
41. pentafluorobenzene
42. *tert*-amyl-methyl ether
43. 1,2-dichloroethane
44. isobutyl alcohol
45. trichloroethene
46. 1,4-difluorobenzene
47. dibromomethane
48. 1,2-dichloropropane
49. bromodichloromethane
50. methyl methacrylate
51. *cis*-1,3-dichloropropene
52. 2-chloroethyl vinyl ether
53. toluene-d8
54. toluene
55. 2-nitropropane
56. tetrachloroethene
57. 2-bromo-1-chloropropane
58. 4-methyl-2-pentanone
59. *trans*-1,3-dichloropropene
60. 1,1,2-trichloroethane
61. ethyl methacrylate
62. dibromochloromethane
63. 1,3-dichloropropane
64. 1,2-dibromoethane
65. 2-hexanone
66. chlorobenzene-d5
67. chlorobenzene
68. ethylbenzene
69. 1,1,1,2-tetrachloroethane
70. *m*-xylene
71. *p*-xylene
72. *o*-xylene
73. bromoform
74. stryrene
75. isopropylbenzene
76. 4-bromo-1-fluorobenzene (SS)
77. bromobenzene
78. *cis*-1,4-dichloro-2-butene
79. 1,4-dichlorobutane
80. *n*-propylbenzene
81. 1,1,2,2-tetrachloroethane
82. 2-chlorotoluene
83. 1,2,3-trichloropropane
84. 1,3,5-trimethylbenzene
85. *trans*-1,4-dichloro-2-butene
86. 4-chlorotoluene
87. *tert*-butylbenzene
88. pentachloroethane
89. 1,2,4-trimethylbenzene
90. *sec*-butylbenzene
91. *p*-isopropyltoluene
92. 1,3-dichlorobenzene
93. 1,4-dichlorobenzene-d4
94. 1,4-dichlorobenzene
95. *n*-butylbenzene
96. 1,2-dichlorobenzene
97. 1,2-dibromo-3-chloropropane
98. nitrobenzene
99. hexachlorobutadiene
100. 1,2,4-trichlorobenzene
101. naphthalene
102. 1,2,3-trichlorobenzene

Acknowledgments: Purge & trap courtesy of O.I. Analytical.

for more info

EPA Method 8240 chromatograms
www.restek.com/chromatograms

Search: chromatogram number
GC_EV00426

restek innovation!

Good choice for alcohols & oxygenates!

free literature

Analysis of Trace Oxygenates in Petroleum-Contaminated Wastewater, Using Purge-and-Trap/GC/MS (US EPA Methods 5030B & 8260)

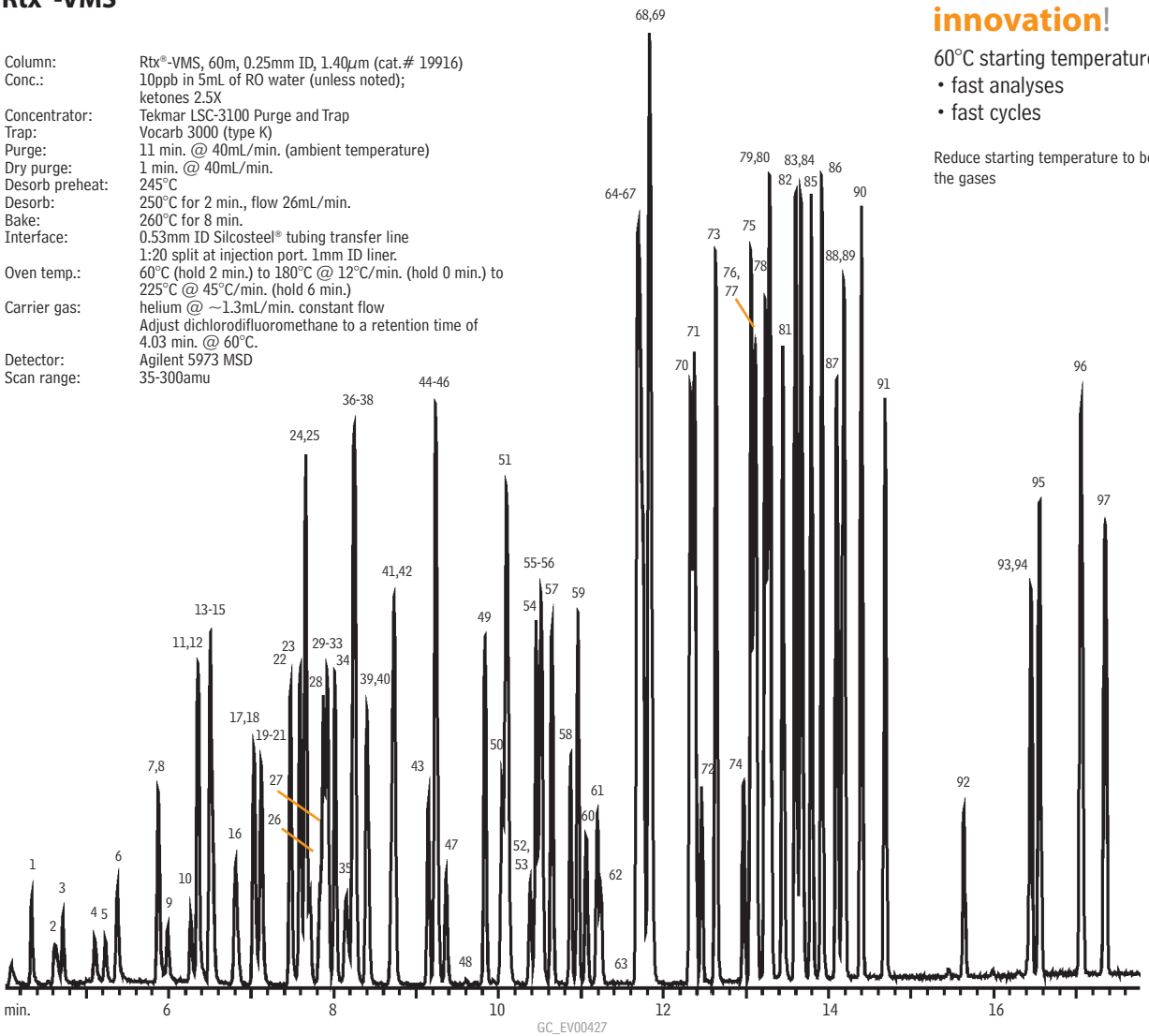
This 8-page note describes a practical, effective approach to monitoring oxygenates in wastewater. We evaluated the Rtx®-VMS stationary phase for oxygenates recovery, adjusted purge and trap conditions to increase responses for oxygenates, and optimized GC conditions to eliminate coelutions of ion-sharing analytes. The result is a sensitive, accurate analysis for gasoline oxygenates in wastewater, in the presence of much higher total gasoline content.

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Applications Note
lit. cat.# 59856

Volatile Organics
US EPA Method 8260B
Rtx®-VMS

Column:	Rtx®-VMS, 60m, 0.25mm ID, 1.40µm (cat.# 19916)
Conc.:	10ppb in 5mL of RO water (unless noted); ketones 2.5X
Concentrator:	Tekmar LSC-3100 Purge and Trap
Trap:	Vocarb 3000 (type K)
Purge:	11 min. @ 40mL/min. (ambient temperature)
Dry purge:	1 min. @ 40mL/min.
Desorb preheat:	245°C
Desorb:	250°C for 2 min., flow 26mL/min.
Bake:	260°C for 8 min.
Interface:	0.53mm ID Silcosteel® tubing transfer line 1:20 split at injection port. 1mm ID liner.
Oven temp.:	60°C (hold 2 min.) to 180°C @ 12°C/min. (hold 0 min.) to 225°C @ 45°C/min. (hold 6 min.)
Carrier gas:	helium @ ~1.3mL/min. constant flow Adjust dichlorodifluoromethane to a retention time of 4.03 min. @ 60°C.
Detector:	Agilent 5973 MSD
Scan range:	35-300amu



GC_EV00427

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60°C starting temperature
- fast analyses
- fast cycles

Reduce starting temperature to best focus the gases

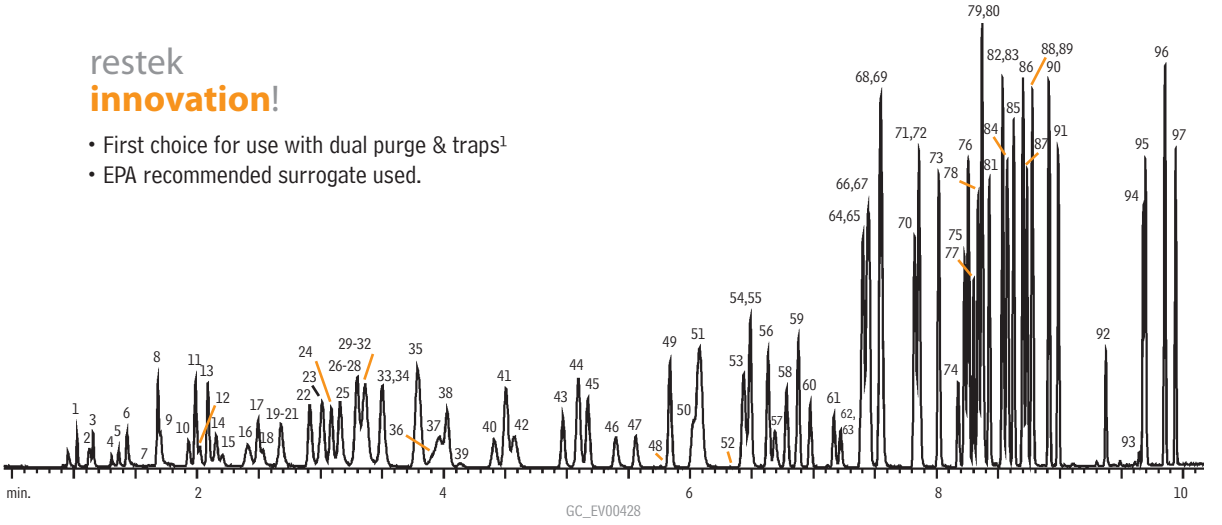
1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. ethanol (2500ppb)
8. 1,1-dichloroethene
9. carbon disulfide (40ppb)
10. allyl chloride
11. methylene chloride
12. acetone
13. *trans*-1,2-dichloroethene
14. *tert*-butyl alcohol (100ppb)
15. methyl *tert*-butyl ether
16. diisopropyl ether
17. 1,1-dichloroethane
18. acrylonitrile
19. vinyl acetate*
20. allyl alcohol (250ppb)
21. ethyl-*tert*-butyl ether*
22. *cis*-1,2-dichloroethene
23. 2,2-dichloropropane
24. bromochloromethane
25. chloroform
26. ethyl acetate
27. methyl acrylate
28. propargyl alcohol (500ppb)
29. dibromofluoromethane (SMC)
30. tetrahydrofuran
31. carbon tetrachloride
32. 2-butanone
33. 1,1,1-trichloroethane
34. 1,1-dichloropropene
35. pentafluorobenzene (IS)
36. *tert*-amyl methyl ether
37. benzene
38. isobutyl alcohol (500ppb)
39. 1,2-dichloroethane
40. isopropyl acetate
41. 1,4-difluorobenzene (SMC)
42. trichloroethene
43. dibromomethane
44. bromodichloromethane
45. 1,2-dichloropropane
46. methyl methacrylate
47. *n*-propyl acetate
48. 2-chloroethanol (2500ppb)
49. *cis*-1,3-dichloropropene
50. toluene-d8 (SMC)
51. toluene
52. 4-methyl-2-pentanone
53. pyridine (250ppb)
54. *trans*-1,3-dichloropropene
55. ethyl methacrylate
56. tetrachloroethene
57. 1,1,2-trichloroethane
58. dibromochloromethane
59. 1,3-dichloropropane
60. *n*-butyl acetate
61. 1,2-dibromoethane
62. 2-hexanone
63. 2-picoline (250ppb)
64. ethylbenzene
65. chlorobenzene-D5 (IS)
66. chlorobenzene
67. 1,1,1,2-tetrachloroethane
68. *m*-xylene
69. *p*-xylene
70. *o*-xylene
71. styrene
72. bromoform
73. isopropylbenzene
74. 4-bromo-1-fluorobenzene (SMC)
75. *n*-propylbenzene
76. 1,1,2,2-tetrachloroethane
77. bromobenzene
78. 1,3,5-trimethylbenzene
79. 2-chlorotoluene
80. 1,2,3-trichloropropane
81. 4-chlorotoluene
82. *tert*-butylbenzene
83. 1,2,4-trimethylbenzene
84. pentachloroethane
85. *sec*-butylbenzene
86. *p*-isopropyltoluene
87. 1,3-dichlorobenzene
88. 1,4-dichlorobenzene-d4 (IS)
89. 1,4-dichlorobenzene
90. *n*-butylbenzene
91. 1,2-dichlorobenzene
92. 1,2-dibromo-3-chloropropane
93. nitrobenzene (250ppb)
94. hexachlorobutadiene
95. 1,2,4-trichlorobenzene
96. naphthalene
97. 1,2,3-trichlorobenzene

*Peaks 19 & 21 share an ion (43).

Volatile Organics
US EPA Method 8260B
Rtx®-VMS

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- First choice for use with dual purge & traps[1]
- EPA recommended surrogate used.

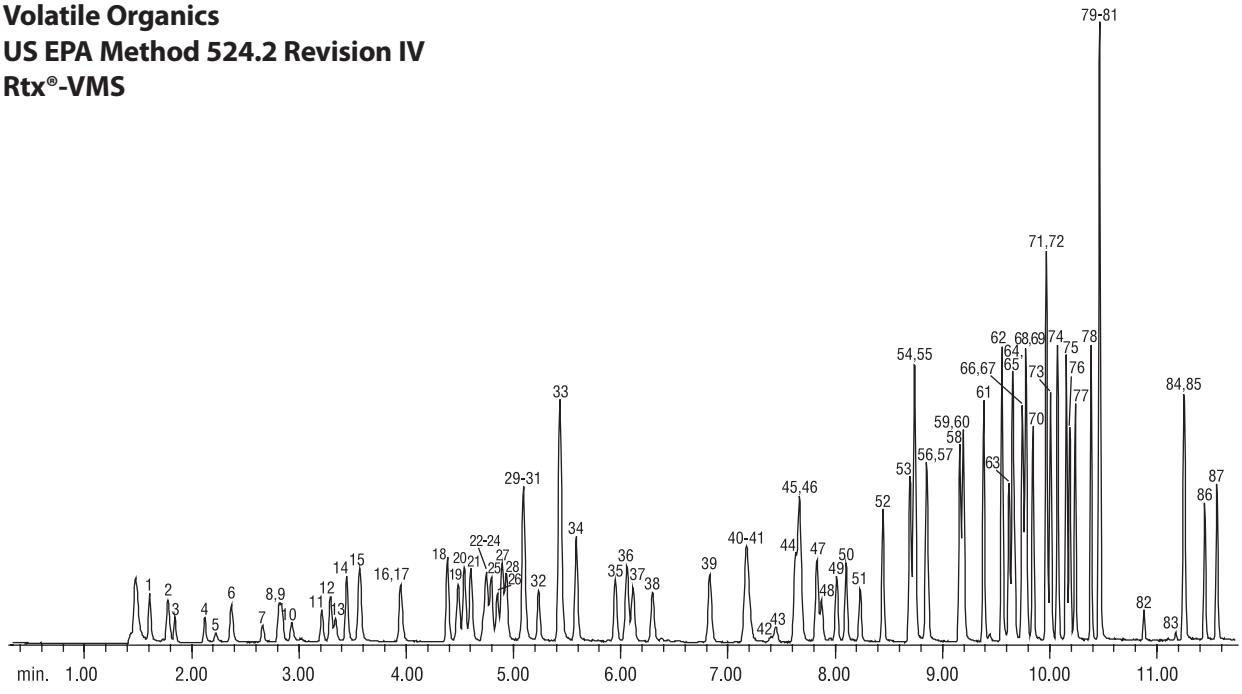


Column:	Rtx®-VMS, 20m, 0.18mm ID, 1.00µm (cat.# 49914)
Conc.:	10ppb in 5mL of RO water unless otherwise noted; ketones at 2.5X
Concentrator:	Tekmar LSC-3100 Purge and Trap
Trap:	Vocarb 3000 (type K)
Purge:	11 min. @ 40mL/min. (ambient temperature)
Dry purge:	1 min. @ 40mL/min.
Desorb preheat:	245°C
Desorb:	250°C for 2 min., flow 40mL/min.
Bake:	260°C for 8 min.
Interface:	0.53mm ID Silcosteel® tubing transfer line 1:40 split at injection port. 1mm ID liner.
Oven temp.:	50°C (hold 4 min.) to 100°C @ 18°C/min. (hold 0 min.) to 230°C @ 40°C/min. (hold 3 min.)
Carrier gas:	helium @ ~1.0mL/min. constant flow Adjust dichlorodifluoromethane to a retention time of 1.03 min. @ 50°C.
Detector:	Agilent 5973 MSD
Scan range:	35-300amu

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. ethanol (2500ppb)
8. 1,1-dichloroethene
9. carbon disulfide (40ppb)
10. allyl chloride
11. methylene chloride
12. acetone
13. *trans*-1,2-dichloroethene
14. methyl *tert*-butyl ether
15. *tert*-butyl alcohol (100ppb)
16. diisopropyl ether
17. 1,1-dichloroethane
18. acrylonitrile
19. vinyl acetate
20. allyl alcohol (250ppb)
21. ethyl-*tert*-buyl ether
22. *cis*-1,2-dichloroethene
23. 2,2-dichloropropane
24. bromochloromethane
25. chloroform
26. ethyl acetate
27. carbon tetrachloride
28. methyl acrylate
29. propargyl alcohol (500ppb)
30. dibromofluoromethane (SMC)
31. tetrahydrofuran
32. 1,1,1-trichloroethane
33. 2-butanone
34. 1,1-dichloropropene
35. benzene
36. pentafluorobenzene (IS)
37. *tert*-amyl-methyl ether
38. 1,2-dichloroethane
39. isobutyl alcohol (500ppb)
40. isopropyl acetate
41. trichloroethene
42. 1,4-difluorobenzene (SMC)
43. dibromomethane
44. 1,2-dichloropropane
45. bromodichloromethane
46. methyl methacrylate
47. *n*-propyl acetate
48. 2-chloroethanol (2500ppb)
49. *cis*-1,3-dichloropropene
50. toluene-d8 (SMC)
51. toluene
52. pyridine (250ppb)
53. tetrachloroethene
54. 4-methyl-2-pentanone
55. *trans*-1,3-dichloropropene
56. 1,1,2-trichloroethane
57. ethyl methacrylate
58. dibromochloromethane
59. 1,3-dichloropropane
60. 1,2-dibromoethane
61. *n*-butyl acetate
62. 2-hexanone
63. 2-picoline (250ppb)
64. chlorobenzene-D5 (IS)
65. chlorobenzene
66. ethylbenzene
67. 1,1,1,2-tetrachloroethane
68. *m*-xylene
69. *p*-xylene
70. *o*-xylene
71. stryrene
72. bromoform
73. isopropylbenzene
74. 4-bromo-1-fluorobenzene (SMC)
75. bromobenzene
76. *n*-propylbenzene
77. 1,1,2,2-tetrachloroethane
78. 2-chlorotoluene
79. 1,3,5-trimethylbenzene
80. 1,2,3-trichloropropane
81. 4-chlorotoluene
82. *tert*-butylbenzene
83. pentachloroethane
84. 1,2,4-trimethylbenzene
85. *sec*-butylbenzene
86. *p*-isopropyltoluene
87. 1,3-dichlorobenzene
88. 1,4-dichlorobenzene-d4 (IS)
89. 1,4-dichlorobenzene
90. *n*-butylbenzene
91. 1,2-dichlorobenzene
92. 1,2-dibromo-3-chloropropane
93. nitrobenzene (250ppb)
94. hexachlorobutadiene
95. 1,2,4-trichlorobenzene
96. naphthalene
97. 1,2,3-trichlorobenzene

[1]A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

Volatile Organics
US EPA Method 524.2 Revision IV
Rtx®-VMS



GC_EV00718

Purge and Trap Conditions:

Concentrator:	Tekmar LSC-3100 purge and trap
Trap:	Vocarb 3000 (type K)
Purge:	11 min. @ 40mL/min. @ ambient temperature.
Dry purge:	1 min. @ 40mL/min. (MCS bypassed using Silcosteel® tubing)
Desorb preheat:	245°C
Desorb:	250°C for 2 min., flow 33mL/min.
Bake:	260°C for 8 min.
Interface:	Silcosteel® transfer line 1:30 split at injection port. 1mm ID split inlet liner (cat.# 20972)

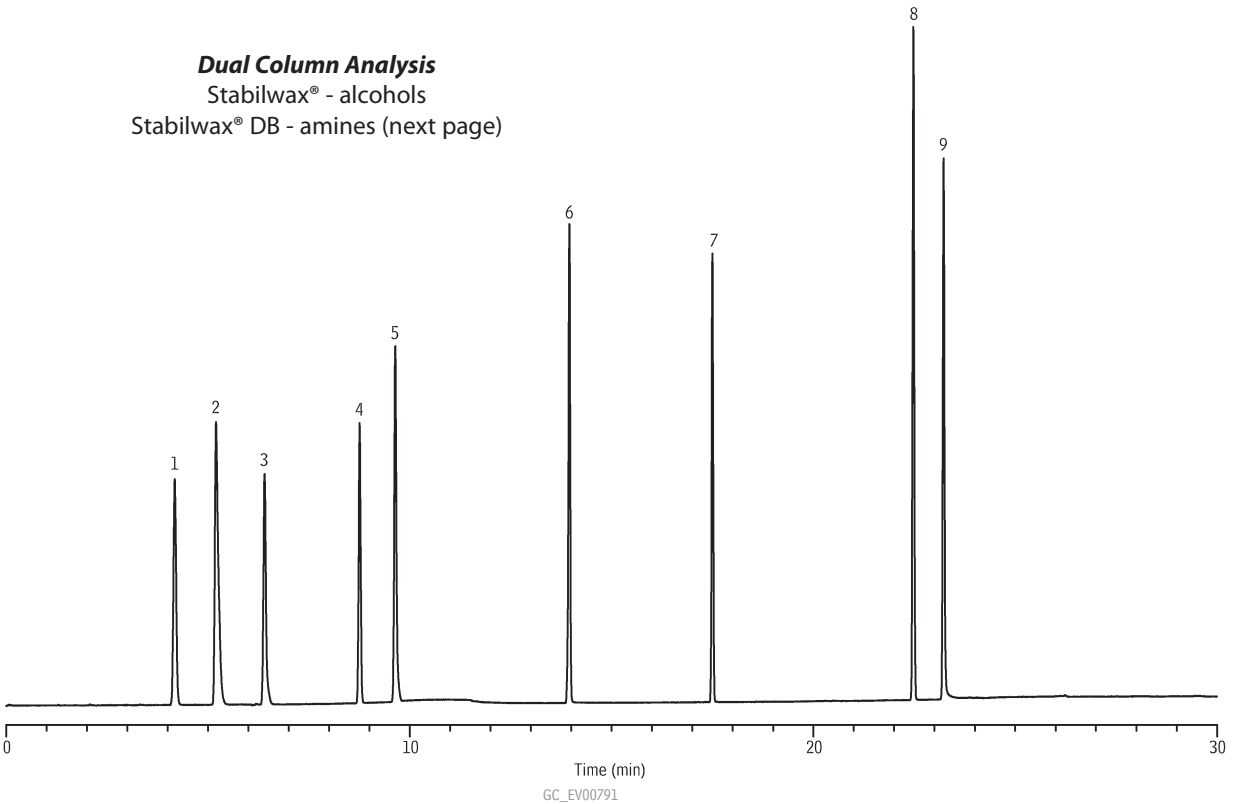
Column:	Rtx®-VMS, 30m, 0.25mm ID, 1.4µm (cat.# 19915)
Sample:	502.2 Calibration Mix #1 (cat.# 30042) Drinking Water VOA MegaMix®, 524.2 Rev 4 (cat.# 30601) 524 Internal Standard/Surrogate Mix (cat.# 30201) Ketone Mix, EPA Method 524.2 Rev 4.1 (cat.# 30602) Compounds at 20 ppb each in 5mL RO water (ketones at 50ppb; internal standards at 40ppb)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.1mL/min.
Dead time:	1.48 min. @ 40°C
Oven temp.:	40°C (hold 2 min.) to 85°C @ 14°C/min. (hold 2 min.) to 220°C @ 30°C/min. (hold 4 min.).
Det:	Agilent 5971A GC/MS
Transfer line temp.:	280°C
Scan range:	35-300amu
Tune	PFTBA/BFB
Ionization:	EI

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofluoromethane
7. diethyl ether
8. 1,1-dichloroethene
9. carbon disulfide
10. iodomethane
11. allyl chloride
12. methylene chloride
13. acetone
14. *trans*-1,2-dichloroethene
15. methyl *tert*-butyl ether
16. 1,1-dichloroethane
17. acrylonitrile
18. *cis*-1,2-dichloroethene
19. 2,2-dichloropropane
20. bromochloromethane
21. chloroform
22. methyl acrylate
23. carbon tetrachloride
24. tetrahydrofuran
25. 1,1,1-trichloroethane
26. 2-butanone
27. 1,1-dichloropropene
28. 1-chlorobutane
29. propionitrile
30. methacrylonitrile
31. benzene
32. 1,2-dichloroethane
33. fluorobenzene
34. trichloroethene
35. dibromomethane
36. 1,2-dichloropropane
37. bromodichloromethane
38. methyl methacrylate
39. *cis*-1,3-dichloropropene
40. toluene
41. chloroacetonitrile
42. 2-nitropropane
43. 1,1-dichloropropanone
44. 4-methyl-2-pentanone
45. tetrachloroethene
46. *trans*-1,3-dichloropropene
47. 1,1,2-trichloroethane
48. ethyl methacrylate
49. dibromochloromethane
50. 1,3-dichloropropane
51. 1,2-dibromoethane
52. 2-hexanone
53. chlorobenzene
54. ethylbenzene
55. 1,1,1,2-tetrachloroethane
56. *m*-xylene
57. *p*-xylene
58. *o*-xylene
59. styrrene
60. bromoform
61. isopropylbenzene
62. 4-bromofluorobenzene
63. bromobenzene
64. *n*-propylbenzene
65. 1,1,2,2-tetrachloroethane
66. 2-chlorotoluene
67. 1,2,3-trichloropropane
68. 1,3,5-trimethylbenzene
69. *trans*-1,4-dichloro-2-butene
70. 4-chlorotoluene
71. *tert*-butylbenzene
72. pentachloroethane
73. 1,2,4-trimethylbenzene
74. *sec*-butylbenzene
75. *p*-isopropyltoluene
76. 1,3-dichlorobenzene
77. 1,4-dichlorobenzene
78. *n*-butylbenzene
79. hexachloroethane
80. 1,2-dichlorobenzene-d4
81. 1,2-dichlorobenzene
82. 1,2-dibromo-3-chloropropane
83. nitrobenzene
84. hexachlorobutadiene
85. 1,2,4-trichlorobenzene
86. naphthalene
87. 1,2,3-trichlorobenzene

*Peaks 42 & 43 share an ion (43).

Volatile Organics
US EPA Method 1671
Stabilwax®

Dual Column Analysis
Stabilwax® - alcohols
Stabilwax® DB - amines (next page)



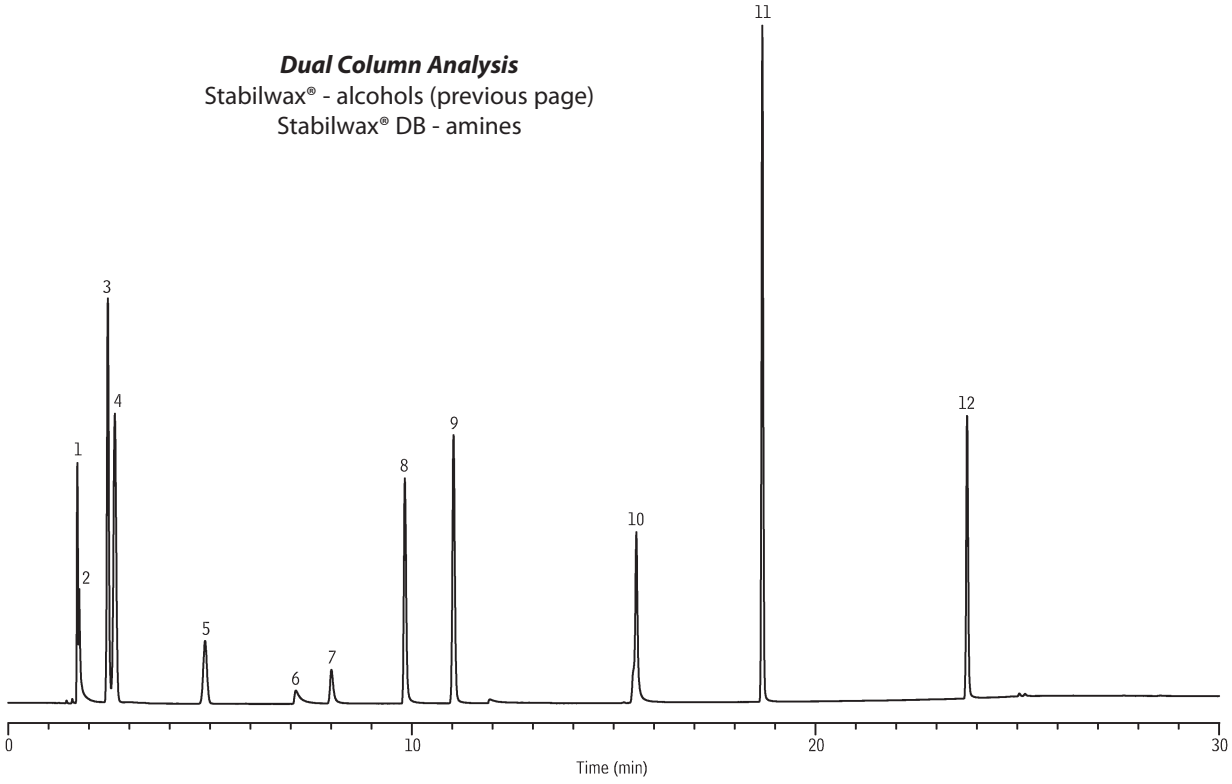
Peak	Retention Time (min.)
1. tetrahydrofuran (IS)	4.17
2. methanol	5.20
3. ethanol	6.40
4. acetonitrile	8.75
5. *n*-propanol	9.64
6. methyl Cellosolve®	13.95
7. formamide	17.50
8. dimethyl sulfoxide	22.47
9. ethylene glycol	23.22

Columns:	shown: Stabilwax®, 30m, 0.32mm ID, 1.0µm (cat.# 10654) (Column 2: Stabilwax® DB, 30m, 0.32mm ID, 1.0µm (cat.# 10854), next page) Flow from injector split to two columns using 0.53mm ID intermediate-polarity deactivated guard column (cat.# 10045), SeCure™ "Y" Connector (cat.# 20278), and "Y" Press-Tight® Connector (cat.# 20405)
Sample:	100µg/mL 1671 volatile organics mix in deionized water
Inj.:	1.0µL, split (split ratio 12:1), 4mm gooseneck splitless inlet liner (cat.# 20798)
Inj. temp.:	200°C
Carrier gas:	helium, constant pressure
Linear velocity:	2.48mL/min. / 39.25cm/sec. @ 40°C (Column 2: 2.51mL/min. / 39.68cm/sec. @ 40°C)
Oven temp.:	40°C (5 min.) to 180°C @ 7°C/min., hold 5 min.
Det.:	FID @ 250°C

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Volatile Organics
US EPA Method 1671
Stabilwax® DB

Dual Column Analysis
Stabilwax® - alcohols (previous page)
Stabilwax® DB - amines



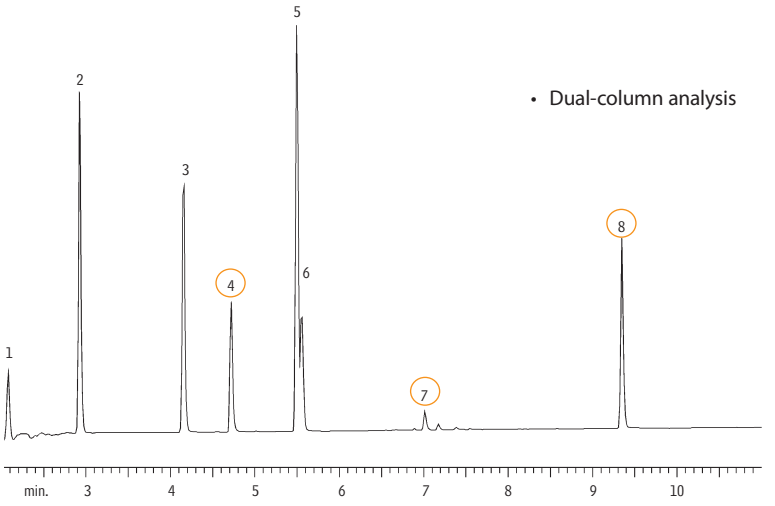
Peak	Retention Time (min.)	Concentration (µg/mL)
1. dimethylamine	1.71	200
2. methylamine	1.76	200
3. diethylamine	2.46	200
4. triethylamine	2.64	200
5. tetrahydrofuran (IS)	4.88	100
6. methanol	7.12	40
7. ethanol	8.01	40
8. acetonitrile	9.82	200
9. *n*-propanol	11.03	200
10. methyl Cellosolve®	15.56	200
11. formamide	18.68	500
12. dimethyl sulfoxide	23.75	100
ethylene glycol	no elution*	500

*Included in sample, but does not elute due to base deactivation in the DB phase.

Columns:	shown: Stabilwax® DB, 30m, 0.32mm ID, 1.0µm (cat.# 10854) (Column 1: Stabilwax®, 30m, 0.32mm ID, 1.0µm (cat.# 10654), previous page) Flow from injector split to two columns using 0.53mm ID intermediate-polarity deactivated guard column (cat.# 10045), SeCure™ "Y" Connector (cat.# 20278), and "Y" Press-Tight® Connector (cat.# 20405)
Sample:	1671 volatile organics mix in deionized water, concentrations indicated on figure.
Inj.:	1.0µL, split (split ratio 12:1), 4mm gooseneck splitless inlet liner (cat.# 20798)
Inj. temp.:	200°C
Carrier gas:	helium, constant pressure
Linear velocity:	2.51mL/min. / 39.68cm/sec. @ 40°C (Column 1: 2.48mL/min. / 39.25cm/sec. @ 40°C)
Oven temp.:	40°C (5 min.) to 180°C @ 7°C/min., hold 5 min.
Det.:	FID @ 250°C

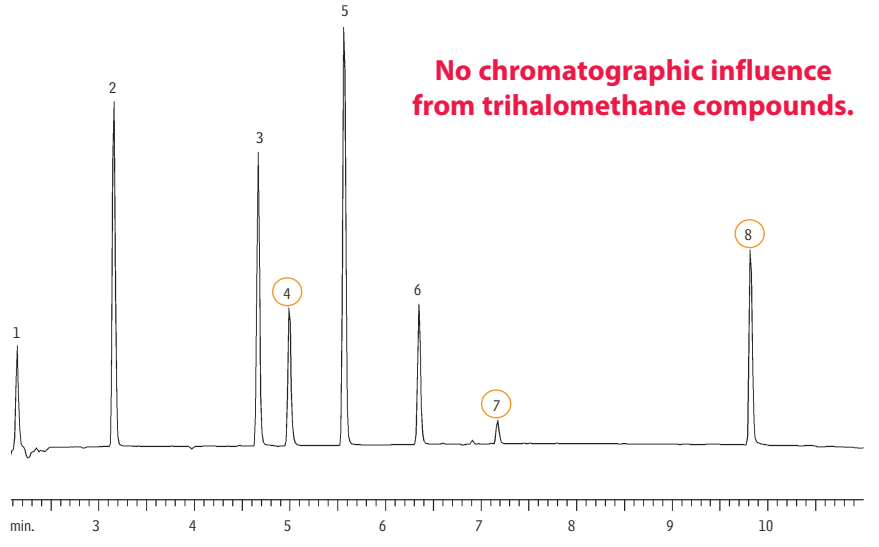
EDB/DBCP
US EPA Method 504.1
Rtx®-CLPesticides & Rtx®-CLPesticides2

Rtx®-CLPesticides



- Dual-column analysis

Rtx®-CLPesticides2

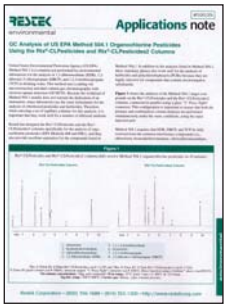


No chromatographic influence from trihalomethane compounds.

GC_EV00020

1. chloroform
2. bromodichloromethane
3. chlorodibromomethane
4. 1,2-dibromoethane (EDB)
5. 1,1,1,2-tetrachloroethane
6. bromoform
7. 1,2,3-trichloropropane
8. 1,2-dibromo-3-chloropropane (DBCP)

Columns:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.50µm (cat.# 11139), Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324), 0.32mm ID guard column (cat.# 10044), universal angled "Y" Press-Tight® connector (cat.# 20403)
Inj.	Direct injection using a Uniliner® inlet liner (cat.#20335)
On-column conc.:	10pg each compound.
Oven temp.:	35°C (hold 2 min.) to 300°C @ 12°C/min.
Inj./det. temp.:	200°C/300°C
Carrier gas:	helium, 12psi constant pressure



free literature

GC Analysis of US EPA Method 504.1 Organochlorine Pesticides, Using the Rtx®-CLPesticides and Rtx®-CLPesticides2 Columns

A versatile column pair for analyzing organochlorine pesticides, herbicides, or PCBs

Analysts following Method 504.1 in monitoring 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (TCP) in drinking water will value Rtx®-CLPesticides and Rtx®-CLPesticides2 columns because this same primary column/confirmation column pair can be used to perform numerous related analyses: organochlorine pesticides (e.g., by EPA Method 608 or 8081), herbicides, or polychlorinated biphenyls (PCBs). Details in this 2-page note show EDB, DBCP, and TCP are fully resolved from common interference compounds, per requirements of Method 504.1.

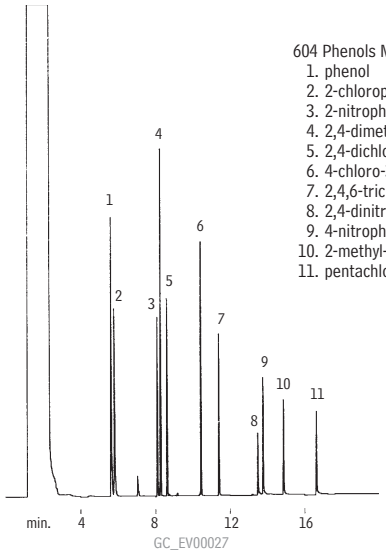
Applications Note
lit. cat.# 59539

Rtx®-CLPesticides and Rtx®-CLPesticides2 columns also are ideal for:

- ***Triazine herbicides (lit. cat.# 59101)***
- ***PCBs (lit. cat.# 59120)***
- ***Haloacetic acids (lit. cat.# 59175)***
- ***Polycyclic aromatic hydrocarbons (lit. cat.# 59196A)***

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Phenols
US EPA Method 604
MXT®-5

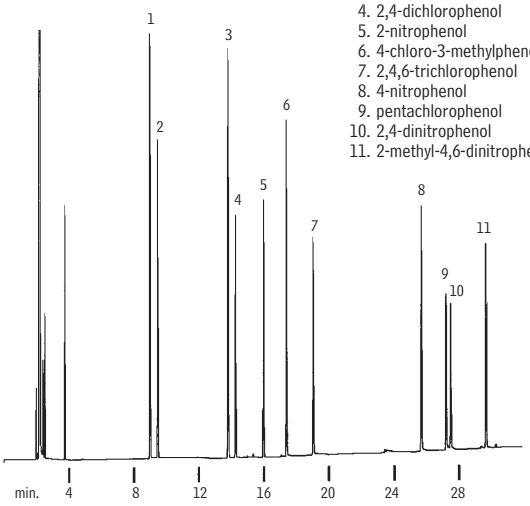


GC_EV00027

604 Phenols Mix (cat.# 31029)
1. phenol
2. 2-chlorophenol
3. 2-nitrophenol
4. 2,4-dimethylphenol
5. 2,4-dichlorophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 2,4-dinitrophenol
9. 4-nitrophenol
10. 2-methyl-4,6-dinitrophenol
11. pentachlorophenol

Column:	MXT®-5, 30m, 0.28mm ID, 0.25µm (cat.# 70224)
Inj.:	1.0µL splitless injection of phenols
Conc.:	25ng/µL per component
Oven temp.:	40°C to 250°C @ 10°C/min.
Inj./det. temp.:	280°C/300°C
Carrier gas:	hydrogen
Linear velocity:	50cm/sec. set @ 40°C
FID sensitivity:	2.56 x 10^{-10} AFS

Phenols
US EPA Method 604
Rtx®-200



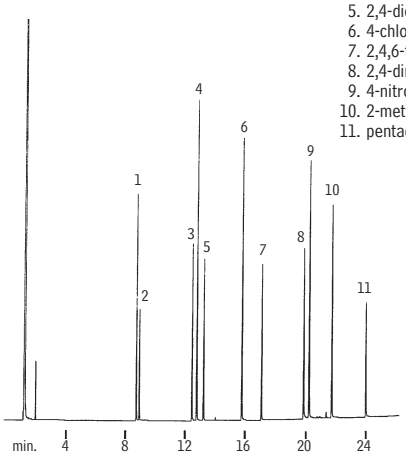
GC_EV00028

604 Phenols Mix (cat.# 31029)
1. phenol
2. 2-chlorophenol
3. 2,4-dimethylphenol
4. 2,4-dichlorophenol
5. 2-nitrophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 4-nitrophenol
9. pentachlorophenol
10. 2,4-dinitrophenol
11. 2-methyl-4,6-dinitrophenol

Column:	Rtx®-200, 30m, 0.32mm ID, 0.25µm (cat.# 15024)
Inj.:	1.0µL split injection of a 200ng standard
Oven temp.:	50°C (hold 4 min.) to 250°C @ 6°C/min.
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	20cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	40:1



Phenols
US EPA Method 604
Rtx®-5



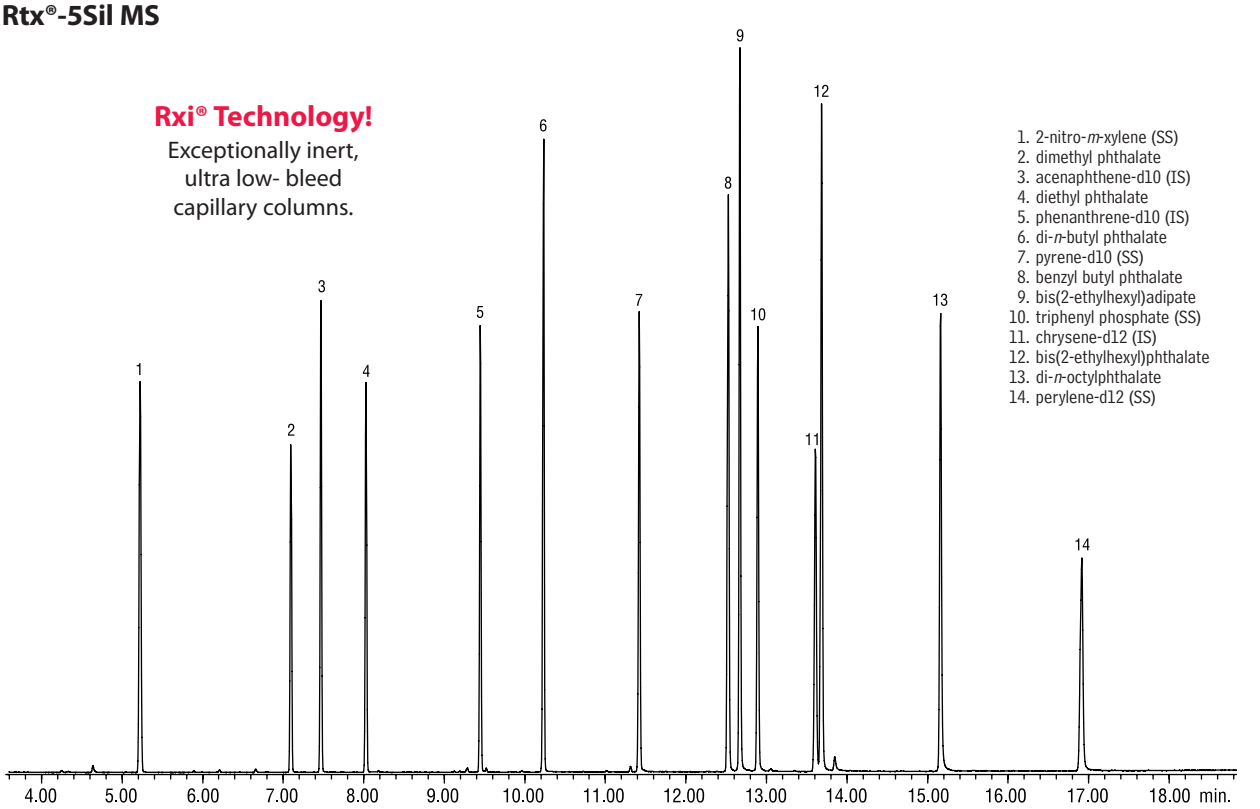
GC_EV00030

604 Phenols Mix (cat.# 31029)
1. phenol
2. 2-chlorophenol
3. 2-nitrophenol
4. 2,4-dimethylphenol
5. 2,4-dichlorophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 2,4-dinitrophenol
9. 4-nitrophenol
10. 2-methyl-4,6-dinitrophenol
11. pentachlorophenol

Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Inj.:	1.0µL split injection of phenols.
Conc.:	3-5ng/µL per component.
Oven temp.:	50°C (hold 4 min.) to 250°C @ 8°C/min.
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 110°C
FID sensitivity:	8 x 10^{-11} AFS
Split ratio:	40:1

Semivolatile Organics
US EPA Method 506
Rtx®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.



1. 2-nitro-*m*-xylene (SS)
2. dimethyl phthalate
3. acenaphthene-d10 (IS)
4. diethyl phthalate
5. phenanthrene-d10 (IS)
6. di-*n*-butyl phthalate
7. pyrene-d10 (SS)
8. benzyl butyl phthalate
9. bis(2-ethylhexyl)adipate
10. triphenyl phosphate (SS)
11. chrysene-d12 (IS)
12. bis(2-ethylhexyl)phthalate
13. di-*n*-octylphthalate
14. perylene-d12 (SS)

GC_EV00745

Column:	Rtx®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 12723)
Sample:	506 Calibration Mix, 1000µg/mL each analyte (cat.# 31845) Method 525.2 Internal Standard Mix (cat.# 31825) Method 525.2 Surrogate Standard Mix (cat.# 31826)
Inj.:	1.0µL, 20ppm each analyte (10ng on column) 4mm splitless single gooseneck inlet liner (cat.# 20799) splitless hold time 0.40 min., 0.45 min. pressure pulse @ 50psi
GC:	Agilent 6890
Inj. temp.:	270°C
Carrier gas:	helium, constant flow
Flow rate:	1.0mL/min.
Oven temp.:	80°C (hold 0.5 min.) to 260°C @ 18°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35–550amu
Solvent delay:	3 min.
Tune:	DFTPP

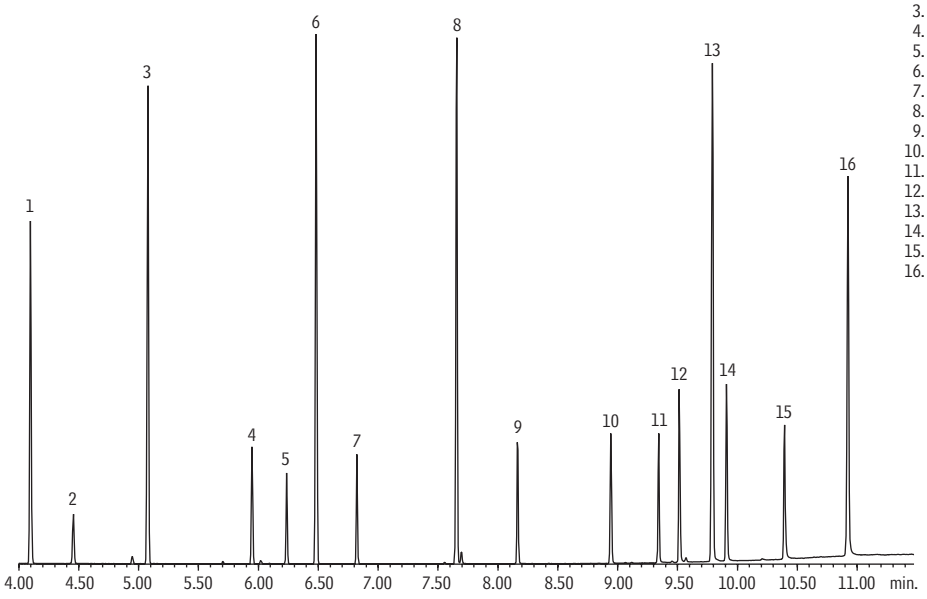
a **plus 1** story

"Any time I have any type of chromatography question, I know that I can call Restek Technical Service for assistance. Every time I have spoken to them, they have been extremely helpful, and friendly!"

Carisa A. Kelley, Exygen Research

Phthalate & Adipate Esters
US EPA Method 506
Rxi®-1ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.



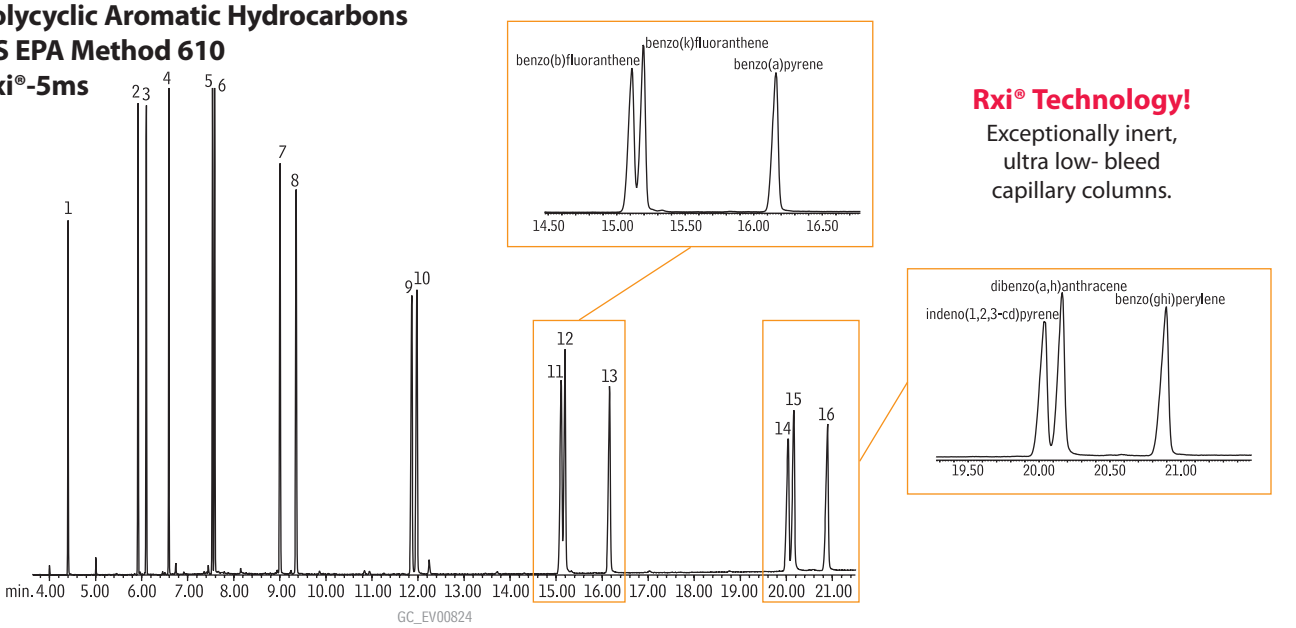
GC_EV00832

1. 1,4-dichlorobenzene-d4 (IS)
2. nitrobenzene-d5 (SS)
3. naphthalene-d8 (IS)
4. 2-fluorobiphenyl (SS)
5. dimethylphthalate
6. acenaphthene-d10 (IS)
7. diethylphthalate
8. phenanthrene-d10 (IS)
9. di-*n*-butylphthalate
10. *p*-terphenyl-d14 (SS)
11. benzyl butyl phthalate
12. bis(2-ethylhexyl)adipate
13. chrysene-d12 (IS)
14. bis(2-ethylhexyl)phthalate
15. di-*n*-octylphthalate
16. perylene-d12 (IS)

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	US EPA Method 506 mix: 506 Calibration Mix (cat.# 31845), SV Internal Standard Mix (cat.# 31206), B/N Surrogate Mix (4/89 SOW) (cat.# 31024)
Inj.:	1.0µL, 5µg/mL each analyte (internal standards 25µg/mL), split (10:1) 4mm Drilled Uniliner® inlet liner (hole on bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	50°C (hold 1 min.) to 330°C @ 30°C/min. (hold 2 min.)
Det.:	Agilent 5973 MSD
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	3.75 min.
Tune:	DFTPP
Ionization:	EI

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Polycyclic Aromatic Hydrocarbons
US EPA Method 610
Rxi®-5ms



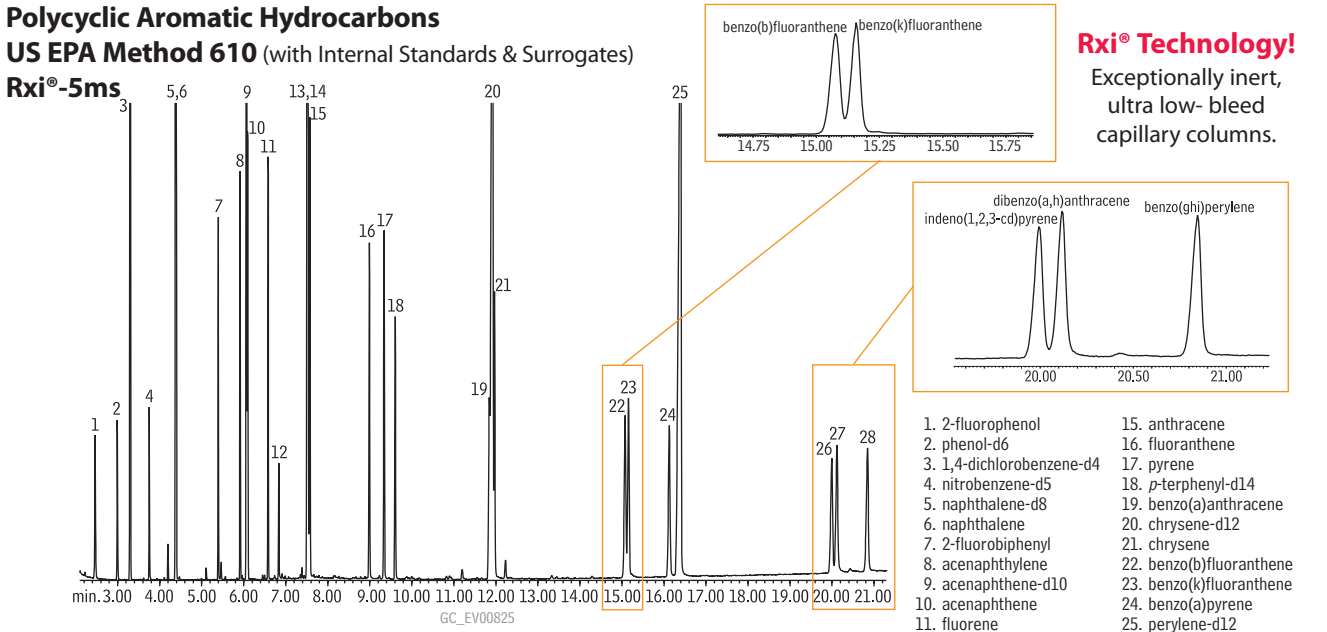
GC_EV00824

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	SV Calibration Mix #5/610 PAH Mix (cat.# 31011)
Inj.:	1.0µL, 10ppm each analyte (10ng on column), splitless (hold 0.1 min.) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	275°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	75°C (hold 0.5 min.) to 245°C @ 25°C/min., to 330°C @ 4°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	2 min.
Tune:	DFTPP
Ionization:	EI

1. naphthalene
2. acenaphthylene
3. acenaphthene
4. fluorene
5. phenanthrene
6. anthracene
7. fluoranthene
8. pyrene
9. benzo(a)anthracene
10. chrysene
11. benzo(b)fluoranthene
12. benzo(k)fluoranthene
13. benzo(a)pyrene
14. indeno(1,2,3-cd)pyrene
15. dibenzo(a,h)anthracene
16. benzo(ghi)perylene

Polycyclic Aromatic Hydrocarbons
US EPA Method 610 (with Internal Standards & Surrogates)
Rxi®-5ms



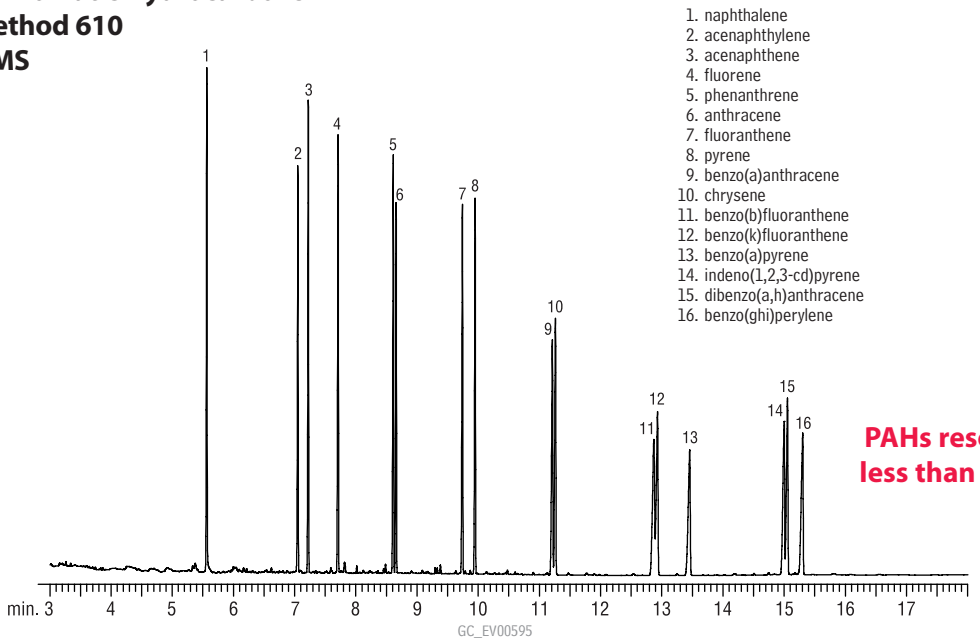
GC_EV00825

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	SV Calibration Mix #5/610 PAH Mix (cat.# 31011), Acid Surrogate Mix (4/89 SOW) (cat.# 31025), B/N Surrogate Mix (4/89 SOW) (cat.# 31024), SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL, 10ppm each analyte (10ng on column; 40ng each internal standard), splitless (hold 0.1 min.) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	275°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	75°C (hold 0.5 min.) to 245°C @ 25°C/min., to 330°C @ 4°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	2 min.
Tune:	DFTPP
Ionization:	EI

1. 2-fluorophenol
2. phenol-d6
3. 1,4-dichlorobenzene-d4
4. nitrobenzene-d5
5. naphthalene-d8
6. naphthalene
7. 2-fluorobiphenyl
8. acenaphthylene
9. acenaphthene-d10
10. acenaphthene
11. fluorene
12. 2,4,6-tribromophenol
13. phenanthrene-d10
14. phenanthrene
15. anthracene
16. fluoranthene
17. pyrene
18. *p*-terphenyl-d14
19. benzo(a)anthracene
20. chrysene-d12
21. chrysene
22. benzo(b)fluoranthene
23. benzo(k)fluoranthene
24. benzo(a)pyrene
25. perylene-d12
26. indeno(1,2,3-cd)pyrene
27. dibenzo(a,h)anthracene
28. benzo(ghi)perylene

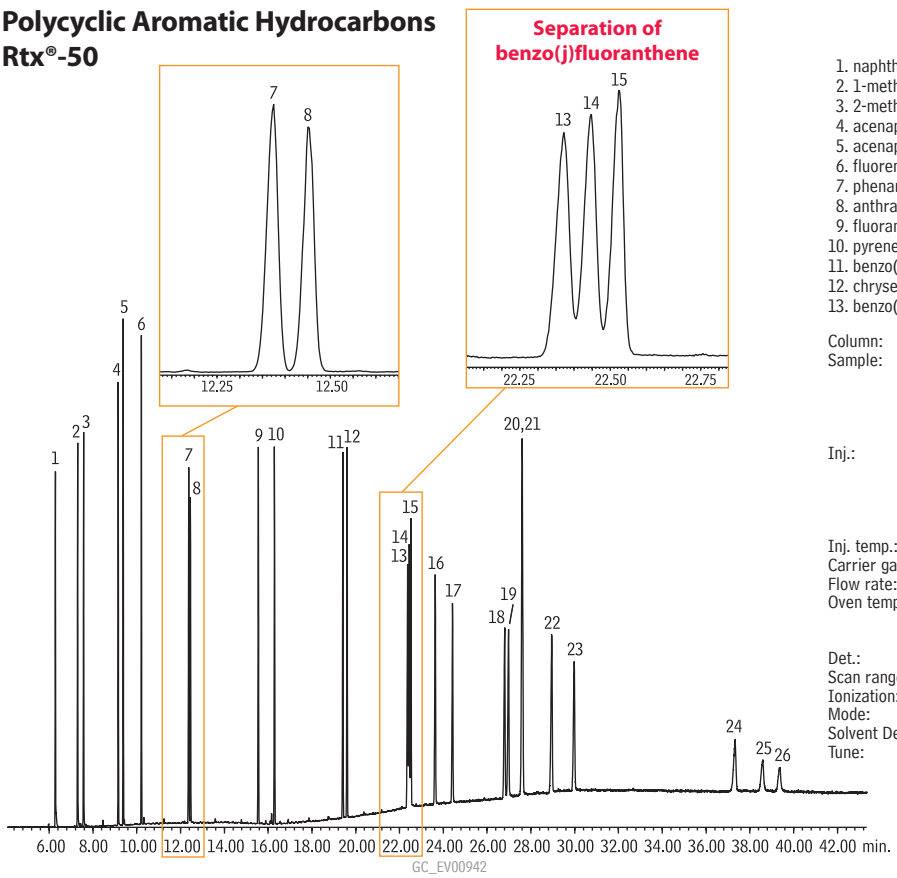
Polycyclic Aromatic Hydrocarbons
US EPA Method 610
Rtx®-5Sil MS



PAHs resolved in less than 16 min.!

Column:	Rtx®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 12723)
Sample:	50µg/mL 610 PAH Mix (cat.# 31011) in methylene chloride
Inj.:	1.0µL splitless (hold 2 min.), 2mm splitless inlet liner w/wool (cat.# 20829)
Inj. temp.:	330°C
Carrier gas:	hydrogen, 4mL/min. constant flow
Oven temp.:	40°C (hold 2 min.) to 250°C @ 25°C/min. to 265°C @ 5°C/min. to 300°C (hold 4 min.) @ 25°C/min.
Det.:	FID @ 350°C

Polycyclic Aromatic Hydrocarbons
Rtx®-50



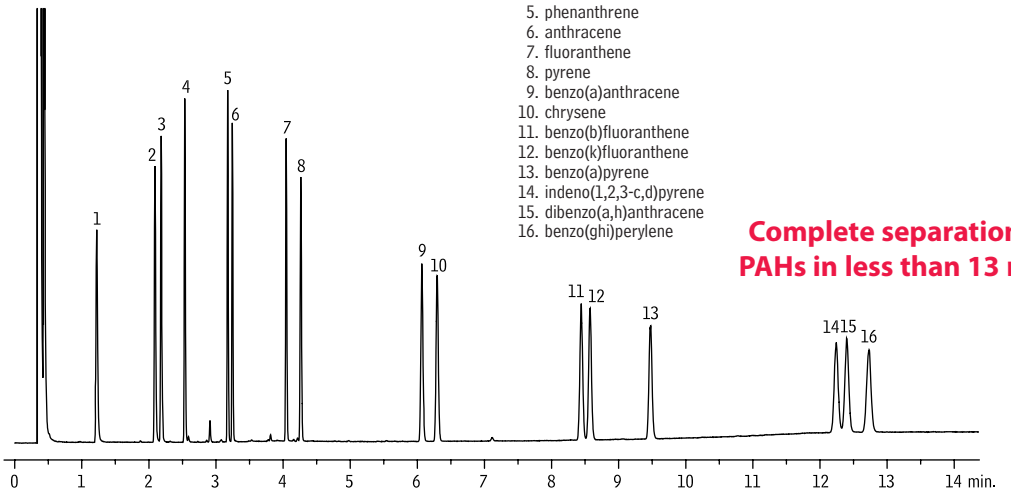
1. naphthalene
2. 1-methylnaphthalene
3. 2-methylnapthalene
4. acenaphthylene
5. acenapthene
6. fluorene
7. phenanthrene
8. anthracene
9. fluoranthene
10. pyrene
11. benzo(a)anthracene
12. chrysene
13. benzo(b)fluoranthene
14. benzo(k)fluoranthene
15. benzo(j)fluoranthene
16. benzo(a)pyrene
17. 3-methylcholanthrene
18. dibenzo(a,h)acridine
19. dibenzo(a,j)acridine
20. indeno(1,2,3-cd)pyrene
21. dibenzo(a,h)anthracene
22. benzo(ghi)perylene
23. 7H-dibenzo(c,g)carbazole
24. dibenzo(a,e)pyrene
25. dibenzo(a,i)pyrene
26. dibenzo(a,h)pyrene

Column:	Rtx®-50, 30m, 0.25mm ID, 0.25µm (cat.# 10523)
Sample:	PAH Mix, 20µg/mL each compund SV Calibration Mix #5/610 PAH Mix (cat.# 31011) PAH Supplement Mix for Method 8100 (cat.# 31857) 1-methylnapthalene (cat.# 31283) 2-methylnapthalene (cat.# 31285)
Inj.:	1.0µL (20ng on-column concentration), pulsed splitless: pulse 20psi @ 0.3 min., 40mL/min. @ 0.2 min., 4mm Drilled Uniliner® (hole near top) inlet liner (cat.# 21055)
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	90°C (hold 2.0 min.) to 215°C @ 25°C/min. to 220°C @ 2.5°C/min. to 300°C @ 10°C/min. to 320°C @ 2.5°C/min. (hold 15 min.)
Det.:	MS
Scan range:	50-550amu
Ionization:	EI
Mode:	scan
Solvent Delay:	4.0 min.
Tune:	DFTPP

Polycyclic Aromatic Hydrocarbons
Rt®-PAH

1. naphthalene
2. acenaphthylene
3. acenaphthene
4. fluorene
5. phenanthrene
6. anthracene
7. fluoranthene
8. pyrene
9. benzo(a)anthracene
10. chrysene
11. benzo(b)fluoranthene
12. benzo(k)fluoranthene
13. benzo(a)pyrene
14. indeno(1,2,3-c,d)pyrene
15. dibenzo(a,h)anthracene
16. benzo(ghi)perylene

Complete separation of PAHs in less than 13 min.



GC_EV00894

Column:	Rt®-PAH, 12m, 0.25mm ID, 0.15µm (cat.# 19733)
Sample:	16 component EPA Method 610 PAH standard (20ng/µl of each component in dichloromethane)
Inj.:	1.0µL split (split ratio 10:1)
Inj. temp.:	225°C
Carrier gas:	helium, 110kPa column head pressure
Oven temp.:	80°C to 220°C @ 40°C/min., 220°C to 285°C @ 8°C/min. (hold 5 min.)
Detector:	FID @ 290°C

Chromatogram courtesy of J&K Scientific.

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

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Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com



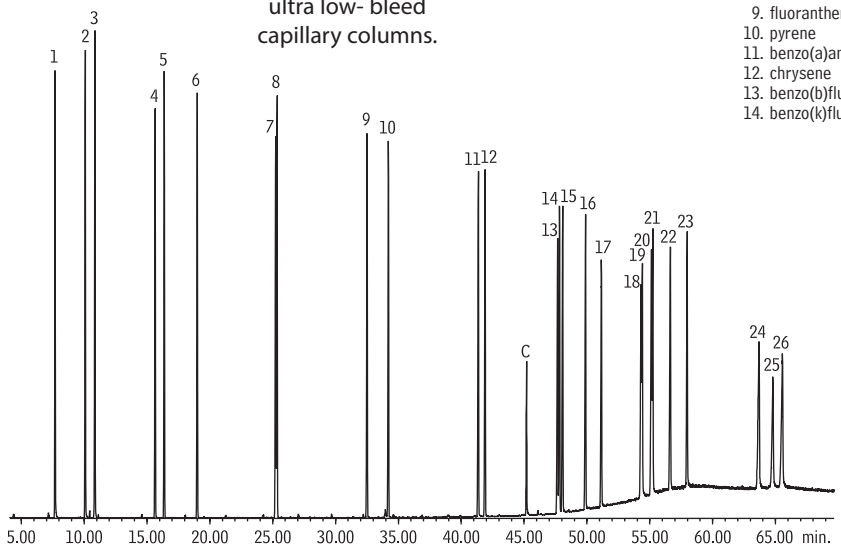
Mike Shuey, Customer Service

Polycyclic Aromatic Hydrocarbons
Rxi®-17

- maximum resolution
- benzo(j)fluoranthene resolved

Rxi® Technology!

Exceptionally inert, ultra low- bleed capillary columns.



GC_EV00924

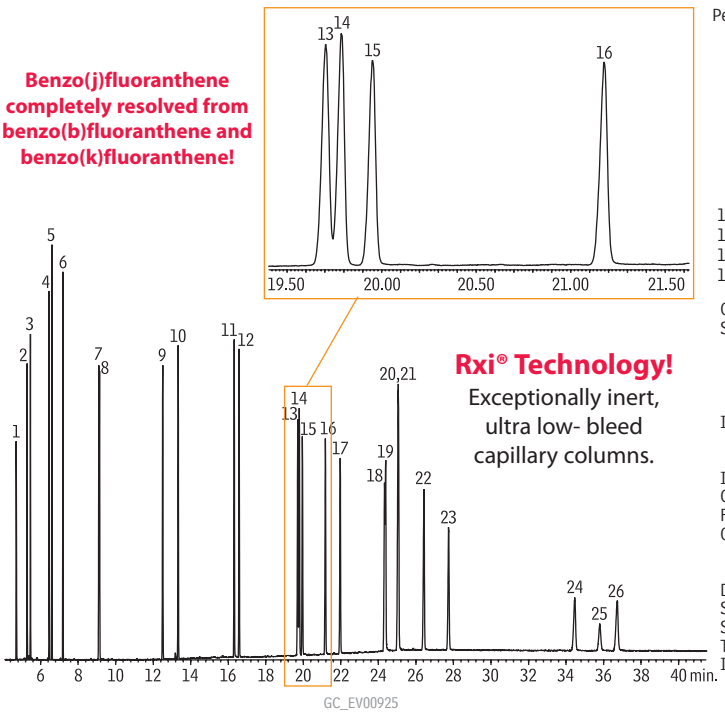
Peak List	Ret. Time (min.)
1. naphthalene	7.70
2. 1-methylnaphthalene	10.08
3. 2-methylnapthalene	10.85
4. acenaphthylene	15.64
5. acenaphthene	16.36
6. fluorene	19.00
7. phenanthrene	25.24
8. anthracene	25.36
9. fluoranthene	32.50
10. pyrene	34.21
11. benzo(a)anthracene	41.37
12. chrysene	41.91
13. benzo(b)fluoranthene	47.67
14. benzo(k)fluoranthene	47.82
15. benzo(j)fluoranthene	48.07
16. benzo(a)pyrene	49.89
17. 3-methylcholanthrene	51.15
18. dibenzo(a,h)acridine	54.30
19. dibenzo(a,j)acridine	54.41
20. indeno(1,2,3-cd)pyrene	55.13
21. dibenzo(a,h)anthracene	55.24
22. benzo(ghi)perylene	56.64
23. 7H-dibenzo(c,g)carbazole	57.98
24. dibenzo(a,e)pyrene	63.69
25. dibenzo(a,i)pyrene	64.79
26. dibenzo(a,h)pyrene	65.56

c = contaminant

Column:	Rxi®-17, 30m, 0.25mm ID, 0.25µm (cat.# 13523)
Sample:	PAH mix, 50µg/mL each component: EPA Method 610 Mix (cat.# 31011) PAH Supplement Mix (cat.# 31857) 1-methylnapthalene (cat.# 31283) 2-methylnapthalene (cat.# 31285)
Instrument:	Agilent 6890
Inj.:	1.0µL pulsed splitless injection (50ng each component on column), 4mm Drilled Uniliner® inlet liner with hole near top (cat.# 21055); pulse: 20psi @ 0.3 min., 40mL/min. @ 0.2 min.
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (hold 0.5 min.) to 320°C @ 4°C/min. (hold 20 min.)
Det.:	Agilent 5973 GC/MS
Scan range:	50-550amu
Solvent delay:	4.0 min.
Tune:	DFTPP
Ionization:	EI

Polycyclic Aromatic Hydrocarbons
Rxi®-17

Benzo(j)fluoranthene completely resolved from benzo(b)fluoranthene and benzo(k)fluoranthene!



Rxi® Technology!

Exceptionally inert, ultra low- bleed capillary columns.

GC_EV00925

Peak List	Ret. Time (min.)
1. naphthalene	4.70
2. 1-methylnaphthalene	5.28
3. 2-methylnapthalene	5.46
4. acenaphthylene	6.45
5. acenaphthene	6.60
6. fluorene	7.18
7. phenanthrene	9.10
8. anthracene	9.14
9. fluoranthene	12.50
10. pyrene	13.33
11. benzo(a)anthracene	16.32
12. chrysene	16.58
13. benzo(b)fluoranthene	19.70
14. benzo(k)fluoranthene	19.78
15. benzo(j)fluoranthene	19.95
16. benzo(a)pyrene	21.17
17. 3-methylcholanthrene	21.97
18. dibenzo(a,h)acridine	24.33
19. dibenzo(a,j)acridine	24.39
20. indeno(1,2,3-cd)pyrene	25.04
21. dibenzo(a,h)anthracene	25.07
22. benzo(ghi)perylene	26.43
23. 7H-dibenzo(c,g)carbazole	27.75
24. dibenzo(a,e)pyrene	34.46
25. dibenzo(a,i)pyrene	35.80
26. dibenzo(a,h)pyrene	36.73

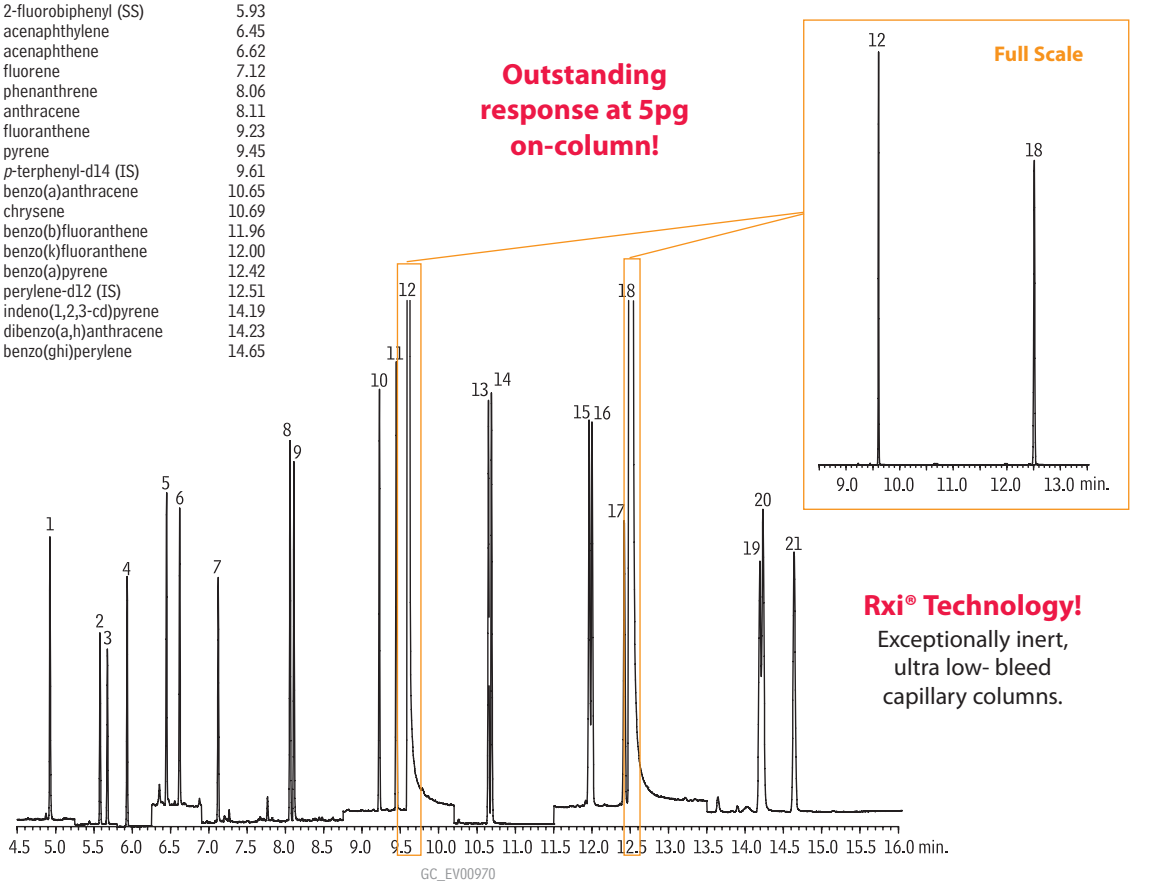
Column:	Rxi®-17, 30m, 0.25mm ID, 0.25µm (cat.# 13523)
Sample:	PAH mix, 20µg/mL each component: EPA Method 610 Mix (cat.# 31011) PAH Supplement Mix (cat.# 31857) 1-methylnaphthalene (cat.# 31283) 2-methylnaphthalene (cat.# 31285)
Inj.:	1.0µL pulsed splitless injection (20ng each component on column), 4mm Drilled Uniliner® inlet liner with hole near top (cat.# 21055); pulse: 20psi @ 0.3 min., 40mL/min. @ 0.2 min.
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	90°C (hold 1.0 min.) to 215°C @ 25°C/min. (hold 0.5 min.) to 235°C @ 4°C/min., to 280°C @ 15°C/min., to 320°C @ 4°C/min. (hold 20 min.)
Det.:	Agilent 5973 GC/MS
Scan range:	50-550amu
Solvent delay:	4.0 min.
Tune:	DFTPP
Ionization:	EI

Polycyclic Aromatic Hydrocarbons
Rxi®-5Sil MS

NEW!

Peak List	Retention Time
1. naphthalene	4.93
2. 2-methylnaphthalene	5.58
3. 1-methylnaphthalene	5.68
4. 2-fluorobiphenyl (SS)	5.93
5. acenaphthylene	6.45
6. acenaphthene	6.62
7. fluorene	7.12
8. phenanthrene	8.06
9. anthracene	8.11
10. fluoranthene	9.23
11. pyrene	9.45
12. *p*-terphenyl-d14 (IS)	9.61
13. benzo(a)anthracene	10.65
14. chrysene	10.69
15. benzo(b)fluoranthene	11.96
16. benzo(k)fluoranthene	12.00
17. benzo(a)pyrene	12.42
18. perylene-d12 (IS)	12.51
19. indeno(1,2,3-cd)pyrene	14.19
20. dibenzo(a,h)anthracene	14.23
21. benzo(ghi)perylene	14.65

Outstanding response at 5pg on-column!



Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Column:	Rxi®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 13623)
Sample:	PAH mix, 1µL of 0.005µg/mL (IS 2µg/mL) SV Calibration Mix #5 (cat.# 31011) 1-methylnaphthalene (cat.# 31283) 2-methylnaphthalene (cat.# 31285) 2-fluorobiphenyl (cat.# 31091)
Inj.:	1.0µL (5pg on-column concentration), 4mm Drilled Uniliner® (hole near top) inlet liner w/wool (cat.# 21055-200.5), pulsed splitless: pulse 20psi @ 0.2 min., 60mL/min. @ 0.15 min.
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	1.4mL/min.
Oven temp.:	50°C (hold 0.5 min.) to 290°C @ 25°C/min. to 320°C @ 5°C/min.
Det.:	MS
Transfer line temp:	290°C
Ionization:	EI
Mode:	SIM

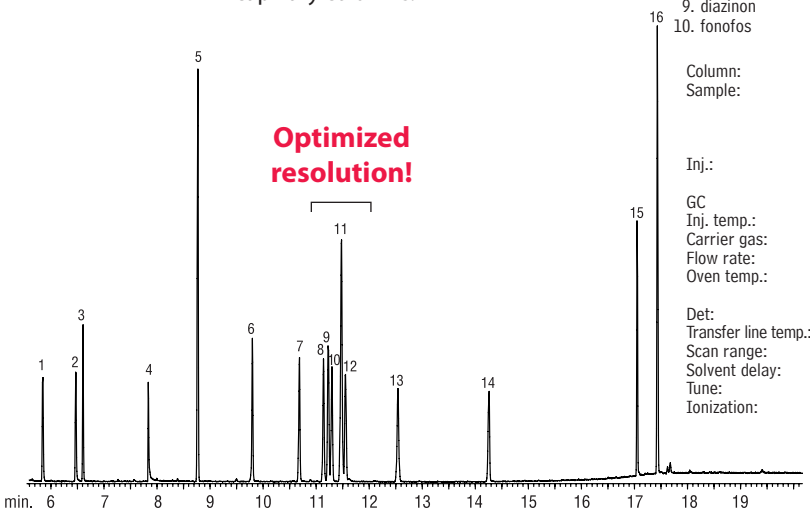
Single Ion Monitoring Program

Group	Time	Ion(s)	Dwell (ms)
1	4.00	128	100
2	5.25	142	100
3	5.80	172	100
4	6.25	152	100
5	6.90	166	100
6	7.60	178	100
7	8.75	202, 244	100
8	10.2	228	100
9	11.5	252, 264	100
10	13.5	276, 278	100

Semivolatile Organics
US EPA Method 526 (Screening)
Rtx®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Optimized resolution!



GC_EV00656

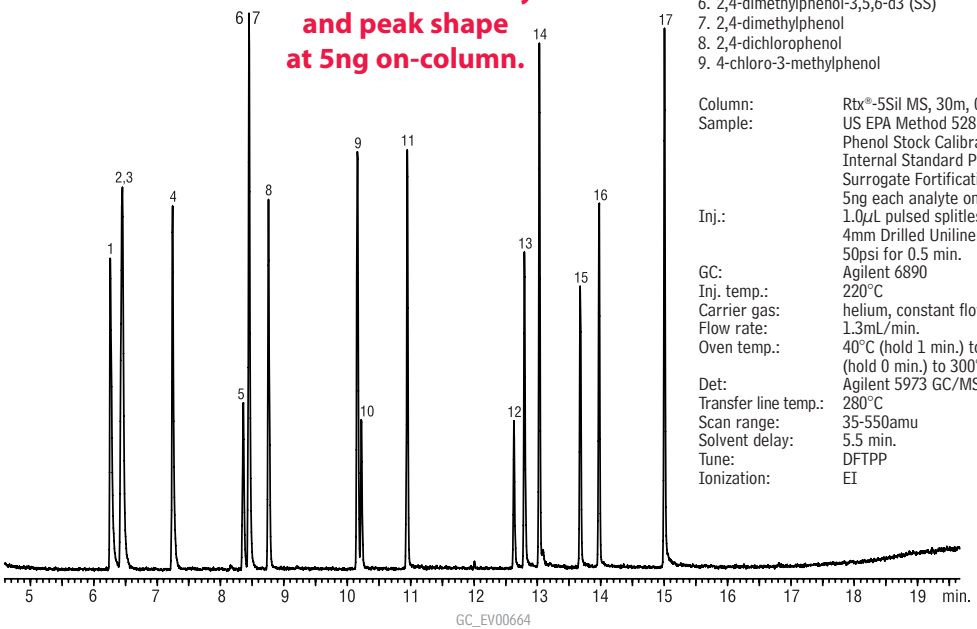
1. nitrobenzene
2. 2,4-dichlorophenol
3. 1,3-dimethyl-2-nitrobenzene (SS)
4. 2,4,6-trichlorophenol
5. acenaphthene-d10 (IS#1)
6. azobenzene*
7. prometon
8. terbufos
9. diazinon
10. fonofos
11. phenanthrene-d10 (IS#2)
12. disulfoton
13. acetochlor
14. cyanazine
15. triphenylphosphate (SS)
16. chrysene-d12

* Compound listed in method, 1,2-diphenylhydrazine, decomposes to azobenzene.

Column:	Rtx®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 12723)
Sample:	US EPA Method 526 Mix 1µL 10ppm (20ppm IS) Primary Dilution Standard/Semivolatiles/EPA 526 (cat.# 31691) Surrogate Standard/Method 526 (cat.# 31693) Internal Standard/Method 526 (cat.# 31692)
Inj.:	1.0µL splitless (hold 0.3 min.), 4mm Drilled Uniliner® inlet liner (cat.# 21055)
GC	Agilent 6890
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Flow rate:	0.8mL/min.
Oven temp.:	50°C (hold 1 min.) to 200°C @ 20°C/min. (hold 5 min.) to 310°C @ 30°/min. (hold 3 min.)
Det:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	5.5 min.
Tune:	DFTPP
Ionization:	EI

Phenols
US EPA Method 528
Rtx®-5Sil MS

Excellent sensitivity and peak shape at 5ng on-column.



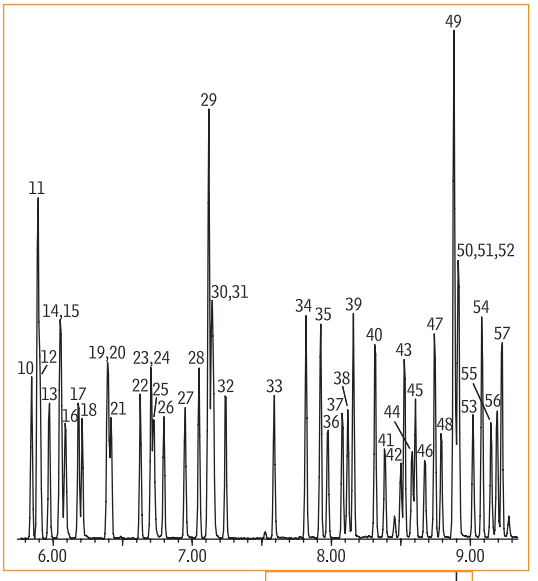
GC_EV00664

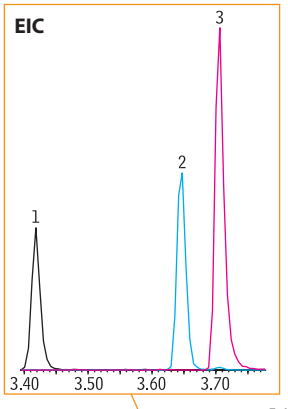
1. phenol
2. 2-chlorophenol-3,4,5,6-d4 (SS)
3. 2-chlorophenol
4. 2-methylphenol
5. 2-nitrophenol
6. 2,4-dimethylphenol-3,5,6-d3 (SS)
7. 2,4-dimethylphenol
8. 2,4-dichlorophenol
9. 4-chloro-3-methylphenol
10. 1,2-dimethyl-3-nitrobenzene (IS#1)
11. 2,4,6-trichlorophenol
12. 2,4-dinitrophenol
13. 4-nitrophenol
14. 2,3,4,5-tetrachlorophenol (IS#2)
15. 2-methyl-4,6-dinitrophenol
16. 2,4,6-tribromophenol (SS)
17. pentachlorophenol

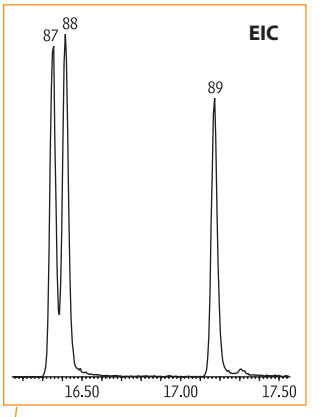
Column:	Rtx®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 12723)
Sample:	US EPA Method 528 Mix 1µL 5ppm standard Phenol Stock Calibration Solution (cat.# 31694) Internal Standard Phenols Method 528 (cat.# 31696) Surrogate Fortification Standard/Phenols (cat.# 31692) 5ng each analyte on-column
Inj.:	1.0µL pulsed splitless (hold 0.5 min.), 4mm Drilled Uniliner® inlet liner (cat.# 21055), pulsed pressure 50psi for 0.5 min.
GC:	Agilent 6890
Inj. temp.:	220°C
Carrier gas:	helium, constant flow
Flow rate:	1.3mL/min.
Oven temp.:	40°C (hold 1 min.) to 220°C @ 12°C/min. (hold 0 min.) to 300°C @ 30°C/min. (hold 1 min.)
Det:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	5.5 min.
Tune:	DFTPP
Ionization:	EI

Semivolatile Organics
US EPA Method 8270
Rxi®-5Sil MS

Column:	Rxi®-5Sil MS, 30m, 0.25mm ID, 0.5µm (cat.# 13638)
Sample:	US EPA Method 8270D Mix, 1µL of 10µg/mL (IS 40µg/mL) 8270 MegaMix® (cat.# 31850) Benzoic Acid (cat.# 31879) 8270 Benzidines Mix (cat.# 31852) Acid Surrogate Mix (4/89 SOW) (cat.# 31025) Revised B/N Surrogate Mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL (10ng on-column concentration), 4mm Drilled Uniliner® (hole near bottom) inlet liner (cat.# 20756), pulsed splitless: pulse 30psi @ 0.3 min., 40mL/min. @ 0.25 min.
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	40°C (hold 1.0 min.) to 280°C @ 25°C/min. to 320°C @ 5°C/min. (hold 3.5 min.)
Det.:	MS
Transfer line temp:	280°C
Scan range:	35-550amu
Ionization:	EI
Mode:	scan







- Drilled Uniliner® liner
- 10ng each compound
- Silarylene phase
- 0.5µm film thickness

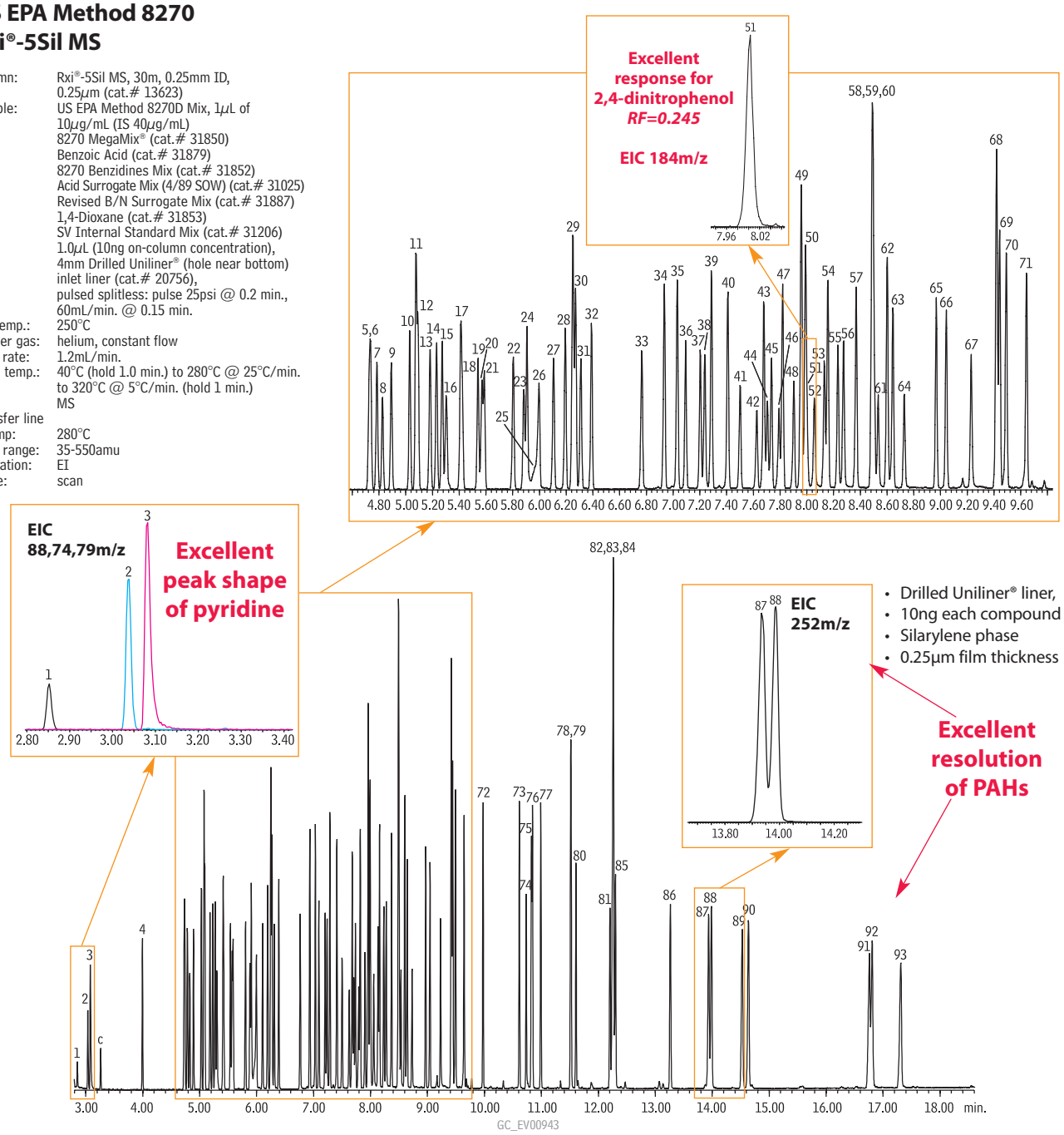
Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

GC_EV00944

1. 1,4-dioxane
2. n-nitrosodimethylamine
3. pyridine
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 2-methylphenol
15. 1,2-dichlorobenzene
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/ 3-methylphenol
18. n-nitroso-di-n-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2,4-dimethylphenol
24. benzoic acid
25. 2-nitrophenol
26. bis(2-chloroethoxy)methane
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. 2,4-dinitrophenol
51. acenaphthene
52. 4-nitrophenol
53. 2,4-dinitrotoluene
54. dibenzofuran
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. 4-chlorophenyl phenyl ether
59. 4-nitroanaline
60. fluorene
61. 4,6-dinitro-2-methylphenol
62. n-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-n-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. 3,3'-dimethylbenzidine
77. pyrene
78. p-terphenyl-d14 (SS)
79. butyl benzyl phthalate
80. bis(2-ethylhexyl) adipate
81. bis(2-ethylhexyl) phthalate
82. 3,3'-dichlorobenzidine
83. benzo(a)anthracene
84. chrysene-d12 (IS)
85. chrysene
86. di-n-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene

Semivolatile Organics
US EPA Method 8270
Rxi®-5Sil MS

Column:	Rxi®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 13623)
Sample:	US EPA Method 8270D Mix, 1µL of 10µg/mL (IS 40µg/mL) 8270 MegaMix® (cat.# 31850) Benzoic Acid (cat.# 31879) 8270 Benzidines Mix (cat.# 31852) Acid Surrogate Mix (4/89 SOW) (cat.# 31025) Revised B/N Surrogate Mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL (10ng on-column concentration), 4mm Drilled Uniliner® (hole near bottom) inlet liner (cat.# 20756), pulsed splitless: pulse 25psi @ 0.2 min., 60mL/min. @ 0.15 min.
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	40°C (hold 1.0 min.) to 280°C @ 25°C/min. to 320°C @ 5°C/min. (hold 1 min.)
Det.:	MS
Transfer line temp:	280°C
Scan range:	35-550amu
Ionization: Mode:	EI scan



1. 1,4-dioxane
2. *n*-nitrosodimethylamine
3. pyridine
c. toluene
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 1,2-dichlorobenzene
15. 2-methylphenol
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/3-methylphenol
18. *n*-nitroso-di-*n*-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2-nitrophenol
24. 2,4-dimethylphenol
25. benzoic acid
26. bis(2-chloroethoxy)methane
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. acenaphthene
51. 2,4-dinitrophenol
52. 4-nitrophenol
53. 2,4-dinitrotoluene
54. dibenzofuran
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. 4-chlorophenyl phenyl ether
59. fluorene
60. 4-nitroanaline
61. 4,6-dinitro-2-methylphenol
62. *n*-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-*n*-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. pyrene
77. *p*-terphenyl-d14 (SS)
78. 3,3'-dimethylbenzidine
79. butyl benzyl phthalate
80. bis(2-ethylhexyl) adipate
81. 3,3'-dichlorobenzidine
82. benzo(a)anthracene
83. bis(2-ethylhexyl) phthalate
84. chrysene-d12 (IS)
85. chrysene
86. di-*n*-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene

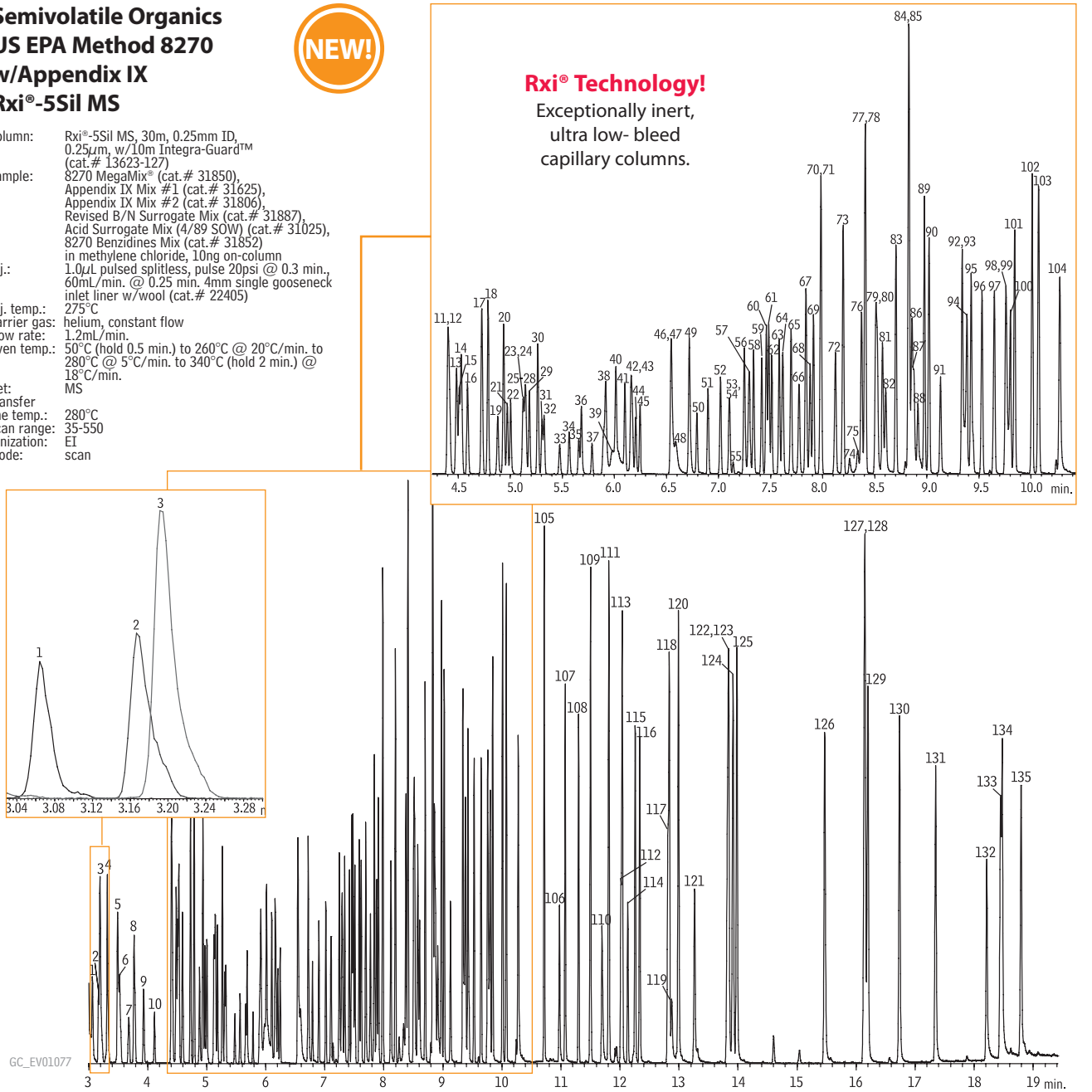
c = contaminant

Semivolatile Organics US EPA Method 8270 w/Appendix IX Rxi®-5Sil MS

NEW!

Column:	Rxi®-5Sil MS, 30m, 0.25mm ID, 0.25µm, w/10m Integra-Guard™ (cat.# 13623-127)
Sample:	8270 MegaMix® (cat.# 31850), Appendix IX Mix #1 (cat.# 31625), Appendix IX Mix #2 (cat.# 31806), Revised B/N Surrogate Mix (cat.# 31887), Acid Surrogate Mix (4/89 SOW) (cat.# 31025), 8270 Benzidines Mix (cat.# 31852) in methylene chloride, 10ng on-column
Inj.:	1.0µL pulsed splitless, pulse 20psi @ 0.3 min., 60mL/min. @ 0.25 min. 4mm single gooseneck inlet liner w/wool (cat.# 22405)
Inj. temp.:	275°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	50°C (hold 0.5 min.) to 260°C @ 20°C/min. to 280°C @ 5°C/min. to 340°C (hold 2 min.) @ 18°C/min.
Det:	MS
Transfer line temp.:	280°C
Scan range:	35-550
Ionization:	EI
Mode:	scan

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.



1. 1,4-dioxane
2. N-nitrosodimethylamine
3. pyridine
4. ethyl methacrylate
5. 2-picoline
6. N-nitrosomethylethylamine
7. methyl methanesulfonate
8. 2-fluorophenol
9. N-nitrosodiethylamine
10. ethyl methanesulfonate
11. benzaldehyde
12. phenol
13. aniline
14. bis(2-chloroethyl)ether
15. pentachloroethane
16. 2-chlorophenol
17. 1,3-dichlorobenzene
18. 1,4-dichlorobenzene
19. benzyl alcohol
20. 1,2-dichlorobenzene
21. 2-methylphenol
22. bis(2-chloroisopropyl)ether
23. 4-methylphenol
24. 3-methylphenol
25. acetophenone
26. N-nitroso-di-*n*-propylamine
27. nitrosopyrrolydine
28. 4-nitrosomorpholine
29. *o*-toluidine
30. hexachloroethane
31. nitrobenzene-d5 (SS)
32. nitrobenzene
33. N-nitrosopiperidine
34. isophorone
35. 2-nitrophenol
36. 2,4-dimethylphenol
37. bis(2-chloroethoxy)methane
38. 2,4-dichlorophenol
39. α,α-dimethylphenylamine
40. 1,2,4-trichlorobenzene
41. naphthalene
42. 2,6-dichlorophenol
43. 4-chloroaniline
44. hexachloropropene
45. hexachlorobutadiene
46. N-nitroso-*n*-butylamine
47. caprolactam
48. 1,4-phenylenediamine
49. 4-chloro-3-methylphenol
50. isosafrole
51. 2-methylnaphthalene
52. 1-methylnaphthalene
53. hexachlorocyclopentadiene
54. 1,2,4,5-tetrachlorobenzene
55. isosafrole
56. 2,4,6-trichlorophenol
57. 2,4,5-trichlorophenol
58. 2-fluorobiphenyl (SS)
59. safrole
60. biphenyl
61. 2-chloronaphthalene
62. 1-chloronaphthalene
63. diphenyl ether
64. 2-nitroaniline
65. 1,4-naphthoquinone
66. 1,4-dinitrobenzene
67. dimethylphthalate
68. 1,3-dinitrobenzene
69. 2,6-dinitrotoluene
70. acenaphthylene
71. 1,2-dinitrobenzene
72. 3-nitroaniline
73. acenaphthene
74. 2,4-dinitrophenol
75. 4-nitrophenol
76. pentachlorobenzene
77. dibenzofuran
78. 2,4-dinitrotoluene
79. 1-naphthalamine
80. 2,3,4,6-tetrachlorophenol
81. 2,3,5,6-tetrachlorophenol
82. 2-naphthylamine
83. diethyl phthalate
84. fluorene
85. 4-chlorophenyl phenyl ether
86. 2-methyl-5-nitroaniline
87. 4-nitroaniline
88. 4,6-dinitro-2-methylphenol
89. diphenylamine
90. azobenzene
91. 2,4,6-tribromophenol (SS)
92. diallate
93. 1,3,5-trinitrobenzene
94. phenacetin
95. 4-bromophenyl phenyl ether
96. hexachlorobenzene
97. atrazine
98. 4-aminobiphenyl
99. pentachlorophenol
100. pentachloronitrobenzene
101. propyzamide
102. phenanthrene
103. anthracene
104. carbazole
105. di-*n*-butylphthalate
106. 4-nitroquinoline-1-oxide
107. methapyriline
108. isodrin
109. fluoranthene
110. benzidine
111. pyrene
112. Aramite (isomer)
113. *p*-terphenyl-d14 (SS)
114. Aramite (isomer)
115. dimethylaminoazobenzene
116. dichlorobenzilate
117. 3,3-dimethylbenzidine
118. benzyl butyl phthalate
119. Kepone
120. bis(2-ethylhexyl)adipate
121. 2-acetylaminofluorene
122. 3,3'-dichlorobenzidine
123. chrysene
124. benzo(a)anthracene
125. bis(2-ethylhexyl)phthalate
126. di-*n*-octyl phthalate
127. benzo(b)fluoranthene
128. 7,12-dimethylbenzo(a)anthracene
129. benzo(k)fluoranthene
130. benzo(a)pyrene
131. 3-methylcholanthrene
132. dibenzo(a,j)acridine
133. indeno(1,2,3-cd)pyrene
134. dibenzo(a,h)anthracene
135. benzo(ghi)perylene



Rxi®-5Sil MS

Exceptionally Inert Columns for GC/MS and Trace Level Analyses

- **Low bleed** at high temperatures, for higher sensitivity and lower detection limits.
- **Excellent inertness** for acidic and basic compounds.
- Engineered to assure **column-to-column reproducibility.**

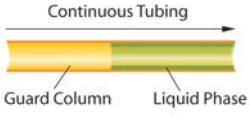
ID	df (µm)	temp. limits	length	cat. #	price
0.18mm	0.18	-60 to 330/350°C	20-Meter	43602	$455
0.18mm	0.36	-60 to 330/350°C	20-Meter	43604	$455
0.25mm	0.25	-60 to 330/350°C	15-Meter	13620	$330
0.25mm	0.25	-60 to 330/350°C	30-Meter	13623	$530
0.25mm	0.25	-60 to 330/350°C	60-Meter	13626	$905
0.25mm	0.50	-60 to 330/350°C	30-Meter	13638	$530
0.32mm	0.25	-60 to 330/350°C	30-Meter	13624	$570
0.32mm	0.50	-60 to 330/350°C	30-Meter	13639	$570

Rxi®-5Sil MS with Integra-Guard™

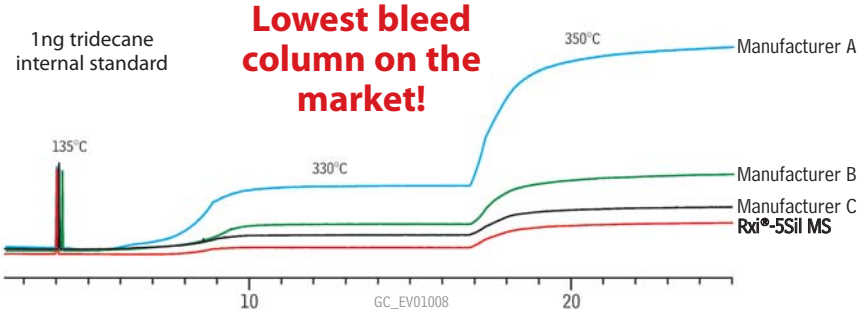
Description	qty.	cat.#	price
15m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13620-127	$410
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13623-124	$610
30m, 0.25mm ID, 0.25µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13623-127	$630
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13638-124	$610
30m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/10m Integra-Guard Column	ea.	13638-127	$630
30m, 0.32mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column	ea.	13639-125	$655

Visit **www.restek.com/rxi** for a complete listing of Restek's Rxi®-5Sil MS Columns!

Integra-Guard™ built-in guard column



New **Rxi®-5Sil MS** columns outperform competitors, producing lower bleed at 300°C and 350°C than any other column on the market.



Columns: 30m, 0.25mm ID, 0.25µm; For analytical conditions, visit **www.restek.com/rxi**

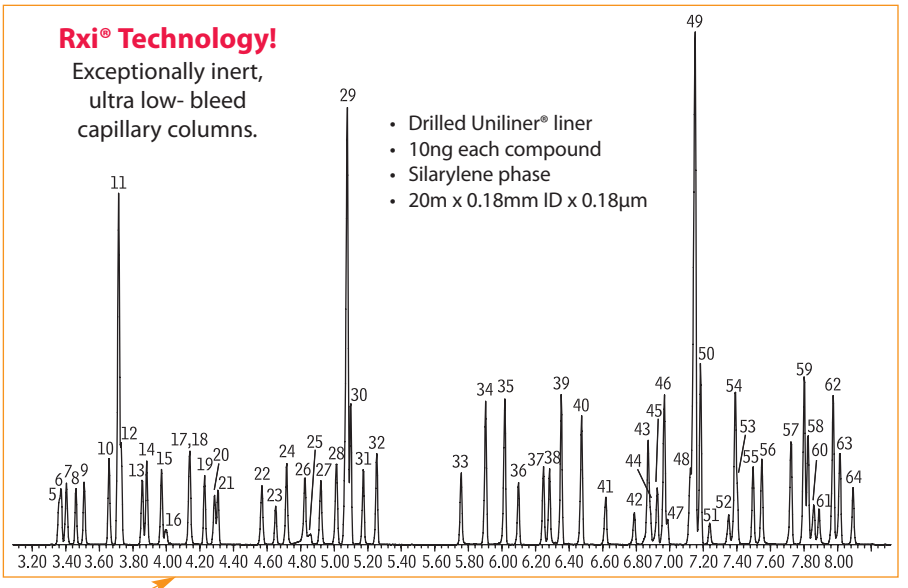
Semivolatile Organics
US EPA Method 8270
Rxi®-5Sil MS

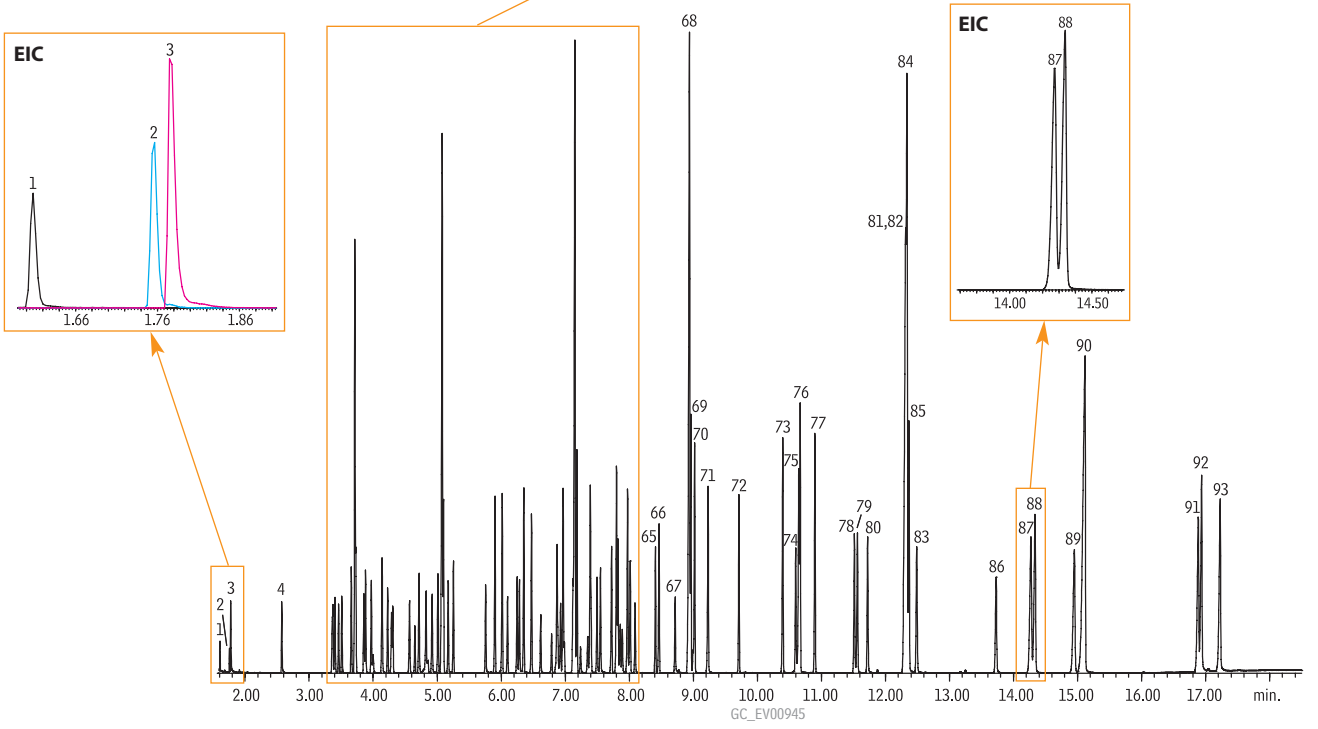
Column:	Rxi®-5Sil MS, 20m, 0.18mm ID, 0.18µm (cat.# 43602)
Sample:	US EPA Method 8270D Mix, 1µL of 10µg/mL (IS 40µg/mL) 8270 MegaMix® (cat.# 31850) Benzoic Acid (cat.# 31879) 8270 Benzidines Mix (cat.# 31852) Acid Surrogate Mix (4/89 SOW) (cat.# 31025) Revised B/N Surrogate Mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL (10ng on-column concentration), 4mm Drilled Uniliner® (hole near bottom) inlet liner (cat.# 20756), pulsed splitless: pulse 30psi @ 0.2 min., 60mL/min. @ 0.15 min.
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.0mL/min.
Oven temp.:	50°C (hold 0.5 min.) to 260°C @ 20°C/min. to 280°C @ 5°C/min. to 330°C @ 20°C/min. (hold 1.0 min.)
Det.:	MS
Transfer line temp:	280°C
Scan range:	35-550amu
Ionization:	EI
Mode:	scan

Rxi® Technology!

Exceptionally inert, ultra low- bleed capillary columns.

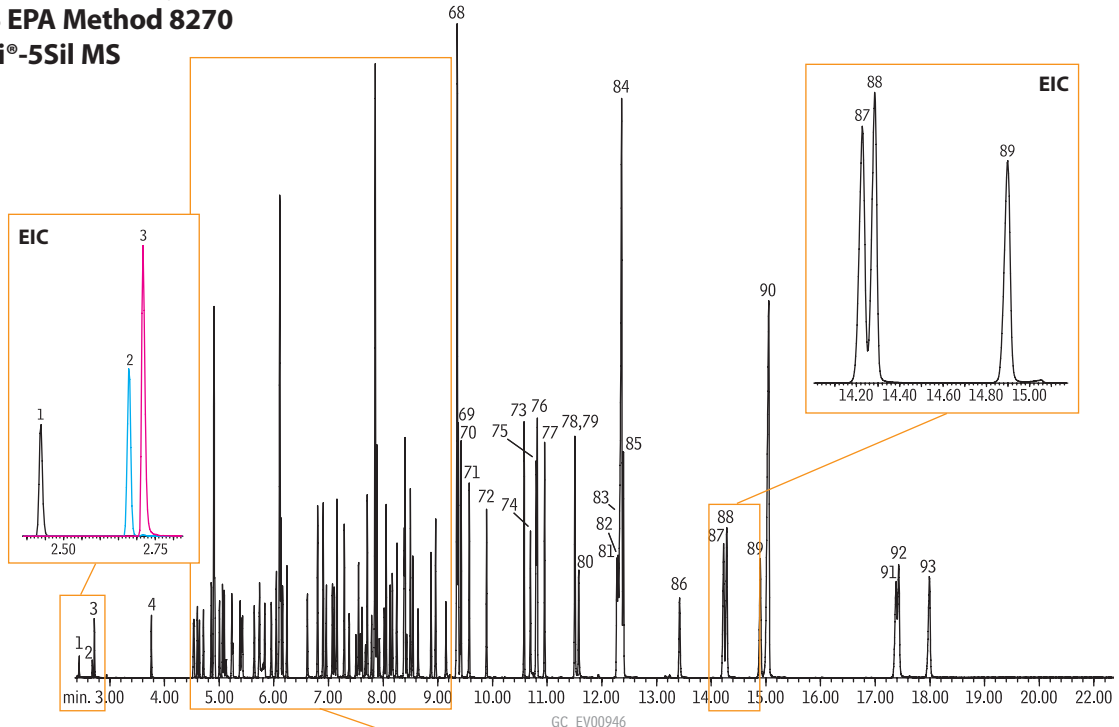
- Drilled Uniliner® liner
- 10ng each compound
- Silarylene phase
- 20m x 0.18mm ID x 0.18µm

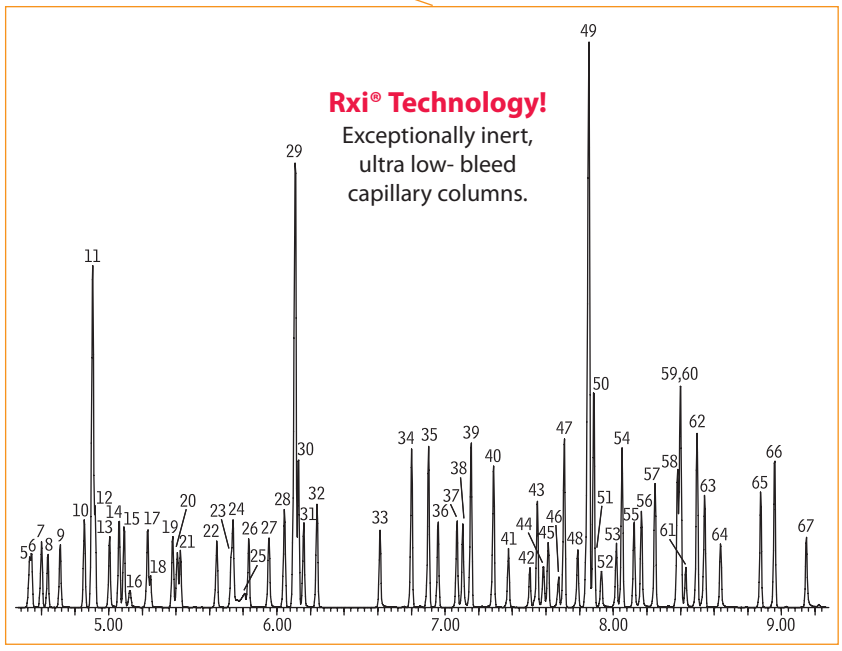




1. 1,4-dioxane
2. *n*-nitrosodimethylamine
3. pyridine
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 1,2-dichlorobenzene
15. 2-methylphenol
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/ 3-methylphenol
18. *n*-nitroso-di-*n*-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2-nitrophenol
24. 2,4-dimethylphenol
25. bis(2-chloroethoxy)methane
26. benzoic acid
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. acenaphthene
51. 2,4-dinitrophenol
52. 4-nitrophenol
53. dibenzofuran
54. 2,4-dinitrotoluene
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. fluorene
59. 4-chlorophenyl phenyl ether
60. 4-nitroanaline
61. 4,6-dinitro-2-methylphenol
62. *n*-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-*n*-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. pyrene
77. *p*-terphenyl-d14 (SS)
78. 3,3'-dimethylbenzidine
79. butyl benzyl phthalate
80. bis(2-ethylhexyl) adipate
81. benzo(a)anthracene
82. 3,3'-dichlorobenzidine
83. chrysene-d12 (IS)
84. chrysene
85. bis(2-ethylhexyl) phthalate
86. di-*n*-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene

Semivolatile Organics
US EPA Method 8270
Rxi®-5Sil MS





Column:	Rxi®-5Sil MS, 20m, 0.18mm ID, 0.36µm (cat.# 43604)
Sample:	US EPA Method 8270D Mix, 1µL of 10µg/mL (IS 40µg/mL) 8270 MegaMix® (cat.# 31850) Benzoic Acid (cat.# 31879) 8270 Benzidines Mix (cat.# 31852) Acid Surrogate Mix (4/89 SOW) (cat.# 31025) Revised B/N Surrogate Mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL (10ng on-column concentration), 4mm Drilled Uniliner® (hole near bottom) inlet liner (cat.# 20756), pulsed splitless: pulse 30psi @ 0.2 min., 60mL/min. @ 0.15 min.
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	40°C (hold 1.0 min.) to 280°C @ 25°C/min. to 330°C @ 5°C/min.
Det.:	MS
Transfer line temp:	280°C
Scan range:	35-550amu
Ionization:	EI
Mode:	scan

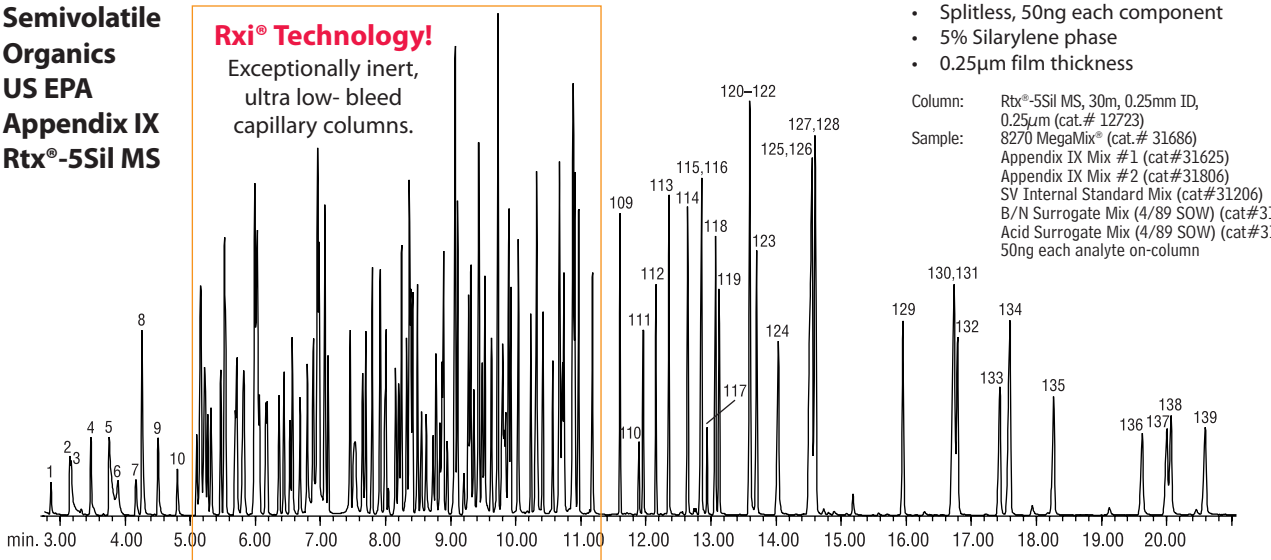
1. 1,4-dioxane
2. *n*-nitrosodimethylamine
3. pyridine
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 2-methylphenol
15. 1,2-dichlorobenzene
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/ 3-methylphenol
18. *n*-nitroso-di-*n*-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2-nitrophenol
24. 2,4-dimethylphenol
25. benzoic acid
26. bis(2-chloroethoxy)methane
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. acenaphthene
51. 2,4-dinitrophenol
52. 4-nitrophenol
53. 2,4-dinitrotoluene
54. dibenzofuran
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. fluorene
59. 4-chlorophenyl phenyl ether
60. 4-nitroanaline
61. 4,6-dinitro-2-methylphenol
62. *n*-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-*n*-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. pyrene
77. *p*-terphenyl-d14 (SS)
78. butyl benzyl phthalate
79. 3,3'-dimethylbenzidine
80. bis(2-ethylhexyl) adipate
81. 3,3'-dichlorobenzidine
82. bis(2-ethylhexyl) phthalate
83. benzo(a)anthracene
84. chrysene-d12 (IS)
85. chrysene
86. di-*n*-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene

Semivolatile Organics US EPA Appendix IX Rtx®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

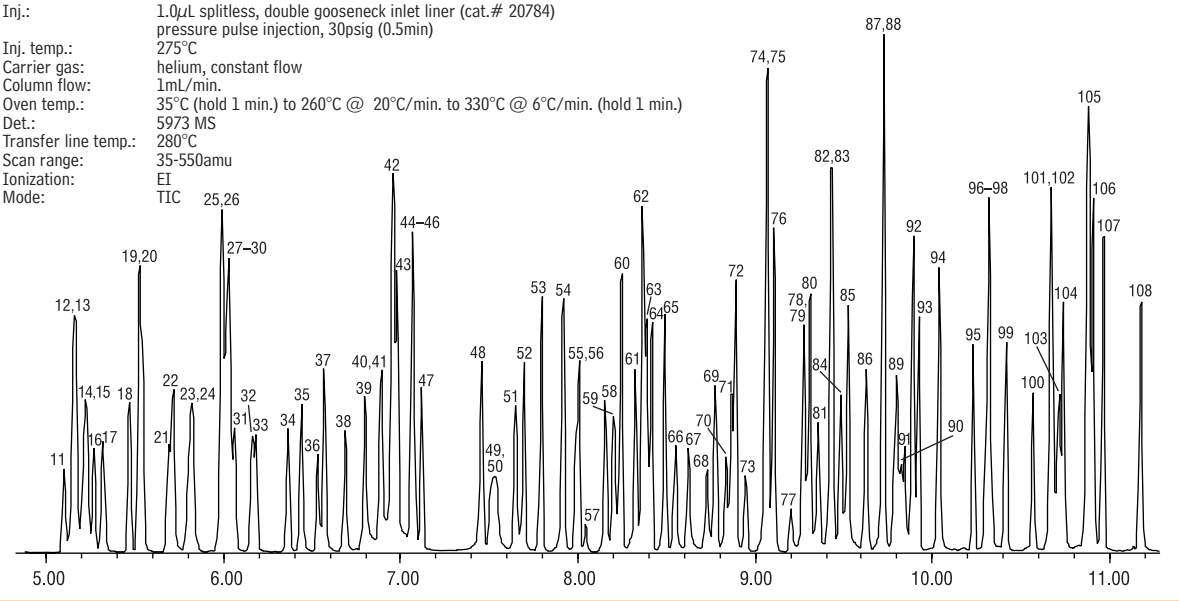
- Splitless, 50ng each component
- 5% Silarylene phase
- 0.25µm film thickness

Column: Rtx®-5Sil MS, 30m, 0.25mm ID, 0.25µm (cat.# 12723)
Sample: 8270 MegaMix® (cat.# 31686)
Appendix IX Mix #1 (cat#31625)
Appendix IX Mix #2 (cat#31806)
SV Internal Standard Mix (cat#31206)
B/N Surrogate Mix (4/89 SOW) (cat#31062)
Acid Surrogate Mix (4/89 SOW) (cat#31063)
50ng each analyte on-column



GC_EV00682

Inj.: 1.0µL splitless, double gooseneck inlet liner (cat.# 20784) pressure pulse injection, 30psig (0.5min)
Inj. temp.: 275°C
Carrier gas: helium, constant flow
Column flow: 1mL/min.
Oven temp.: 35°C (hold 1 min.) to 260°C @ 20°C/min. to 330°C @ 6°C/min. (hold 1 min.)
Det.: 5973 MS
Transfer line temp.: 280°C
Scan range: 35-550amu
Ionization: EI
Mode: TIC

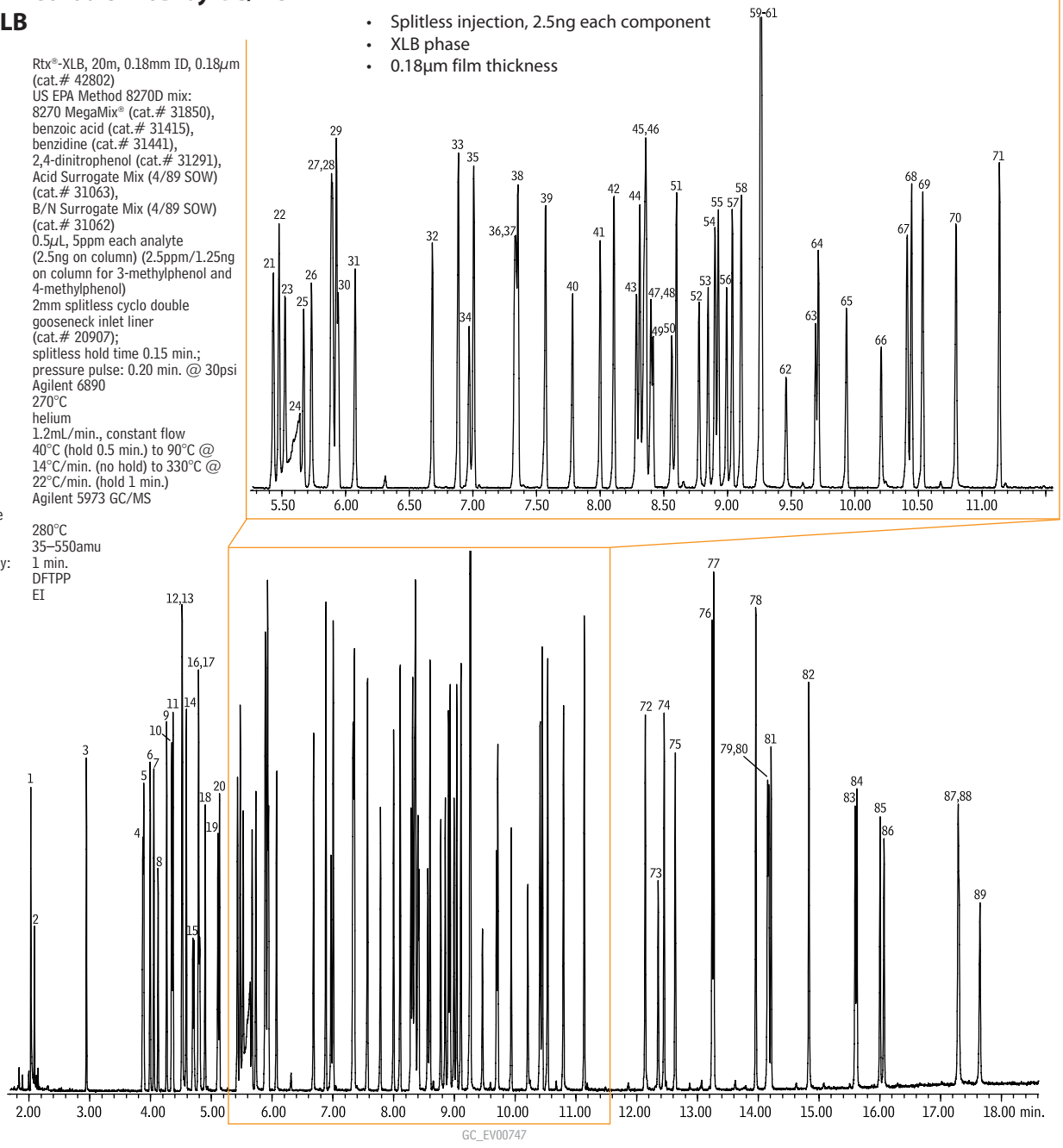


1. 1,4-dioxane
2. pyridine
3. N-nitrosodimethylamine
4. ethyl methacrylate
5. 2-picoline
6. N-nitrosomethylethylamine
7. methyl methanesulfonate
8. 2-fluorophenol
9. N-nitrosodiethylamine
10. ethyl methanesulfonate
11. benzaldehyde
12. phenol-d6 (SS)
13. phenol
14. aniline
15. pentachloroethane
16. bis(2-chloroethyl)ether
17. 2-chlorophenol
18. 1,3-dichlorobenzene
19. 1,4-dichlorobenzene-d4 (IS)
20. 1,4-dichlorobenzene
21. benzyl alcohol
22. 1,2-dichlorobenzene
23. 2-methylphenol
24. bis(2-chloroisopropyl)ether
25. acetophenone
26a. 4-methylphenol
26b. 3-methylphenol
27. N-nitroso-di-*n*-propylamine
28. nitrosopyrrolydine
29. *o*-toluidine
30. 4-nitrosomorpholine
31. hexachloroethane
32. nitrobenzene-d5 (SS)
33. nitrobenzene
34. N-nitrosopiperidine
35. isophorone
36. 2-nitrophenol
37. 2,4-dimethylphenol
38. bis(2-chloroethoxy)methane
39. 2,4-dichlorophenol
40. 1,2,4-trichlorobenzene
41. α,α-dimethylphenylamine
42. naphthalene-d8 (IS)
43. naphthalene
44. 2,6-dichlorophenol
45. 4-chloroaniline
46. hexachloropropene
47. hexachlorobutadiene
48. N-nitroso-*n*-butylamine
49. 1,4-phenylenediamine
50. caprolactam
51. 4-chloro-3-methylphenol
52. isosafrole
53. 2-methylnaphthalene
54. 1-methylnaphthalene
55. hexachlorocyclopentadiene
56. 1,2,4,5-tetrachlorobenzene
57. isosafrole
58. 2,4,6-trichlorophenol
59. 2,4,5-trichlorophenol
60. 2-fluorobiphenyl (SS)
61. safrole
62. biphenyl
63. 2-chloronaphthalene
64. 1-chloronaphthalene
65. diphenyl ether
66. 2-nitroaniline
67. 1,4-naphthoquinone
68. 1,4-dinitrobenzene
69. dimethylphthalate
70. 1,3-dinitrobenzene
71. 2,6-dinitrotoluene
72. acenaphthylene
73. 1,2-dinitrobenzene
74. 3-nitroaniline
75. acenaphthene-d10 (IS)
76. acenaphthene
77. 2,4-dinitrophenol
78. pentachlorobenzene
79. 4-nitrophenol
80. dibenzofuran
81. 2,4-dinitrotoluene
82. 1-naphthalamine
83. 2,3,4,6-tetrachlorophenol
84. 2,3,5,6-tetrachlorophenol
85. 2-naphthylamine
86. diethyl phthalate
87. fluorene
88. 4-chlorophenyl phenyl ether
89. 2-methyl-5-nitroaniline
90. 4-nitroaniline
91. 4,6-dinitro-2-methylphenol
92. diphenylamine
93. azobenzene
94. 2,4,6-tribromophenol (SS)
95. diallate
96. 1,3,5-trinitrobenzene
97. phenacetin
98. 4-bromophenyl phenyl ether
99. hexachlorobenzene
100. atrazine
101. 4-aminobiphenyl
102. pentachlorophenol
103. pentachloronitrobenzene
104. propyzamide
105. phenanthrene-d10 (IS)
106. phenanthrene
107. anthracene
108. carbazole
109. di-*n*-butylphthalate
110. 4-nitroquinoline-1-oxide
111. methapyriline
112. isodrin
113. fluoranthene
114. pyrene
115. Aramite (isomer)
116. *p*-terphenyl-d14 (SS)
117. Aramite (isomer)
118. dimethylaminoazobenzene
119. dichlorobenzilate
120. 3,3-dimethylbenzidine
121. benzyl butyl phthalate
122. Kepone
123. bis(2-ethylhexyl)adipate
124. 2-acetylaminofluorene
125. benz(a)anthracene
126. chrysene-d12 (IS)
127. chrysene
128. bis(2-ethylhexyl)phthalate
129. di-*n*-octyl phthalate
130. benzo(b)fluoranthene
131. 7,12-dimethylbenzo(a)anthracene
132. benzo(k)fluoranthene
133. benzo(a)pyrene
134. perylene-d12 (IS)
135. 3-methylcholanthrene
136. dibenzo(a,j)acridine
137. indeno(1,2,3-cd)pyrene
138. dibenzo(a,h)anthracene
139. benzo(ghi)perylene

Semivolatile Organics
US EPA Method 8270D by GC/MS
Rtx®-XLB

- Splitless injection, 2.5ng each component
- XLB phase
- 0.18µm film thickness

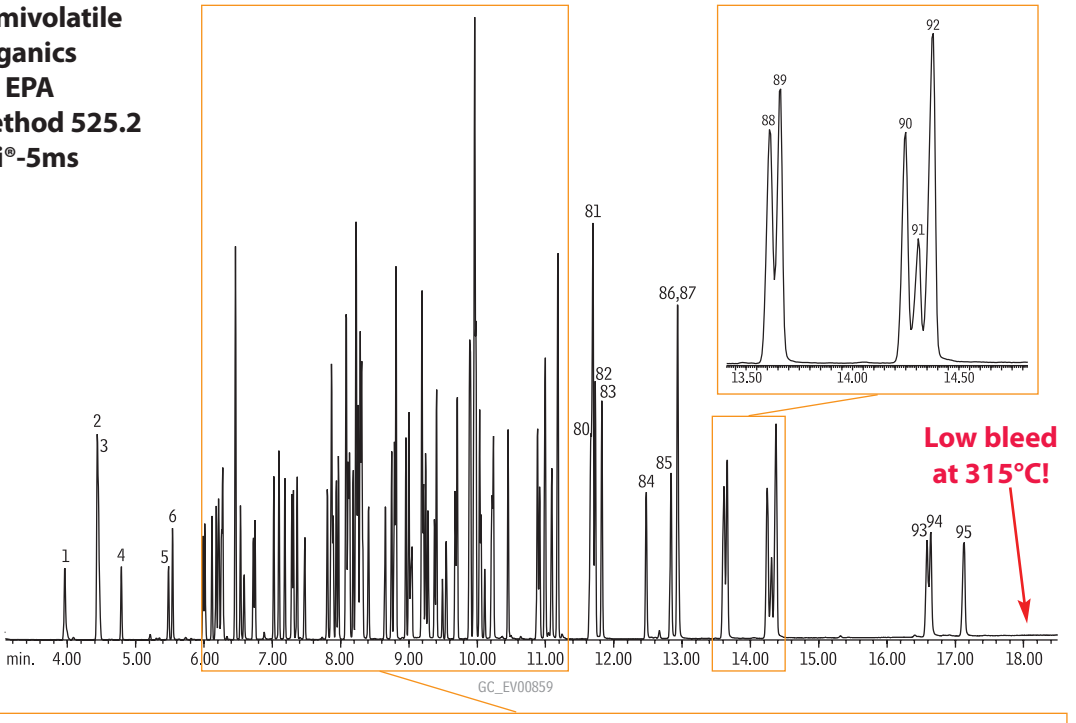
Column:	Rtx®-XLB, 20m, 0.18mm ID, 0.18µm (cat.# 42802)
Sample:	US EPA Method 8270D mix: 8270 MegaMix® (cat.# 31850), benzoic acid (cat.# 31415), benzidine (cat.# 31441), 2,4-dinitrophenol (cat.# 31291), Acid Surrogate Mix (4/89 SOW) (cat.# 31063), B/N Surrogate Mix (4/89 SOW) (cat.# 31062)
Inj.:	0.5µL, 5ppm each analyte (2.5ng on column) (2.5ppm/1.25ng on column for 3-methylphenol and 4-methylphenol) 2mm splitless cyclo double gooseneck inlet liner (cat.# 20907); splitless hold time 0.15 min.; pressure pulse: 0.20 min. @ 30psi
GC:	Agilent 6890
Inj. temp.:	270°C
Carrier gas:	helium
Flow rate:	1.2mL/min., constant flow
Oven temp.:	40°C (hold 0.5 min.) to 90°C @ 14°C/min. (no hold) to 330°C @ 22°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35–550amu
Solvent delay:	1 min.
Tune:	DFTPP
Ionization:	EI

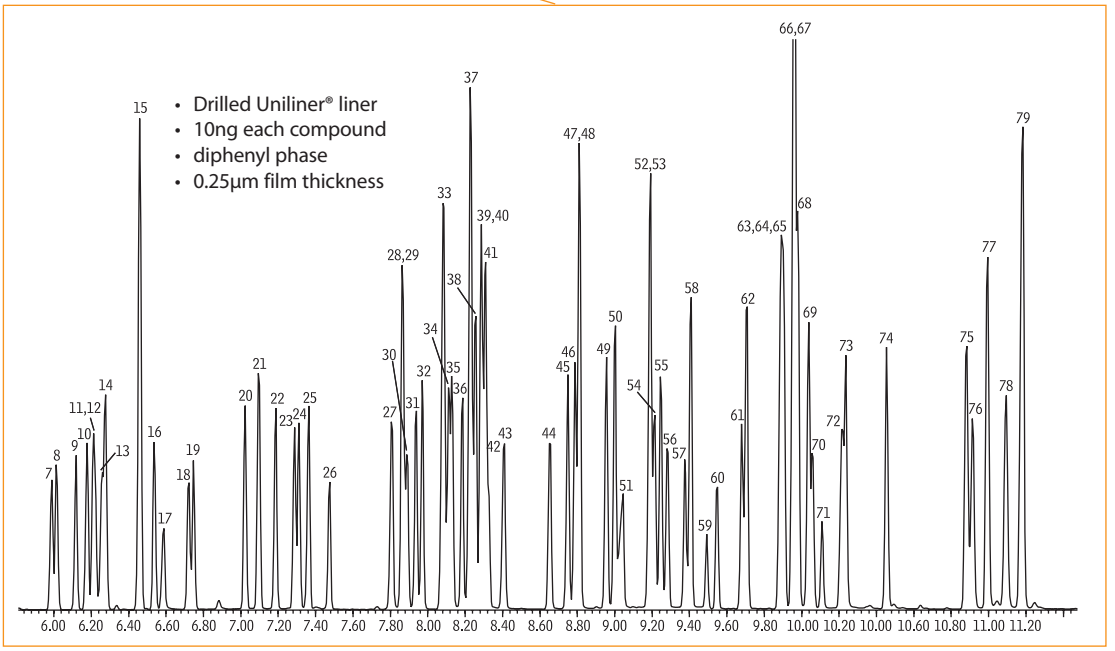


GC_EV00747

1. pyridine
2. N-nitrosodimethylamine
3. 2-fluorophenol
4. phenol-d6
5. phenol
6. aniline
7. 2-chlorophenol
8. bis(2-chloroethyl)ether
9. 1,3-dichlorobenzene
10. 1,4-dichlorobenzene-d4
11. 1,4-dichlorobenzene
12. 1,2-dichlorobenzene
13. benzyl alcohol
14. 2-methylphenol
15. bis(2-chloroisopropyl)ether
16. hexachloroethane
17a. 4-methylphenol
17b. 3-methylphenol
18. N-nitroso-di-*n*-propylamine
19. nitrobenzene-d5
20. nitrobenzene
21. isophorone
22. 2,4-dimethylphenol
23. 2-nitrophenol
24. benzoic acid
25. bis(2-chloroethoxy)methane
26. 2,4-dichlorophenol
27. 1,2,4-trichlorobenzene
28. naphthalene-d8
29. naphthalene
30. hexachlorobutadiene
31. 4-chloroanaline
32. 4-chloro-3-methylphenol
33. 2-methylnaphthalene
34. hexachlorocyclopentadiene
35. 1-methylnaphthalene
36. 2,4,6-trichlorophenol
37. 2,4,5-trichlorophenol
38. 2-fluorobiphenyl
39. 2-chloronaphthalene
40. 2-nitroaniline
41. dimethylphthalate
42. acenaphthylene
43. 2,6-dinitrotoluene
44. acenaphthene-d10
45. 1,4-dinitrobenzene
46. acenaphthene
47. 1,3-dinitrobenzene
48. 3-nitroaniline
49. 1,2-dinitrobenzene
50. 4-nitrophenol
51. dibenzofuran
52. 2,3,4,6-tetrachlorophenol
53. 2,3,5,6-tetrachlorophenol
54. 2,4-dinitrophenol
55. diethyl phthalate
56. 2,4-dinitrotoluene
57. 4-chlorophenyl phenyl ether
58. fluorene
59. diphenylamine
60. 4-nitroaniline
61. azobenzene
62. 2,4,6-tribromophenol
63. 4,6-dinitro-2-methylphenol
64. 4-bromophenyl phenyl ether
65. hexachlorobenzene
66. pentachlorophenol
67. phenanthrene-d10
68. phenanthrene
69. anthracene
70. carbazole
71. di-*n*-butylphthalate
72. fluoranthene
73. benzidine
74. pyrene
75. *p*-terphenyl-d14
76. benzyl butyl phthalate
77. bis(2-ethylhexyl)adipate
78. bis(2-ethylhexyl)phthalate
79. benzo(a)anthracene
80. chrysene-d12
81. chrysene
82. di-*n*-octyl phthalate
83. benzo(b)fluoranthene
84. benzo(k)fluoranthene
85. benzo(a)pyrene
86. perylene-d12
87. indeno(1,2,3-cd)pyrene
88. dibenzo(a,h)anthracene
89. benzo(ghi)perylene

Semivolatile Organics US EPA Method 525.2 Rxi®-5ms





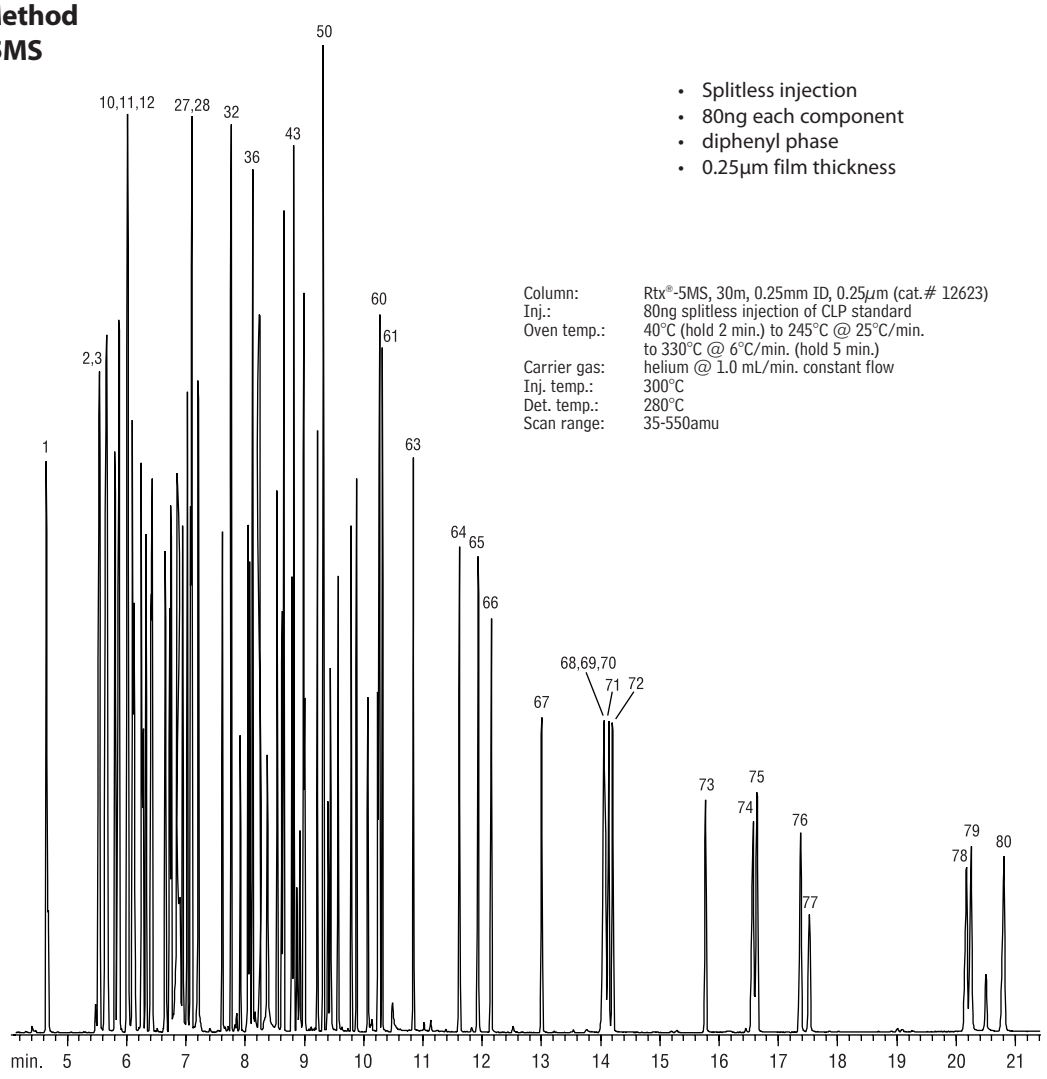
1. isophorone
2. 2-nitro-*m*-xylene (SS)
3. naphthalene
4. dichlorvos (DDVP)
5. hexachlorocyclopentadiene
6. EPTC
7. mevinphos
8. butylate
9. vernolate
10. dimethyl phthalate
11. pebulate
12. etridiazole (Terrazole®)
13. 2,6-dinitrotoluene
14. acenaphthylene
15. acenaphthene-d10 (IS)
16. chlorneb
17. tebuthiuron
18. 2,4-dinitrotoluene
19. molinate
20. diethyl phthalate
21. fluorene
22. propachlor
23. ethoprop (ethoprophos)
24. cycloate
25. chlorpropham
26. trifluralin
27. atraton
28. hexachlorobenzene
29. prometon
30. simazine
31. atrazine
32. propazine
33. pentachlorophenol
34. terbufos
35. pronamide (propyzamide)
36. diazinon
37. phenanthrene-d10 (IS)
38. phenanthrene
39. disulfoton
40. methyl paraoxon
41. anthracene
42. terbacil
43. chlorothalonil
44. metribuzin
45. simetryn
46. ametryn
47. alachlor
48. prometryn
49. terbutryn
50. di-*n*-butyl phthalate
51. bromacil
52. cyanazine (Bladex)
53. metolochlor
54. chlorpyrifos (Dursban®)
55. triademefon
56. Dacthal® (DCPA)
57. MGK-264 (isomer A)
58. diphenamid
59. MGK-264 (isomer B)
60. merphos
61. heptachlor epoxide
62. fluoranthene
63. stirofos
64. disulfoton sulfone
65. butachlor
66. pyrene-d10 (SS)
67. fenamiphos
68. pyrene
69. napropamide (Devrinol®)
70. *trans*-nonachlor
71. merphos oxide
72. tricyclazole (Beam)
73. carboxin
74. chlorobenzilate
75. benzyl butyl phthalate
76. norflurazon
77. bis(2-ethylhexyl) adipate
78. hexazinone (Velpar®)
79. triphenylphosphate (SS)
80. benzo(a)anthracene
81. chrysene-d12 (IS)
82. chrysene
83. bis(2-ethylhexyl) phthalate
84. fenarimol
85. *cis*-permethrin
86. *trans*-permethrin
87. di-*n*-octyl phthalate
88. benzo(b)fluoranthene
89. benzo(k)fluoranthene
90. benzo(a)pyrene
91. fluridone (Sonar®)
92. perylene-d12 (SS)
93. indeno(1,2,3-cd)pyrene
94. dibenzo(a,h)anthracene
95. benzo(ghi)perylene

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	US EPA Method 525.2 mix, 10µg/mL each analyte, 25µg/mL each internal standard and surrogate: Method 525.2 Semivolatile Mix (cat.# 31899), Organonitrogen Pesticide Mix #1 (cat.# 33012), Organonitrogen Pesticide Mix #2 (cat.# 33011), Organophosphate Pesticide Mix #1 (cat.# 33013), Nitrogen/Phosphorous Pesticide Mix #2 (cat.# 32423), Method 525.2 Internal Standard Mix (cat.# 31825), Method 525.2 Surrogate Standard Mix (cat.# 31826)
Instrument:	Agilent 6890
Inj.:	1.0µL, pulsed splitless injection: 50psi (0.3 min.), 80mL/min. (0.15 min.), gas saver 15mL/min. (1 min.), 4mm Drilled Uniliner® inlet liner, hole near bottom (cat.# 20771)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	90°C (1 min.) to 270°C @ 20°C/min., to 315°C @ 6°C/min.
Det.:	Agilent 5973 MSD
Interface line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	3.00 min.
Tune:	DFTPP
Ionization:	EI

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Semivolatile Organics
CLP Method
Rtx®-5MS

- Splitless injection
- 80ng each component
- diphenyl phase
- 0.25µm film thickness



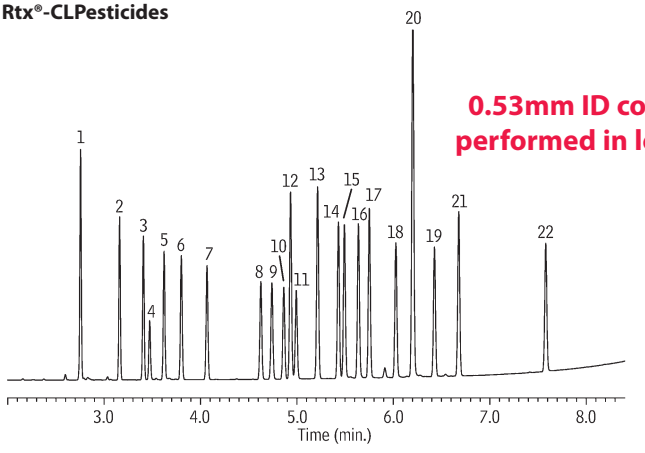
Column:	Rtx®-5MS, 30m, 0.25mm ID, 0.25µm (cat.# 12623)
Inj.:	80ng splitless injection of CLP standard
Oven temp.:	40°C (hold 2 min.) to 245°C @ 25°C/min. to 330°C @ 6°C/min. (hold 5 min.)
Carrier gas:	helium @ 1.0 mL/min. constant flow
Inj. temp.:	300°C
Det. temp.:	280°C
Scan range:	35-550amu

GC_EV00544

	RT
1. 2-fluorophenol (SS)	4.65
2. phenol-d6 (SS)	5.53
3. phenol	5.55
4. bis(2-chloroethyl)ether	5.64
5. 2-chlorophenol-d4 (SS)	5.66
6. 2-chlorophenol	5.67
7. 1,3-dichlorobenzene	5.81
8. 1,4-dichlorobenzene-d4 (IS)	5.86
9. 1,4-dichlorobenzene	5.87
10. 1,2-dichlorobenzene-d4 (IS)	6.01
11. benzyl alcohol	6.01
12. 1,2-dichlorobenzene	6.03
13. 2-methylphenol	6.10
14. bis(2-chloroisopropyl)ether	6.13
15. 4-methylphenol/3-methylphenol	6.25
16. N-nitroso-di-*n*-propylamine	6.28
17. hexachloroethane	6.33
18. nitrobenzene-d5 (SS)	6.41
19. nitrobenzene	6.43
20. isophorone	6.66
21. 2-nitrophenol	6.73
22. 2,4-dimethylphenol	6.75
23. bis(2-chloroethoxy)methane	6.85
24. benzoic acid	6.91
25. 2,4-dichlorophenol	6.95
26. 1,2,4-trichlorobenzene	7.03
27. naphthalene-d8 (IS)	7.08
28. naphthalene	7.10
29. 4-chloroaniline	7.20
30. hexachlorobutadiene	7.21
31. 4-chloro-3-methylphenol	7.62
32. 2-methylnaphthalene	7.77
33. hexachlorocyclopentadiene	7.92
34. 2,4,6-trichlorophenol	8.05
35. 2,4,5-trichlorophenol	8.08
36. 2-fluorobiphenyl (SS)	8.13
37. 2-chloronaphthalene	8.25
38. 2-nitroaniline	8.38
39. dimethylphthalate	8.54
40. 2,6-dinitrotoluene	8.62
41. acenaphthylene	8.66
42. acenaphthene-d10 (IS)	8.79
43. acenaphthene	8.83
44. 3-nitroaniline	8.88
45. 2,4-dinitrophenol	8.88
46. 4-nitrophenol	8.92
47. dibenzofuran	8.99
48. 2,4-dinitrotoluene	9.01
49. diethyl phthalate	9.22
50. 4-chlorophenyl phenyl ether	9.32
51. fluorene	9.33
52. 4-nitroaniline	9.39
53. 2-methyl-4,6-dinitrophenol	9.40
54. diphenylamine	9.44
55. 2,4,6-tribromophenol (SS)	9.57
56. 4-bromophenyl phenyl ether	9.80
57. hexachlorobenzene	9.88
58. pentachlorophenol	10.07
59. phenanthrene-d10 (IS)	10.24
60. phenanthrene	10.27
61. anthracene	10.32
62. carbazole	10.49
63. di-*n*-butylphthalate	10.84
64. fluoranthene	11.62
65. pyrene	11.94
66. *p*-terphenyl-d14 (SS)	12.16
67. benzyl butyl phthalate	13.01
68. benzo(a)anthracene	14.05
69. 3,3'-dichlorobenzidine	14.06
70. chrysene-d12 (IS)	14.08
71. chrysene	14.14
72. bis(2-ethylhexyl)phthalate	14.2
73. di-*n*-octyl phthalate	15.77
74. benzo(b)fluoranthene	16.57
75. benzo(k)fluoranthene	16.64
76. benzo(a)pyrene	17.38
77. perylene-d12 (IS)	17.52
78. indeno(1,2,3-cd)pyrene	20.18
79. dibenzo(a,h)anthracene	20.26
80. benzo(ghi)perylene	20.81

Organochlorine Pesticide Mix AB #2
Rtx®-CLPesticides and Rtx®-CLPesticides2

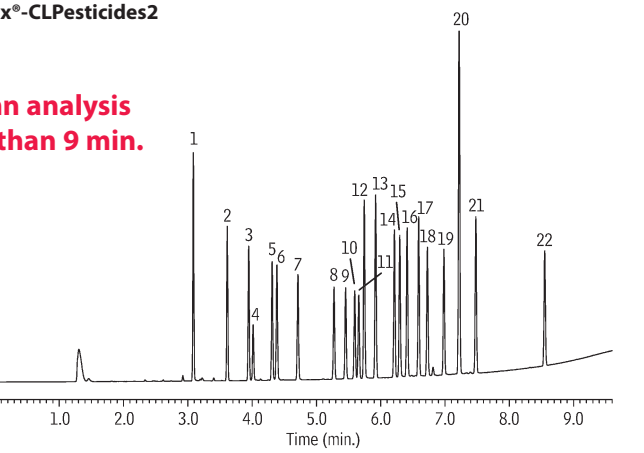
Rtx®-CLPesticides



GC_EV00936

0.53mm ID column analysis performed in less than 9 min.

Rtx®-CLPesticides2



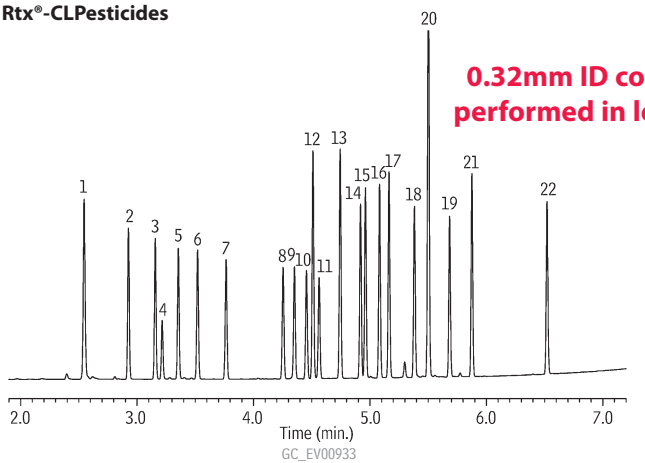
GC_EV00937

Columns: Rtx®-CLPesticides, 30m, 0.53mm ID, 0.50µm (cat.# 11140) and Rtx®-CLPesticides2, 30m, 0.53mm ID, 0.42µm (cat.# 11340) with 5m x 0.53mm ID Rxi® deactivated guard tubing (cat.# 10054), connected using Siltek® Treated Universal "Y" Press-Tight® connector (cat.# 20486)
Sample: Organochlorine Pesticide Mix AB #2, 8-80µg/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200µg/mL each component in acetone (cat.# 32000)
Inj.: 1.0µL splitless (hold 0.3 min.), 4mm single gooseneck inlet liner (cat.# 20799)
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Linear velocity: 45cm/sec. @ 120°C
Oven temp.: 120°C to 200°C @ 45°C/min. to 230°C @ 12.5°C/min. to 320°C (hold 2 min.) @ 20°C/min.
Det.: ECD @ 330°C

1. 2,4,5,6-tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. heptachlor
7. aldrin
8. heptachlor epoxide (isomer B)
9. γ-chlordane
10. α-chlordane
11. endosulfan I
12. 4,4'-DDE
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. endosulfan sulfate
20. methoxychlor
21. endrin ketone
22. decachlorobiphenyl (SS)

Organochlorine Pesticide Mix AB #2
Rtx®-CLPesticides and Rtx®-CLPesticides2

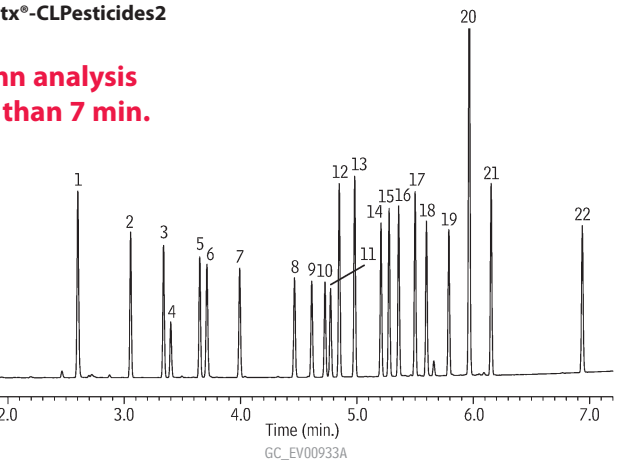
Rtx®-CLPesticides



GC_EV00933

0.32mm ID column analysis performed in less than 7 min.

Rtx®-CLPesticides2



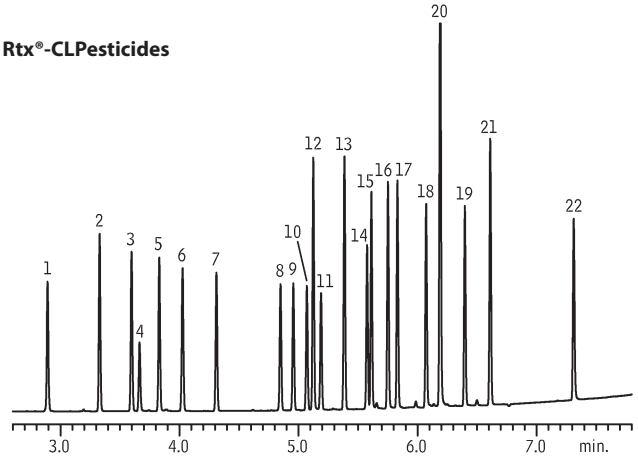
GC_EV00933A

Columns: Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141) and Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Deactivated Universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample: Organochlorine Pesticide Mix AB #2, 8-80µg/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200µg/mL each component in acetone (cat.# 32000)
Inj.: 1.0µL splitless (hold 0.3 min.), 4mm single gooseneck inlet liner (cat.# 20799)
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Linear velocity: 60cm/sec. @ 120°C
Oven temp.: 120°C to 200°C @ 45°C/min. to 230°C @ 15°C/min. to 330°C (hold 2 min.) @ 30°C/min.
Det.: ECD @ 330°C

1. 2,4,5,6-tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. heptachlor
7. aldrin
8. heptachlor epoxide (isomer B)
9. γ-chlordane
10. α-chlordane
11. endosulfan I
12. 4,4'-DDE
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. endosulfan sulfate
20. methoxychlor
21. endrin ketone
22. decachlorobiphenyl (SS)

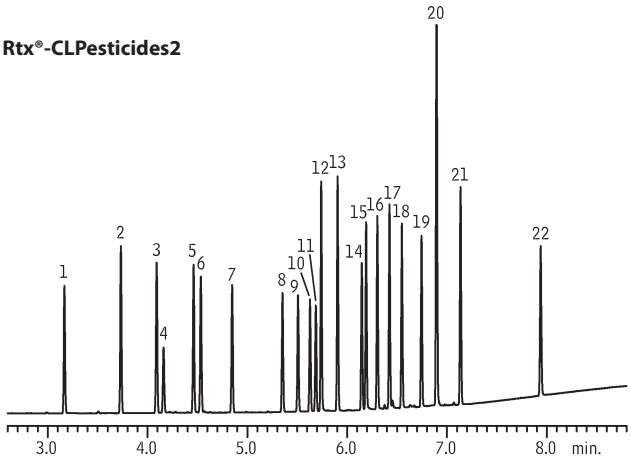
Organochlorine Pesticide Mix AB #2
Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.25mm ID column set)

Rtx®-CLPesticides



GC_EV00940

Rtx®-CLPesticides2



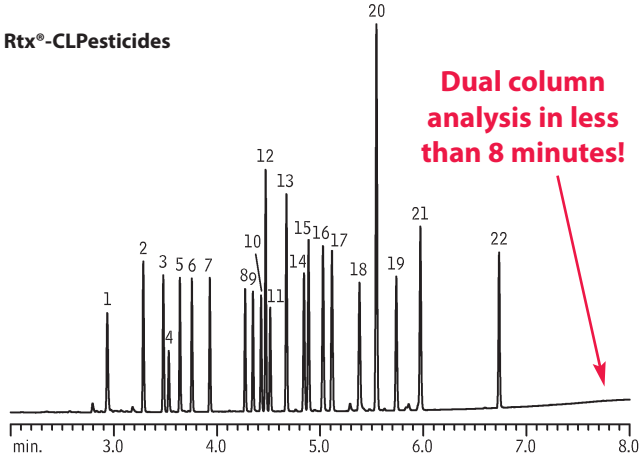
GC_EV00941

Columns: Rtx®-CLPesticides, 30m, 0.25mm ID, 0.25µm (cat.# 11123) and Rtx®-CLPesticides2, 30m, 0.25mm ID, 0.20µm (cat.# 11323) with 5m x 0.25mm ID Rxi® deactivated guard tubing (cat.# 10029), connected using Siltek®-treated Universal "Y" Press-Tight® Connector (cat.# 20486)
Sample: Organochlorine Pesticide Mix AB #2, 8–80µg/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200µg/mL each component in acetone (cat.# 32000)
Inj.: 0.5µL splitless (hold 0.5 min.), 2mm Cyclo Double Gooseneck inlet liner (cat.# 20908)
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Linear velocity: 41cm/sec. @ 125°C
Oven temp.: 125°C to 200°C @ 45°C/min. to 230°C @ 12.5°C/min. to 330°C (hold 2 min.) @ 30°C/min.
Det.: ECD @ 330°C

1. 2,4,5,6-tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. heptachlor
7. aldrin
8. heptachlor epoxide (isomer B)
9. γ-chlordane
10. α-chlordane
11. endosulfan I
12. 4,4'-DDE
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. endosulfan sulfate
20. methoxychlor
21. endrin ketone
22. decachlorobiphenyl (SS)

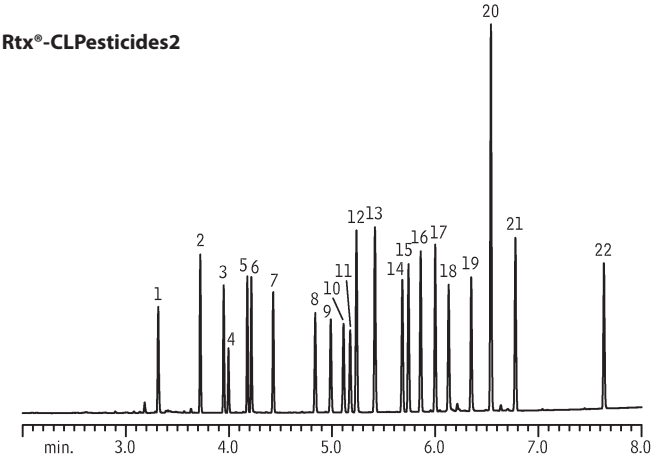
Organochlorine Pesticides
Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.18mm ID column set)

Rtx®-CLPesticides



GC_EV00892

Rtx®-CLPesticides2



GC_EV00893

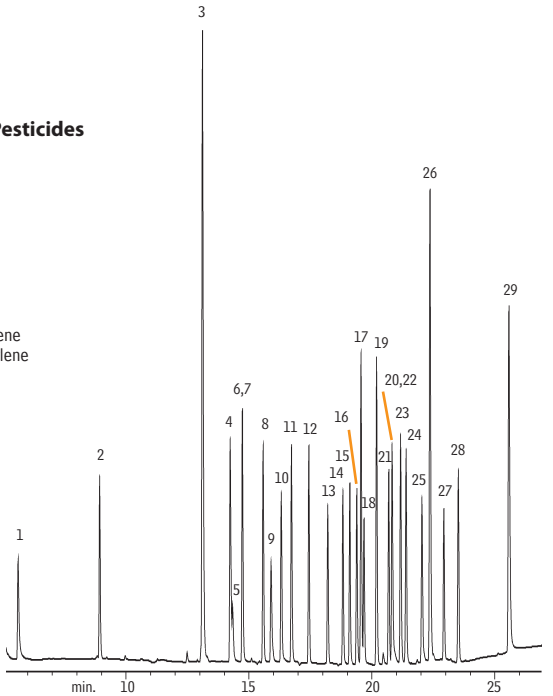
Columns: Rtx®-CLPesticides, 20m, 0.18mm ID, 0.18µm (cat.# 42102) and Rtx®-CLPesticides2, 20m, 0.18mm ID, 0.14µm (cat.# 42302) with 5m x 0.53mm ID intermediate-polarity deactivated guard tubing (cat.# 10045), connected using SeCure™ "Y" Connector Kit (cat.# 20276) with Universal "Y" Press-Tight® Connector
Sample: Organochlorine Pesticide Mix AB #2 (cat.# 32292), 8-80µg/mL each component in hexane/toluene, Pesticide Surrogate Mix (cat.# 32000), 200µg/mL each component in acetone
Inj.: 0.5µL splitless (hold 0.75 min.), 2mm single gooseneck inlet liner (cat.# 20796)
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Linear velocity: 20cm/sec. @ 140°C
Oven temp.: 140°C (hold 1 min.) to 250°C @ 35°C/min. (hold 1 min.) to 330°C @ 35°C/min. (hold 3 min.)
Det.: ECD @ 350°C

1. 2,4,5,6-tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. heptachlor
7. aldrin
8. heptachlor epoxide
9. γ-chlordane
10. α-chlordane
11. endosulfan I
12. 4,4'-DDE
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. endosulfan sulfate
20. methoxychlor
21. endrin ketone
22. decachlorobiphenyl (SS)

Organochlorine Pesticides
US EPA Method 8081A
Rtx®-CLPesticides & Rtx®-CLPesticides2

Rtx®-CLPesticides

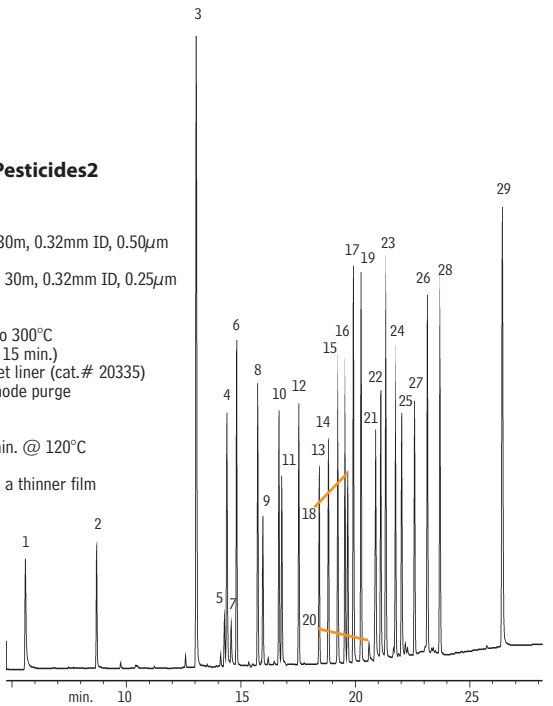
1. dibromochloropropane
2. hexachlorocyclopentadiene
3. 2,4,5,6-tetrachloro-*m*-xylene
4. hexachlorobenzene
5. *cis*-diallate
6. α-BHC
7. *trans*-diallate
8. γ-BHC
9. β-BHC
10. δ-BHC
11. heptachlor
12. aldrin
13. isodrin
14. heptachlor epoxide
15. γ-chlordane
16. α-chlordane
17. 4,4'-DDE
18. endosulfan I
19. dieldrin
20. chlorobenzilate
21. endrin
22. 4,4'-DDD
23. endosulfan II
24. 4,4'-DDT
25. endrin aldehyde
26. methoxychlor
27. endosulfan sulfate
28. endrin ketone
29. decachlorobiphenyl



Rtx®-CLPesticides2

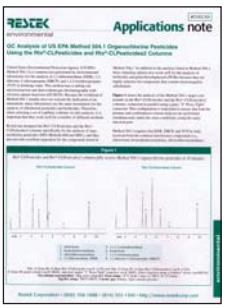
Columns:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.50µm (cat.# 11139)*
	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324)
On-column conc.:	16–160pg
Oven temp.:	80°C (hold 1 min.) to 300°C @ 10°C/min. (hold 15 min.)
Inj.:	direct, Uniliner® inlet liner (cat.# 20335)
Det.:	ECD, 300°C, with anode purge
Dead time:	1.9 min.
Head pressure:	8.7psi (constant)
Flow rate:	helium @ 1.3mL/min. @ 120°C

*Rtx®-CLPesticides is also offered with a thinner film thickness (cat.# 11141).



GC_EV00077

free literature



GC Analysis of US EPA Method 504.1 Organochlorine Pesticides, Using the Rtx®-CLPesticides and Rtx®-CLPesticides2 Columns

A versatile column pair for analyzing organochlorine pesticides, herbicides, or PCBs

Analysts following Method 504.1 in monitoring 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (TCP) in drinking water will value Rtx®-CLPesticides and Rtx®-CLPesticides2 columns because this same primary column/confirmation column pair can be used to perform numerous related analyses: organochlorine pesticides (e.g., by EPA Method 608 or 8081), herbicides, or polychlorinated biphenyls (PCBs). Details in this 2-page note show EDB, DBCP, and TCP are fully resolved from common interference compounds, per requirements of Method 504.1.

Applications Note
lit. cat.# 59539

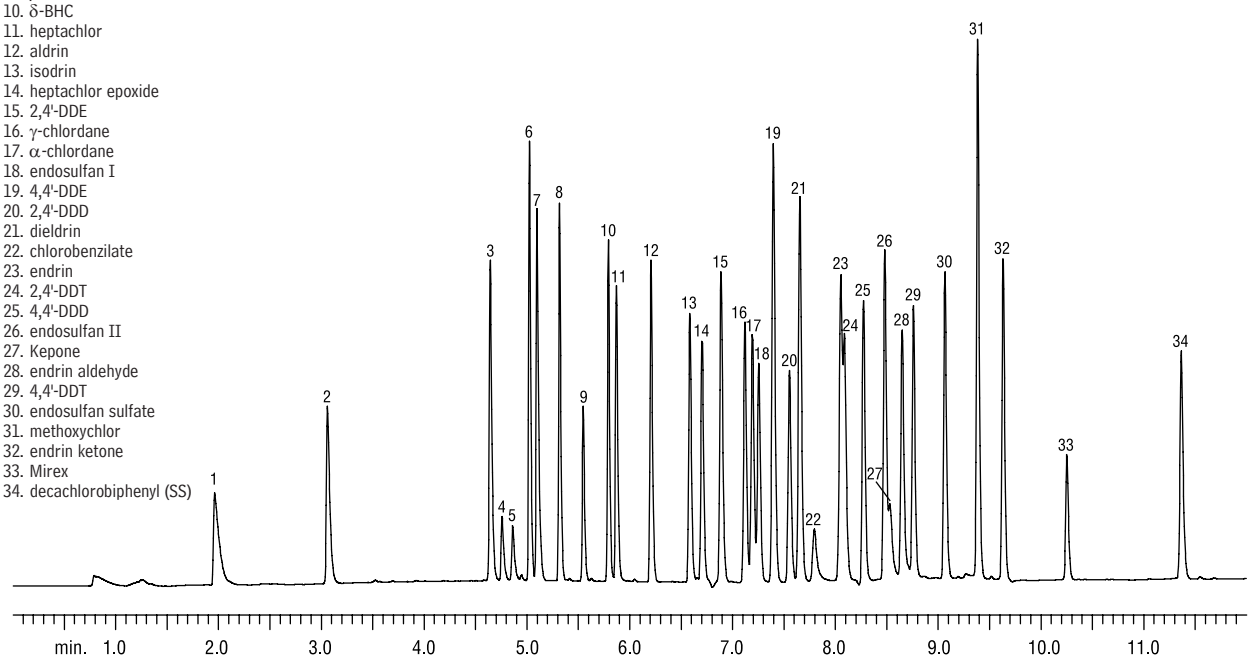
Rtx®-CLPesticides and Rtx®-CLPesticides2 columns also are ideal for:

- ***Triazine herbicides (lit. cat.# 59101)***
- ***PCBs (lit. cat.# 59120)***
- ***Haloacetic acids (lit. cat.# 59175)***
- ***Polynuclear aromatic hydrocarbons (lit. cat.# 59196A)***

Download your free copy of the literature listed here from **www.restek.com**.

Organochlorine Pesticides
US EPA Method 8081A
Rtx®-XLB

1. 1,2-dibromo-3-chloropropane
2. hexachlorocyclopentadiene
3. 2,4,5,6-tetrachloro-*m*-xylene (SS)
4. *cis*-diallate
5. *trans*-diallate
6. α-BHC
7. hexachlorobenzene
8. γ-BHC
9. β-BHC
10. δ-BHC
11. heptachlor
12. aldrin
13. isodrin
14. heptachlor epoxide
15. 2,4'-DDE
16. γ-chlordane
17. α-chlordane
18. endosulfan I
19. 4,4'-DDE
20. 2,4'-DDD
21. dieldrin
22. chlorobenzilate
23. endrin
24. 2,4'-DDT
25. 4,4'-DDD
26. endosulfan II
27. Kepone
28. endrin aldehyde
29. 4,4'-DDT
30. endosulfan sulfate
31. methoxychlor
32. endrin ketone
33. Mirex
34. decachlorobiphenyl (SS)



GC_EV00721

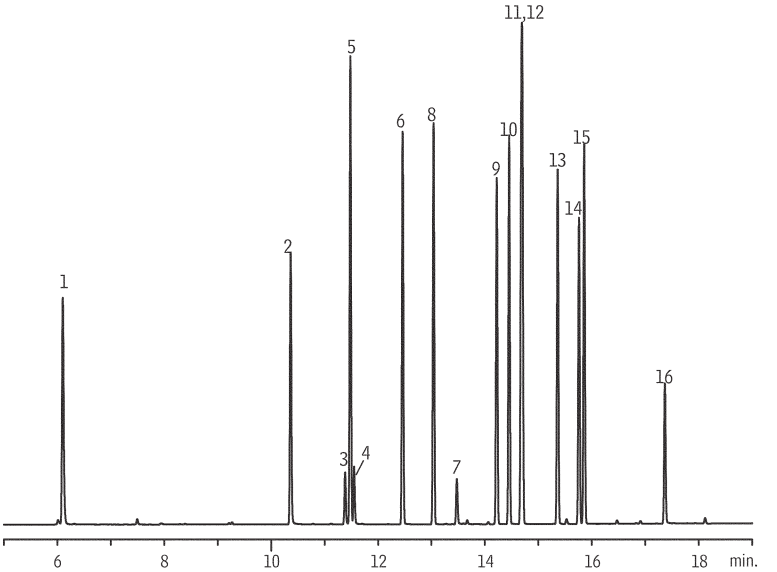
Column:	Rtx®-XLB, 30m, 0.32mm ID, 0.5μm (cat.# 12839)
Sample:	8081A pesticides, 80-160ppb in hexane 8081A Pesticides/Surrogates 8080 Organochlorine Pesticide Mix AB #2 (20 components) (cat.# 32292) 8081a Organochlorine Pesticide Mix C #2 (7 components) (cat.# 32295) 2,4'-DDT (cat.# 32200) 2,4'-DDD (cat.# 32098) 2,4'-DDE (cat.# 32099) Kepone (custom) Mirex (custom) 2,4,5,6-tetrachloro-*m*-xylene (ss, 20ppb) (cat.# 32027) decachlorobiphenyl (ss, 40ppb) (cat.# 32029)
Inj.:	1.0μL splitless (hold 0.75 min.), 4mm Drilled Uniliner® inlet liner (cat.# 21055)
Inj. temp.:	220°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	60cm/sec. @ 120°C
Oven temp.:	120°C (hold 0.5 min.) to 260°C @ 29°C/min. (hold 2.5 min.), to 330°C @ 28°C/min. (hold 3 min.)
Det.:	ECD @ 320°C

Searching for a chromatogram?
www.restek.com

Pesticides & Herbicides
US EPA Method 505
Rtx®-CLPesticides & Rtx®-CLPesticides2

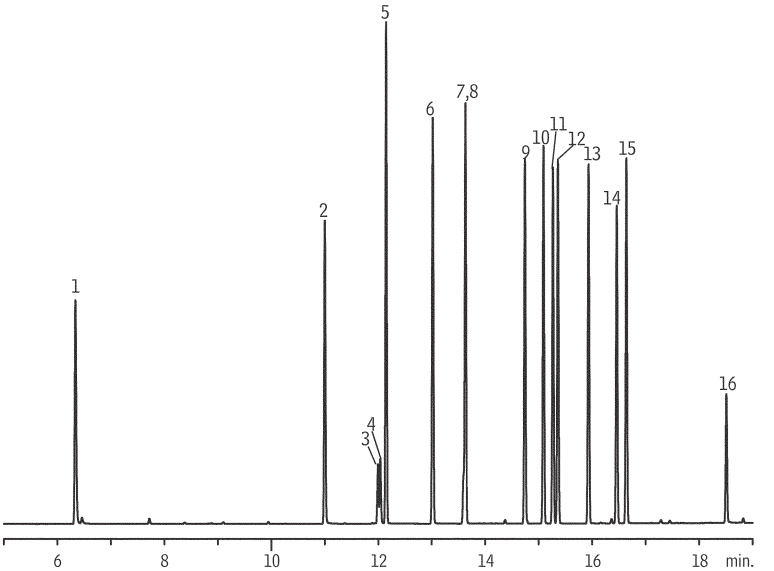
NEW!

Rtx®-CLPesticides



GC_EV01004

Rtx®-CLPesticides2



GC_EV01005

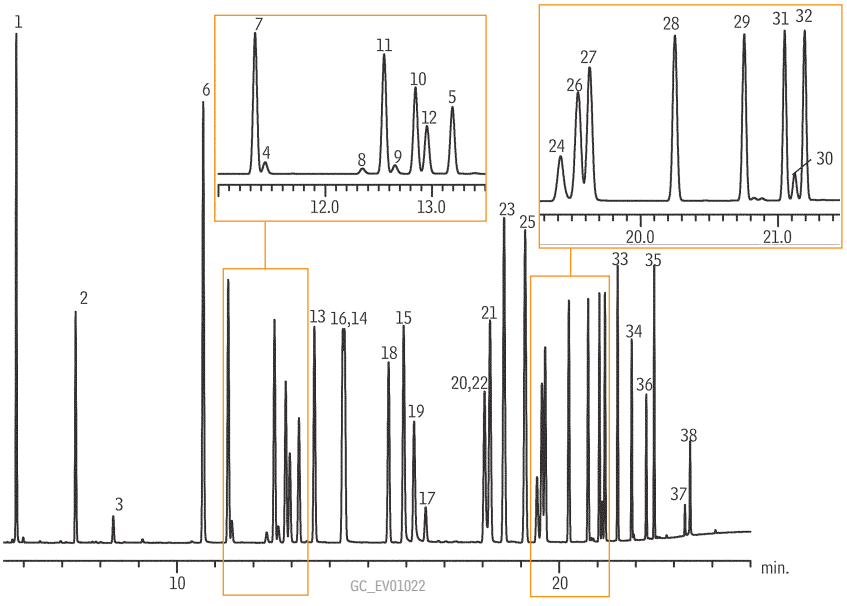
1. hexachlorocyclopentadiene
2. hexachlorobenzene
3. simazine
4. atrazine
5. γ-BHC
6. heptachlor
7. alachlor
8. aldrin
9. heptachlor epoxide
10. γ-chlordane
11. *trans*-nonachlor
12. α-chlordane
13. dieldrin
14. endrin
15. *cis*-nonachlor
16. methoxychlor

Column:	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) and Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141) with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Universal "Y" Press-Tight® Connector (cat.# 20405-261)
Sample:	200ng/mL 505 Organohalide Pesticide Mix (cat.# 32024), 4.2µg/mL Simazine (cat.# 32236), 4.2µg/mL Atrazine (cat.# 32208) in methanol
Inj.:	2µL splitless (hold 0.75 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	40cm/sec. @ 90°C
Oven temp.:	90°C (hold 1 min.) to 310°C (hold 5 min.) @ 10°C/min.
Det. temp.:	ECD @ 325°C

Pesticides & Herbicides
US EPA Method 508.1
Rtx®-CLPesticides & Rtx®-CLPesticides2

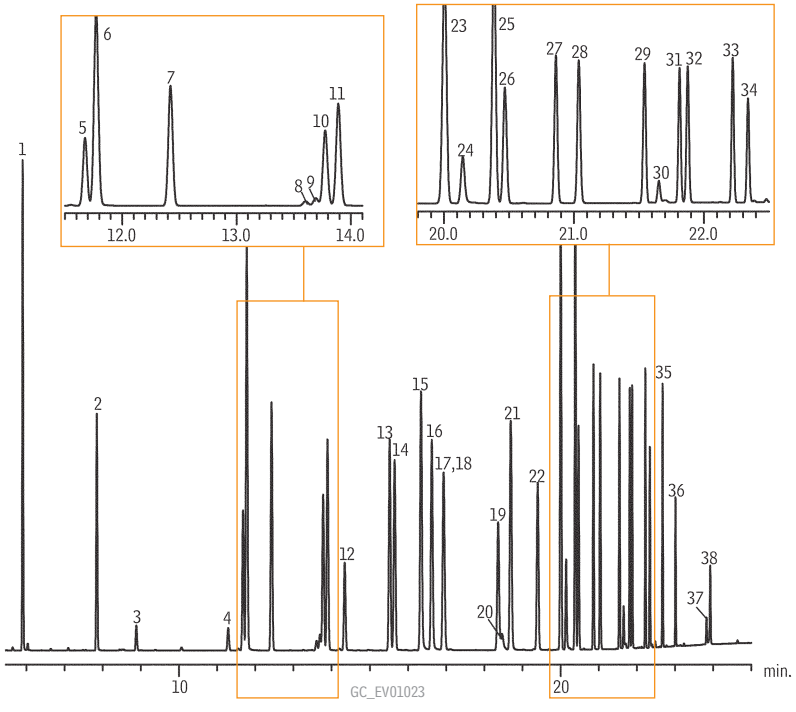
NEW!

Rtx®-CLPesticides



1. hexachlorocyclopentadiene
2. etridiazole
3. chloroneb
4. propachlor
5. trifluralin
6. hexachlorobenzene
7. α-BHC
8. simazine
9. atrazine
10. pentachloronitrobenzene (IS)
11. γ-BHC
12. β-BHC
13. δ-BHC
14. heptachlor
15. chlorothalonil
16. metribuzin
17. alachlor
18. aldrin
19. 4,4'-dibromobiphenyl (SS)
20. metachlor
21. DCPA
22. heptachlor epoxide
23. γ-chlordane
24. cyanazine
25. α-chlordane
26. endosulfan I
27. 4,4'-DDE
28. dieldrin
29. endrin
30. chlorobenzilate
31. 4,4'-DDD
32. endosulfan II
33. 4,4'-DDT
34. endrin aldehyde
35. endosulfan sulfate
36. methoxychlor
37. *cis*-permethrin
38. *trans*-permethrin

Rtx®-CLPesticides2

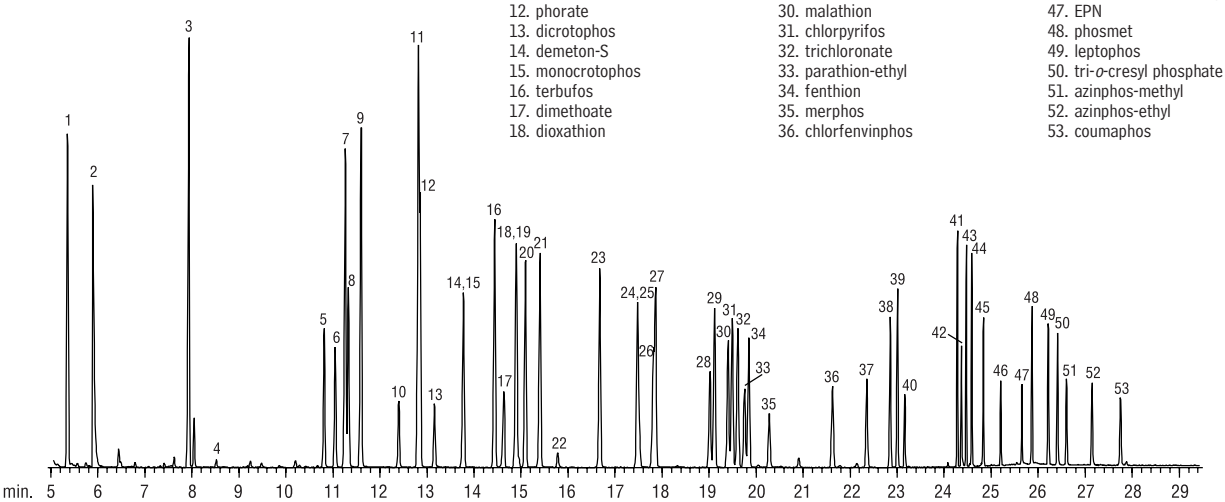


Column:	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25μm (cat.# 11324) and Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32μm (cat.# 11141) with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Universal "Y" Press-Tight® Connector (cat.# 20405-261)
Sample:	50ng/mL 508.1 Calibration Mix #1 (cat.# 32094), 100ng/mL 508.1 Calibration Mix #2 (cat.# 32095), 100ng/mL 508.1 Calibration Mix #3 (cat.# 32096), 50ng/mL 508.1 Internal Standard (cat.# 32091), 250ng/mL 508.1 Surrogate (cat.# 32092), 500ng/mL Atrazine (cat.# 32208), 500ng/mL Simazine (cat.# 32236) in ethyl acetate
Inj.:	2μL splitless (hold 0.75 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	26cm/sec. @ 80°C
Oven temp.:	80°C (hold 0.5 min.) to 155°C (hold 1 min.) @ 19°C/min. to 210°C @ 4°C/min. to 310°C (hold 0.5 min.) @ 25°C/min.
Detector temp.:	ECD @ 325°C

Organophosphorus Pesticides
US EPA Method 8141A
Rtx®-OPPesticides2

Best column for most resolved compounds for Method 8141A.

1. dichlorvos
2. hexamethylphosphoramide
3. mevinphos
4. trichlorfon
5. TEPP
6. demeton-O
7. thionazin
8. tributyl phosphate (IS)
9. ethoprop
10. naled
11. sulfotepp
12. phorate
13. dicrotophos
14. demeton-S
15. monocrotophos
16. terbufos
17. dimethoate
18. dioxathion
19. fonophos
20. diazinon
21. disulfoton
22. phosphamidon isomer
23. dichlorofenthion
24. chlorpyrifos methyl
25. phosphamidon
26. parathion-methyl
27. ronnel
28. fenitrothion
29. aspon
30. malathion
31. chlorpyrifos
32. trichloronate
33. parathion-ethyl
34. fenthion
35. merphos
36. chlorfenvinphos
37. crotoxyphos
38. stirofos
39. tokuthion
40. merphos oxone (breakdown product)
41. ethion
42. fensulfothion
43. bolstar
44. carbophenothion
45. famphur
46. triphenyl phosphate (SS)
47. EPN
48. phosmet
49. leptophos
50. tri-*o*-cresyl phosphate
51. azinphos-methyl
52. azinphos-ethyl
53. coumaphos



GC_EV00602

Column: Rtx®-OPPesticides2, 30m, 0.25mm ID, 0.25µm (cat.# 11243)
Sample: US EPA Method 8141A Custom Standard Mix 1µL 100ppm (100ng on column)
Triphenylphosphate Standard (cat.# 32281)
Tributylphosphate Standard (cat.# 32280)
8140/8141 OP Pesticides Calibration Mix A (cat.# 32277)
8141 OP Pesticides Calibration Mix B (cat.# 32278)
Custom Mixes: Call Restek for Information
Inj.: 1.0µL splitless (hold 0.4 min.), 4mm double gooseneck inlet liner (cat.# 20785)

Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1.0mL/min.
Oven temp.: 80°C (hold 0.5 min.) to 140°C @ 20°C/min. to 210°C @ 4°C/min. (hold 1 min.) to 280°C @ 30°C (hold 5 min.)
Det: MS
Transfer line temp.: 280°C
Scan range: 35-400amu
Ionization: EI

for **more** info

GC Columns for Pesticide Analyses
Choose from 9 capillary GC phases for pesticide analyses and more than 50 combinations of column ID and phase film thickness. For descriptions of special purpose columns, **see pages 26-27**. To locate a column type in this catalog, **see pages 18-19**.

Partners in Pesticide Analysis

RESTEK + ChemService Pesticide Standards = Pluss PLUS ONE

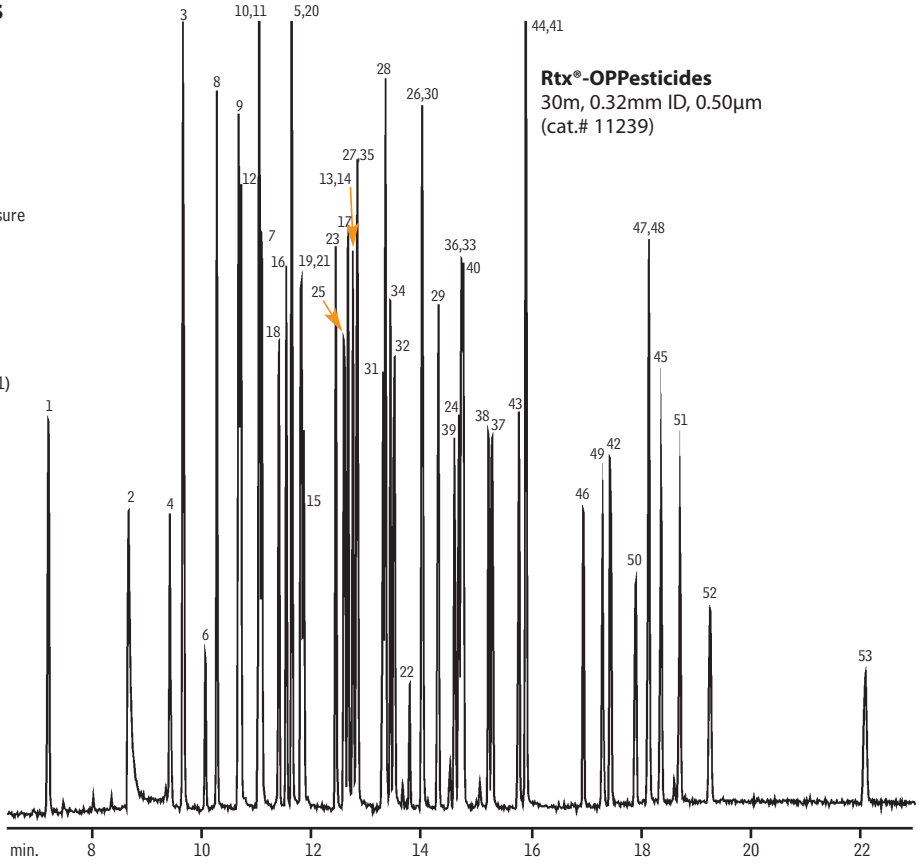
Please visit www.restek.com/pesticides for information about the ChemService product line.

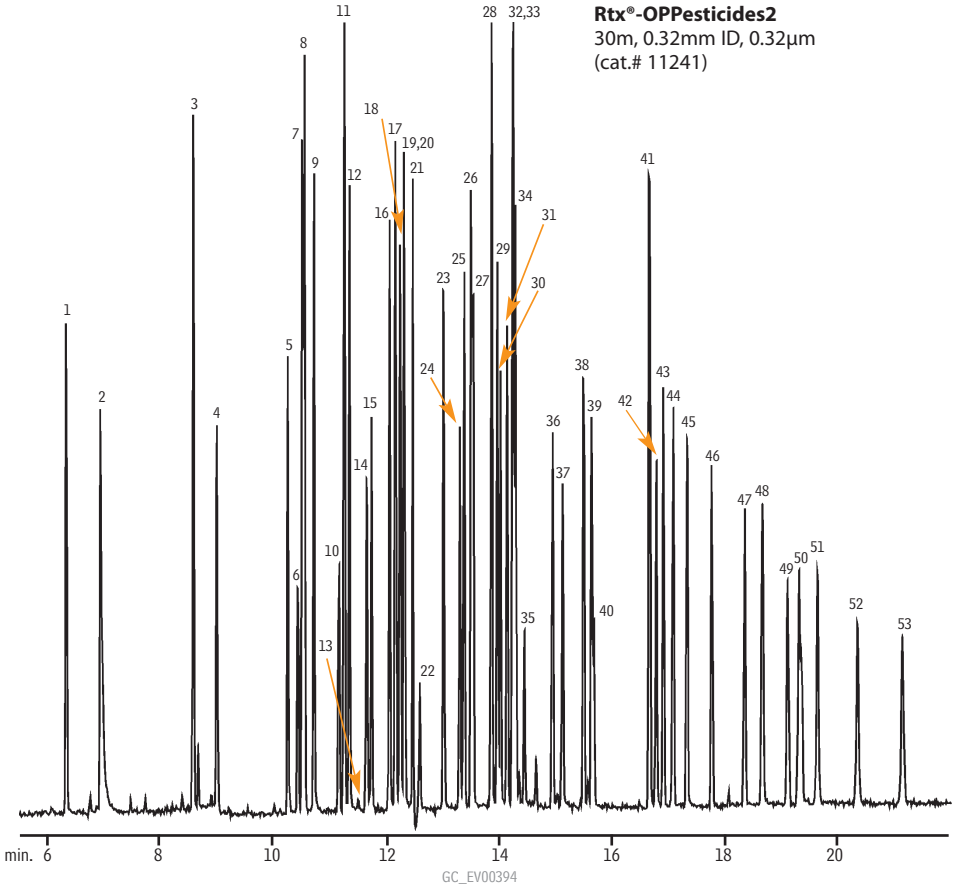
Organophosphorus Pesticides US EPA Method 8141A Rtx®-OPPesticides & Rtx®-OPPesticides2

Dual-column injector

GC:	splitless, purge on 1.0 min. constant pressure
Oven temp.:	80°C (hold 0.5 min.) to 280°C @ 12°C/min. (hold 10 min.)
Injector:	200°C
Inlet liner:	4mm Siltek® single gooseneck inlet liner
Detector:	FPD @ 250°C
Dead time:	1.03 min. @ 80°C
Injection:	1µL US EPA Method 8141A Custom Standard Mixes (100ng/mL) Triphenylphosphate Standard (cat.# 32281) Tributylphosphate Standard (cat.# 32280) 8140/8141 OP Pesticides Calibration Mix A (cat.# 32277) 8141 OP Pesticides Calibration Mix B (cat.# 32278)

1. dichlorvos
2. hexamethylphosphoramide
3. mevinphos
4. trichlorfon
5. TEPP
6. demeton-O
7. tributyl phosphate (SS)
8. thionazin
9. ethoprop
10. naled
11. sulfotepp
12. phorate
13. dicrotophos
14. monocrotophos
15. demeton-S
16. terbufos
17. dimethoate
18. diazinon
19. dioxathion
20. fonophos
21. disulfoton
22. phosphamidon isomer (breakdown product)
23. dichlorofenthion
24. phosphamidon
25. chlorpyrifos methyl
26. parathion-methyl
27. ronnel
28. aspon
29. fenitrothion
30. malathion
31. chlorpyrifos
32. trichloronate
33. parathion-ethyl
34. fenthion
35. merphos
36. chlorfenvinphos
37. crotoxyphos
38. stirofos
39. tokuthion
40. merphos oxone (breakdown product)
41. ethion
42. fensulfothion
43. bolstar
44. carbophenothion
45. famphur
46. triphenyl phosphate (SS)
47. EPN
48. phosmet
49. leptophos
50. tri-*o*-cresyl phosphate
51. azinphos-methyl
52. azinphos-ethyl
53. coumaphos

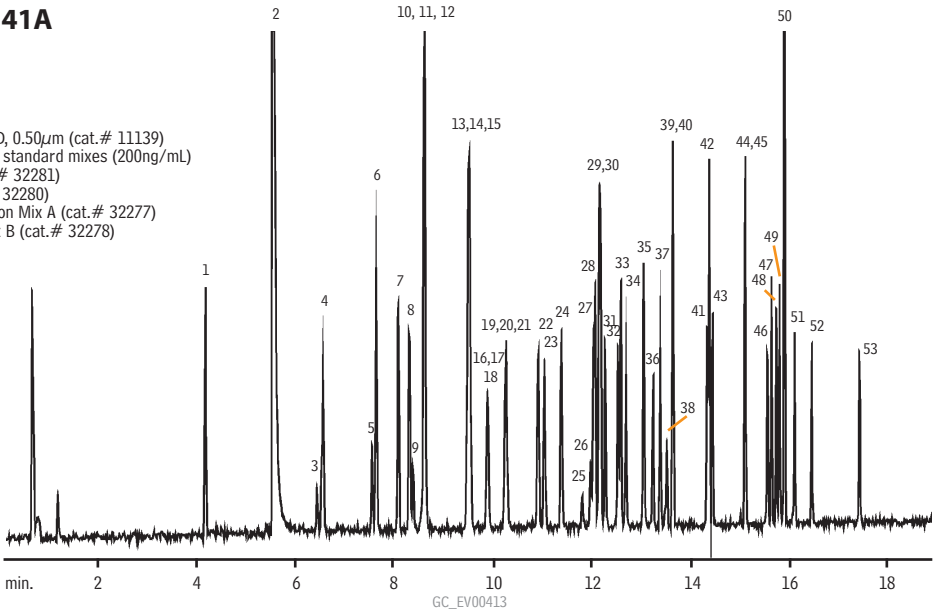




GC_EV00394

Organophosphorus Pesticides
US EPA Method 8140/8141/8141A
Rtx®-CLPesticides

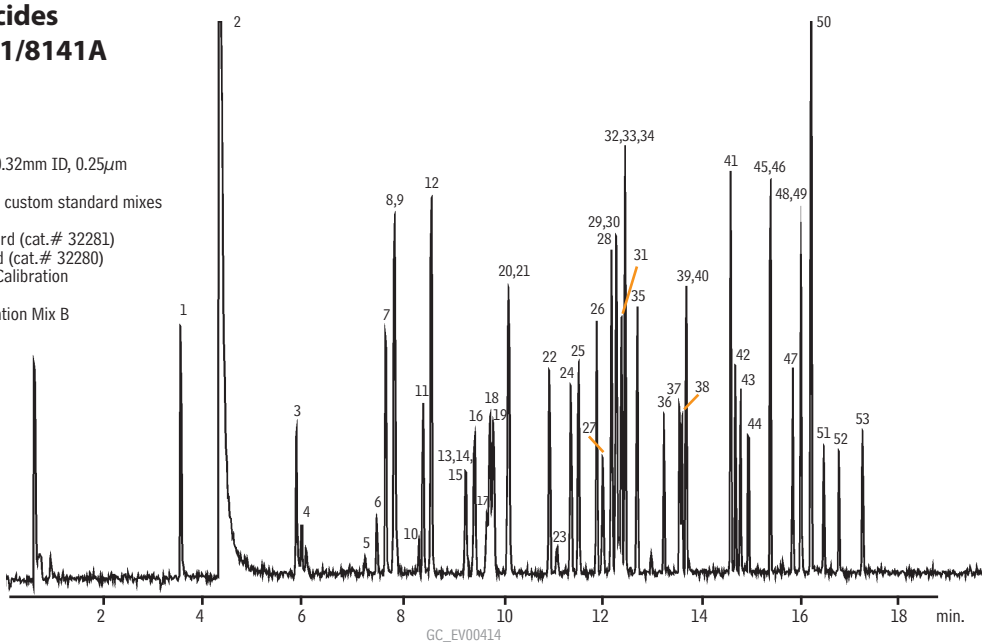
Column: Rtx®-CLPesticides, 30m, 0.32mm ID, 0.50µm (cat.# 11139)
Sample: 1µL US EPA Method 8141A custom standard mixes (200ng/mL)
Triphenylphosphate Standard (cat.# 32281)
Tributylphosphate Standard (cat.# 32280)
8140/8141 OP Pesticides Calibration Mix A (cat.# 32277)
8141 OP Pesticides Calibration Mix B (cat.# 32278)
Splitless hold time: 1 min.
Oven temp.: 100°C to 180°C @ 10°C/min. (hold 2 min.), to 300°C @ 18°C/min. (hold 3 min.)
Inj./det. temp.: 250°C/280°C FPD



1. dichlorvos
2. hexamethylphosphoramide
3. trichlorfon
4. mevinphos
5. demeton-O
6. thionazin
7. ethoprop
8. phorate
9. naled
10. tributyl phosphate (SS)
11. TEPP
12. sulfotepp
13. demeton-S
14. terbufos
15. fonophos
16. dicrotophos
17. diazinon
18. disulfoton
19. dioxathion
20. monocrotophos
21. dimethoate
22. dichlorofenthion
23. chlorpyrifos methyl
24. ronnel
25. phosphamidon isomer
26. merphos
27. chlorpyrifos
28. fenthion
29. aspon
30. parathion-methyl
31. trichloronate
32. malathion
33. fenitrothion
34. phosphamidon
35. parathion-ethyl
36. chlorfenvinphos
37. tokuthion
38. merphos oxone
39. crotoxyphos
40. stirofos
41. bolstar
42. famphur
43. carbophenothion
44. fensulfothion
45. triphenyl phosphate (SS)
46. leptophos
47. ethion
48. phosmet
49. EPN
50. tri-*o*-cresyl phosphate
51. azinphos-methyl
52. azinphos-ethyl
53. coumaphos

Organophosphorus Pesticides
US EPA Method 8140/8141/8141A
Rtx®-CLPesticides2

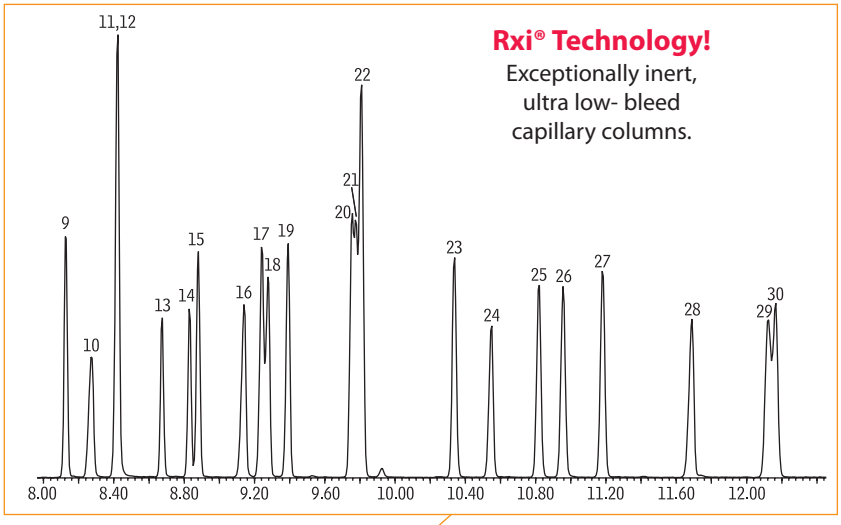
Column: Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324)
Sample: 1µL US EPA Method 8141A custom standard mixes (200ng/mL)
Triphenylphosphate Standard (cat.# 32281)
Tributylphosphate Standard (cat.# 32280)
8140/8141 OP Pesticides Calibration Mix A (cat.# 32277)
8141 OP Pesticides Calibration Mix B (cat.# 32278)
Splitless hold time: 1 min.
Oven temp.: 100°C to 180°C @ 10°C/min. (hold 2 min.), to 300°C @ 18°C/min. (hold 3 min.)
Inj./det. temp.: 250°C/280°C FPD

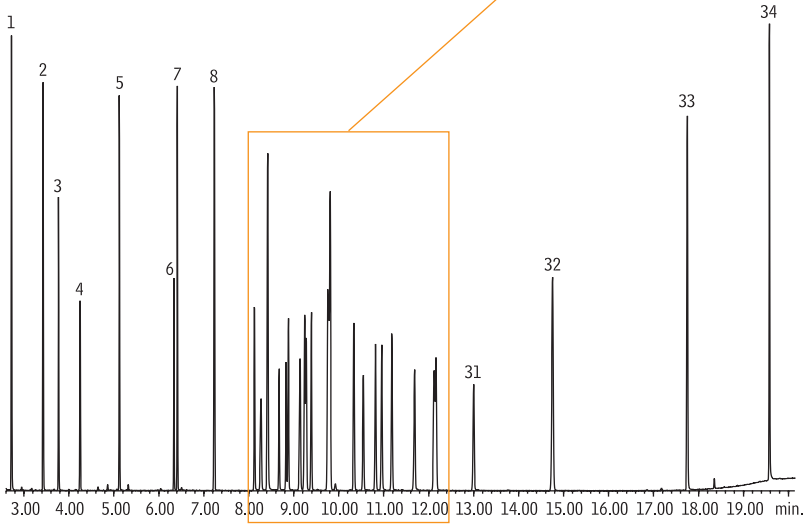


1. dichlorvos
2. hexamethylphosphoramide
3. mevinphos
4. trichlorfon
5. demeton-O
6. thionazin
7. tributyl phosphate (SS)
8. ethoprop
9. TEPP
10. naled
11. phorate
12. sulfotepp
13. demeton-S
14. dicrotophos
15. dioxathion
16. terbufos
17. monocrotophos
18. fonophos
19. diazinon
20. disulfoton
21. dimethoate
22. dichlorofenthion
23. phosphamidon isomer
24. chlorpyrifos methyl
25. ronnel
26. parathion-methyl
27. phosphamidon
28. aspon
29. chlorpyrifos
30. trichloronate
31. merphos
32. fenitrothion
33. fenthion
34. malathion
35. parathion-ethyl
36. chlorfenvinphos
37. crotoxyphos
38. tokuthion
39. merphos oxone
40. stirofos
41. famphur
42. bolstar
43. carbophenothion
44. fensulfothion
45. triphenyl phosphate (SS)
46. ethion
47. EPN
48. phosmet
49. leptophos
50. tri-*o*-cresyl phosphate
51. azinphos-methyl
52. azinphos-ethyl
53. coumaphos

Pesticides
Minnesota Ag List 1
Rxi®-1ms

1. 2-fluorophenol (SS)
2. phenol-d6 (SS)
3. 1,4-dichlorobenzene-d4 (IS)
4. nitrobenzene-d5 (SS)
5. naphthalene-d8 (IS)
6. EPTC
7. 2-fluorobiphenyl (SS)
8. acenaphthene-d10 (IS)
9. propachlor
10. desisopropyl atrazine
11. desethyl atrazine
12. 2,4,6-tribromophenol (SS)
13. ethalfluralin
14. trifluralin
15. phorate
16. simazine
17. prometon
18. atrazine
19. propazine
20. terbufos
21. fonofos
22. phenanthrene-d10 (IS)
23. triallate
24. metribuzin
25. dimethenamid
26. acetochlor
27. alachlor
28. cyanazine
29. metolachlor
30. chlorpyrifos
31. pendimethalin
32. *p*-terphenyl-d14 (SS)
33. chrysene-d12 (IS)
34. perylene-d12 (IS)



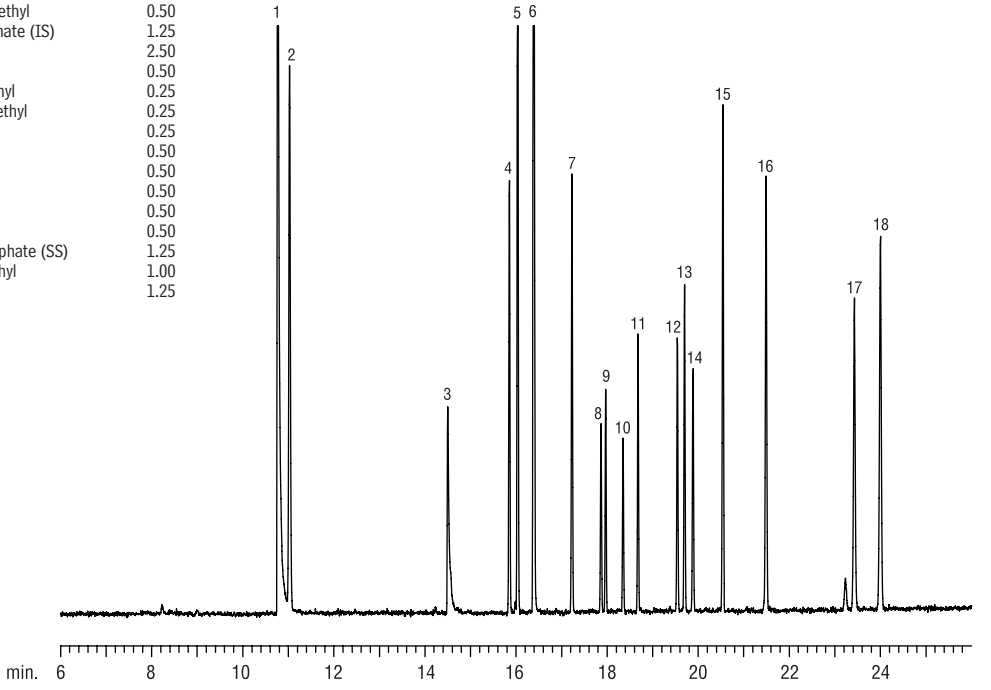


GC_EV00837

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	Minnesota Ag List 1 Pesticides Mix A (cat.# 32406), Minnesota Ag List 1 Pesticides Mix B (cat.# 32407), SV Internal Standard Mix (cat.# 31206), B/N Surrogate Mix (4/89 SOW) (cat.# 31024), Acid Surrogate Mix (4/89 SOW) (cat.# 31025)
Inj.:	1.0µL, 10µg/mL each analyte (internal standards 25µg/mL), split (10:1) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	70°C (hold 1 min.) to 180°C @ 20°C/min., to 230°C @ 5°C/min., to 325°C @ 40°C/min. (hold 3.5 min.)
Det.:	Agilent 5973 MSD
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	2.50 min.
Tune:	DFTPP
Ionization:	EI

Organophosphorus Pesticides (European)
Rtx®-CLPesticides

	Concentration on-column (ng)
1. methamidophos	1.25
2. dichlorvos	1.25
3. acephate	0.50
4. demeton-S-methyl	0.50
5. tributylphosphate (IS)	1.25
6. omethoate	2.50
7. dimethoate	0.50
8. tolclofos-methyl	0.25
9. pirimiphos methyl	0.25
10. chlorpyriphos	0.25
11. malathion	0.50
12. tokuthion	0.50
13. methidathion	0.50
14. profenfos	0.50
15. ethion	0.50
16. triphenylphosphate (SS)	1.25
17. azinphos-methyl	1.00
18. pyrazophos	1.25

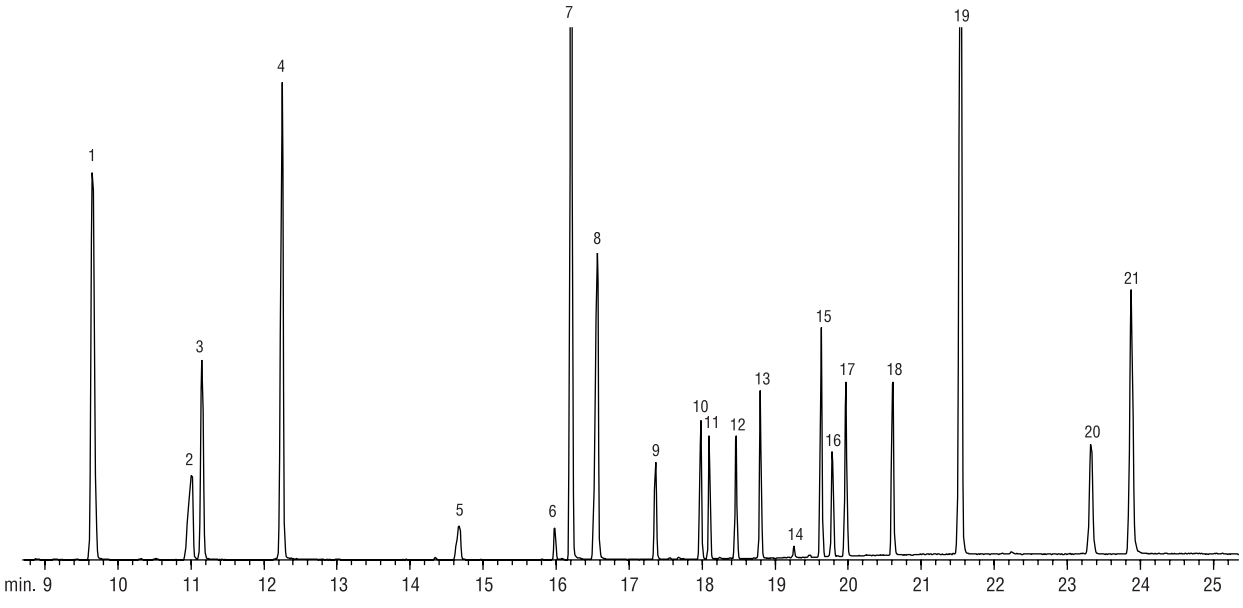


GC_EV00676

Column:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.50µm (cat.# 11139)
Sample:	European OPP Mix (cat.# 32418) 100–1000µg/mL in acetone
Inj.:	0.5µL direct, open-top Siltek® Drilled Uniliner® inlet liner (cat.# 21055-214.5)
Inj. temp.:	250°C
Carrier gas:	helium, constant pressure
Linear velocity:	35cm/sec. @ 80°C
Oven temp.:	80°C (hold 1 min.) to 150°C @ 7°C/min. to 280°C @ 15°C/min. (hold 10 min.)
Det.:	FPD @ 280°C



Organophosphorus Pesticides (European)
Rtx®-CLPesticides



GC_EV00648

Column:	Rtx®-CLPesticides, 30m, 0.25mm ID, 0.25µm (cat.# 11123)
Sample:	Custom European Mix 1-bromo-2-nitrobenzene (cat.# 32279) 4-chloro-3-nitrobenzotrifluoride (cat.# 32282) tributylphosphate (cat.# 32280) triphenylphosphate (cat.# 32281)
Inj.:	1.0µL splitless (hold 0.4 min.) 4mm double gooseneck inlet liner (cat.# 20785)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow, 6psi head pressure
Flow rate:	0.75mL/min.
Linear velocity:	28cm/sec.*
Dead time:	1.82 min. @ 80°C
Oven temp.:	80°C (hold 1.0 min.) to 150°C @ 7°C/min. (no hold) to 280°C @ 15°C/min. (hold 7 min.)
Det.:	Agilent 5971A GC/MS
Transfer line temp.:	280°C
Scan range:	35–400amu
Solvent Delay	5 min.
Tune	PFTBA
Ionization:	EI

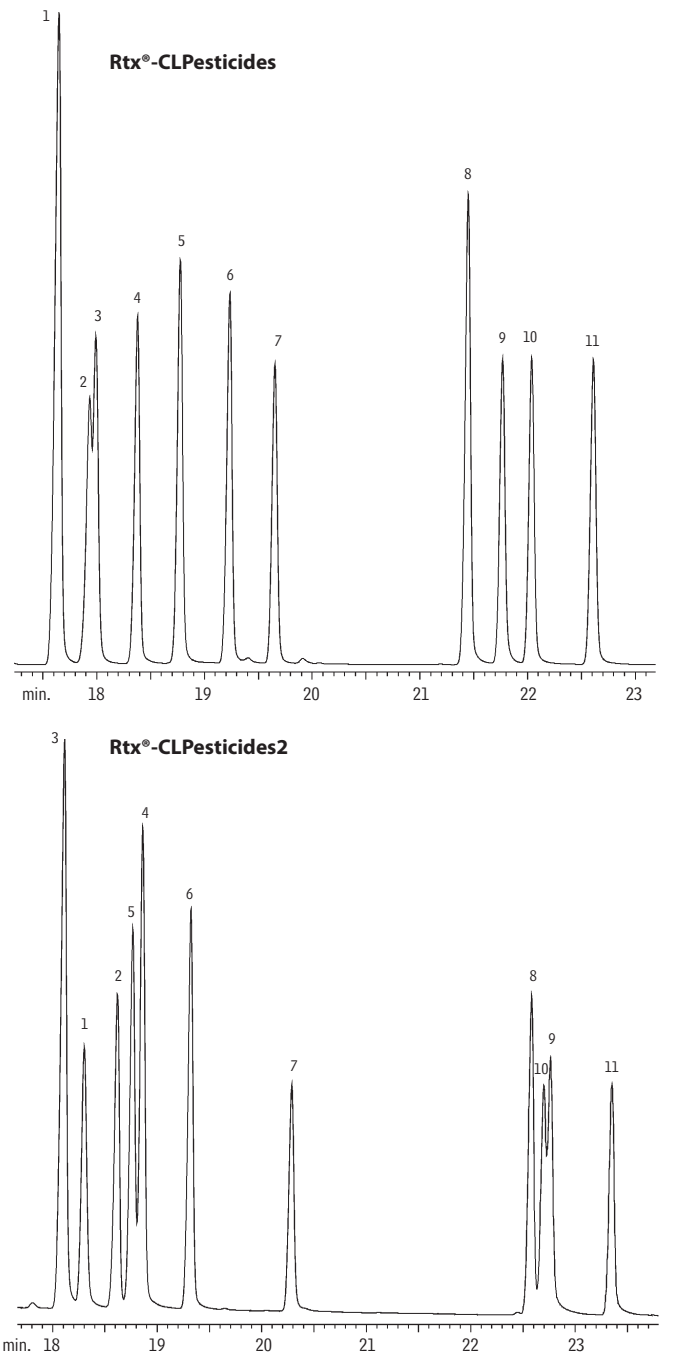
Compound	Conc. on-column (ng)
1. 4-chloro-3-nitro-trifluoride	100
2. methamidophos	50
3. dichlorvos	50
4. 1-bromo-2-nitrobenzene	100
5. acephate	20
6. demeton-S-methyl	20
7. TBP (IS)	100
8. omethoate	100
9. dimethoate	20
10. tolclofos-methyl	10
11. pirimiphos methyl	10
12. chlorpyrifos	10
13. malathion	20
14. quinalphos	10
15. tokuthion (prothiofos)	20
16. methidathion	20
17. profenfos	20
18. ethion	20
19. TPP (SS)	100
20. azinphos-methyl	40
21. pyrazophos	50

a **plus 1** story

"Thank you for being a top notch GC Analytical Supply Company that always continues to offer newer products & services."

John T. Brunette, Chemist, Bausch & Lomb

Nitrogen/Phosphorus Pesticides & Herbicides
US EPA Method 619
Rtx®-CLPesticides & Rtx®-CLPesticides2 (dual column analysis)



	CAS No.
1. prometon	1610-18-0
2. simazine	122-34-9
3. atraton	1610-17-9
4. propazine	139-40-2
5. atrazine	1912-24-9
6. terbuthylazine	5915-41-3
7. secbumeton	26259-45-0
8. simetryne	1014-70-6
9. ametryne	834-12-8
10. prometryne	7287-19-6
11. terbutryne	886-50-0

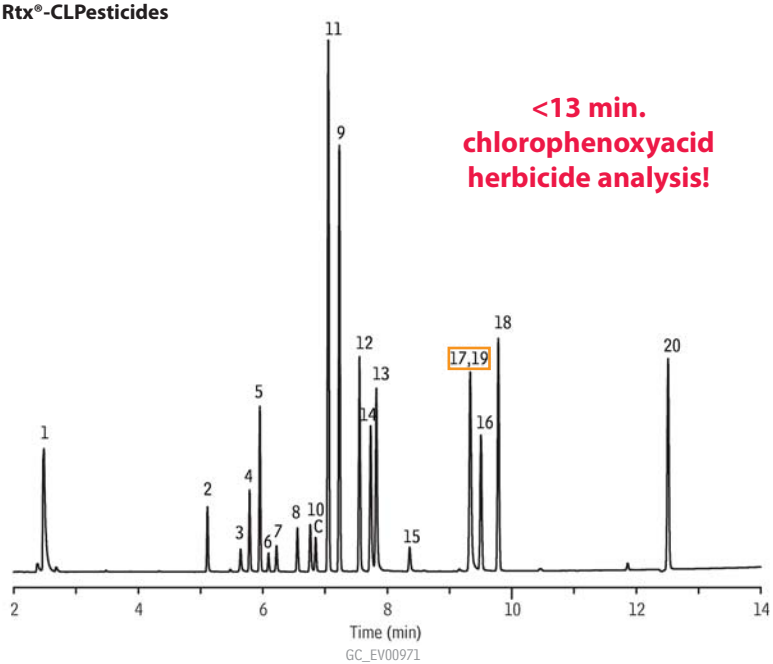
GC_EV00056

Columns:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.50µm (cat.# 11139) and Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) with a 5m, 0.32mm ID guard column (cat.# 10044) and a "Y" Press-Tight® connector (cat.# 20403)
Inj.:	Direct injection using a Uniliner® inlet liner (cat.#21303) and adaptor for an Agilent 5890 (cat.# 20964)
Conc.:	On-column, 50pg each compound
Oven temp.:	100°C (hold 0 min.) to 250°C @ 4°C/min. (hold 5 min.)
Inj./det. temp.:	250°C/275°C
Carrier gas:	hydrogen, 9.65psi constant pressure
GC:	Agilent 6890 with purged packed injection port

Herbicides
US EPA Method 8151A
Rtx®-CLPesticides & Rtx®-CLPesticides2

NEW!

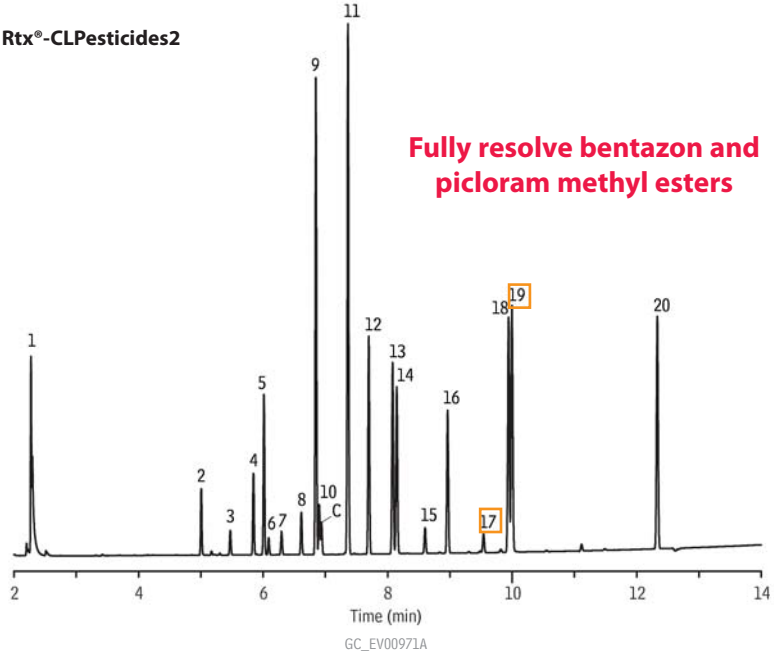
Rtx®-CLPesticides



<13 min. chlorophenoxyacid herbicide analysis!

GC_EV00971

Rtx®-CLPesticides2



Fully resolve bentazon and picloram methyl esters

GC_EV00971A

1. dalapon methyl ester
2. 3,5-dichlorobenzoic acid methyl ester (SS)
3. 4-nitroanisole
4. DCAA methyl ester (SS)
5. dicamba methyl ester
6. MCPP methyl ester
7. MCPA methyl ester
8. dichlorprop methyl ester
9. 4,4'-DBOB (IS)
10. 2,4-D methyl ester
11. pentachloroanisole
12. 2,4,5-TP methyl ester
13. 2,4,5-T methyl ester
14. chloramben methyl ester
15. 2,4-DB methyl ester
16. dinoseb methyl ester
17. bentazon methyl ester
18. DCPA
19. picloram methyl ester
20. acifluorfen methyl ester

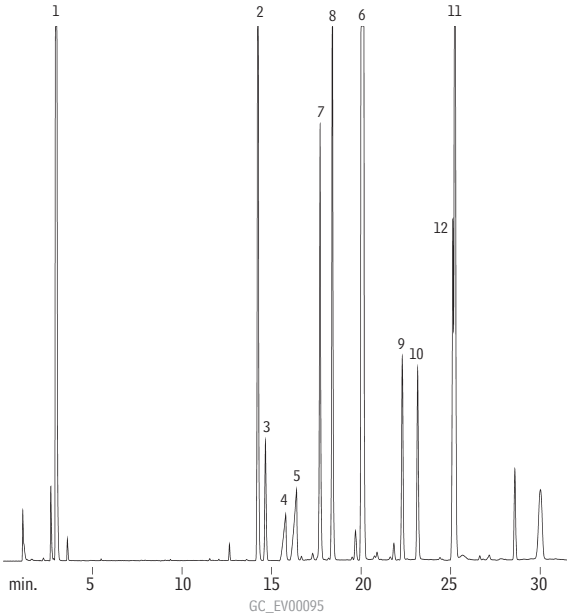
C. contaminant

Column:	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) and Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141), with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Deactivated Universal "Y" Press-Tight® Connector (cat.# 20405-261)
Sample:	200ng/mL Herbicide Mix #1 (cat.# 32055) in hexane 1,000ng/mL Herbicide Mix #2 (cat.# 32057) in hexane 20,000ng/mL Herbicide Mix #3 (cat.# 32059) in hexane 200ng/mL Herbicide Mix #4 (cat.# 32062) in hexane 250ng/mL Herbicide Internal Standard (cat.# 32053) in hexane 400ng/mL Herbicide Surrogate (cat.# 32050) in hexane
Inj.:	1.0µL splitless (hold 0.75 min.), 4mm Cyclo Double Gooseneck inlet liner (cat.# 20895)
Inj. temp.:	250°C
Carrier gas:	helium, constant pressure
Flow rate:	36cm/sec. @ 70°C
Oven temp.:	70°C (hold 0.5 min.) to 190°C @ 25°C/min. (hold 1 min.) to 300°C @ 11°C/min. (hold 5 min.)
Det.:	ECD @ 325°C

Chlorophenoxyacid Herbicides
US EPA Method 615
Rtx®-5

Analysis optimized using Pro *ez*GC software!

1. dalapon
2. DCAA (SS)
3. dicamba
4. MCPP
5. MCPA
6. DBOB (IS)
7. dichlorprop
8. 2,4-D
9. 2,4,5-TP
10. 2,4,5-T
11. dinoseb
12. 2,4-DB



Column:	Rtx®-5, 30m, 0.53mm ID, 0.50µm (cat.# 10240)
Sample:	0.5µL direct injection of chlorophenoxy herbicides, on-column concentration 10–10,000µg/mL
Oven temp.:	60°C to 150°C @ 8°C/min. (hold 5 min.), to 210°C @ 4°C/min.
Inj./det. temp.:	250°C/275°C
Carrier gas:	helium
Linear velocity:	35cm/sec. set @ 60°C
Det.:	ECD w/anode purge

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Description	qty.	cat.#	price
Pro *ez*GC Method Development Software CD-ROM	ea.	21487	$201



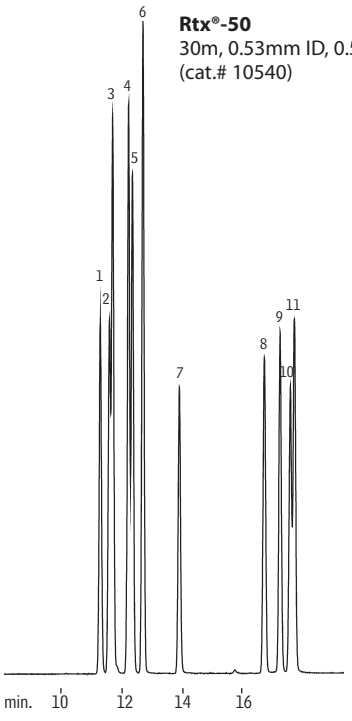
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An unbeatable price to enhance analysis speed & resolution!

Triazine Herbicides
US EPA Method 619
Rtx®-50, Rtx®-200

Rtx®-50
30m, 0.53mm ID, 0.50µm
(cat.# 10540)

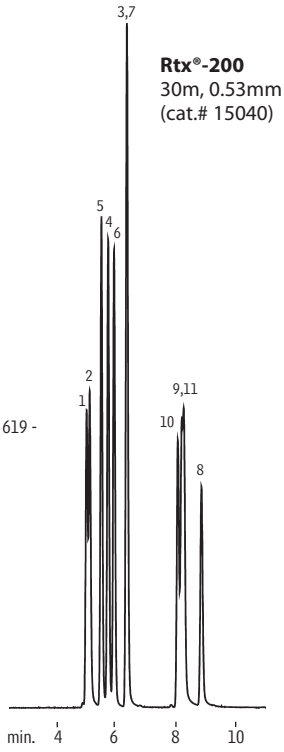


GC_EV00058

1. atraton
2. prometon
3. terbutylazine
4. atrazine
5. simazine
6. propazine
7. secbumeton
8. terbutryne
9. ametryne
10. simetryne
11. prometryne

Sample:	0.5µL direct injection of EPA Method 619 - triazine herbicides.
Conc.:	on-column, 50ng
Oven temp.:	150°C to 250°C @ 4°C/min. (hold 5 min.)
Inj./det. temp.:	250°C/275°C
Detector:	TSD
Carrier gas:	helium
Linear velocity:	40cm/sec. set @ 150°C

Rtx®-200
30m, 0.53mm ID, 0.50µm
(cat.# 15040)



GC_EV00059

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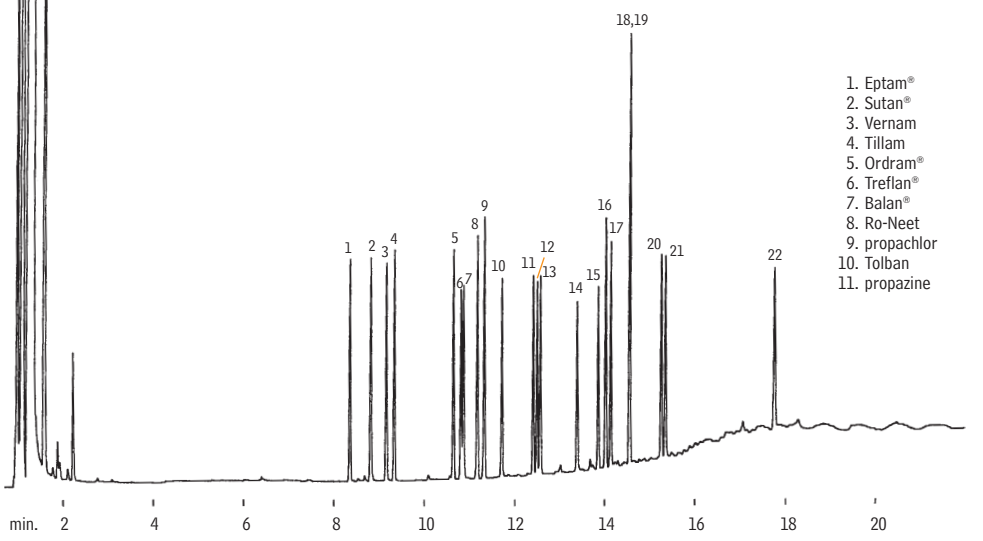
Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com



Hanna Rutter, Customer Service

Nitrogen-Containing Herbicides
Rtx®-35

Column:	Rtx®-35, 30m, 0.53mm ID, 0.50µm (cat.# 10440)
Inj.:	0.2µL direct injection, Uniliner® inlet liner, approximately 10ng per component.
Oven temp.:	60°C (hold 1 min.) to 290°C @ 15°C/min. (hold 5 min.)
Inj./det. temp.:	290°C
Carrier gas:	helium
Linear velocity:	40cm/sec. (flow rate: 5.2cc/min.)
FID sensitivity:	16 x 10^{-11} AFS



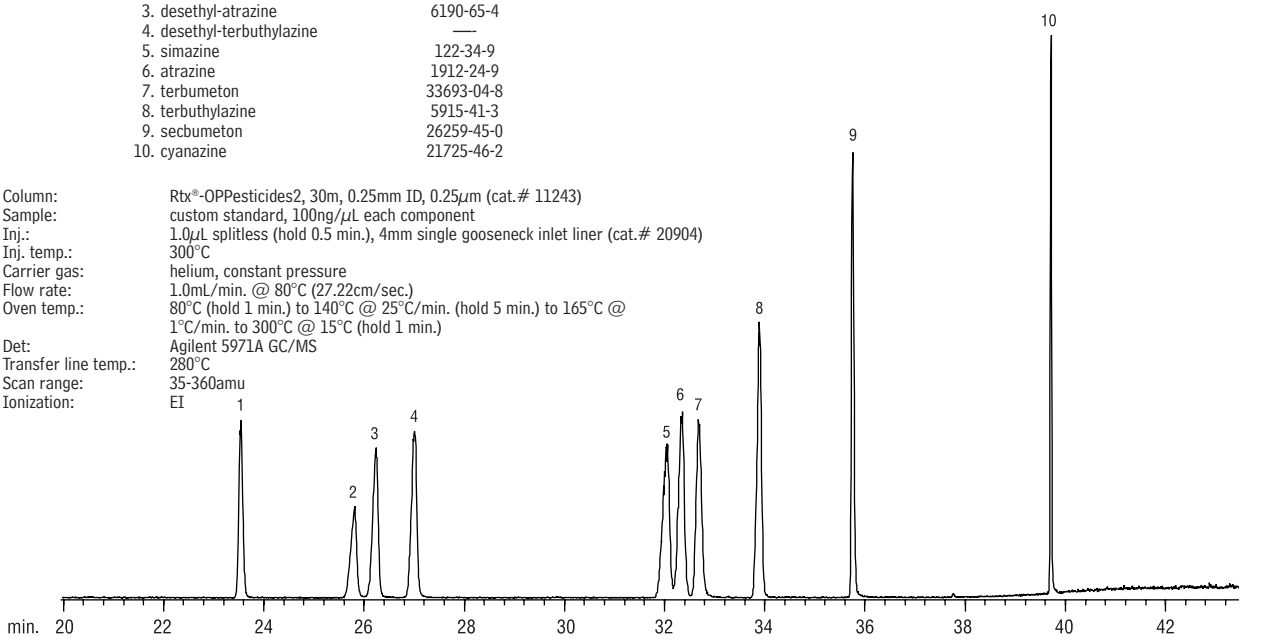
1. Eptam®
2. Sutan®
3. Vernam
4. Tillam
5. Ordram®
6. Treflan®
7. Balan®
8. Ro-Neet
9. propachlor
10. Toban
11. propazine
12. atrazine
13. simazine
14. terbacil
15. Sencor®
16. Dual®
17. Paarlan
18. Prowl
19. bromacil
20. oxadiazon
21. GOAL®
22. hexazinone

GC_EV00088

Triazine Herbicides (French) & Degradation Products
Rtx®-OPPesticides2

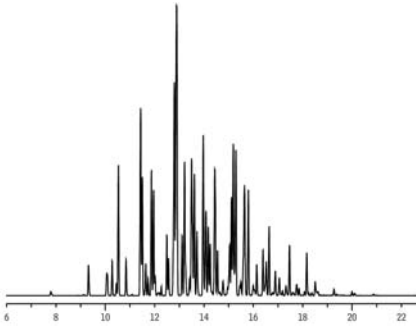
Peak List:	CAS#
1. trifluralin	1582-09-8
2. desisopropylatrazine	1007-28-9
3. desethyl-atrazine	6190-65-4
4. desethyl-terbuthylazine	—
5. simazine	122-34-9
6. atrazine	1912-24-9
7. terbumeton	33693-04-8
8. terbuthylazine	5915-41-3
9. secbumeton	26259-45-0
10. cyanazine	21725-46-2

Column:	Rtx®-OPPesticides2, 30m, 0.25mm ID, 0.25µm (cat.# 11243)
Sample:	custom standard, 100ng/µL each component
Inj.:	1.0µL splitless (hold 0.5 min.), 4mm single gooseneck inlet liner (cat.# 20904)
Inj. temp.:	300°C
Carrier gas:	helium, constant pressure
Flow rate:	1.0mL/min. @ 80°C (27.22cm/sec.)
Oven temp.:	80°C (hold 1 min.) to 140°C @ 25°C/min. (hold 5 min.) to 165°C @ 1°C/min. to 300°C @ 15°C (hold 1 min.)
Det:	Agilent 5971A GC/MS
Transfer line temp.:	280°C
Scan range:	35-360amu
Ionization:	EI



GC_EV00626

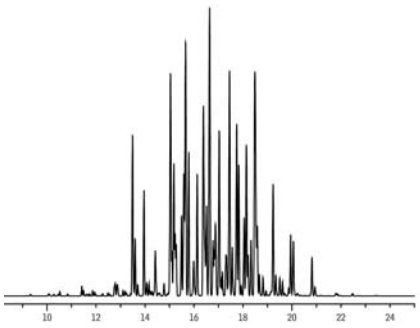
Aroclor 1242 PCBs
Rtx®-PCB



GC_EV00752

Sample: 200ng/mL Aroclor 1242 (cat.# 32009)

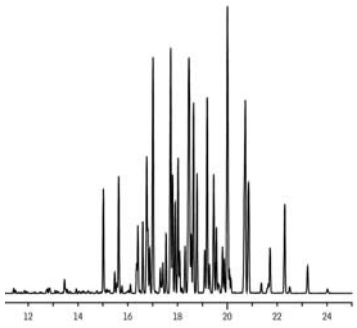
Aroclor 1254 PCBs
Rtx®-PCB



GC_EV00753

Sample:	200ng/mL Aroclor 1254 (cat.# 32011)
Column:	Rtx®-PCB, 30m, 0.25mm ID, 0.25µm (cat.# 13223)
Inj.:	1.0µL splitless (hold 0.75 min.), 3.5mm ID single gooseneck inlet liner (cat.# 20962)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	71cm/sec. @ 110°C
Oven temp.:	100°C (hold 1.0 min.) to 300°C @ 10°C/min. (hold 4 min.)
Det.:	ECD @ 310°C

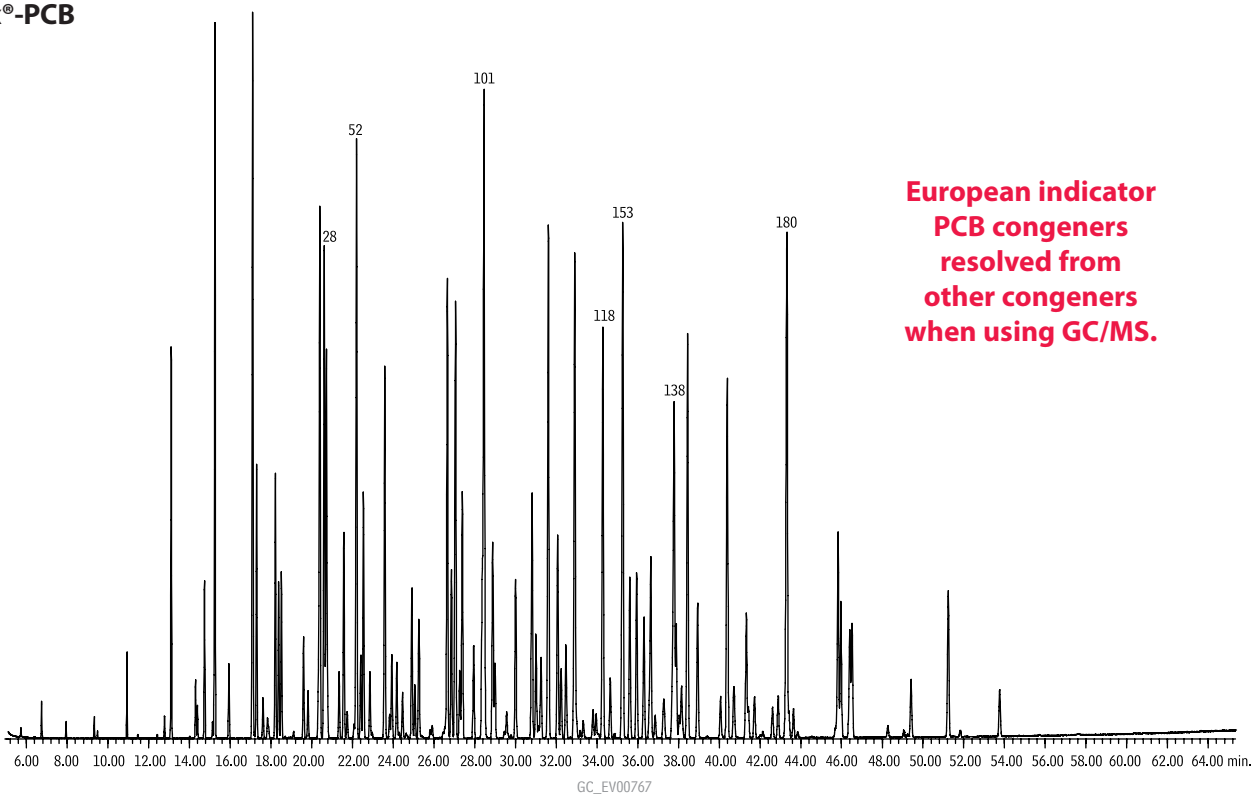
Aroclor 1260 PCBs
Rtx®-PCB



GC_EV00754

Sample: 200ng/mL Aroclor 1260 (cat.# 32012)

Aroclor 1242/1254/1262 PCBs
Rtx®-PCB



GC_EV00767

European indicator PCB congeners resolved from other congeners when using GC/MS.

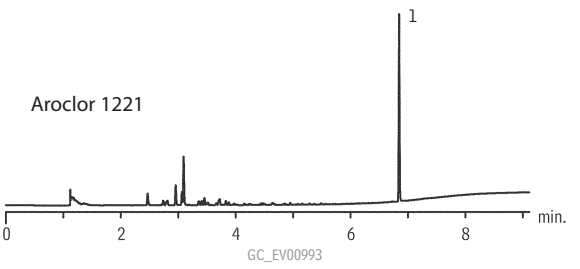
Column:	Rtx®-PCB, 60m, 0.25mm ID, 0.25µm (cat.# 13226)
Sample:	Aroclor 1242 (cat.# 32009), 1254 (cat.# 32011), 1262 (cat.# 32409), 333ppm each
Inj.:	1.0µL splitless (hold 0.75 min.), 4mm single gooseneck inlet liner w/wool (cat.# 22405)
Inj. temp.:	280°C
Carrier gas:	helium, constant flow
Flow rate:	1.1mL/min.
Oven temp.:	100°C (hold 1 min.) to 200°C @ 30°C/min., to 320°C @ 2°C/min. (hold 1 min.)
Det.:	MS
Transfer line temp.:	280°C
Scan range:	50 to 550amu
Ionization:	EI
Mode:	scan

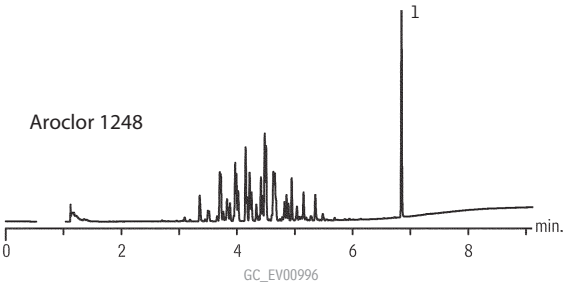
Aroclor PCBs
Rtx-CLPesticides

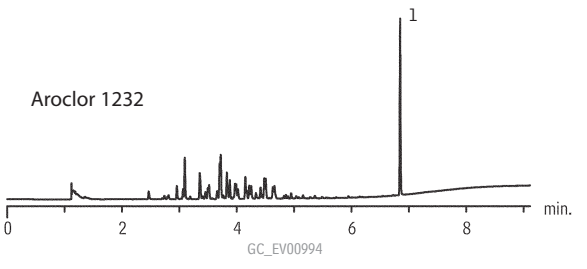
NEW!

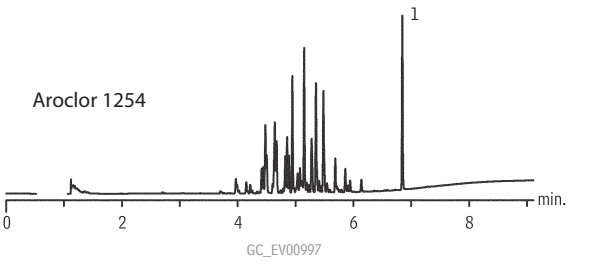
Rtx®-CLPesticides
30m, 0.32mm ID, 0.32µm (cat.# 11141)

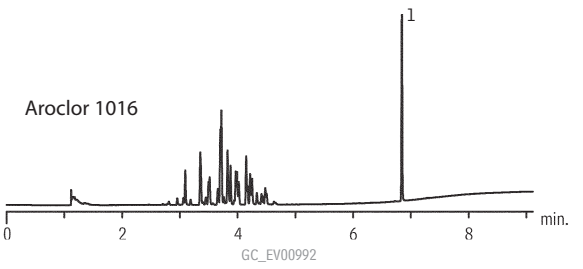
1. decachlorobiphenyl (DCB)

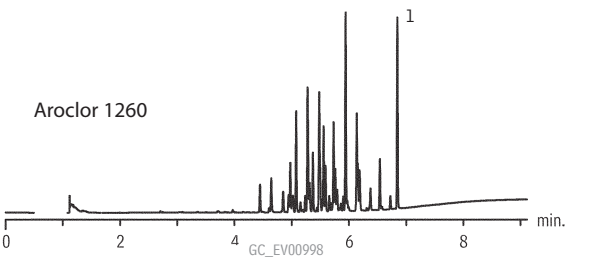


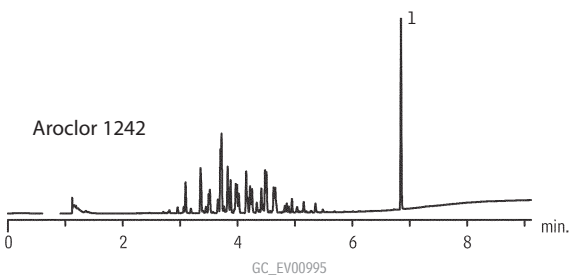












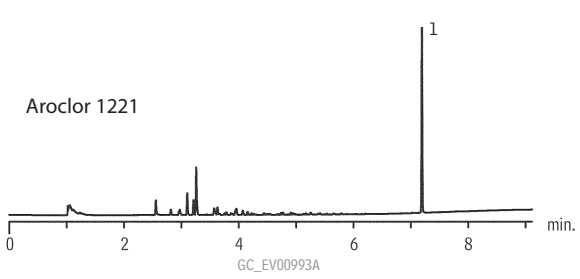
Column:	Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141)
Sample:	1,000µg/mL each Aroclor compound in hexane diluted to 1,000ppb, decachlorobiphenyl (BZ #209) 200µg/mL in acetone (cat.# 32029) diluted to 100ppb
Inj.:	1.0µL pulsed splitless @ 30psi (hold 0.3 min.), 4mm cyclo double gooseneck inlet liner (cat.# 20895)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	60cm/sec. @ 120°C
Oven temp.:	120°C to 200°C @ 45°C/min. to 230°C @ 15°C/min. to 330°C (hold 2 min.) @ 30°C/min.
Det.:	ECD @ 330°C

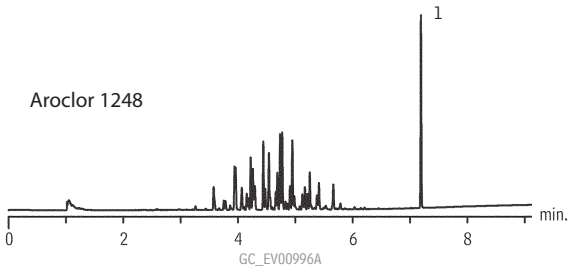
Aroclor PCBs
Rtx-CLPesticides2

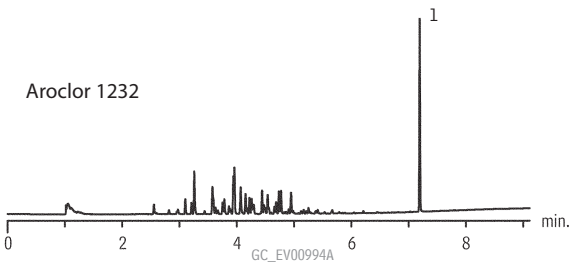
NEW!

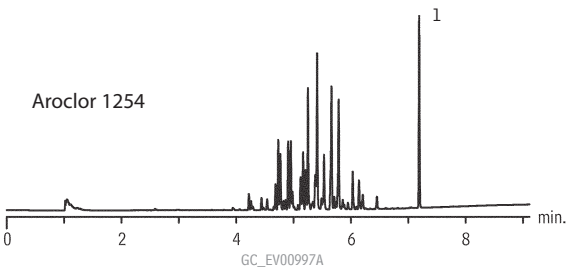
Rtx®-CLPesticides2
30m, 0.32mm ID, 0.25µm (cat.# 11324)

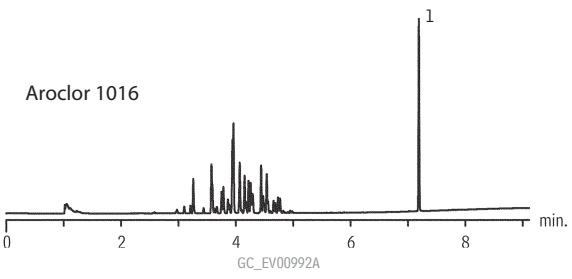
1. decachlorobiphenyl (DCB)

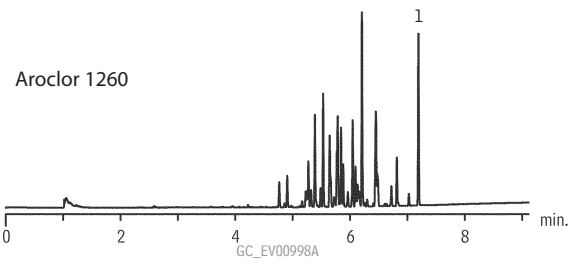


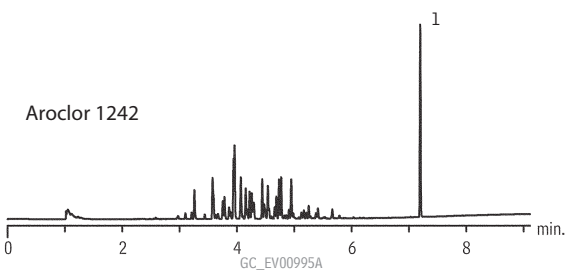










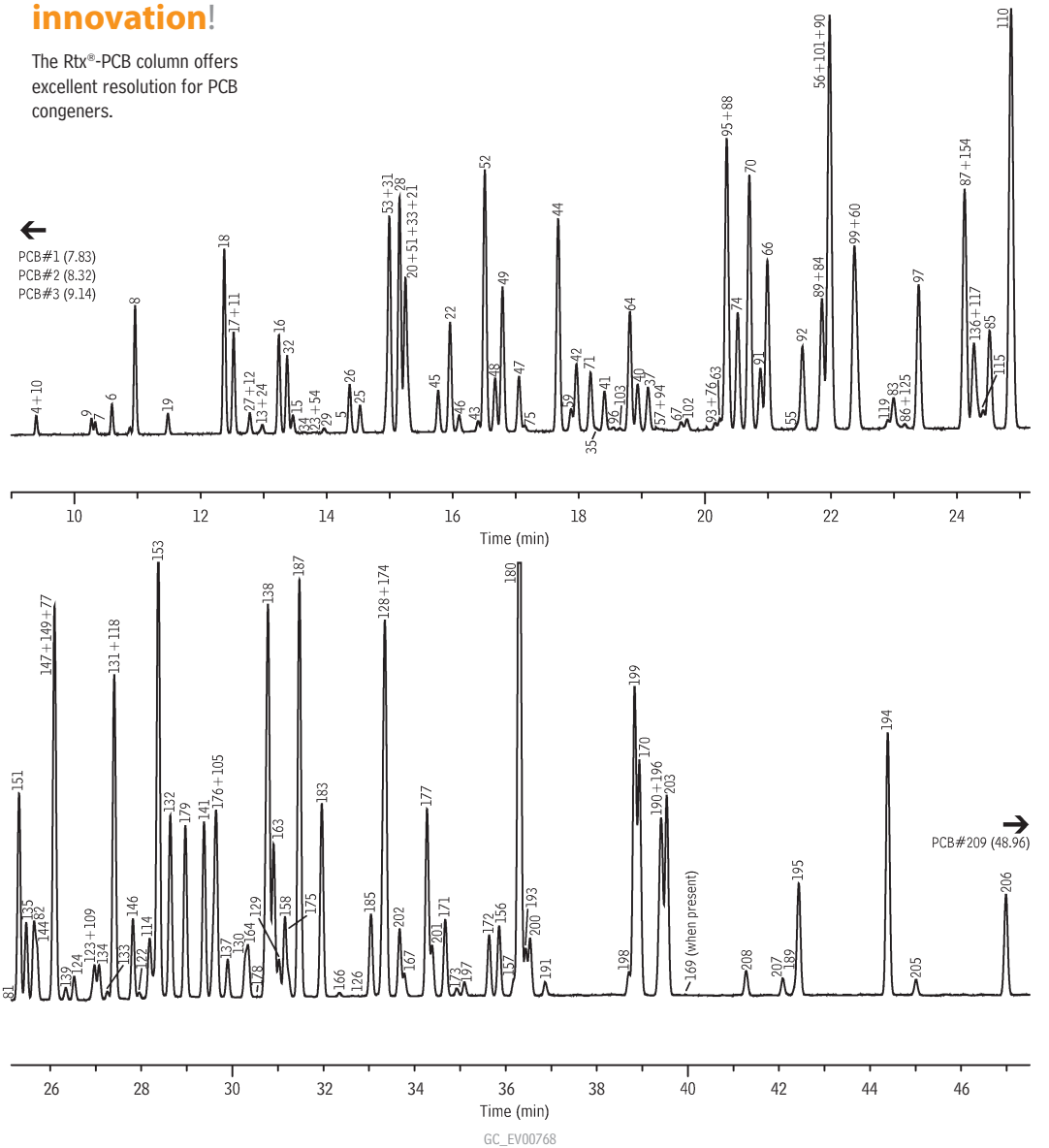


Column:	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324)
Sample:	1,000µg/mL each Aroclor compound in hexane diluted to 1,000ppb, decachlorobiphenyl (BZ #209) 200µg/mL in acetone (cat.# 32029) diluted to 100ppb
Inj.:	1.0µL pulsed splitless @ 30psi (hold 0.3 min.), 4mm cyclo double gooseneck inlet liner (cat.# 20895)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	60cm/sec. @ 120°C
Oven temp.:	120°C to 200°C @ 45°C/min. to 230°C @ 15°C/min. to 330°C (hold 2 min.) @ 30°C/min.
Det.:	ECD @ 330°C

Aroclor 1242/1254/1262 PCBs
Rtx®-PCB

restek
innovation!

The Rtx®-PCB column offers excellent resolution for PCB congeners.

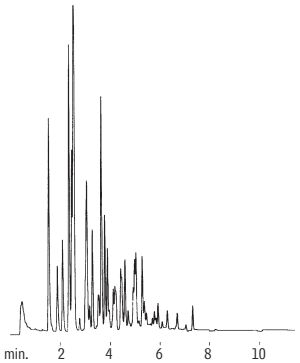


GC_EV00768

Column:	Rtx®-PCB, 40m, 0.18mm ID, 0.18µm (cat.# 41303)
Sample:	300ng/mL Aroclor 1242/1254/1262 in hexane: Aroclor 1242 (cat.# 32009), Aroclor 1254 (cat.# 32011), Aroclor 1262 (cat.# 32409)
Inj.:	1.0µL splitless (hold 0.75 min.), 4mm single gooseneck inlet liner (cat.# 20983)
Inj. temp.:	230°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	40cm/sec. @ 100°C
Oven temp.:	100°C (hold 1 min.) to 200°C @ 30°C/min., to 320°C @ 2°C/min. (hold 1 min.)
Det.:	ECD @ 330°C

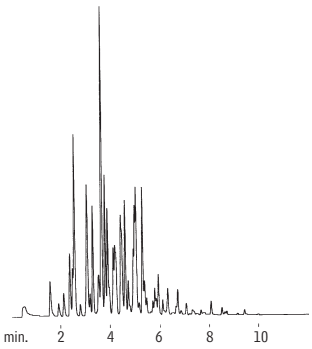
Aroclor PCBs (Quick Screening)
Rtx®-5

Aroclor 1221 Mix (cat.# 32007)



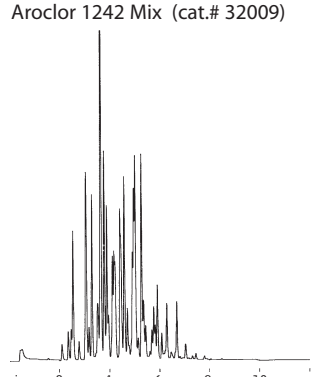
GC_EV00096

Aroclor 1232 Mix (cat.# 32008)



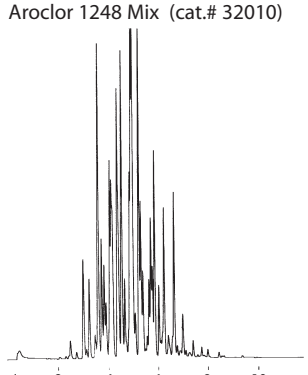
GC_EV00097

Aroclor 1242 Mix (cat.# 32009)



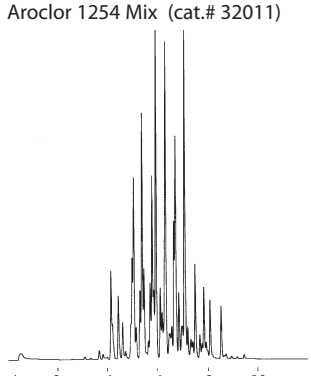
GC_EV00098

Aroclor 1248 Mix (cat.# 32010)



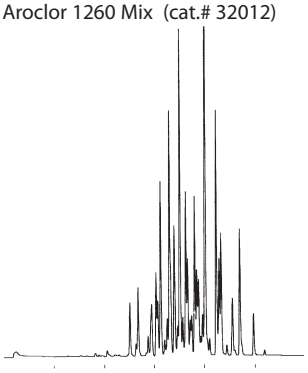
GC_EV00099

Aroclor 1254 Mix (cat.# 32011)



GC_EV00100

Aroclor 1260 Mix (cat.# 32012)

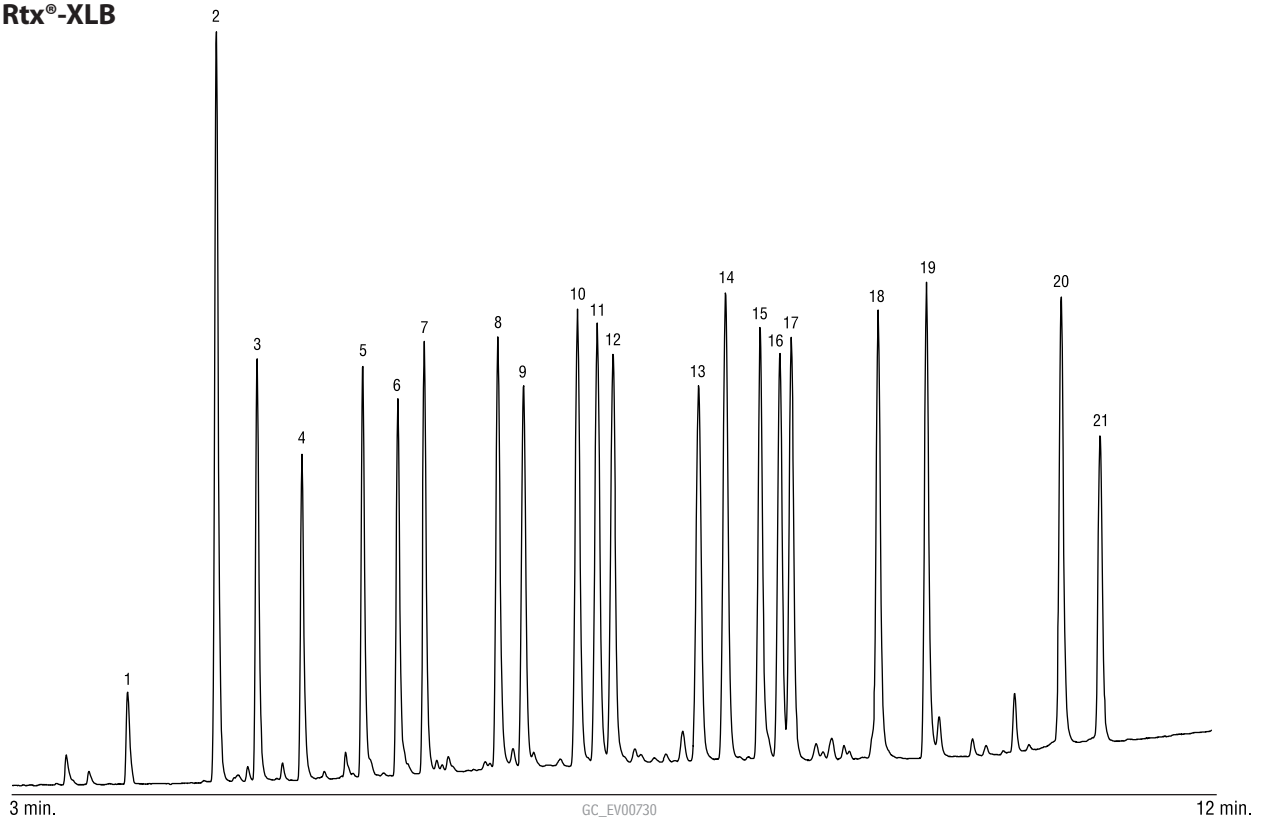


GC_EV00101

Column:	Rtx®-5, 15m, 0.53mm ID, 0.50µm (cat.# 10237)
Inj.:	1.0µL direct injection
Conc.:	50ppm
Oven temp.:	150°C to 300°C @ 12°C/min. (hold 5 min.)
Inj./det. temp.:	250°C/310°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 150°C
ECD sensitivity:	16kHz full scale

PCB Mixtures

PCB Congeners
Rtx®-XLB



Column:	Rtx®-XLB, 30m, 0.32mm ID, 0.50µm (cat.# 12839)
Sample:	200ppb each PCB congener in hexane (cat.# 32416), 200ppb 2,4,5,6-tetrachloro-*m*-xylene (SS) (cat.# 32027), 100ppb decachlorobiphenyl (IS) (cat.# 32289)
Inj.:	1.0µL splitless (hold 0.75 min.), 4mm Drilled Uniliner® inlet liner (cat.# 21055)
Inj. temp.:	220°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	66cm/sec. @ 120°C
Oven temp.:	120°C (hold 0.5 min.) to 260°C @ 29°C/min. (hold 2.5 min.), to 330°C @ 28°C/min. (hold 5 min.)
Det.:	ECD @ 320°C

Compound	RT (min.)
1. 2-chlorobiphenyl	3.86
2. 2,4,5,6 tetrachloro-*m*-xylene (SS)	4.53
3. 2,3-dichlorobiphenyl	4.83
4. 2,2',5-trichlorobiphenyl	5.17
5. 2,4',5-trichlorobiphenyl	5.63
6. 2,2',5,5'-tetrachlorobiphenyl	5.89
7. 2,2',3,5'-tetrachlorobiphenyl	6.09
8. 2,3',4,4'-tetrachlorobiphenyl	6.64
9. 2,2',4,5,5'-pentachlorobiphenyl	6.84
10. 2,2',3,4,5'-pentachlorobiphenyl	7.24
11. 2,3,3',4',6-pentachlorobiphenyl	7.39
12. 2,2',3,5,5',6-hexachlorobiphenyl	7.51
13. 2,2',4,4',5,5'-hexachlorobiphenyl	8.15
14. 2,2',3,4,5,5'-hexachlorobiphenyl	8.35
15. 2,2',3,4,4',5'-hexachlorobiphenyl	8.61
16. 2,2',3,4',5,5',6-heptachlorobiphenyl	8.76
17. 2,2',3,4,4',5',6-heptachlorobiphenyl	8.84
18. 2,2',3,4,4',5,5'-heptachlorobiphenyl	9.50
19. 2,2',3,3',4,4',5-heptachlorobiphenyl	9.86
20. 2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	10.87
21. decachlorobiphenyl (SS)	11.17

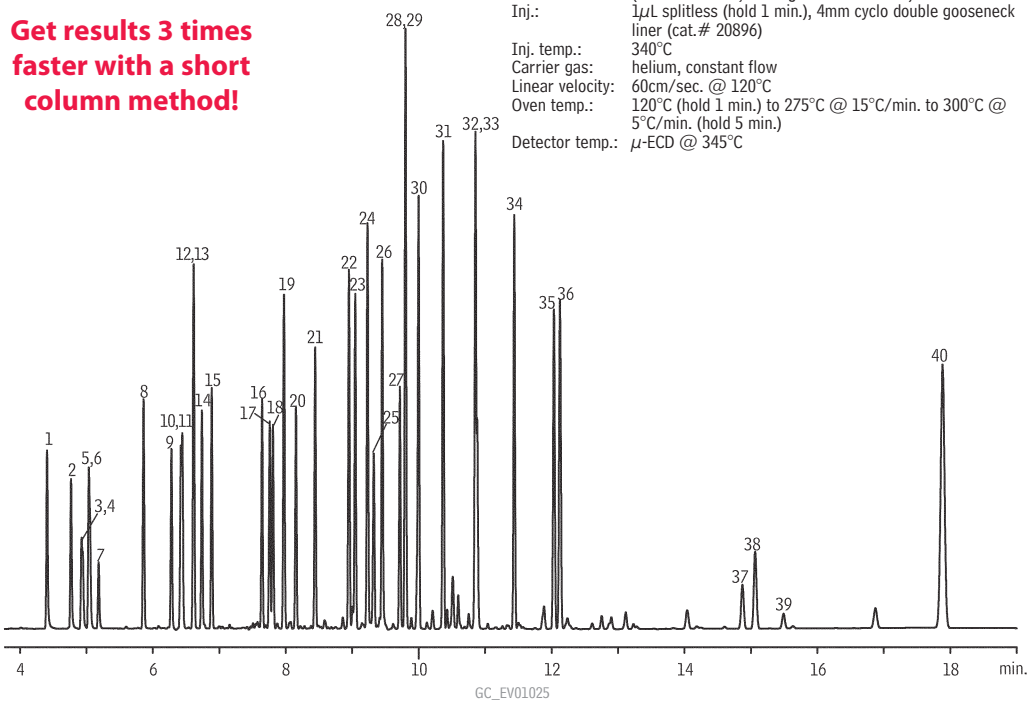
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Brominated Flame Retardants
Rtx®-1614

Get results 3 times faster with a short column method!

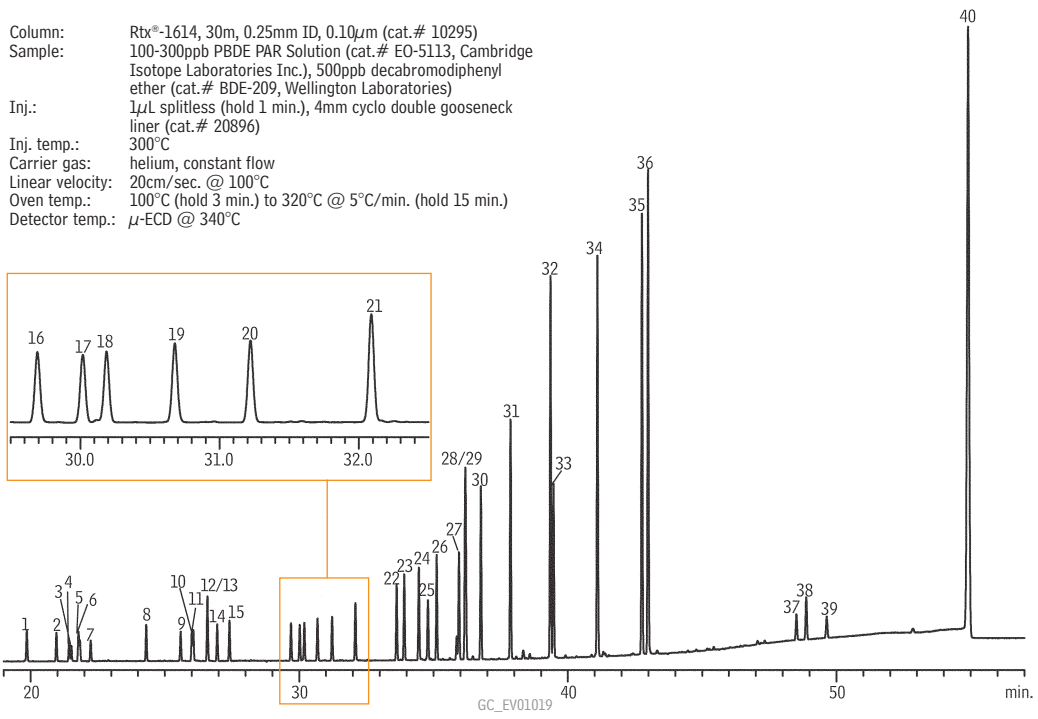
Column:	Rtx®-1614, 15m, 0.25mm ID, 0.10µm (cat.# 10295)
Sample:	100-300ppb PBDE PAR Solution (cat.# EO-5113, Cambridge Isotope Laboratories Inc.), 500ppb decabromodiphenyl ether (cat.# BDE-209, Wellington Laboratories)
Inj.:	1µL splitless (hold 1 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.:	340°C
Carrier gas:	helium, constant flow
Linear velocity:	60cm/sec. @ 120°C
Oven temp.:	120°C (hold 1 min.) to 275°C @ 15°C/min. to 300°C @ 5°C/min. (hold 5 min.)
Detector temp.:	µ-ECD @ 345°C



1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

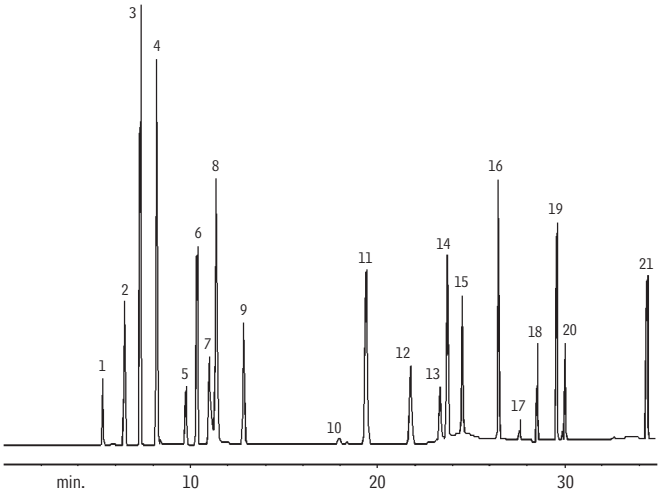
Brominated Flame Retardants
Rtx®-1614

Column:	Rtx®-1614, 30m, 0.25mm ID, 0.10µm (cat.# 10295)
Sample:	100-300ppb PBDE PAR Solution (cat.# EO-5113, Cambridge Isotope Laboratories Inc.), 500ppb decabromodiphenyl ether (cat.# BDE-209, Wellington Laboratories)
Inj.:	1µL splitless (hold 1 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.:	300°C
Carrier gas:	helium, constant flow
Linear velocity:	20cm/sec. @ 100°C
Oven temp.:	100°C (hold 3 min.) to 320°C @ 5°C/min. (hold 15 min.)
Detector temp.:	µ-ECD @ 340°C



1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

Chlorinated Disinfection Byproducts
US EPA Method 551.1
Rtx®-5

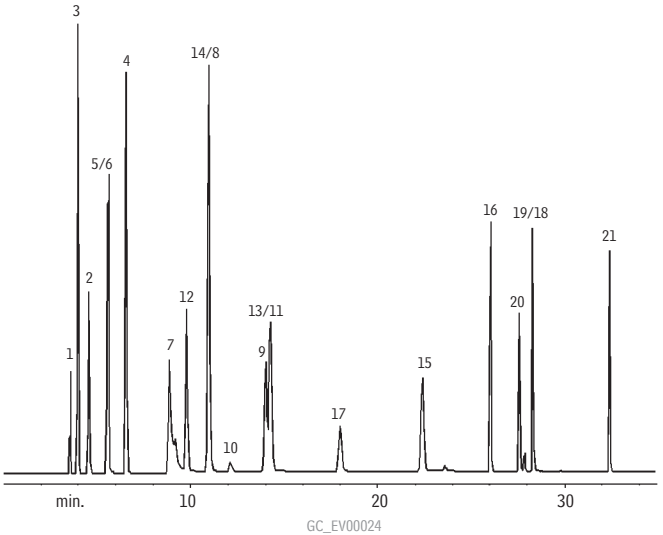


GC_EV00023

Column:	Rtx®-5, 30m, 0.25mm ID, 1.0µm (cat.# 10253)
Inj.:	1.0µL split injection, 1ng on-column concentration
Oven temp.:	35°C (hold 22 min.) to 200°C @ 10°C/min.
Inj./det. temp.:	200°C/290°C
Carrier gas:	helium
Linear velocity:	30cm/sec. @ 50°C
ECD sensitivity:	20kHz full scale
Split ratio:	10:1

1. chloroform
2. 1,1,1-trichloroethane
3. carbon tetrachloride
4. trichloroacetonitrile
5. trichloroethylene
6. bromodichloromethane
7. chloral hydrate
8. dichloroacetonitrile
9. 1,1-dichloro-2-propanone
10. 1,1,2-trichloroethane
11. chloropicrin
12. dibromochloromethane
13. 1,2-dibromoethane (EDB)
14. tetrachloroethylene
15. bromochloroacetonitrile
16. 1,1,1-trichloro-2-propanone
17. bromoform
18. dibromoacetonitrile
19. 1,2,3-trichloropropane
20. 4-bromofluorobenzene (IS)
21. 1,2-dibromo-3-chloropropane (DBCP)

Chlorinated Disinfection Byproducts
US EPA Method 551.1
Rtx®-200

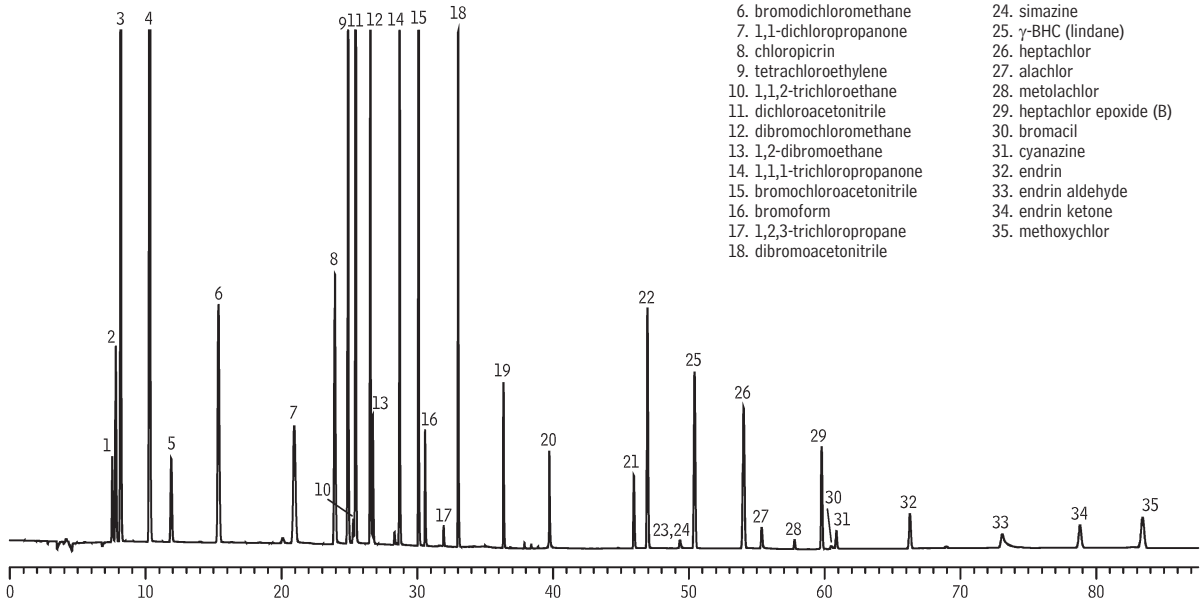


GC_EV00024

Column:	Rtx®-200, 30m, 0.25mm ID, 1.0µm (cat.# 15053)
Inj.:	1.0µL split injection, 1ng on-column concentration
Oven temp.:	35°C (hold 22 min.) to 200°C @ 10°C/min.
Inj./det. temp.:	200°C/290°C
Carrier gas:	helium
Linear velocity:	30cm/sec. @ 50°C
ECD sensitivity:	20kHz full scale
Split ratio:	10:1

Chlorinated Disinfection Byproducts, Chlorinated Solvents, and Halogenated Pesticides
US EPA Method 551.1
Rtx®-1301

1. chloroform
2. 1,1,1-trichloroethane
3. carbon tetrachloride
4. trichloroacetonitrile
5. trichloroethylene
6. bromodichloromethane
7. 1,1-dichloropropanone
8. chloropicrin
9. tetrachloroethylene
10. 1,1,2-trichloroethane
11. dichloroacetonitrile
12. dibromochloromethane
13. 1,2-dibromoethane
14. 1,1,1-trichloropropanone
15. bromochloroacetonitrile
16. bromoform
17. 1,2,3-trichloropropane
18. dibromoacetonitrile
19. 1,2-dibromo-3-chloropropane
20. hexachlorocyclopentadiene
21. trifluralin
22. hexachlorobenzene
23. atrazine
24. simazine
25. γ-BHC (lindane)
26. heptachlor
27. alachlor
28. metolachlor
29. heptachlor epoxide (B)
30. bromacil
31. cyanazine
32. endrin
33. endrin aldehyde
34. endrin ketone
35. methoxychlor



Column:	Rtx®-1301, 30m, 0.25mm ID, 1.0µm (cat.# 16053)
Sample:	5-10µg/mL each analyte (Method 551.1 Pesticide/Herbicide Mix (cat.# 32438) and Disinfection Byproducts & Chlorinated Solvents Mix (cat.# 30615)
Inj.:	1.0µL splitless (hold 0.5 min.), 4mm split injection liner w/wool (cat.# 20781)
Inj. temp.:	200°C
Carrier gas:	helium, constant pressure
Linear velocity:	30cm/sec. @ 35°C
Oven temp.:	35°C (hold 22 min.) to 145°C @ 10°C/min. (hold 2 min.) to 225° @ 20°C/min. (hold 15 min.) to 260° @ 10°C/min. (hold 30 min.)
Det.:	ECD @ 290°C

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

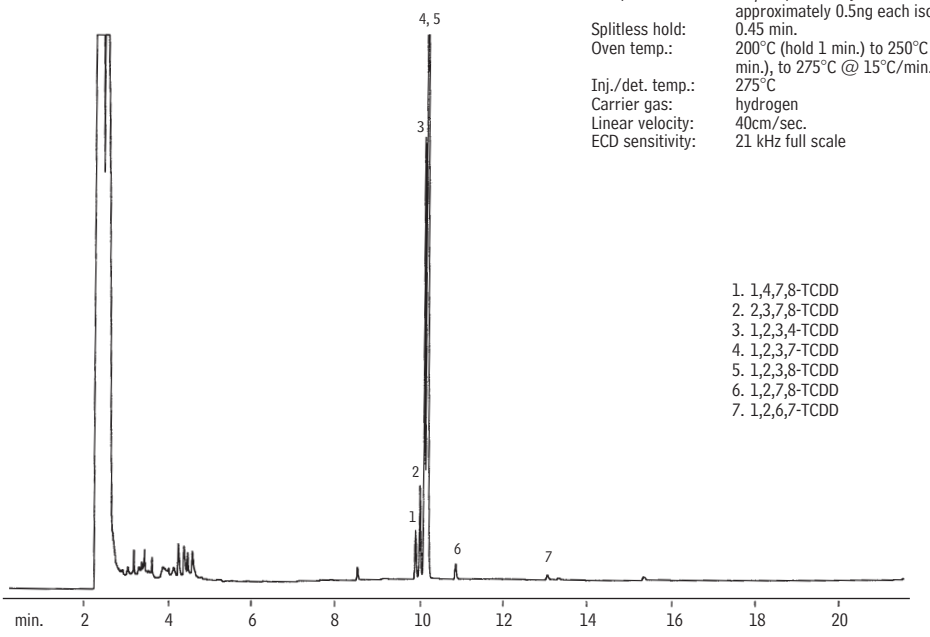
Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com



Dave Facey, Customer Service

TCDD Isomers
Rt®-2330

Column:	Rt®-2330, 60m, 0.25mm ID, 0.20µm (cat.# 10726)
Sample:	2.0µL splitless injection of TCDD isomers, approximately 0.5ng each isomer
Splitless hold:	0.45 min.
Oven temp.:	200°C (hold 1 min.) to 250°C @ 8°C/min. (hold 15 min.), to 275°C @ 15°C/min. (hold 5 min.)
Inj./det. temp.:	275°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
ECD sensitivity:	21 kHz full scale



GC_EV00108

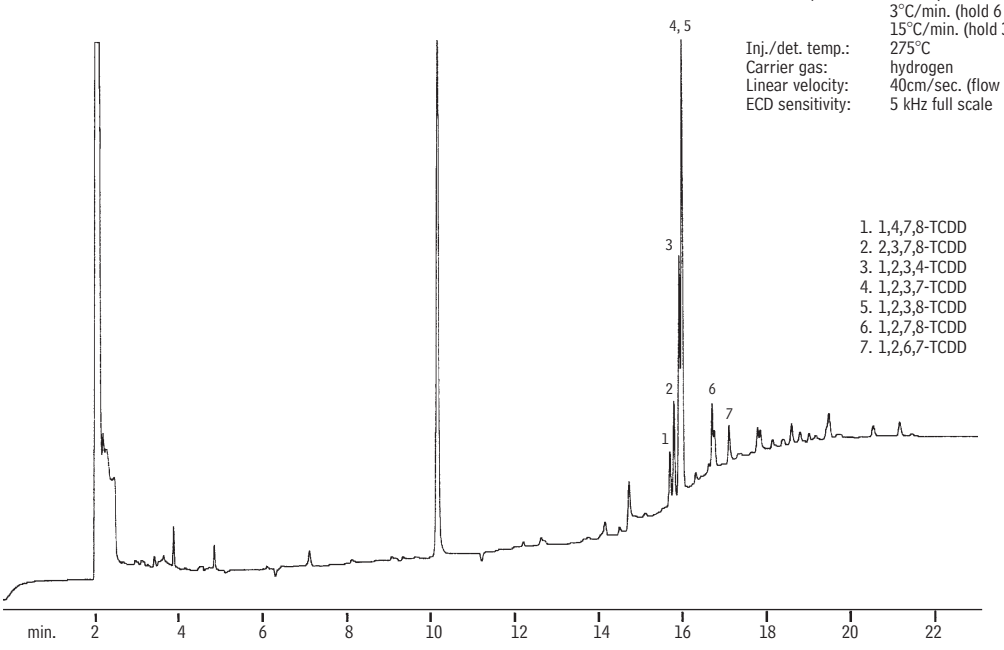
1. 1,4,7,8-TCDD
2. 2,3,7,8-TCDD
3. 1,2,3,4-TCDD
4. 1,2,3,7-TCDD
5. 1,2,3,8-TCDD
6. 1,2,7,8-TCDD
7. 1,2,6,7-TCDD

also **available**

For Rtx®-Dioxin2 columns, designed specifically for dioxin/furan analysis, see **page 87.**

TCDD Isomers
Rt®-2330

Column:	Rt®-2330, 60m, 0.32mm ID, 0.20µm (cat.# 10727)
Sample:	1.5µL cold on-column injection of TCDD isomers, approximately 0.5ng each isomer
Oven temp.:	200°C (hold 1 min.) to 240°C @ 3°C/min. (hold 6 min.), to 275°C @ 15°C/min. (hold 30 min.)
Inj./det. temp.:	275°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 3.2cc/min.)
ECD sensitivity:	5 kHz full scale

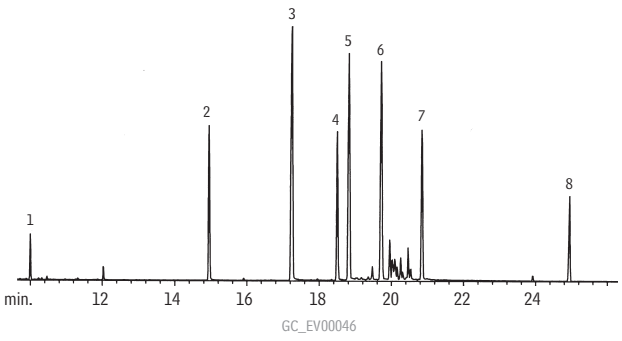


GC_EV00109

1. 1,4,7,8-TCDD
2. 2,3,7,8-TCDD
3. 1,2,3,4-TCDD
4. 1,2,3,7-TCDD
5. 1,2,3,8-TCDD
6. 1,2,7,8-TCDD
7. 1,2,6,7-TCDD

Endocrine Disruptors: Alkyl Phenols
Rtx®-5MS

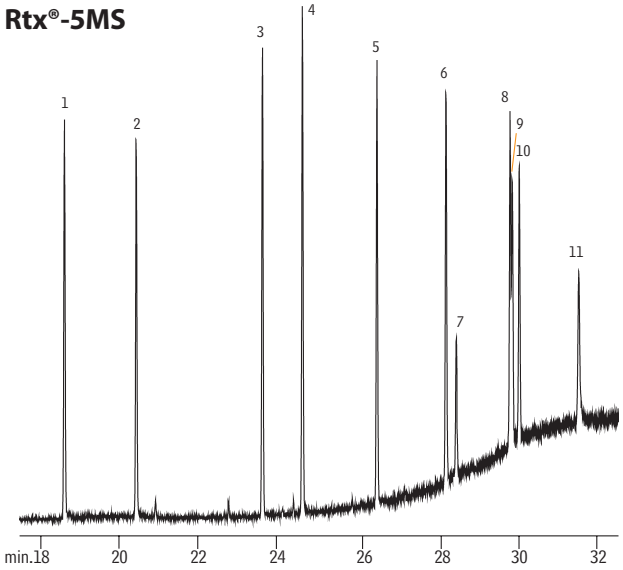
1. *tert*-butyl phenol
2. *n*-pentyl phenol
3. *n*-hexyl phenol
4. *n*-heptyl phenol
5. *tert*-octyl phenol
6. *n*-octyl phenol
7. *n*-nonyl phenol
8. bisphenol A



GC_EV00046

Column:	Rtx®-5MS, 30m, 0.25mm ID, 0.25µm (cat.# 12623)
Conc.:	5–10ng on-column
Inj.:	splitless, purge on @ 1 min.
Oven temp.:	35°C (hold 1 min.) to 300°C @ 10°C/min. (hold 15 min.)
Inj./det. temp.:	275°C/310°C
Carrier gas:	helium

Endocrine Disruptors: Phthalate Esters
Rtx®-5MS



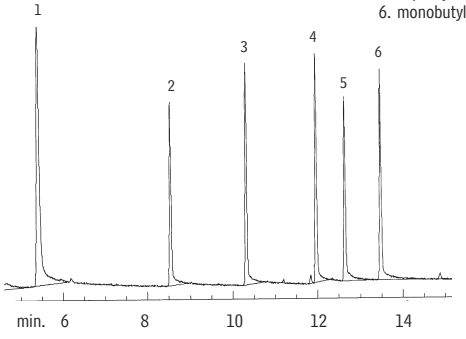
GC_EV00049

1. dimethyl phthalate
2. diethyl phthalate
3. isobutyl phthalate
4. dibutyl phthalate
5. dipentyl phthalate
6. dihexyl phthalate
7. benzylethyl phthalate
8. diheptyl phthalate
9. 2-ethylhexyl phthalate
10. cyclohexyl phthalate
11. dioctyl phthalate

Column:	Rtx®-5MS, 30m, 0.25mm ID, 0.50µm (cat #12638)
Conc.:	100pg on-column injection MS-SIM
Oven temp.:	35°C (hold 1 min.) to 285°C @ 10°C/min.
Pressure:	7.5psi constant pressure

Endocrine Disruptors:
Butyl Tins (hexyl derivatives)
Rtx®-5

1. tetrapropyltin
2. tetrabutyltin
3. tributyltin
4. dibutyltin
5. tripentyltin
6. monobutyltin

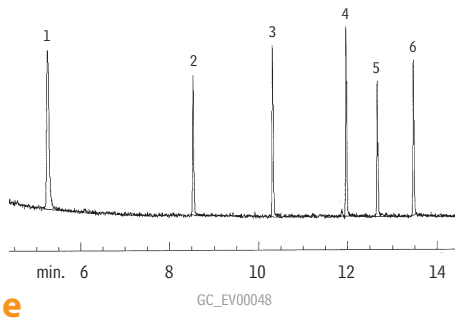


GC_EV00047

Column:	Rtx®-5, 30m, 0.32mm ID, 0.50µm (cat.# 10239)
Conc.:	500pg on-column direct injection
Oven temp.:	100°C (hold 1 min.) to 285°C @ 10°C/min.
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	45cm/sec.
Detector:	FPD with 610nm filter

Endocrine Disruptors:
Butyl Tins (hexyl derivatives)
Rtx®-35

1. tetrapropyltin
2. tetrabutyltin
3. tributyltin
4. dibutyltin
5. tripentyltin
6. monobutyltin



GC_EV00048

Column:	Rtx®-35, 30m, 0.32mm ID, 0.50µm (cat.# 10439)
Conc.:	500pg on-column direct injection
Oven temp.:	100°C (hold 1 min.) to 285°C @ 10°C/min.
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	45cm/sec.
Detector:	FPD with 610nm filter

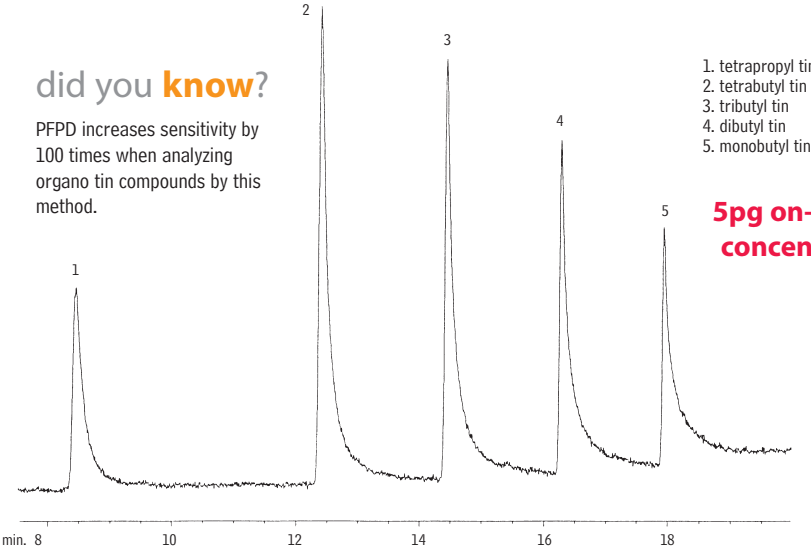
also **available**

Butyl tin reference materials—see **page 452.**

Organo Tins
Rtx®-35

did you **know**?

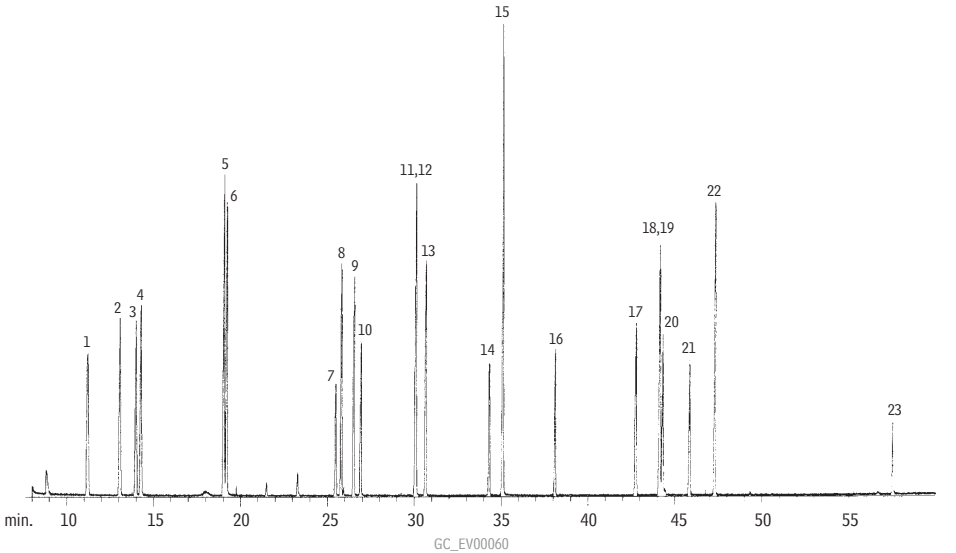
PFPD increases sensitivity by 100 times when analyzing organo tin compounds by this method.



Column:	Rtx®-35, 30m, 0.32mm ID, 1.0µm (cat.# 10454)
Inj.:	direct injection using a Uniliner® inlet liner (cat.# 20335)
Conc.:	5pg on-column
Head pressure:	15psi, constant
Oven temp.:	100°C (hold 1 min.) to 285°C @ 10°C/min. (hold 10 min.)
Detector:	PFPD* Model 5380 courtesy of O.I. Analytical Corp., College Station, TX

*Peak tailing is a function of this detector.

Explosives
Rtx®-200



Column:	Rtx®-200, 30m, 0.25mm ID, 0.25µm (cat.# 15023)
Inj.:	1.0µL splitless injection
Conc.:	20ng/µL
Oven temp.:	80°C (hold 2 min.) to 260°C @ 3°C/min. (hold 2 min.)
Inj. temp.:	280°C
Det.:	MS, 300°C
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 80°C
Splitless hold time:	0.6 min.

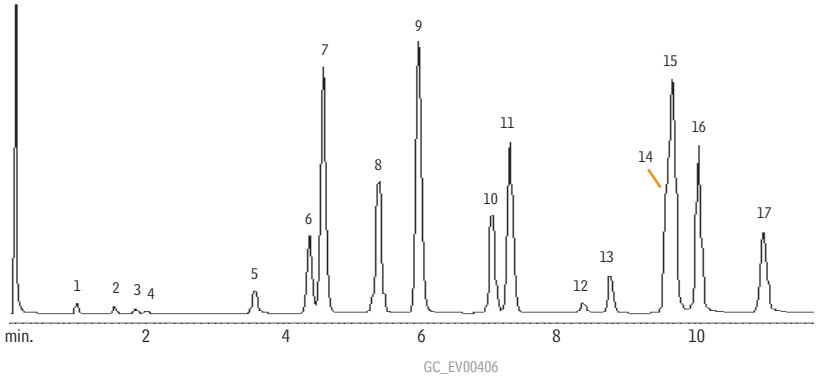
1. 2-nitrotoluene
2. 3-nitrotoluene
3. 4-nitrotoluene
4. 2,3-diaminotoluene
5. 2,6-diaminotoluene
6. 2,4-diaminotoluene
7. 1,4-dinitrobenzene
8. 2,6-dinitrotoluene
9. 2-amino-6-nitrotoluene
10. 1,3-dinitrobenzene
11. 2,4-dinitrotoluene
12. 2-amino-4-nitrotoluene
13. 2,3-dinitrotoluene
14. 3,4-dinitrotoluene
15. 3-nitrobiphenyl
16. 2,4,6-trinitrotoluene
17. 2,4,5-trinitrotoluene
18. 4-amino-2,6-dinitrotoluene
19. 2,3,4-trinitrotoluene
20. 1,3-dinitronaphthalene
21. 2,6-diamino-4-nitrotoluene
22. 2-amino-4,6-dinitrotoluene
23. 2,2-dinitrobiphenyl

Explosives
US EPA Method 8095
Rtx®-TNT & Rtx®-TNT2

restek
innovation!

Improved resolution of nitroaromatic compounds such as those listed in US EPA Method 8095.

Rtx®-TNT

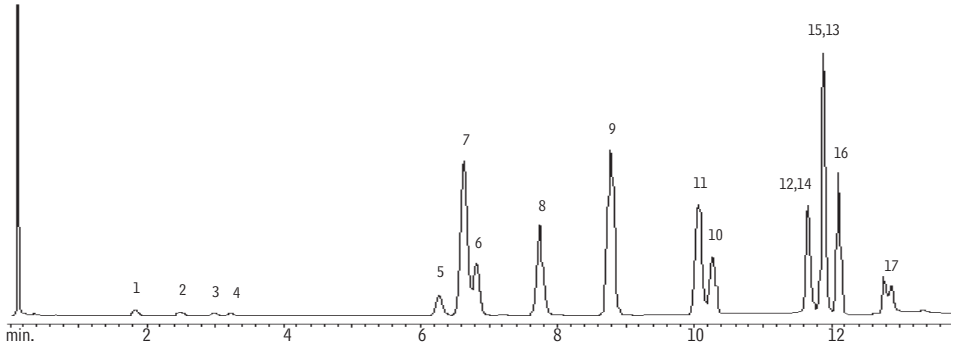


GC_EV00406

Column:	Rtx®-TNT, 6m, 0.53mm ID, 1.50µm (cat.# 12998)
Inj.:	direct injection using a 1mm Siltek® Uniliner® inlet liner (cat.# 21052-214.1)
On-column conc.:	est. 200-1,000pg/compound. 8095 Calibration Mix A (cat.# 31607), 8095 Calibration Mix B (cat.# 31608), and 3,4-dinitrotoluene (cat.# 31452)
Oven temp.:	80°C (hold 1 min.) to 180°C @ 10°C/min. to 300°C @ 30°C/min. (hold 3 min.)
Inj. temp.:	250°C
Det.:	ECD @ 330°C with anode purge
Dead time:	4.4 sec.
Head pressure:	helium @ 3psi (20.7 KPa)
Flow rate:	helium @ 17mL/min. @ 80°C

1. nitrobenzene
2. 2-nitrotoluene
3. 3-nitrotoluene
4. 4-nitrotoluene
5. nitroglycerine
6. 1,3-dinitrobenzene
7. 2,6-dinitrotoluene
8. 2,4-dinitrotoluene
9. 3,4-dinitrotoluene (IS)
10. 1,3,5-trinitrobenzene
11. trinitrotoluene
12. PETN
13. RDX
14. 4-amino-2,6-dinitrotoluene
15. 3,5-dinitroaniline
16. 2-amino-4,6-dinitrotoluene
17. tetryl

Rtx®-TNT2



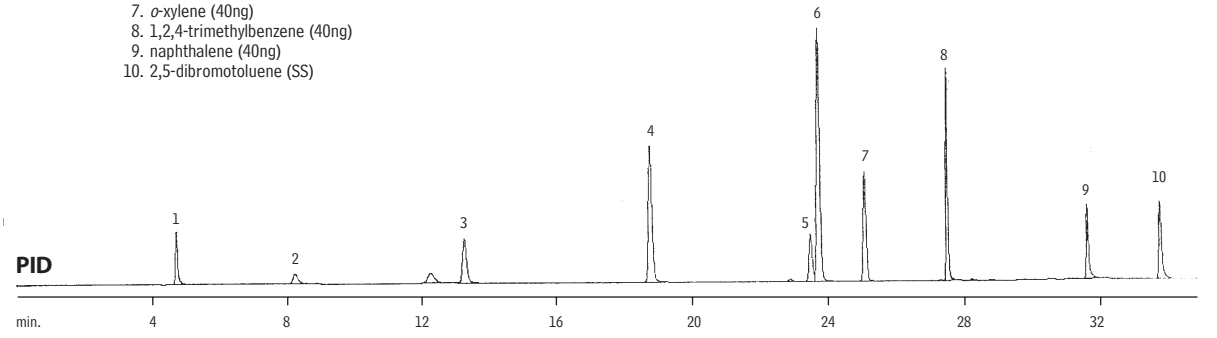
GC_EV00407

Column:	Rtx®-TNT2, 6m, 0.53mm ID, 1.50µm (cat.# 12999)
Inj.:	direct injection using a 1mm Siltek® Uniliner® (cat.# 21052-214.1)
On-column conc.:	est. 200-1,000pg/compound. 8095 Calibration Mix A (cat.# 31607), 8095 Calibration Mix B (cat.# 31608), and 3,4-dinitrotoluene (cat.# 31452)
Oven temp.:	80°C (hold 1 min.) to 180°C @ 10°C/min. to 300°C @ 30°C/min. (hold 3 min.)
Inj. temp.:	250°C
Det.:	ECD @ 330°C with anode purge
Dead time:	4.4 sec.
Head pressure:	helium @ 3psi (20.7 KPa)
Flow rate:	helium @ 17mL/min. @ 80°C

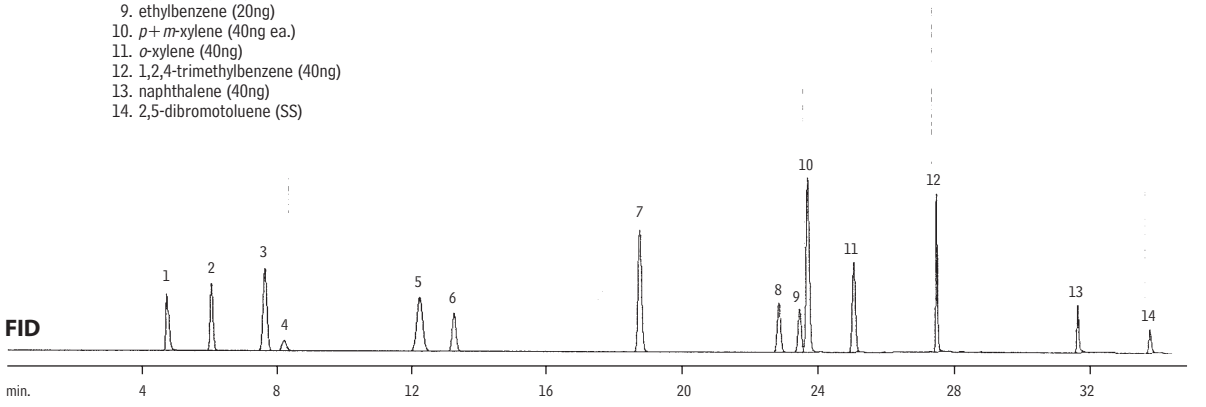
Volatile Petroleum Hydrocarbons (VPH)
Massachusetts Department of Environmental Protection
Rtx®-502.2

For VPH analysis on an Rtx®-502.2 column, use PID for aromatic compounds and FID for aliphatic compounds.

1. methanol
2. methyl *tert*-butyl ether (60ng)
3. benzene (20ng)
4. toluene
5. ethylbenzene (20ng)
6. *p*+*m*-xylene (40ng ea.)
7. *o*-xylene (40ng)
8. 1,2,4-trimethylbenzene (40ng)
9. naphthalene (40ng)
10. 2,5-dibromotoluene (SS)



1. methanol
2. *n*-pentane (40ng)
3. 2-methylpentane (60ng)
4. methyl *tert*-butyl ether (60ng)
5. 2,2,4-trimethylpentane (60ng)
6. benzene (20ng)
7. toluene (60ng)
8. *n*-nonane (40ng)
9. ethylbenzene (20ng)
10. *p*+*m*-xylene (40ng ea.)
11. *o*-xylene (40ng)
12. 1,2,4-trimethylbenzene (40ng)
13. naphthalene (40ng)
14. 2,5-dibromotoluene (SS)



GC_EV00063

Column:	Rtx®-502.2, 105m, 0.53mm ID, 3.0µm (cat.# 10910)
Conc.:	on-column at levels listed
Oven temp:	45°C to 90°C @ 3°C/min., to 140° @ 5°C/min., to 230°C @ 45°C/min. (hold 8 min.)
Carrier gas:	helium @ 15mL/min. Tekmar Model LSC 2000
Trap:	BTEX
Purge:	helium @ 40mL/min. for 11 min.
Dry purge:	2 min.
Desorb preheat:	245°C
Desorb:	2 min. @ 250°C
Bake:	6 min. @ 260°C

Chromatograms courtesy of Severn Trent Laboratories, Burlington, VT.

free literature

Optimizing Massachusetts Volatile Petroleum Hydrocarbon GC Analysis

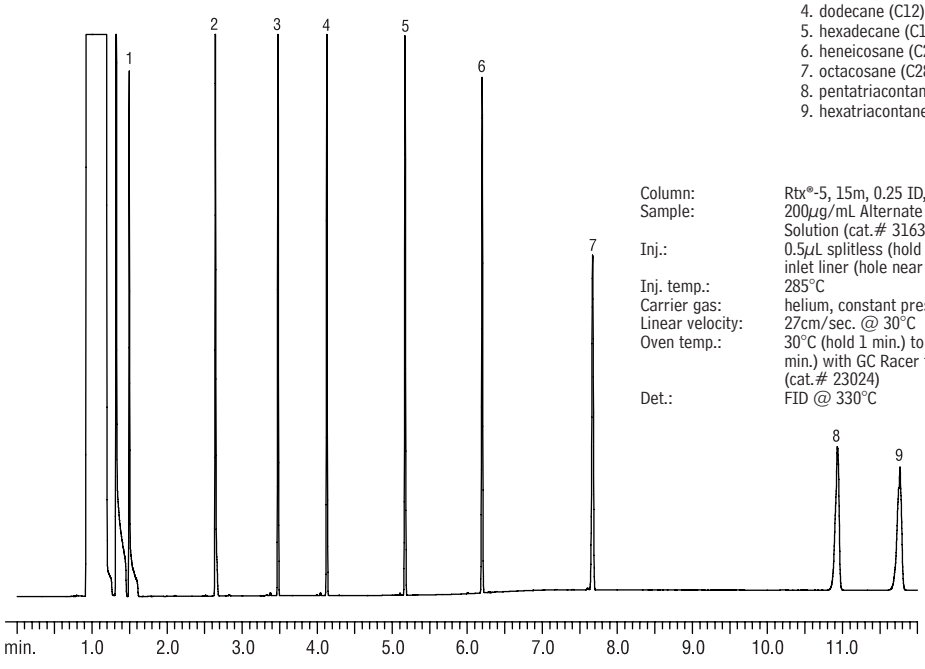
Massachusetts VPH affords more reliable quantification of volatile petroleum hydrocarbons, relative to older "analytical window" methods, and has been adopted by other states and in Canada. This 2-page note offers valuable tips for selecting a trap and a capillary GC column compatible with the methodology. Reference mixes specifically designed for MA VPH are described.

Download your free copy from **www.restek.com**.

Applications Note
lit. cat.# 59150

Texas UST: Alternate Boiling Point/Carbon Number Distribution Marker
Rtx®-5

1. hexane (C6)
2. octane (C8)
3. decane (C10)
4. dodecane (C12)
5. hexadecane (C16)
6. heneicosane (C21)
7. octacosane (C28)
8. pentatriacontane (C35)
9. hexatriacontane (C36)

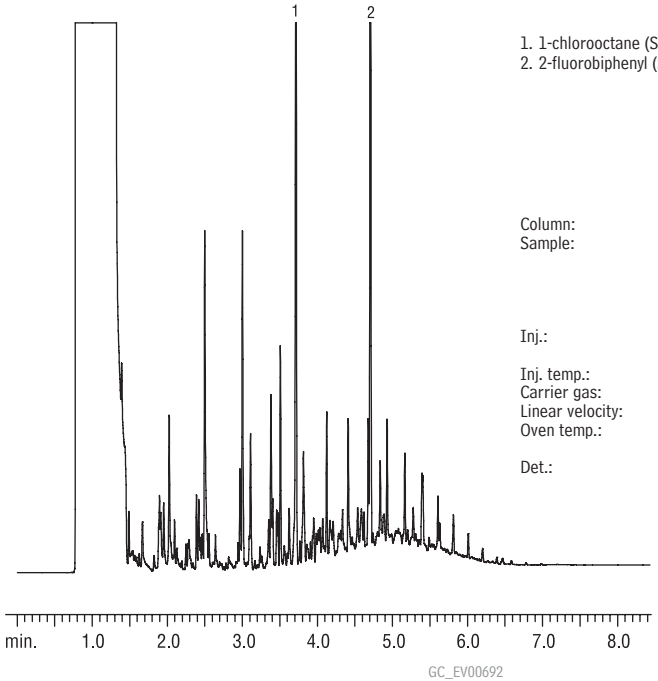


GC_EV00690

Column:	Rtx®-5, 15m, 0.25 ID, 0.25µm (cat.# 10220)
Sample:	200µg/mL Alternate BP/CN Distribution Marker Stock Solution (cat.# 31639) in pentane
Inj.:	0.5µL splitless (hold 0.2 min.), 4mm drilled Uniliner® inlet liner (hole near bottom) (cat.# 20756)
Inj. temp.:	285°C
Carrier gas:	helium, constant pressure
Linear velocity:	27cm/sec. @ 30°C
Oven temp.:	30°C (hold 1 min.) to 330°C @ 60°C/min. (hold 6 min.) with GC Racer for Agilent 5890 Series II GC (cat.# 23024)
Det.:	FID @ 330°C

Texas UST: diesel/gas composites
Rtx®-5

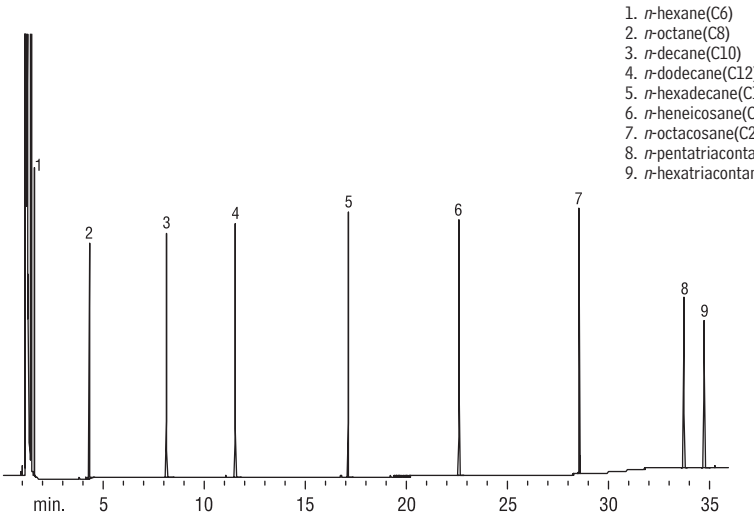
1. 1-chlorooctane (SS)
2. 2-fluorobiphenyl (SS)



GC_EV00692

Column:	Rtx®-5, 15m, 0.25mm ID, 0.25µm (cat.# 10220)
Sample:	1,000µg/mL unleaded gas and diesel fuel #2 composites standard (cat.# 31483) in pentane 250µg/mL 2-fluorobiphenyl standard (cat.# 31096) in dichloromethane 250µg/mL 1-chlorooctane (cat.# 30084) in P&T methanol
Inj.:	0.5µL splitless (hold 0.2 min.), 4mm drilled Uniliner® inlet liner (hole near bottom) (cat.# 20756)
Inj. temp.:	285°C
Carrier gas:	helium, constant pressure
Linear velocity:	27cm/sec. @ 30°C
Oven temp.:	30°C (hold 1 min.) to 330°C @ 60°C/min. (hold 6 min.) with GC Racer for Agilent 5890 Series II GC (cat.# 23024)
Det.:	FID @ 330°C

Texas UST: Alternate Boiling Point/Carbon Number Distribution Marker
Rtx®-5

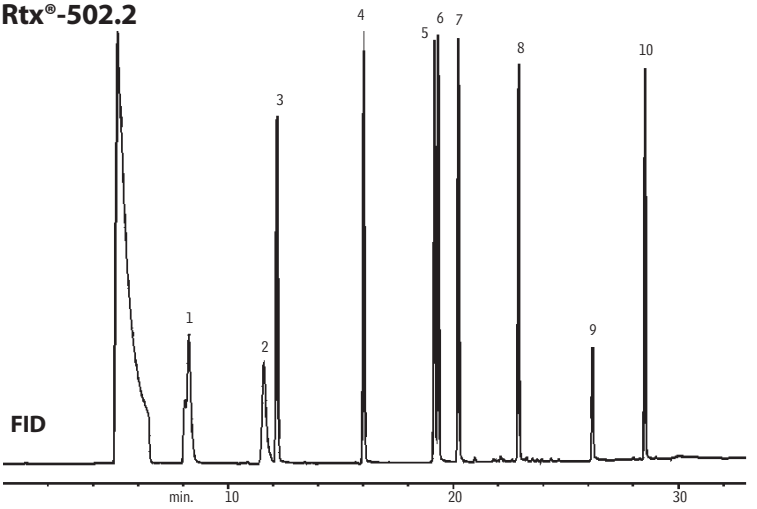


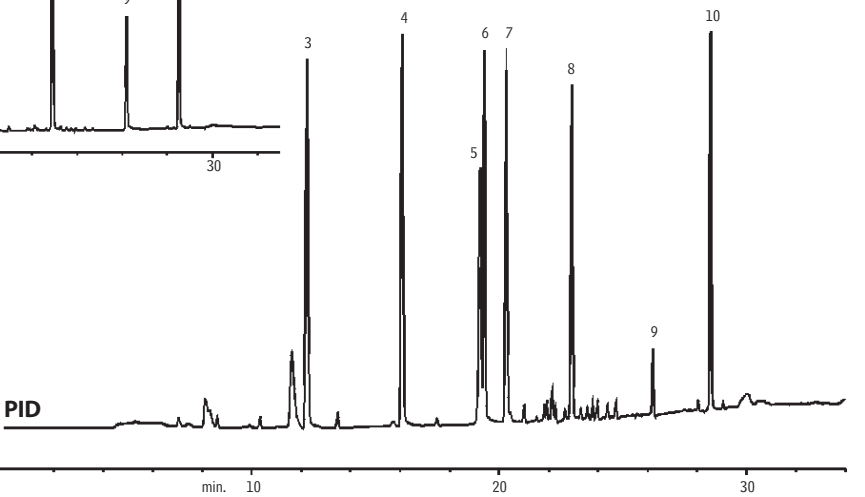
GC_EV00691

Column:	Rtx®-5, 30m, 0.25mm ID, 0.50µm (cat.# 10238)
Sample:	1µL Alternate Boiling Point/Carbon Number Distribution Marker Stock Solution (cat.# 31639), 200µg/mL each component in pentane
Carrier gas:	hydrogen @ 40cm/sec.
Oven temp.:	40°C (hold 2 min.) to 330°C @ 10°C/min. (hold 5 min.)
Inj. temp.:	250°C
Det. temp.:	330°C
Det.:	FID

Wisconsin GRO Mix, plus C12
Rtx®-502.2

Column:	Rtx®-502.2, 105m, 0.53mm ID, 3.0µm (cat.# 10910)
Sample:	GRO Mix (WISC) + C12 (cat.# 30069)
Conc.:	200ppb each in 5mL of H_2O.
Oven temp.:	40°C (hold 1 min.) to 100°C @ 5°C/min. to 240°C @ 8°C/min. (hold 8 min.)
Inj./det. temp.:	200°C/250°C
Carrier gas:	helium
Flow rate:	10mL/min.
Trap:	Tenax®, silica gel, charcoal
Purge:	12 min. @ 40mL/min.
Desorb preheat:	175°C
Desorb temp.:	180°C
Desorb time:	2 min.
Desorb flow:	10mL/min.
FID sensitivity:	16 x 10^{11} AFS

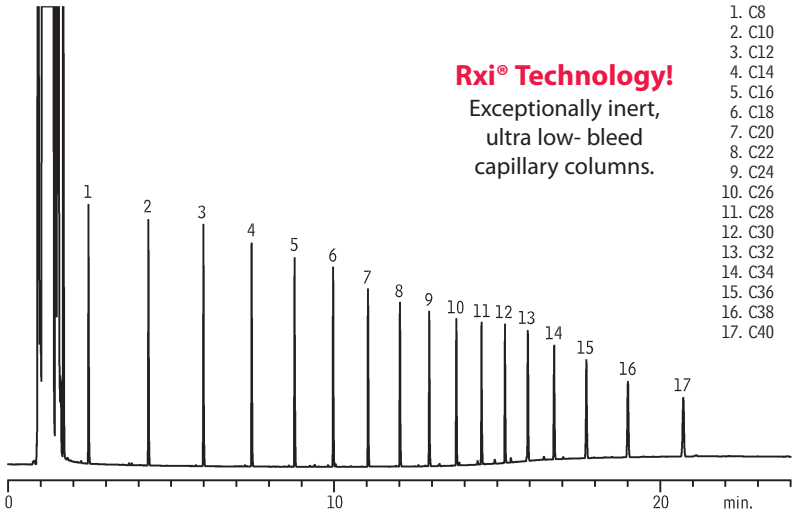




1. 3-methylpentane
2. 2,2,4-trimethylpentane (isooctane)
3. benzene
4. toluene
5. ethylbenzene
6. *m*-xylene
7. *o*-xylene
8. 1,2,4-trimethylbenzene
9. dodecane
10. naphthalene

GC_EV00071

Petroleum Hydrocarbons (TPH)
Rxi®-1ms



Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

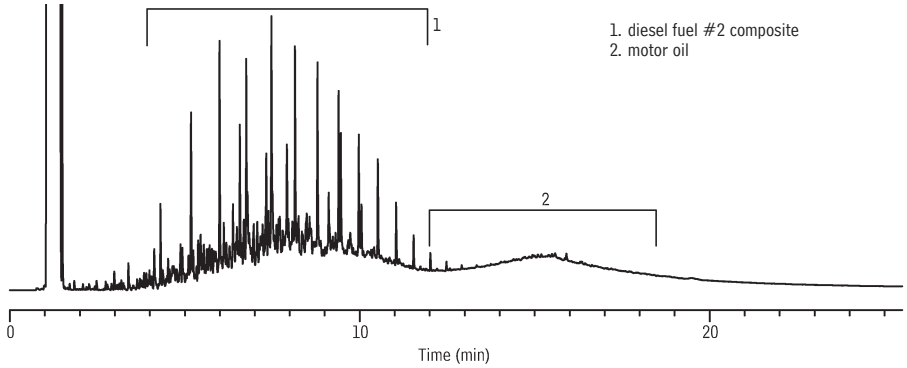
GC_EV00886

Column:	Rxi®-1ms, 20m, 0.18mm ID, 0.18µm (cat.# 13302)
Sample:	Florida TRPH Standard (cat.# 31266), 500µg/mL each component in hexane
Inj.:	0.5µL, split, split ratio 20:1, 3.5mm Precision™ inlet liner (cat.# 21021)
Instrument:	Shimadzu GC-2010*
Inj. temp.:	275°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	55cm/sec. @ 40°C
Oven temp.:	40°C (hold 1 min.) to 330°C @ 20°C/min. (hold 10 min.)
Det.:	FID @ 350°C

*GC courtesy of Shimadzu Scientific.

Lubrication Range Organics
Diesel Fuel #2/Motor Oil
Rxi®-1ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

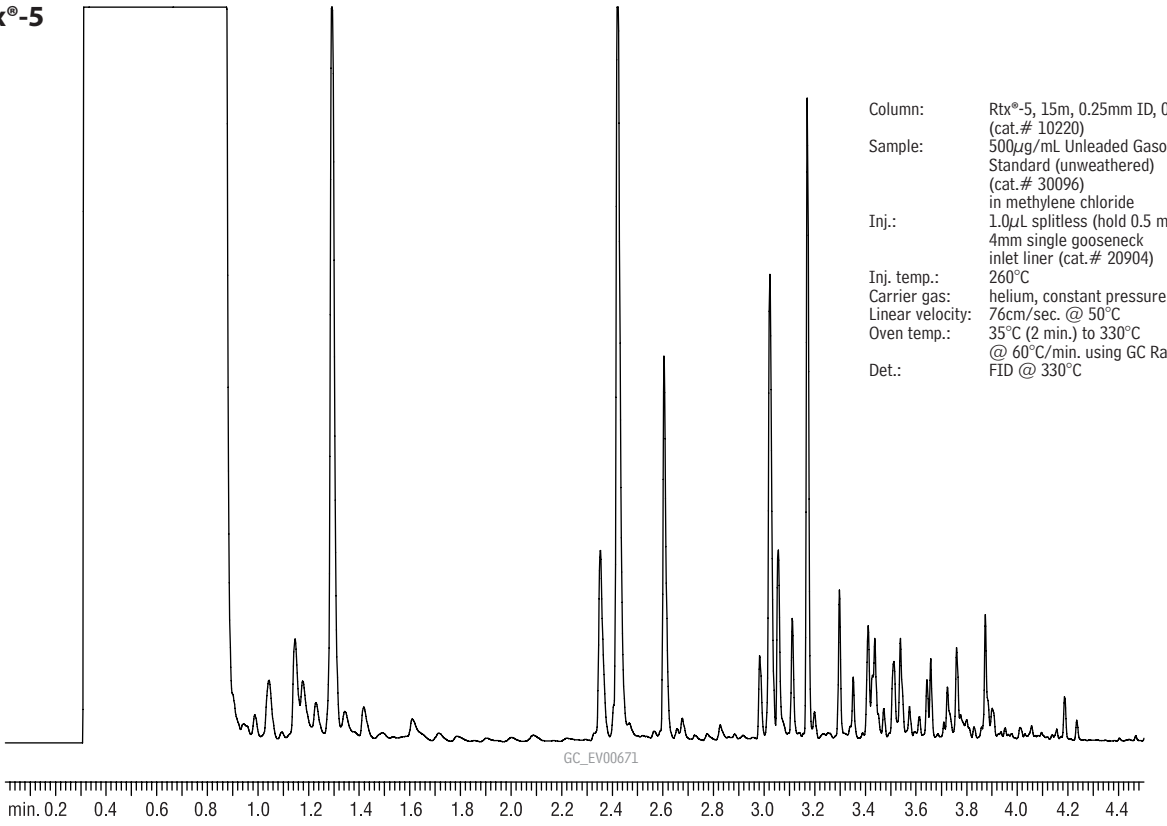


1. diesel fuel #2 composite
2. motor oil

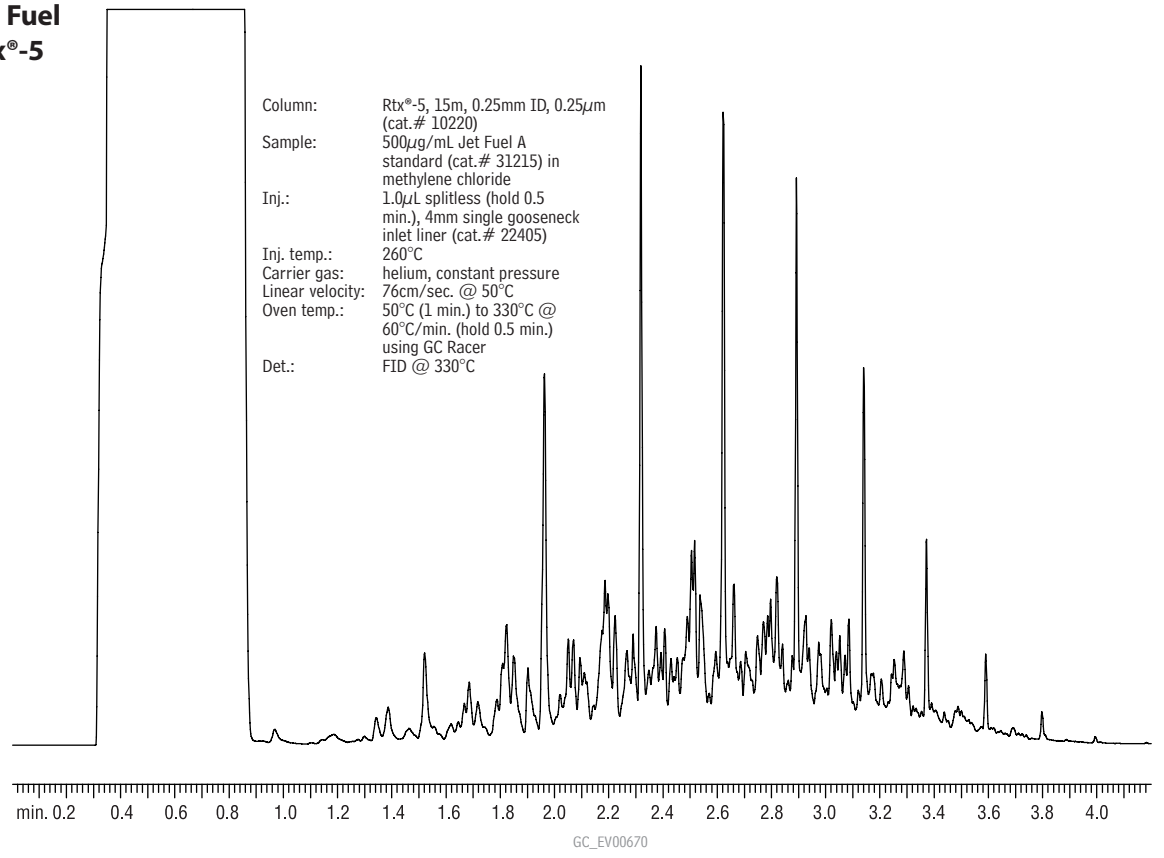
GC_EV00887

Column:	Rxi®-1ms, 20m, 0.18mm ID, 0.18µm (cat.# 13302)
Sample:	Diesel #2/Motor Oil (cat.# 31682) 5,000µg/mL each component in hexane
Inj.:	0.5µL, split, split ratio 20:1, 3.5mm Precision™ inlet liner (cat.# 21021)
Instrument:	Shimadzu GC-2010
Inj. temp.:	275°C
Carrier gas:	hydrogen, constant pressure
Linear velocity:	55cm/sec. @ 40°C
Oven temp.:	40°C (hold 1 min.) to 330°C @ 20°C/min. (hold 10 min.)
Det.:	FID @ 350°C

Unleaded Gasoline
Rtx®-5



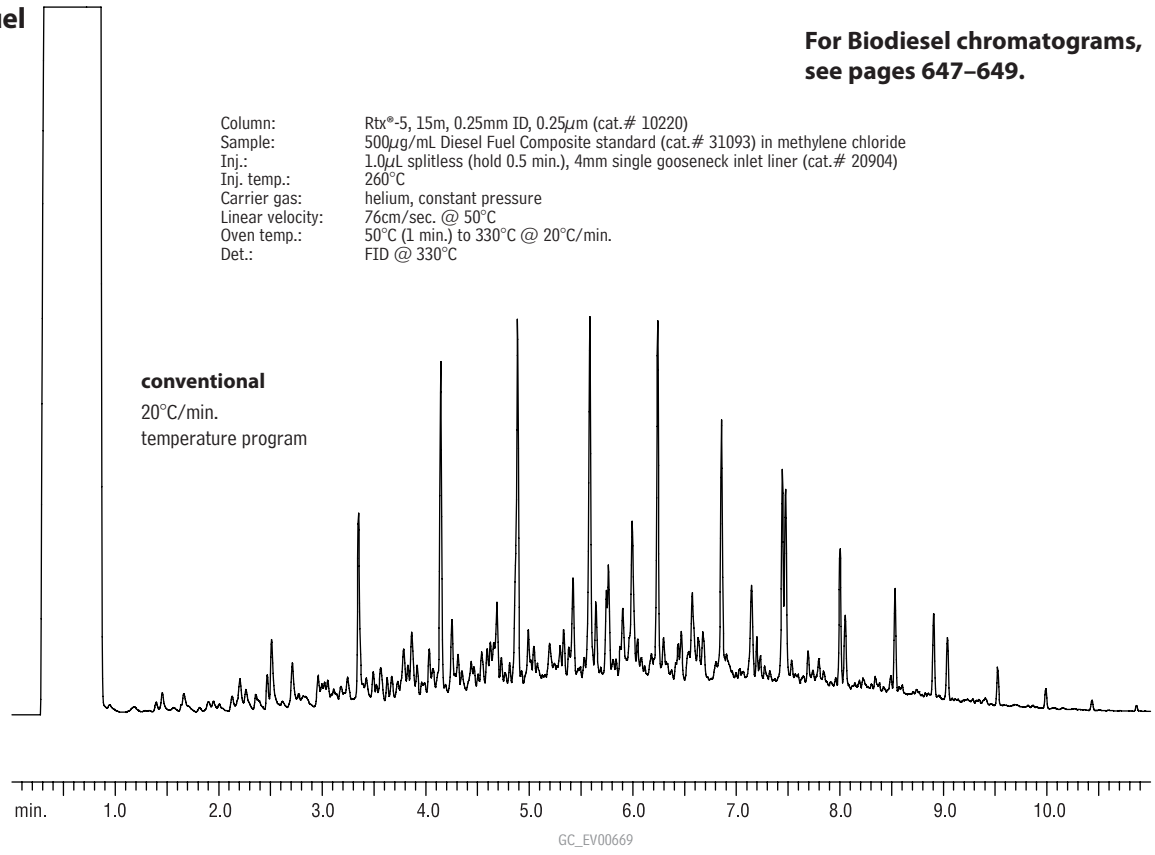
Jet Fuel
Rtx®-5



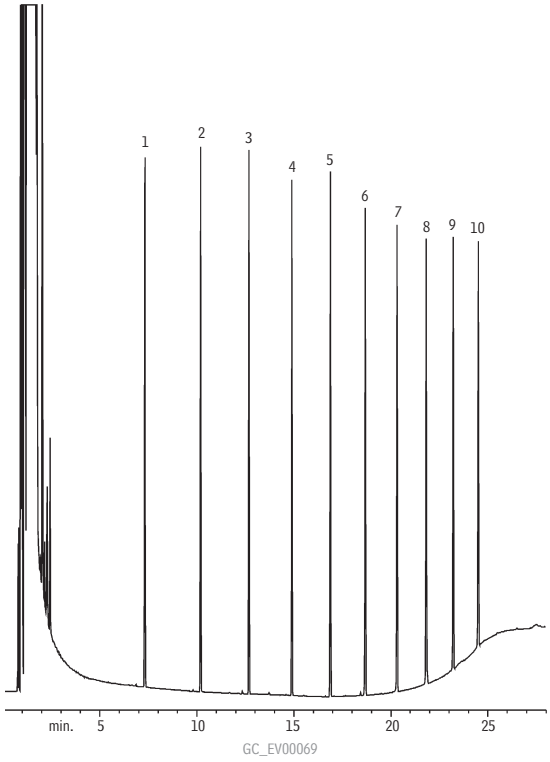
Diesel Fuel
Rtx®-5

For Biodiesel chromatograms, see pages 647–649.

Column:	Rtx®-5, 15m, 0.25mm ID, 0.25µm (cat.# 10220)
Sample:	500µg/mL Diesel Fuel Composite standard (cat.# 31093) in methylene chloride
Inj.:	1.0µL splitless (hold 0.5 min.), 4mm single gooseneck inlet liner (cat.# 20904)
Inj. temp.:	260°C
Carrier gas:	helium, constant pressure
Linear velocity:	76cm/sec. @ 50°C
Oven temp.:	50°C (1 min.) to 330°C @ 20°C/min.
Det.:	FID @ 330°C



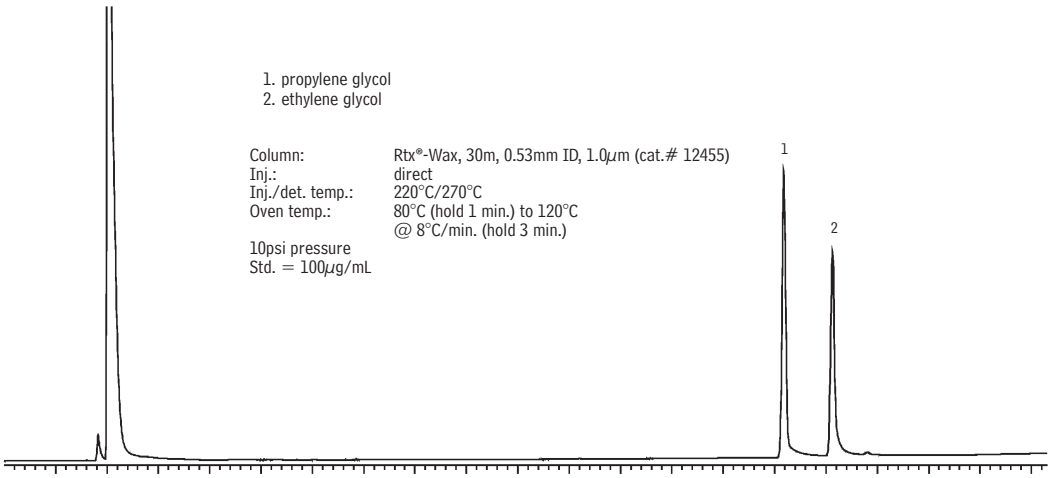
DRO Mix
Rtx®-5



1. C10
2. C12
3. C14
4. C16
5. C18
6. C20
7. C22
8. C24
9. C26
10. C28

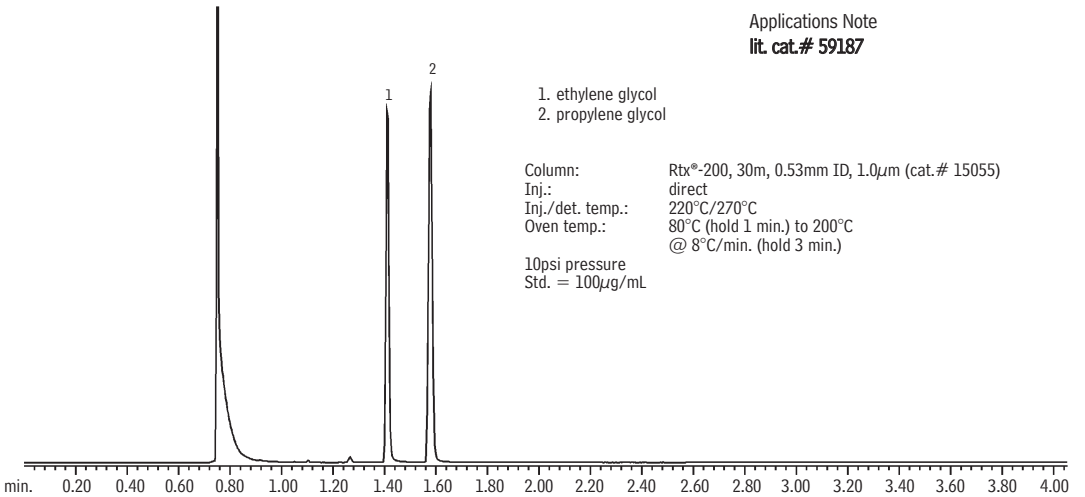
Column:	Rtx®-5, 30m, 0.53mm ID, 1.0µm (cat.# 10255)
Sample:	Direct injection of DRO Mix (cat.# 31064)
Conc.:	50ng/µL
Oven temp.:	40°C (hold 2 min.) to 310°C @ 12°C/min. (hold 10 min.)
Inj./det. temp.:	280°C/310°C
Carrier gas:	helium @ 65cm/sec.
FID sensitivity:	8×10^{-11} AFS

Glycols
Rtx®-Wax



GC_EV00444

Glycols
Rtx®-200



GC_EV00445

free literature

Techniques to Optimizing GC Analysis of Ethylene Glycol in Water

Avoid the problems that aqueous samples can create

Direct injections of water-based samples, such as samples containing ethylene glycol, can cause problems for chromatographers. This 4-page note alerts analysts to the potential for poor peak shape, sample carryover, and FID flameout, and describes approaches to follow to avoid these problems. With care, detection limits of 1-10ppm ethylene glycol can be attained.

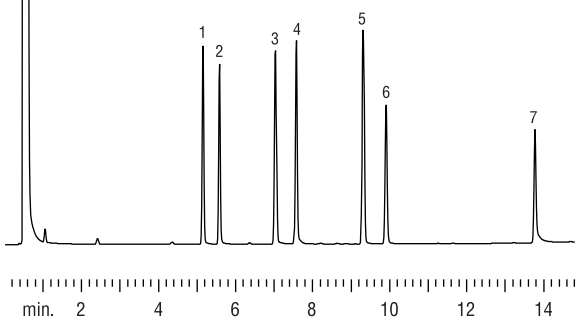
Download your free copy from **www.restek.com**.

Applications Note
lit. cat.# 59187

Glycols
Stabilwax®

1. 1,2-propylene glycol
2. ethylene glycol
3. 1,3-butylene glycol
4. 1,3-propylene glycol
5. 1,4-butylene glycol
6. diethylene glycol
7. glycerol

Column:	Stabilwax®, 30m, 0.53mmID, 1.0µm (cat.# 10655)
Inj.:	1.0µL direct injection, open-top Uniliner® inlet liner without wool (cat.# 20843-205)
Conc.:	150ppm
Solvent:	water/methanol (50:50)
Oven temp.:	80°C to 200°C @ 8°C/min. (hold 10 min.)
Septa purge:	5.0cc/min.
Carrier gas:	helium
Linear velocity:	50cm/sec.
Column flow rate:	6.9mL/min.
Det.:	FID @ 270°C
Make up gas flow:	45cc/min.

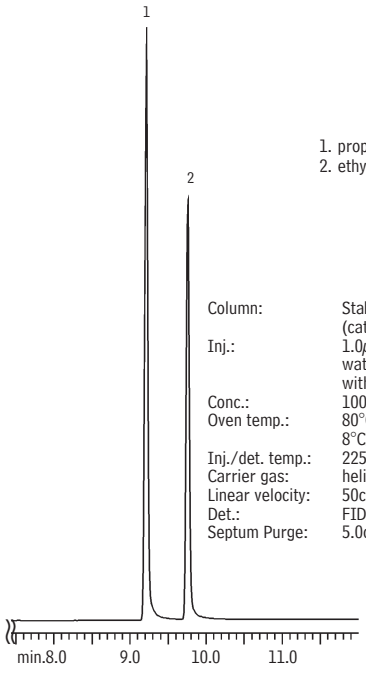


GC_EV00476

Glycols
Stabilwax®

1. propylene glycol
2. ethylene glycol

Column:	Stabilwax®, 30m, 0.53mm ID, 1.0µm (cat.# 10655)
Inj.:	1.0µL of direct injection of glycols in water. Open-top Uniliner® inlet liner without wool (cat.# 20843-205)
Conc.:	100ppm
Oven temp.:	80°C (hold 1 min.) to 200°C @ 8°C/min. (hold 5 min.)
Inj./det. temp.:	225°C/250°C
Carrier gas:	helium
Linear velocity:	50cm/sec.
Det.:	FID
Septum Purge:	5.0cc/min.



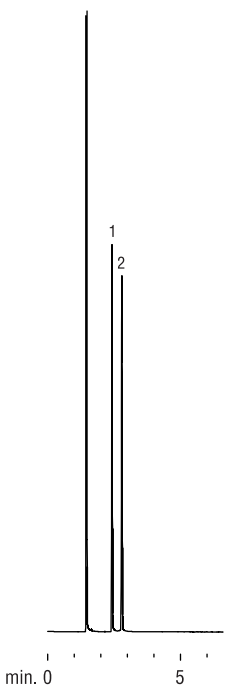
GC_EV00546

Glycols
Rtx®-BAC1 & Rtx®-BAC2

Rtx®-BAC1

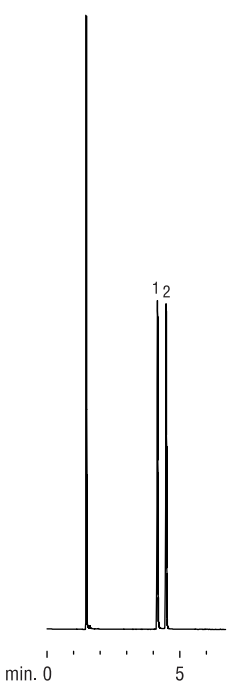
1. ethylene glycol
2. propylene glycol

Columns:	Rtx®-BAC1, 30m, 0.32mm ID, 1.8µm (cat.# 18003) Rtx®-BAC2, 30m, 0.32mm ID, 1.2µm (cat.# 18002)
Inj.:	0.5µL split injection
Conc.:	1%
Solvent:	methanol
Oven temp.:	100°C to 240°C @ 5°C/min. (hold 5 min.)
Inj. temp.:	240°C
Inj. mode:	100:1 split
Inlet liner:	4mm single gooseneck (cat.# 20798)
Septa purge:	5.0cc/min.
Carrier gas:	helium, constant pressure
Pressure:	12psi
Linear velocity:	37cm/sec.
Column flow rate:	2.1mL/min.
Det.:	FID @ 240°C
Make-up gas flow:	40cc/min.

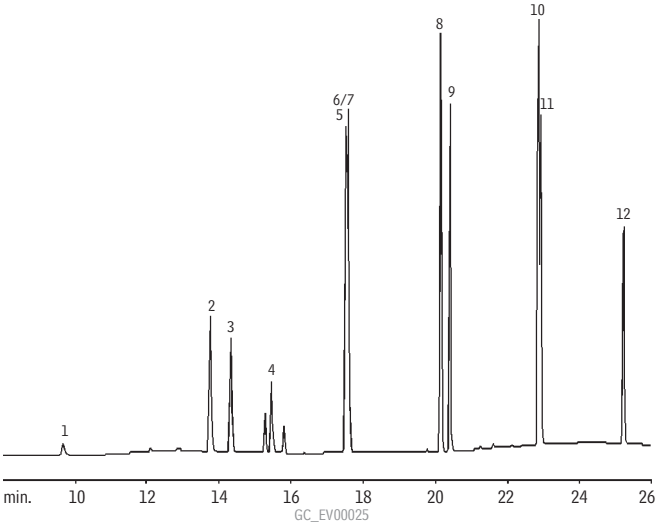


GC_EV00474

Rtx®-BAC2



Haloacetic Acids
US EPA Method 552.2
Rtx®-5

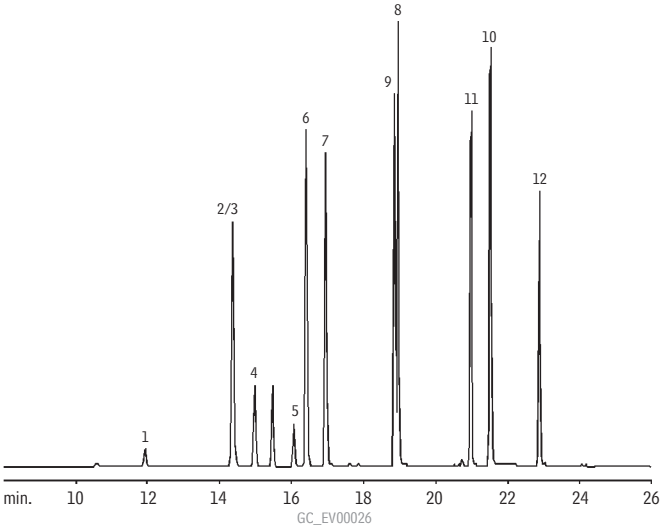


Column:	Rtx®-5, 30m, 0.25mm ID, 1.0µm (cat.# 10253)
Inj.:	1.0µL split injection, 1ng on-column concentration
Oven temp.:	50°C (hold 10 min.) to 225°C @ 8°C/min.
Inj./det. temp.:	200°C/290°C
Carrier gas:	helium
Linear velocity:	30cm/sec. @ 50°C
ECD sensitivity:	20kHz full scale
Split ratio:	10:1

1. monochloroacetic acid (MCAA)
2. monobromoacetic acid (MBAA)
3. dichloroacetic acid (DCAA)
4. dalapon
5. 1,2,3-trichloropropane (I.S.)
6. bromochloroacetic acid (BCAA)
7. trichloroacetic acid (TCAA)
8. dibromoacetic acid (DBAA)
9. bromodichloroacetic acid (BDCAA)
10. 2,3-dibromopropionic acid (Surr.)
11. chlorodibromoacetic acid (CDBAA)
12. tribromoacetic acid (TBAA)

(All compounds derivatized)

Haloacetic Acids
US EPA Method 552.2
Rtx®-200



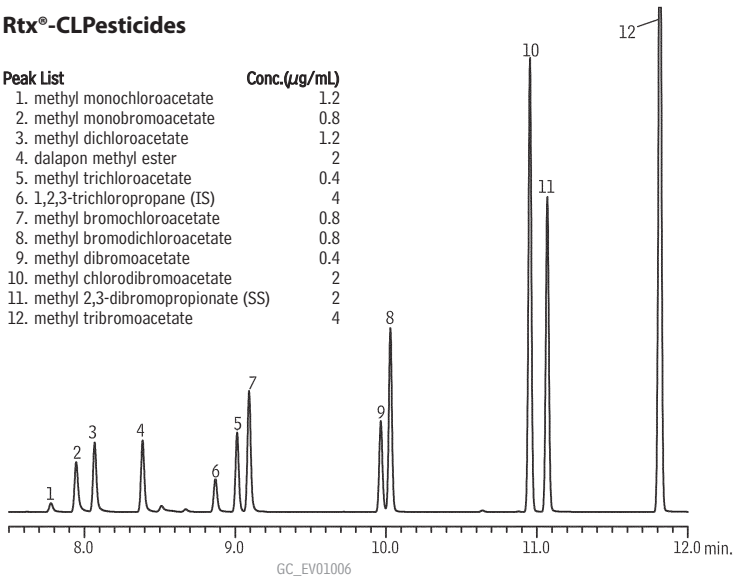
Column:	Rtx®-200, 30m, 0.25mm ID, 1.0µm (cat.# 15053)
Inj.:	1.0µL split injection, 1ng on-column concentration
Oven temp.:	50°C (hold 10 min.) to 225°C @ 8°C/min.
Inj./det. temp.:	200°C/290°C
Carrier gas:	helium
Linear velocity:	30cm/sec. @ 50°C
ECD sensitivity:	20kHz full scale
Split ratio:	10:1

Haloacetic Acids & Dalapon
US EPA Method 552.2
Rtx®-CLPesticides & Rtx®-CLPesticides2

NEW!

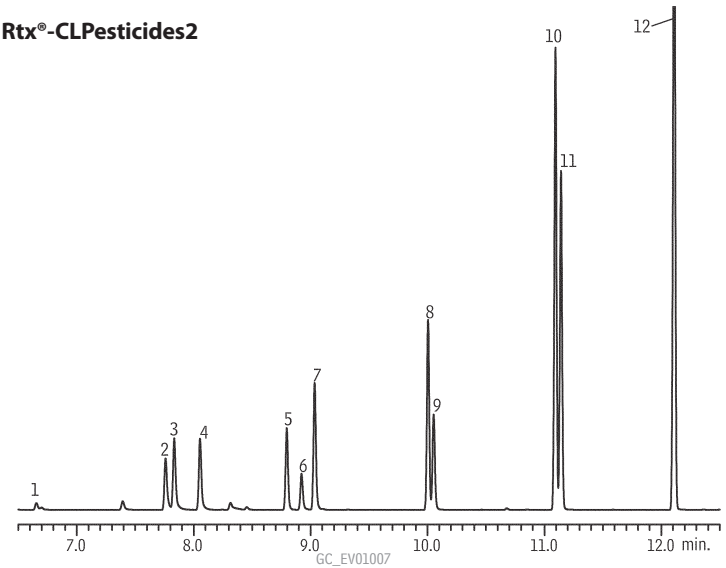
Rtx®-CLPesticides

Peak List	Conc.(µg/mL)
1. methyl monochloroacetate	1.2
2. methyl monobromoacetate	0.8
3. methyl dichloroacetate	1.2
4. dalapon methyl ester	2
5. methyl trichloroacetate	0.4
6. 1,2,3-trichloropropane (IS)	4
7. methyl bromochloroacetate	0.8
8. methyl bromodichloroacetate	0.8
9. methyl dibromoacetate	0.4
10. methyl chlorodibromoacetate	2
11. methyl 2,3-dibromopropionate (SS)	2
12. methyl tribromoacetate	4



GC_EV01006

Rtx®-CLPesticides2



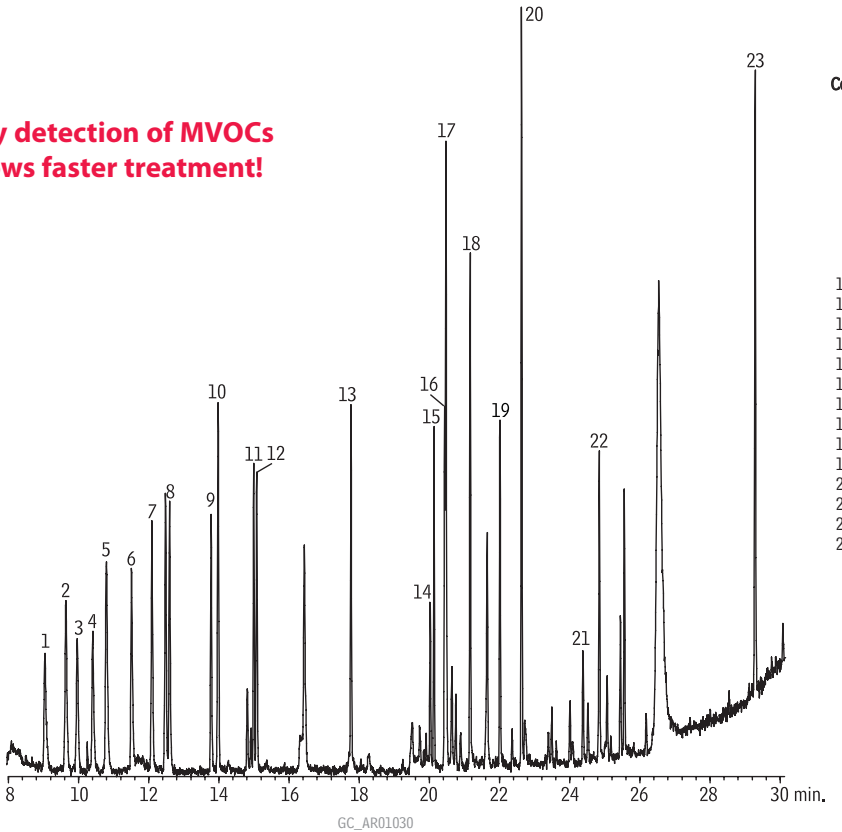
GC_EV01007

Column:	Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25µm (cat.# 11324) and Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32µm (cat.# 11141) with 5m x 0.32mm ID Rxi® deactivated guard tubing (cat.# 10039), connected using Universal "Y" Press-Tight® Connector (cat.# 20405-261)
Sample:	Haloacetic Acid Methyl Ester Mix #2 (cat.# 31647), Dalapon Methyl Ester (cat.# 32057), Methyl-2,3-dibromopropionate (cat.# 31656), 552.2 Internal Standard (cat.# 31648), diluted in methyl *tert*-butyl ether (MTBE)
Inj.:	1µL splitless (hold 0.75 min.), 4mm cyclo double gooseneck liner (cat.# 20896)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	25cm/sec. @ 35°C
Oven temp.:	35°C (hold 4 min.) to 250°C (hold 5 min.) @ 15°C/min.
Detector temp.:	ECD @ 300°C

Microbial VOCs
Rxi®-1ms

NEW!

Early detection of MVOCs allows faster treatment!



Compound	Rt (min.)
1. 2-butanone	9.047
2. 2-methyl-furan	9.640
3. 3-methyl-furan	9.962
4. 2-methyl-1-propanol	10.405
5. 2-methyl-2-butanol	10.791
6. 1-butanol	11.506
7. 3-methyl-2-butanol	12.092
8. 2-pentanol	12.592
9. 2-methyl-1-butanol	13.779
10. dimethyl-disulfide	13.979
11. 3-hexanone	14.994
12. 2-hexanone	15.080
13. 2-heptanone	17.767
14. 1-octen-3-ol	20.019
15. 3-octanone	20.133
16. 3-octanol	20.433
17. 2-pentyl-furan	20.476
18. 2-ethyl-1-hexanol	21.163
19. 1-octanol	22.013
20. 2-isopropyl-3-methoxypyrazine	22.628
21. isoborneol	24.379
22. α-terpineol	24.844
23. geosmin	28.347

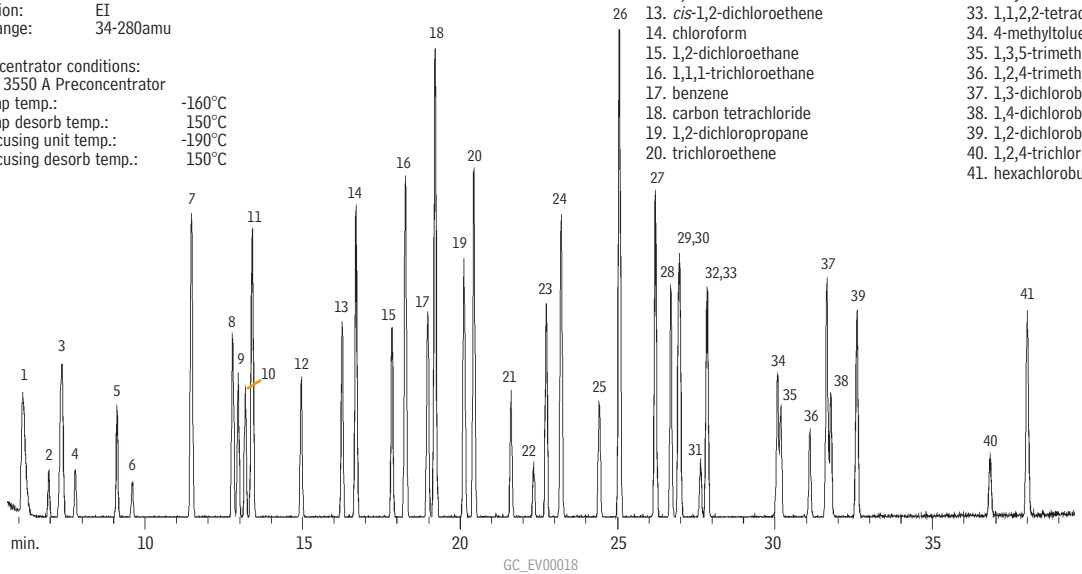
Column:	Rxi®-1ms, 60m, 0.25mm ID, 1.00µm (cat.# 13356)
Sample:	microbial volatile organic compounds, 2ppbv, 60% RH
Inj.:	1.0µL split (split ratio 1:1), 1mm split inlet liner (cat.# 20972)
Inj. temp.:	200°C
Carrier gas:	helium, constant flow
Flow rate:	1.5mL/min.
Oven temp.:	10°C (hold 1 min.) to 235°C @ 8°C/min.
Det:	Agilent 6890/5973 GC/MS 5 min. solvent delay
Transfer line temp.:	260°C
Scan range:	35 to 350amu
Ionization:	EI
Mode:	scan
Other:	Nutech 8900DS Preconcentrator Conditions: Sample = 200mL from canister Cryotrap1 = -160°C Desorb = 20°C Cryotrap2 = 20°C Desorb = 200°C Cryofocuser = 200°C Desorb = 200°C

US EPA TO-14 Compounds
Rtx®-1

Column: Rtx®-1, 60m, 0.32mm ID, 3.0µm (cat.# 10187)
Sample: 5mL of 2ppmv TO-14 standard.
Oven temp.: 30°C (hold 4 min.) to 250°C @ 7°C/min. (hold 15 min.)
Detector: MS
Det. temp.: 250°C
Carrier gas: helium
Linear velocity: 21cm/sec. set @ 30°C
Ionization: EI
Scan range: 34-280amu

Preconcentrator conditions:
Nutech 3550 A Preconcentrator
Cryotrap temp.: -160°C
Cryotrap desorb temp.: 150°C
Cryofocusing unit temp.: -190°C
Cryofocusing desorb temp.: 150°C

1. dichlorodifluoromethane
2. chloromethane
3. 1,2-dichlorotetrafluoroethane
4. vinyl chloride
5. bromomethane
6. chloroethane
7. trichlorofluoromethane
8. 1,1-dichloroethene
9. methylene chloride
10. 3-chloropropene
11. 1,1,2-trichloro-1,2,2-trifluoroethane
12. 1,1-dichloroethane
13. *cis*-1,2-dichloroethene
14. chloroform
15. 1,2-dichloroethane
16. 1,1,1-trichloroethane
17. benzene
18. carbon tetrachloride
19. 1,2-dichloropropane
20. trichloroethene
21. *cis*-1,3-dichloropropene
22. *trans*-1,3-dichloropropene
23. 1,1,2-trichloroethane
24. toluene
25. 1,2-dibromoethane
26. tetrachloroethene
27. chlorobenzene
28. ethylbenzene
29. *m*-xylene
30. *p*-xylene
31. styrene
32. *o*-xylene
33. 1,1,2,2-tetrachloroethane
34. 4-methyltoluene
35. 1,3,5-trimethylbenzene
36. 1,2,4-trimethylbenzene
37. 1,3-dichlorobenzene
38. 1,4-dichlorobenzene
39. 1,2-dichlorobenzene
40. 1,2,4-trichlorobenzene
41. hexachlorobutadiene

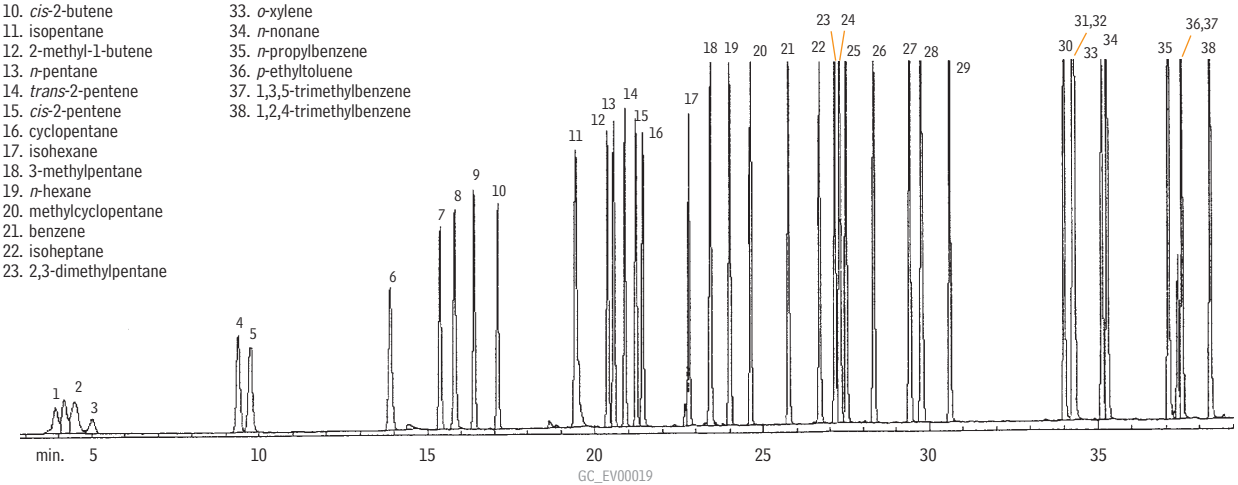


GC_EV00018

Ozone Precursors
Rtx®-1

Column: Rtx®-1, 60m, 0.32mm ID, 3.0µm (cat.# 10187)
Sample: 0.5L of C2-C9 gas standard cryogenically concentrated; 15nL/component desorbed onto column.
Oven temp.: -60°C (hold 5 min.) to 100°C @ 8°C/min., to 150°C @ 6°C/min., then to 240°C @ 8°C/min.
Carrier gas: helium
Linear velocity: 30cm/sec. (flow rate: 1.8cc/min.)
FID sensitivity: 64 x 10^{-12} AFS

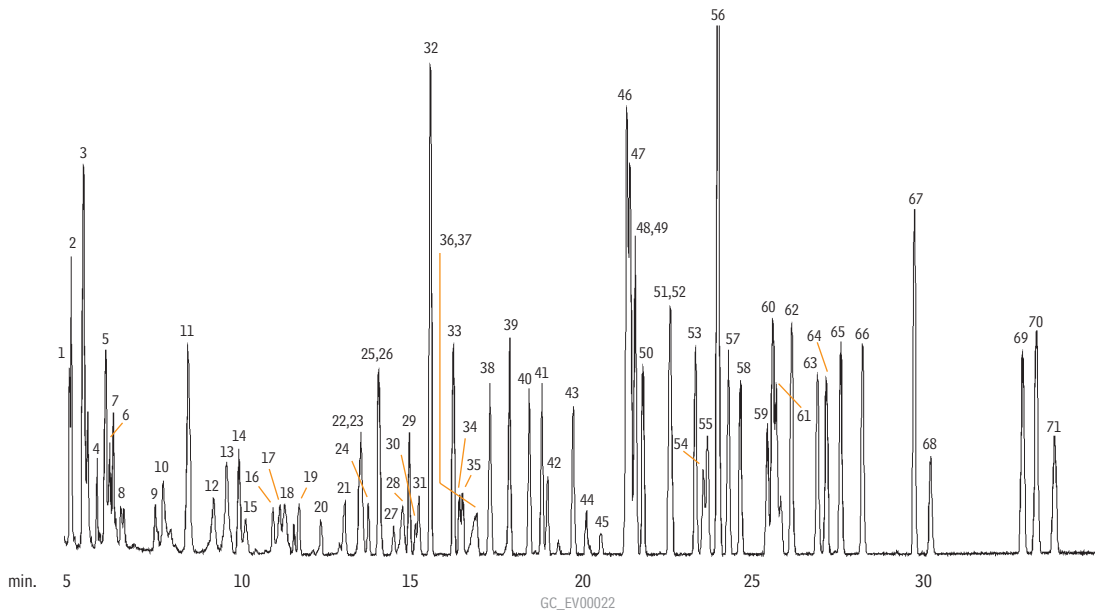
1. ethylene
2. acetylene
3. ethane
4. propylene
5. propane
6. isobutane
7. 1-butene
8. *n*-butane
9. *trans*-2-butene
10. *cis*-2-butene
11. isopentane
12. 2-methyl-1-butene
13. *n*-pentane
14. *trans*-2-pentene
15. *cis*-2-pentene
16. cyclopentane
17. isohexane
18. 3-methylpentane
19. *n*-hexane
20. methylcyclopentane
21. benzene
22. isoheptane
23. 2,3-dimethylpentane
24. 3-methylhexane
25. 2,2,4-trimethylpentane
26. *n*-heptane
27. methylcyclohexane
28. 2,2,3-trimethylpentane
29. toluene
30. ethylbenzene
31. *m*-xylene
32. *p*-xylene
33. *o*-xylene
34. *n*-nonane
35. *n*-propylbenzene
36. *p*-ethyltoluene
37. 1,3,5-trimethylbenzene
38. 1,2,4-trimethylbenzene



GC_EV00019

Permission to publish this chromatogram granted by Radian Corporation.

Air Toxins
Rtx®-502.2

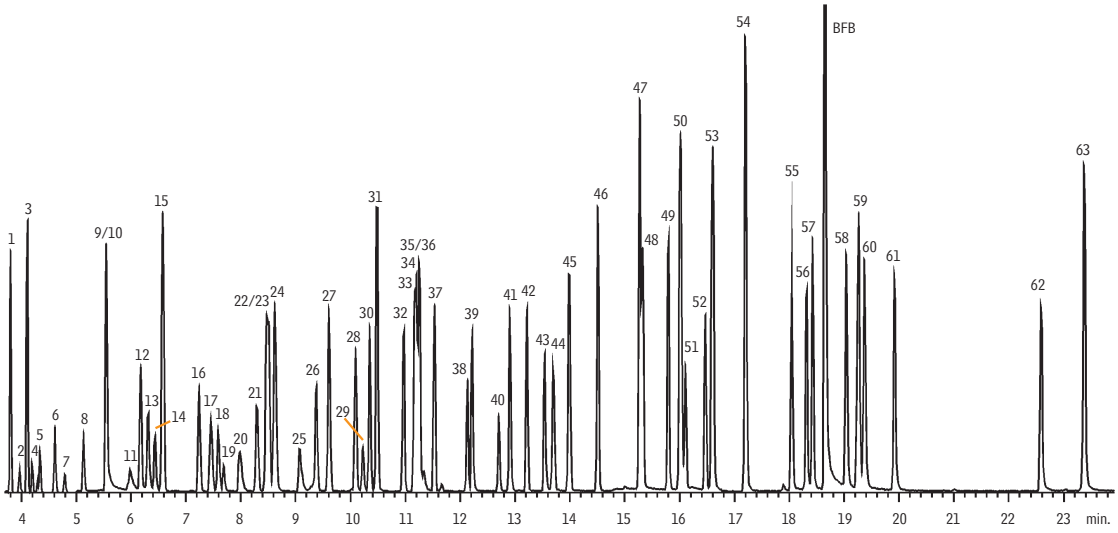


1. chlorodifluoromethane
2. dichlorodifluoromethane
3. dichlorotetrafluoroethane
4. chloromethane
5. butane
6. vinyl chloride
7. 1,3-butadiene
8. acetaldehyde
9. bromomethane
10. chloroethane
11. trichlorofluoromethane
12. isopropanol
13. acetone
14. 1,1-dichloroethene
15. acetonitrile
16. dichloromethane
17. acrylonitrile
18. 1-propanol
19. *trans*-1,2-dichloroethene
20. 1,1-dichloroethane
21. methyl ethyl ketone
22. *cis*-1,2-dichloroethene
23. methacrylonitrile
24. chloroform
25. bromochloromethane
26. tetrahydrofuran
27. 1,1,1-trichloroethane
28. *n*-butanol
29. heptane
30. 1,2-dichloroethane
31. benzene
32. 1,4-difluorobenzene
33. trichloroethene
34. ethyl methacrylate
35. 1,2-dichloropropane
36. 1,4-dioxane
37. bromodichloromethane
38. 4-methyl-2-pentanone
39. octane
40. toluene
41. 2-hexanone
42. 1,1,2-trichloroethane
43. tetrachloroethene
44. dibromochloromethane
45. 1,2-dibromoethane
46. chlorobenzene-d5
47. chlorobenzene
48. *m*-xylene
49. *p*-xylene
50. 2-heptanone
51. styrene
52. *o*-xylene
53. isopropylbenzene
54. bromoform
55. 1,1,1,2-tetrachloroethane
56. 4-bromofluoromethane
57. *n*-propylbenzene
58. 1,3,5-trimethylbenzene
59. α-methylstyrene
60. *tert*-butylbenzene
61. 1,2,4-trimethylbenzene
62. *sec*-butylbenzene
63. 1,3-dichlorobenzene
64. 1,4-dichlorobenzene
65. butylbenzene
66. 1,2-dichlorobenzene
67. dodecane
68. dibromochloropropane
69. 1,2,4-trichlorobenzene
70. hexachlorobutadiene
71. naphthalene

Column:	Rtx®-502.2, 60m, 0.32mm ID, 1.8μm (cat.# 10920)
Sample:	500mL of 10ppbv standard concentrated on an AEROCAN 6000 using a glass bead trap at 165°C then desorbed at 200°C for 4 min. @ 1mL/min., cryofocused @ -175°C then desorbed @ 150°C
Oven temp.:	35°C (hold 6 min.) to 120°C @ 15°C/min., then to 200°C @ 5°C/min., then to 220°C @ 25°C/min. (hold 10 min.)
Det. & det. temp.:	Agilent-5971A GC/MS, 280°C
Carrier gas:	helium @ 1mL/min.
Linear velocity:	20cm/sec.
Scan range:	28-260amu
Solvent delay:	4 min.

Permission to publish this chromatogram granted by Tekmar Company.

US EPA TO-14/TO-15 Compounds
Rtx®-1



GC_EV00379

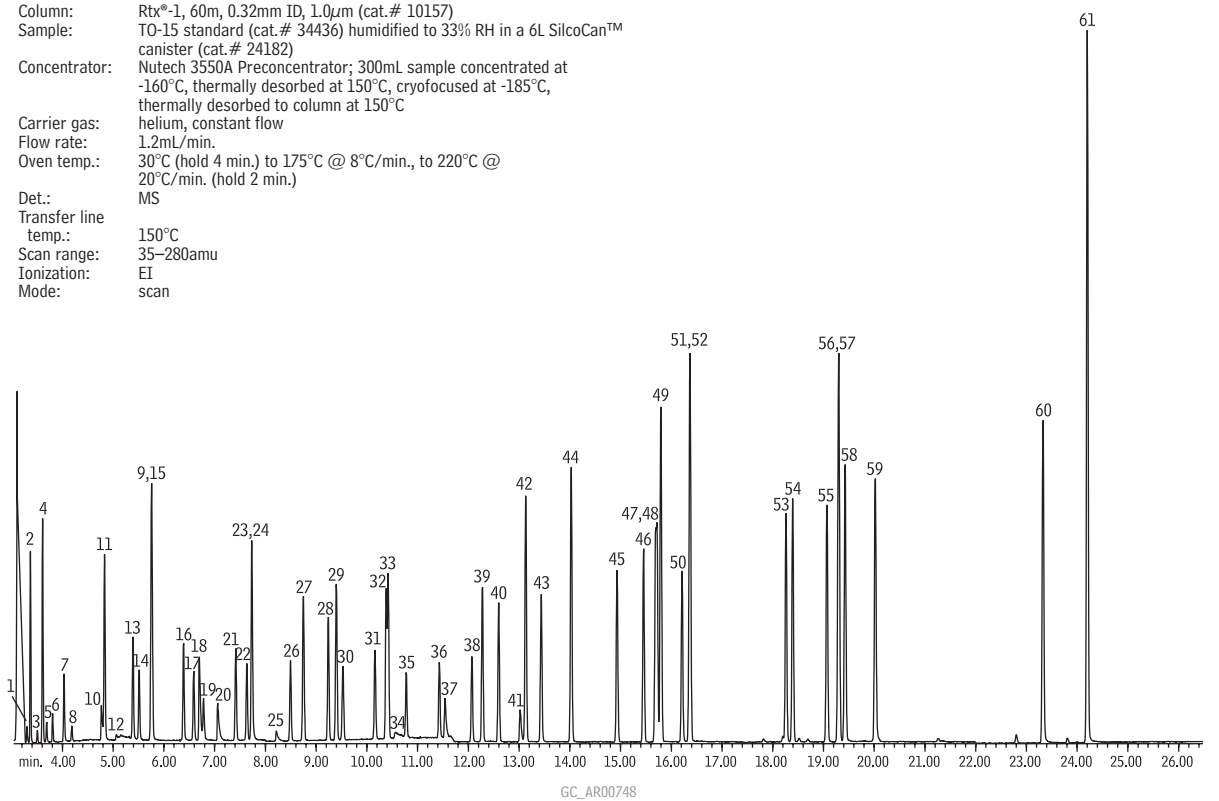
Column:	Rtx®-1, 60m, 0.32mm ID, 1.0µm (cat.# 10157)
Sample:	200mL of 10ppbv TO-15 standard, injected into TO-Can® canister and humidified to 70% RH.
Concentrator:	Nutech 3550 Preconcentrator 200mL of sample concentrated at -160°C, thermally desorbed at 150°C, and cryofocused at -185°C
Oven temp.:	30°C (hold 4 min.) to 175°C @ 9°C/min. to 220°C @ 40°C/min.
Carrier gas:	helium @ 1.2mL/min.
Det.:	Agilent 5971 MS
Scan range:	35-265amu

1. dichlorofluoromethane
2. chloromethane
3. dichlorotetrafluoroethane
4. vinyl chloride
5. 1,3-butadiene
6. bromomethane
7. chloroethane
8. bromoethene
9. acetone
10. trichlorofluoromethane
11. isopropyl alcohol
12. 1,1-dichloroethene
13. methylene chloride
14. 3-chloropropene
15. carbon disulfide
16. Freon® TF
17. *trans*-1,2-dichloroethene
18. 1,1-dichloroethane
19. methyl *tert*-butyl ether
20. methyl ethyl ketone
21. *cis*-1,2-dichloroethene
22. bromochloromethane (IS)
23. *n*-hexane
24. chloroform
25. tetrahydrofuran
26. 1,2-dichloroethane
27. 1,1,1-trichloroethane
28. benzene
29. carbon tetrachloride
30. cyclohexane
31. 1,4-difluorobenzene (IS)
32. 1,2-dichloropropane
33. bromodichloromethane
34. trichloroethene
35. 1,4-dioxane
36. 2,2,4-trimethylpentane
37. *n*-heptane
38. *cis*-1,3-dichloropropene
39. methyl isobutyl ketone
40. *trans*-1,3-dichloropropene
41. 1,1,2-trichloroethane
42. toluene
43. methyl butyl ketone
44. dibromochloromethane
45. 1,2-dibromoethane
46. tetrachloroethene
47. chlorobenzene-d5 (IS)
48. chlorobenzene
49. ethylbenzene
50a. *m*-xylene
50b. *p*-xylene
51. bromoform
52. styrene
53. 1,1,2,2-tetrachloroethane
54. *o*-xylene
55. 2-chlorotoluene
56. 4-ethyltoluene
57. 1,3,5-trimethylbenzene
58. 1,2,4-trimethylbenzene
59. 1,3-dichlorobenzene
60. 1,4-dichlorobenzene
61. 1,2-dichlorobenzene
62. 1,2,4-trichlorobenzene
63. hexachlorobutadiene

Chromatogram courtesy of Gina Maio, Severn Trent Laboratories, Inc., Burlington, VT.

US EPA TO-15 Compounds
Rtx®-1

Column:	Rtx®-1, 60m, 0.32mm ID, 1.0µm (cat.# 10157)
Sample:	TO-15 standard (cat.# 34436) humidified to 33% RH in a 6L SilcoCan™ canister (cat.# 24182)
Concentrator:	Nutech 3550A Preconcentrator; 300mL sample concentrated at -160°C, thermally desorbed at 150°C, cryofocused at -185°C, thermally desorbed to column at 150°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	30°C (hold 4 min.) to 175°C @ 8°C/min., to 220°C @ 20°C/min. (hold 2 min.)
Det.:	MS
Transfer line temp.:	150°C
Scan range:	35–280amu
Ionization:	EI
Mode:	scan

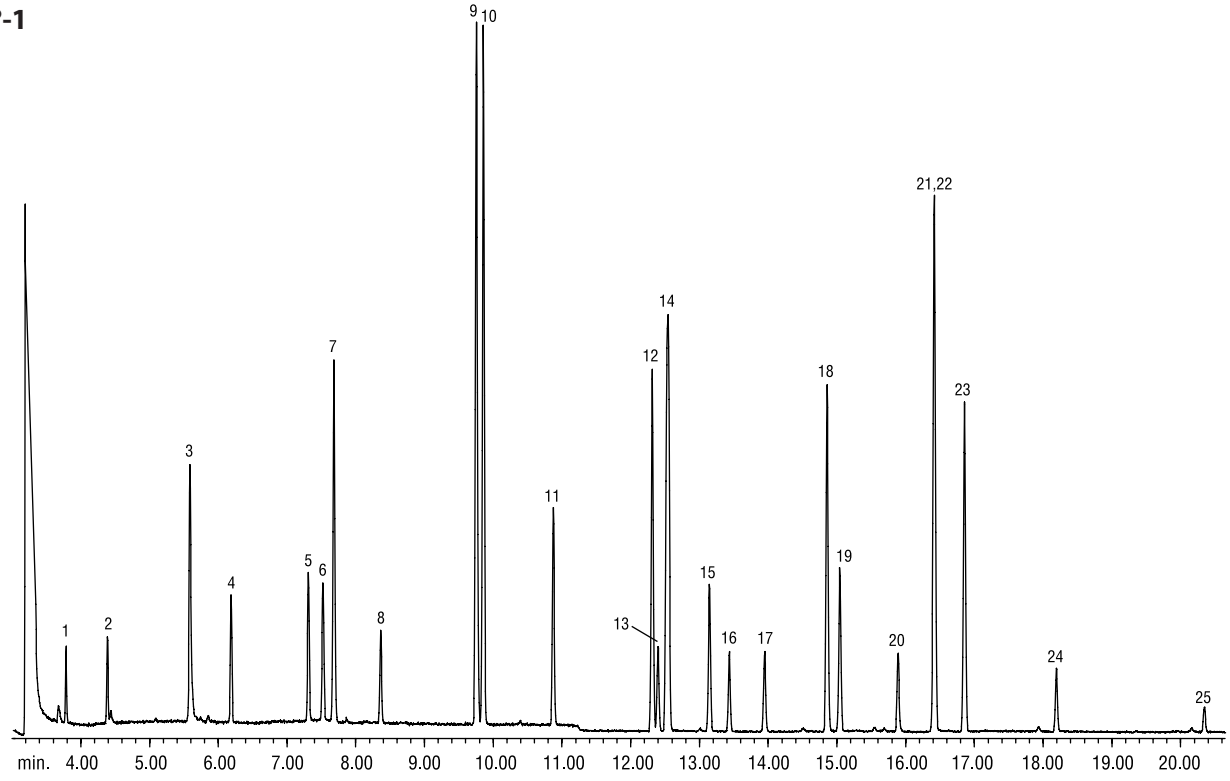


GC_AR00748

1. propylene
2. Freon®-12 (dichlorodifluoromethane)
3. chloromethane
4. Freon®-114 (dichlorotetrafluoroethane)
5. vinyl chloride
6. 1,3-butadiene
7. bromomethane
8. chloroethane
9. carbon disulfide
10. acetone
11. Freon®-11 (trichlorofluoromethane)
12. isopropyl alcohol
13. 1,1-dichloroethene
14. methylene chloride
15. Freon®-113 (1,1,2-trichloro-1,2,2-trifluoroethane)
16. *trans*-1,2-dichloroethene
17. 1,1-dichloroethane
18. methyl *tert*-butyl ether
19. vinyl acetate
20. methyl ethyl ketone
21. *cis*-1,2-dichloroethene
22. hexane
23. chloroform
24. ethyl acetate
25. tetrahydrofuran
26. 1,2-dichloroethane
27. 1,1,1-trichloroethane
28. benzene
29. carbon tetrachloride
30. cyclohexane
31. 1,2-dichloropropane
32. trichloroethylene
33. bromodichloromethane
34. 1,4-dioxane
35. heptane
36. *cis*-1,3-dichloropropene
37. methyl isobutyl ketone
38. *trans*-1,3-dichloropropene
39. 1,1,2-trichloroethane
40. toluene
41. methyl butyl ketone
42. dibromochloromethane
43. 1,2-dibromoethane
44. tetrachloroethylene
45. chlorobenzene
46. ethylbenzene
47. *p*-xylene
48. *m*-xylene
49. bromoform
50. styrene
51. *o*-xylene
52. 1,1,2,2-tetrachloroethane
53. 4-ethyltoluene
54. 1,3,5-trimethylbenzene
55. 1,2,4-trimethylbenzene
56. 1,3-dichlorobenzene
57. benzyl chloride
58. 1,4-dichlorobenzene
59. 1,2-dichlorobenzene
60. 1,2,4-trichlorobenzene
61. hexachloro-1,3-butadiene

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Massachusetts APH Mix
Rtx®-1



GC_AR00697

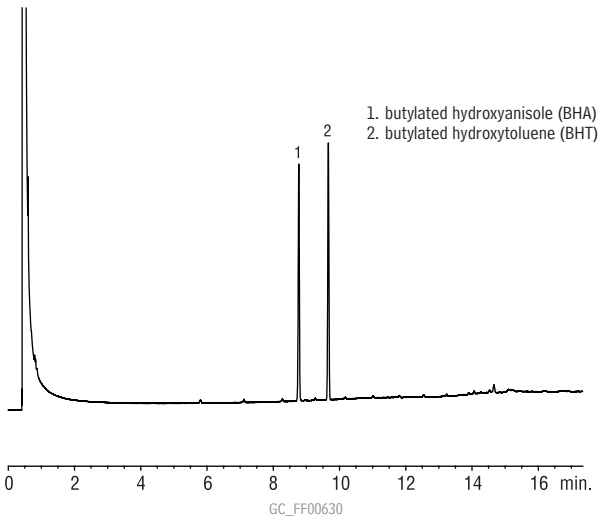
Column:	Rtx®-1, 60m, 0.32mm ID, 1.0µm (cat.# 10157)
Sample:	Massachusetts APH Mix, (cat.# 34446)
Concentrator:	Nutech 3550A Air Preconcentrator, 100mL of a 40ppbv standard concentrated at -160°C, thermally desorbed at 150°C and cryofocused at -185°C
Carrier gas:	helium
Flow rate:	1mL/min.
Oven temp.:	35°C (hold 1 min.) to 220°C @ 8°C/min.
Det:	MS, Agilent 5971
Transfer line temp.:	250°C
Scan range:	35-280amu
Ionization:	EI
Mode:	scan

1. 1,3-butadiene
2. isopentane
3. methyl *tert*-butyl ether
4. hexane
5. benzene
6. cyclohexane
7. 2,3-dimethylpentane
8. heptane
9. toluene-D8
10. toluene
11. octane
12. ethylbenzene
13. 2,3-dimethylheptane

14a. *m*-xylene
14b. *p*-xylene
15. *o*-xylene
16. nonane
17. isopropylbenzene
18. 1-methyl-3-ethylbenzene
19. 1,3,5-trimethylbenzene
20. decane
21. 1,2,3-trimethylbenzene
22. *p*-isopropyltoluene
23. butylcyclohexane
24. undecane
25. dodecane



BHA and BHT
Rtx®-50

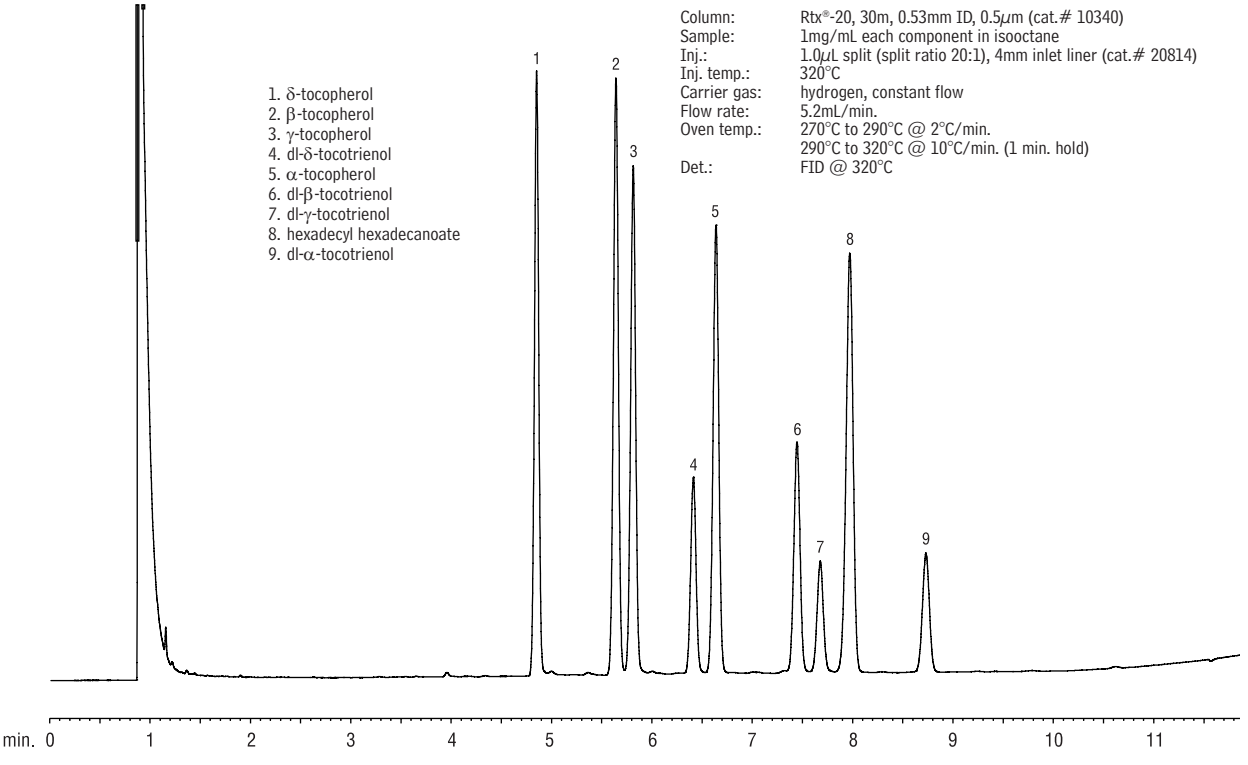


GC_FF00630

Column:	Rtx®-50, 30m, 0.53mm ID, 0.50µm (cat.# 10540)
Sample:	50ppm each in methanol
Inj.:	1.0µL direct, gooseneck splitless inlet liner, 4mm (cat.# 20798)
Inj. temp.:	280°C
Carrier gas:	helium, constant pressure
Linear velocity:	60cm/sec. @ 50°C
Oven temp.:	50°C to 240°C @15°C/min. (hold 3 min.)
Det.:	FID @ 280°C

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Tocopherols and Tocotrienols
Rtx®-20

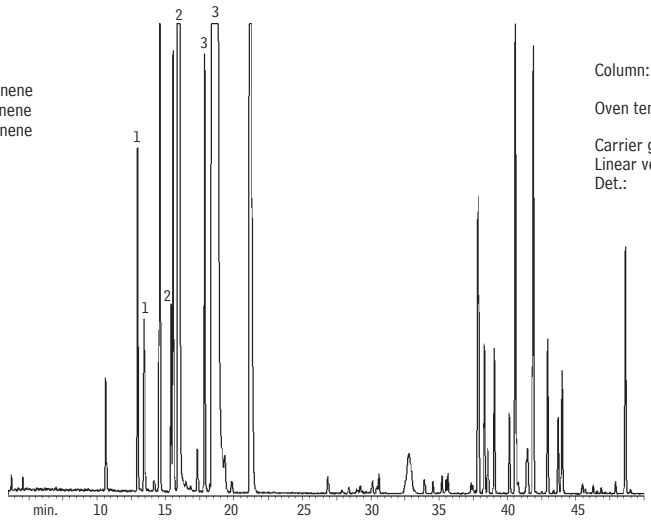


Column:	Rtx®-20, 30m, 0.53mm ID, 0.5µm (cat.# 10340)
Sample:	1mg/mL each component in isooctane
Inj.:	1.0µL split (split ratio 20:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	320°C
Carrier gas:	hydrogen, constant flow
Flow rate:	5.2mL/min.
Oven temp.:	270°C to 290°C @ 2°C/min. 290°C to 320°C @ 10°C/min. (1 min. hold)
Det.:	FID @ 320°C

GC_FF00634

Lemon Oil
Rt®-βDEXsm

1. (-/+)α-pinene
2. (+/-)β-pinene
3. (-/+)limonene

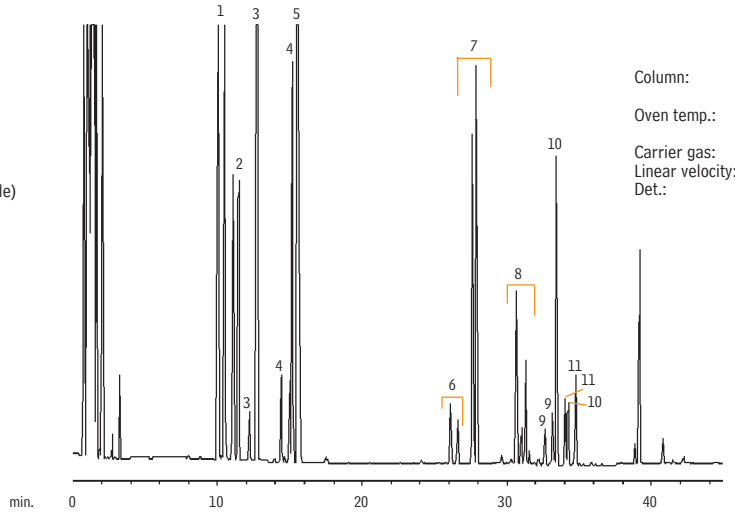


GC_FF00146

Column:	Rt®-βDEXsm, 30m, 0.32mm ID, 0.25μm (cat.# 13104)
Oven temp.:	40°C (hold 1 min.) to 200°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec.
Det.:	FID @ 220°C

Rosemary Oil
Rt®-βDEXsm

1. (-/+)α-pinene
2. (+/-)camphene
3. (+/-)β-pinene
4. (-/+)limonene
5. eucalyptol (1,8-cineole)
6. (-/+)linalool
7. (+/-)camphor
8. (-/+)terpinen-4-ol
9. (+/-)isoborneol
10. (+/-)borneol
11. (+/-)α-terpineol

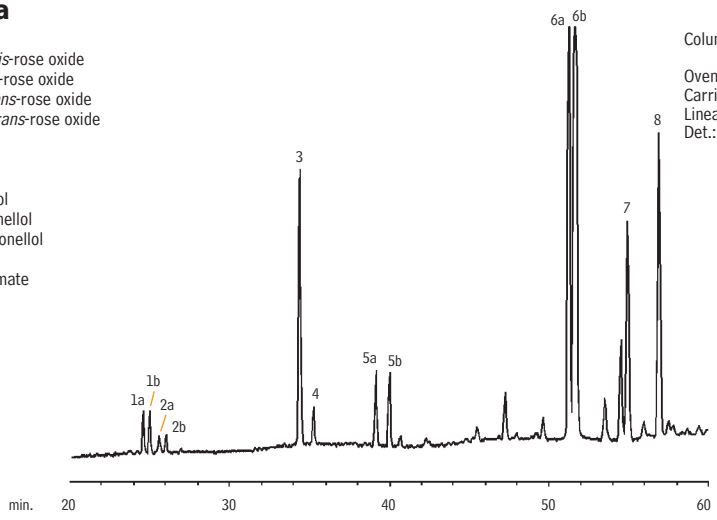


GC_FF00147

Column:	Rt®-βDEXsm, 30m, 0.32mm ID, 0.25μm (cat.# 13104)
Oven temp.:	40°C (hold 1 min.) to 200°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec.
Det.:	FID @ 220°C

Geranium Oil (Commercial)
Rt®-βDEXsa

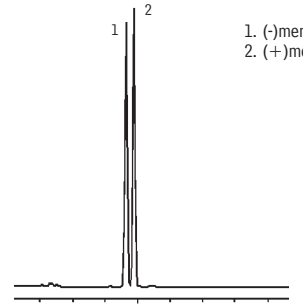
1a. (+)-(2R,4S)-*cis*-rose oxide
1b. (-)-(2S,4R)-*cis*-rose oxide
2a. (-)-(2R,4R)-*trans*-rose oxide
2b. (+)-(2S,4S)-*trans*-rose oxide
3. isomenthone
4. menthone
5a. (-)-(R)-linalool
5b. (+)-(S)-linalool
6a. (-)-(S)-β-citronellol
6b. (+)-(R)-β-citronellol
7. geraniol
8. citronellyl formate



GC_FF00148

Column:	Rt®-βDEXsa, 30m, 0.25mm ID, 0.25μm (cat.# 13109)
Oven temp.:	60°C to 110°C @ 1°C/min. (hold 30 min.)
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 60°C
Det.:	FID @ 220°C

Menthol - Rt®-βDEXsp

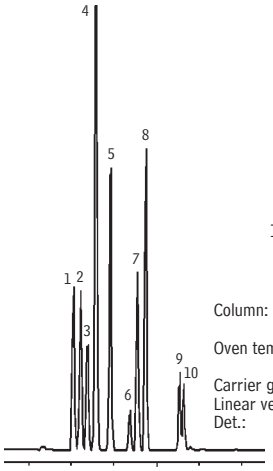


GC_FF00149

1. (-)menthol
2. (+)menthol

Column:	Rt®-βDEXsp, 30m, 0.32mm ID, 0.25μm (cat.# 13110)
Oven temp.:	60°C (hold 1 min.) to 200°C @ 2°C/min.
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 40°C
Det.:	FID @ 220°C

Irone Isomers - Rt®-βDEXcst



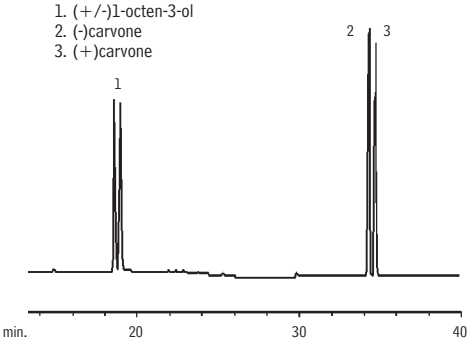
GC_FF00150

1. (-)-(2R,6R)-*trans*-α-irone
2. (+)-(2S,6S)-*trans*-α-irone
3. (+)-(2R,6R)-*trans*-γ-irone
4. (-)-(2S,6S)-*trans*-γ-irone
5. (+)-(2R,6S)-*cis*-α-irone
6. (+)-(2R,6S)-*cis*-γ-irone
7. (-)-(2S,6R)-*cis*-γ-irone
8. (-)-(2S,6R)-*cis*-α-irone
9. (+)-(2R)-β-irone
10. (-)-(2R)-β-irone

Column:	Rt®-βDEXcst, 30m, 0.32mm ID, 0.25μm (cat.# 13102)
Oven temp.:	40°C (hold 1 min.) to 230°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 40°C
Det.:	FID @ 220°C

1-octen-3-ol and carvone - Rt®-βDEXsa

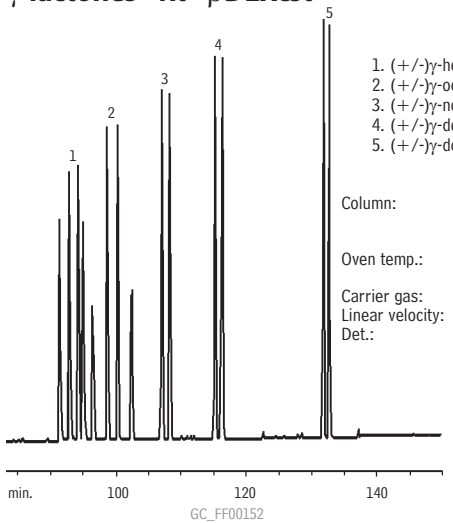
1. (+/-)1-octen-3-ol
2. (-)carvone
3. (+)carvone



GC_FF00151

Column:	Rt®-βDEXsa, 30m, 0.32mm ID, 0.25μm (cat.# 13108)
Oven temp.:	40°C (hold 1 min.) to 230°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 40°C
Det.:	FID @ 220°C

γ-lactones - Rt®-βDEXcst

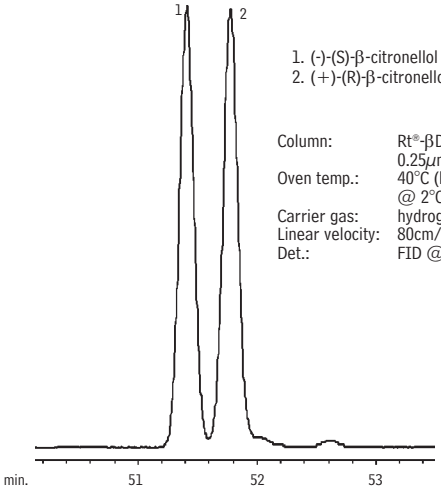


GC_FF00152

1. (+/-)γ-heptalactone
2. (+/-)γ-octalactone
3. (+/-)γ-nonalactone
4. (+/-)γ-decalactone
5. (+/-)γ-dodecalactone

Column:	Rt®-βDEXcst, 30m, 0.32mm ID, 0.25μm (cat.# 13102)
Oven temp.:	60°C (hold 1 min.) to 200°C @ 1°C/min.
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 60°C
Det.:	FID @ 220°C

β-citronellol - Rt®-βDEXsa

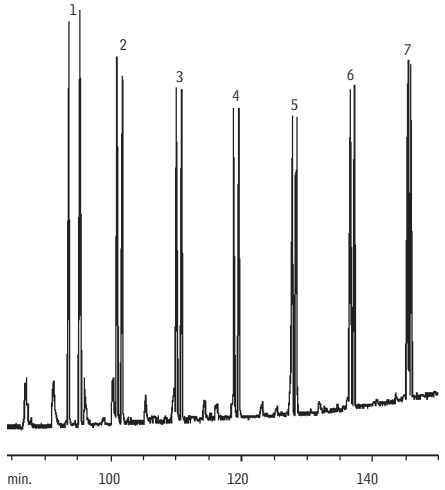


GC_FF00153

1. (-)-(S)-β-citronellol
2. (+)-(R)-β-citronellol

Column:	Rt®-βDEXsa, 30m, 0.32mm ID, 0.25μm (cat.# 13108)
Oven temp.:	40°C (hold 1 min.) to 230°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 40°C
Det.:	FID @ 220°C

δ-lactones - Rt®-βDEXcst



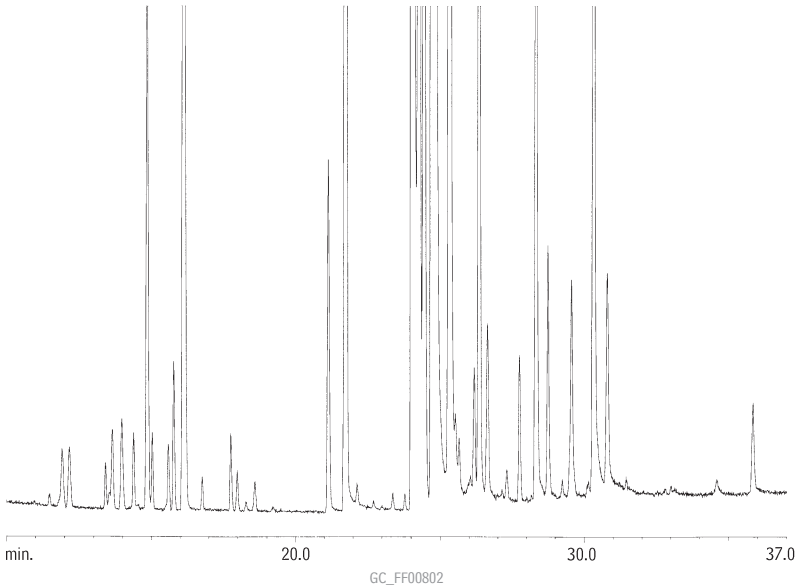
GC_FF00154

1. (+/-)δ-pentalactone
2. (+/-)δ-hexalactone
3. (+/-)δ-heptalactone
4. (+/-)δ-octalactone
5. (+/-)δ-nonalactone
6. (+/-)δ-decalactone
7. (+/-)δ-dodecalactone

Column: Rt®-βDEXcst, 30m, 0.32mm ID, 0.25μm (cat.# 13102)
Oven temp.: 60°C (hold 1 min.) to 200°C @ 1°C/min.
Carrier gas: hydrogen
Linear velocity: 40cm/sec. set @ 60°C
Det.: FID @ 220°C

Commercial Peppermint Oil
Rt®-γDEXsm

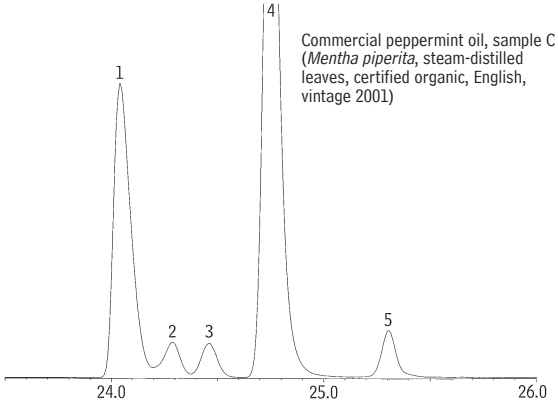
Commercial peppermint oil, sample B



GC_FF00802

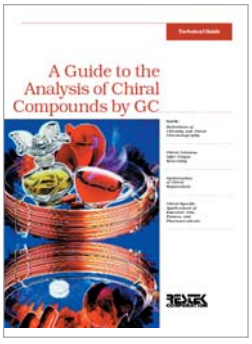
Column:	Rt®-γDEXsm, 30m, 0.25mm ID, 0.25μm (cat.# 13113)
Inj.:	1.0μL neat, split (split ratio 1:150)
Inj. temp.:	230°C
Carrier gas:	helium, constant pressure
Flow rate:	35cm/sec. at 100°C
Oven temp.:	40°C to 120°C @ 5°C/min. to 135°C @ 3°C/min. to 200°C @ 5°C/min.
Det:	MS
Transfer line temp.:	200°C
Scan range:	40-300amu
Ionization:	EI
Mode:	scan

1. menthone
2. menthol
3. menthone
4. menthol
5. menthyl acetate



Commercial peppermint oil, sample C (*Mentha piperita*, steam-distilled leaves, certified organic, English, vintage 2001)

GC_FF00803A



free literature

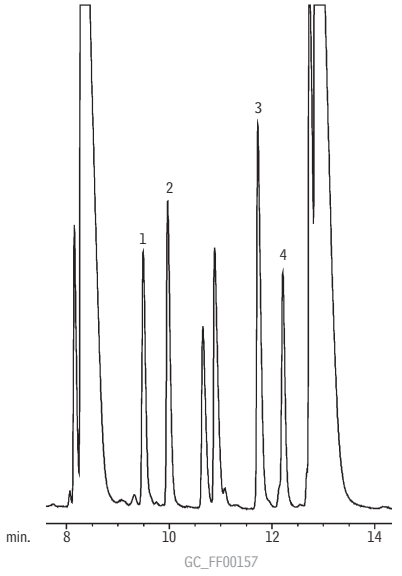
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Technical Guide
lit. cat.# 59889

Apple Juice with Standards
Rt®-βDEXse



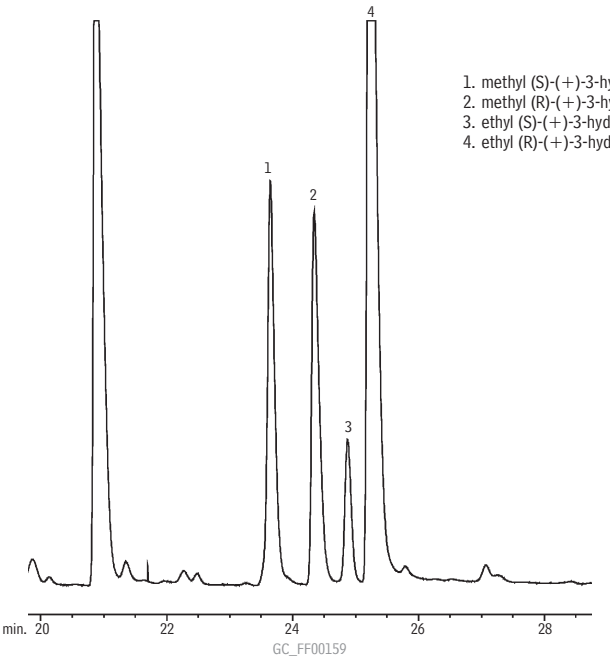
1. (R)-ethyl 2-methylbutyrate
2. (S)-ethyl 2-methylbutyrate
3. (R)-2-methylbutyrate
4. (S)-2-methylbutyrate

Apple Juice
Rt®-βDEXse



Column:	Rt®-βDEXse, 30m, 0.32mm ID, 0.25μm (cat.# 13106)
Inj.:	1.0μL split injection
On-column conc. (standards):	~50ng
Oven temp.:	40°C (hold 1 min.) to 220°C @ 2°C/min.
Inj./det. temp.:	220°C
Carrier gas:	hydrogen
Linear velocity:	80cm/sec.

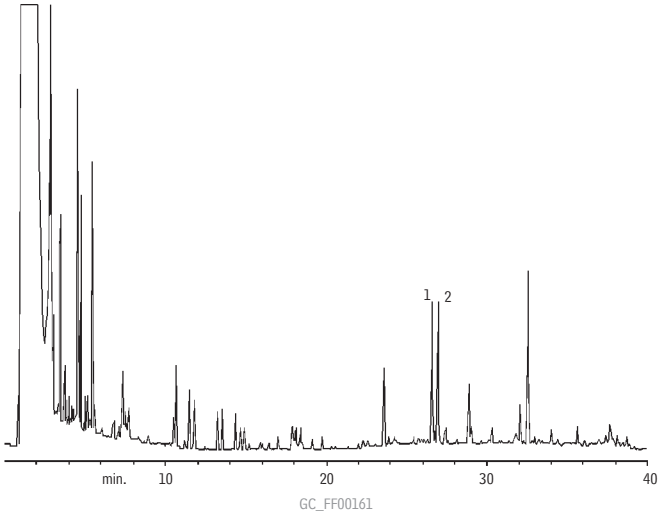
Grape Juice Extract
Rt®-γDEXsa



1. methyl (S)-(+)-3-hydroxybutyrate
2. methyl (R)-(+)-3-hydroxybutyrate
3. ethyl (S)-(+)-3-hydroxybutyrate
4. ethyl (R)-(+)-3-hydroxybutyrate

Column:	Rt®-γDEXsa, 30m, 0.32mm ID, 0.25μm (cat.# 13112)
Inj.:	1.0μL split injection
On-column conc.:	~150ng/enantiomer
Oven temp.:	40°C (hold 1 min.) to 200°C @ 2°C/min.
Inj./det. temp.:	220°C/230°C
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 40°C
Split ratio:	25:1

Raspberry Flavor - Rt®-βDEXsa

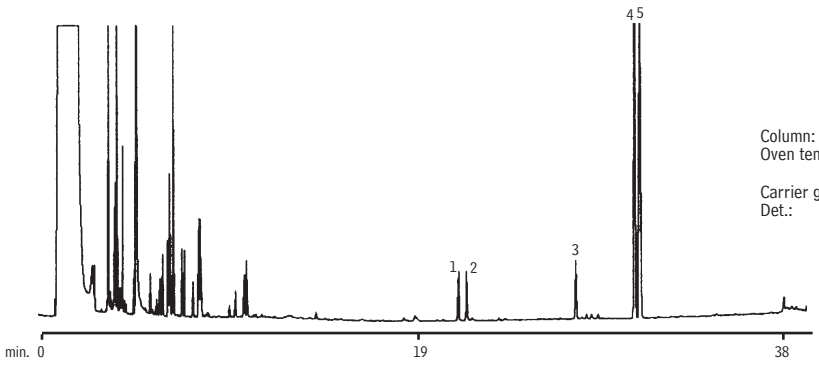


GC_FF00161

1. (R)-α-ionone
2. (S)-α-ionone

Column:	Rt®-βDEXsa, 30m, 0.32mm ID, 0.25μm (cat.# 13108)
Oven temp.:	60°C (hold 2 min.) to 200°C @ 3°C/min.
Carrier gas:	helium; 60cm/sec. set @ 60°C
Det.:	MS @ 220°C

Peach/Vanilla Flavor - Rt®-βDEXsa

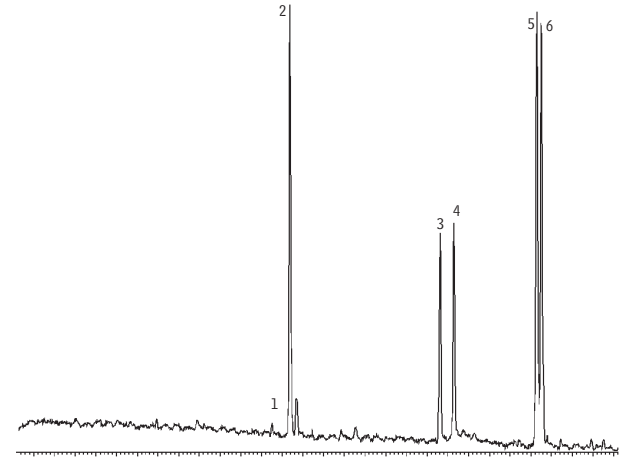


GC_FF00162

1. (R)-γ-octalactone
2. (S)-γ-octalactone
3. (R)-γ-decalactone
4. (R)-γ-undecalactone
5. (S)-γ-undecalactone

Column:	Rt®-βDEXsa, 30m, 0.32mm ID, 0.25μm (cat.# 13108)
Oven temp.:	60°C (hold 2 min.) to 100°C @ 15°C/min. to 220°C @ 3°C/min.
Carrier gas:	helium, 60cm/sec. set @ 60°C
Det.:	MS @ 220°C

Bergamot Flavor - Rt®-βDEXse



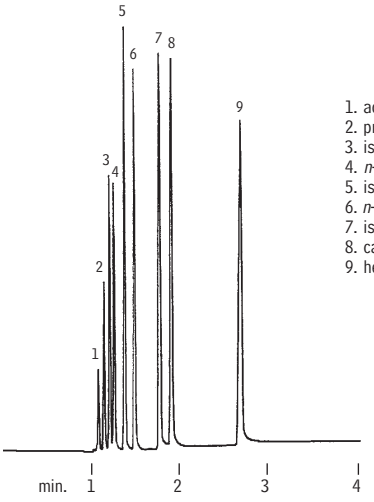
GC_FF00163

1. (S)-limonene
2. (R)-limonene
3. (R)-linalool
4. (S)-linalool
5. (R)-linalyl acetate
6. (S)-linalyl acetate

Column:	Rt®-βDEXse, 30m, 0.32mm ID, 0.25μm (cat.# 13106)
Oven temp.:	40°C (hold 1 min.) to 200°C @ 4°C/min.
Carrier gas:	helium, 60cm/sec. set @ 40°C
Det.:	MS @ 220°C

Fatty Acids (Free)
Rtx®-200

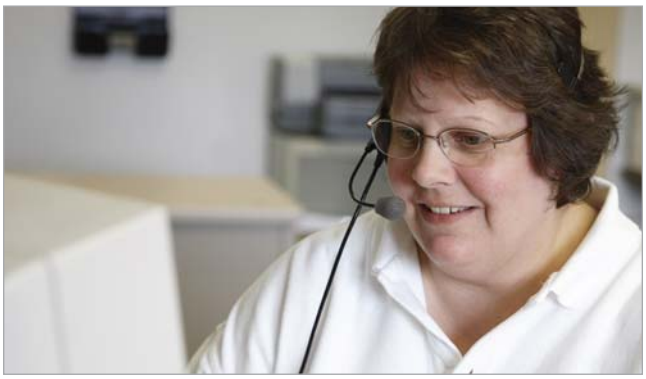
No derivatization needed!



1. acetic acid
2. propionic acid
3. isobutyric acid
4. *n*-butyric acid
5. isovaleric acid
6. *n*-valeric acid
7. isocaproic acid
8. caproic acid
9. heptanoic acid

GC_CH00282

Column:	Rtx®-200, 30m, 0.25mm ID, 0.25µm (cat.# 15023)
Sample:	0.8µL split injection of a free fatty acid standard
Conc.:	approximately 10 to 20ng/µL
Oven temp.:	90°C
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 1.4cc/min.)
FID sensitivity:	4 x 10^{-11} AFS
Split vent:	40cc/min.



Paula Zuchowski, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

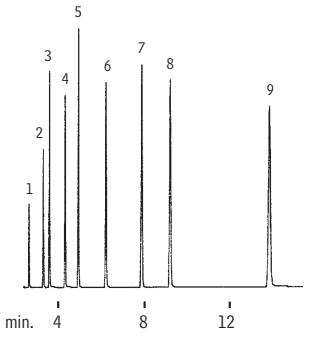
Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com

Fatty Acids (Free)
Stabilwax®-DA

No derivatization needed!

1. acetic acid
2. propionic acid
3. isobutyric acid
4. *n*-butyric acid
5. isovaleric acid
6. *n*-valeric acid
7. isocaproic acid
8. caproic acid
9. heptanoic acid



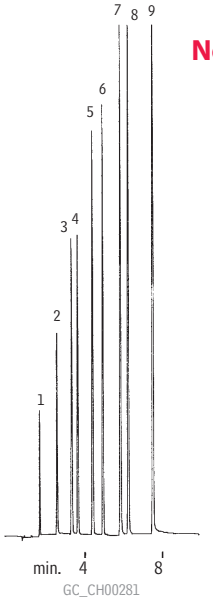
GC_CH00280

Column:	Stabilwax®-DA, 30m, 0.25mm ID, 0.25µm (cat.# 11023)
Sample:	1.0µL split injection of a free acid standard
Conc.:	approximately 10 to 20ng/µL
Oven temp.:	145°C
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	2 x 10^{-11} AFS
Split ratio:	50:1

Fatty Acids (Free)
Rtx®-1

1. acetic acid
2. propionic acid
3. isobutyric acid
4. *n*-butyric acid
5. isovaleric acid
6. *n*-valeric acid
7. isocaproic acid
8. caproic acid
9. heptanoic acid

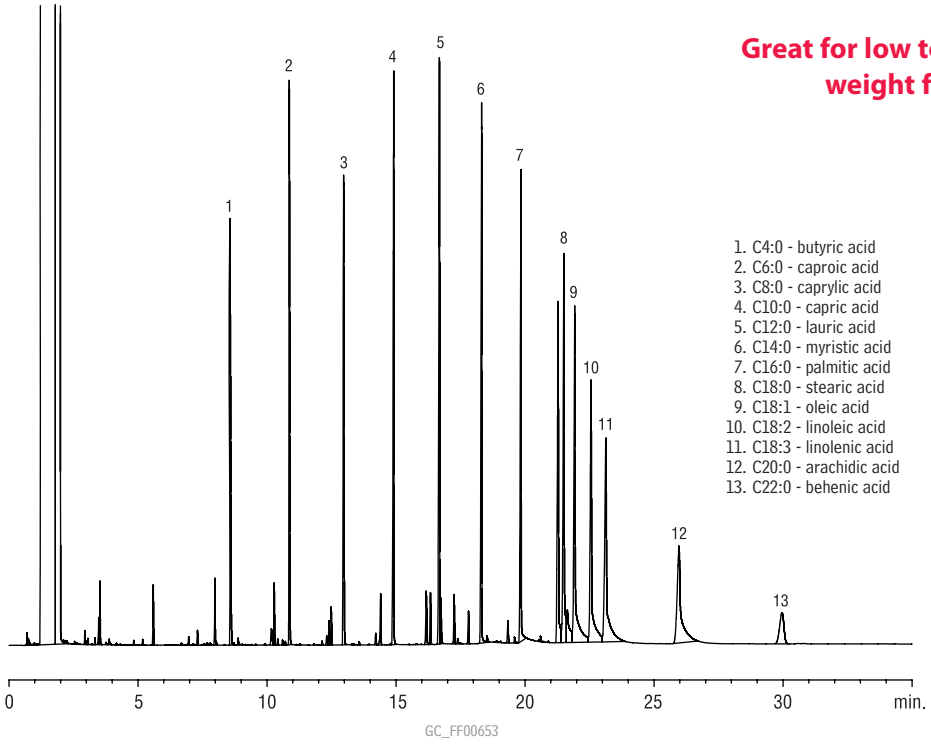
No derivatization needed!



GC_CH00281

Column:	Rtx®-1, 30m, 0.53mm ID, 5.0µm (cat.# 10179)
Sample:	0.2µL injection of a 10–20ng/µL free fatty acid standard in water.
Inj.:	direct injection using a Uniliner® inlet liner
Oven temp.:	60°C to 180°C @ 15°C/min.
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	50cm/sec. (flow rate: 6cc/min.)
FID sensitivity:	4 x 10^{-11} AFS

Fatty Acids (Free)
Stabilwax®-DA



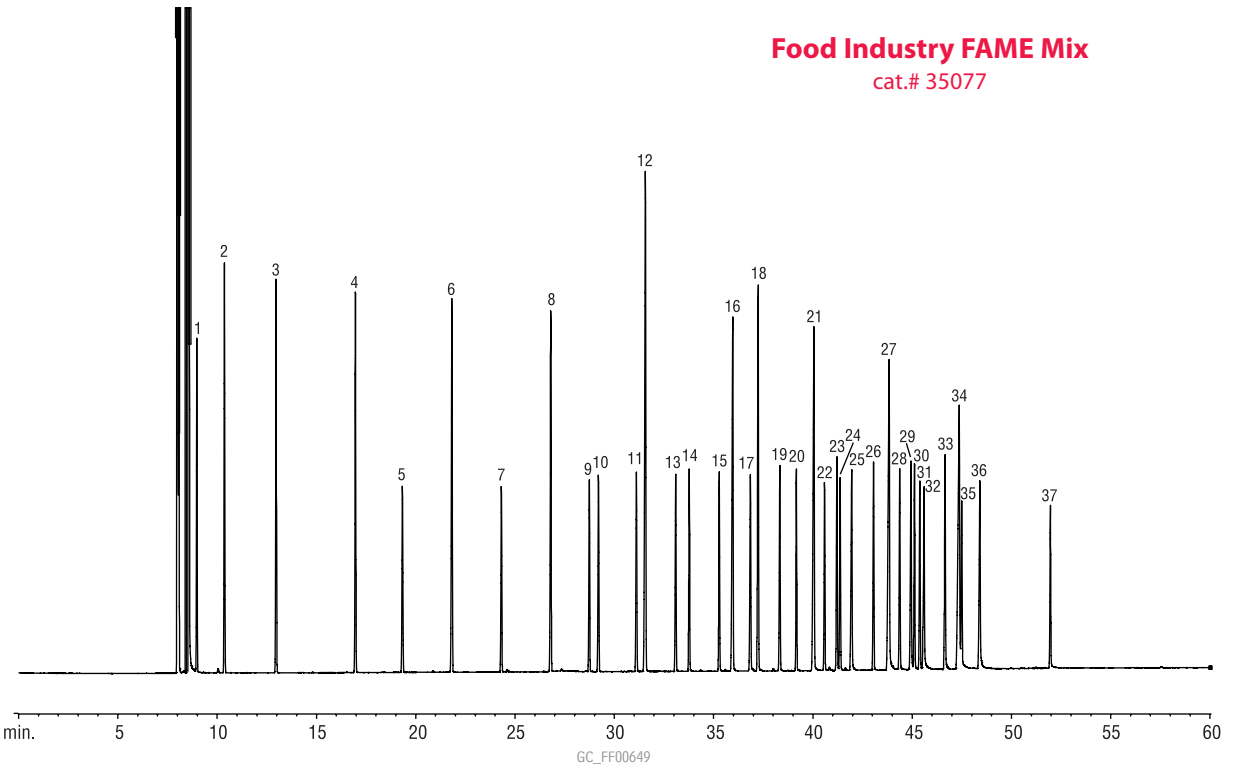
Great for low to high molecular weight fatty acids.

1. C4:0 - butyric acid
2. C6:0 - caproic acid
3. C8:0 - caprylic acid
4. C10:0 - capric acid
5. C12:0 - lauric acid
6. C14:0 - myristic acid
7. C16:0 - palmitic acid
8. C18:0 - stearic acid
9. C18:1 - oleic acid
10. C18:2 - linoleic acid
11. C18:3 - linolenic acid
12. C20:0 - arachidic acid
13. C22:0 - behenic acid

Column:	Stabilwax®-DA, 30m, 0.32mm ID, 0.25µm (cat.# 11024)
Sample:	1.0µL free fatty acid mix
Solvent:	methanol
Conc.:	100ppm in methanol
Inj.:	splitless/250°C
Splitless hold time:	0.25min.
Carrier gas:	hydrogen (constant flow)
Flow rate:	6.0mL/min.
Split flow:	75mL/min.
Det.:	FID @ 250°C
Inlet liner:	laminar cup splitter
Oven temp.:	40°C to 250°C @ 10°C/min. (hold 15 min.)



FAMEs (AOAC 996.06 Standard)
Rt®-2560

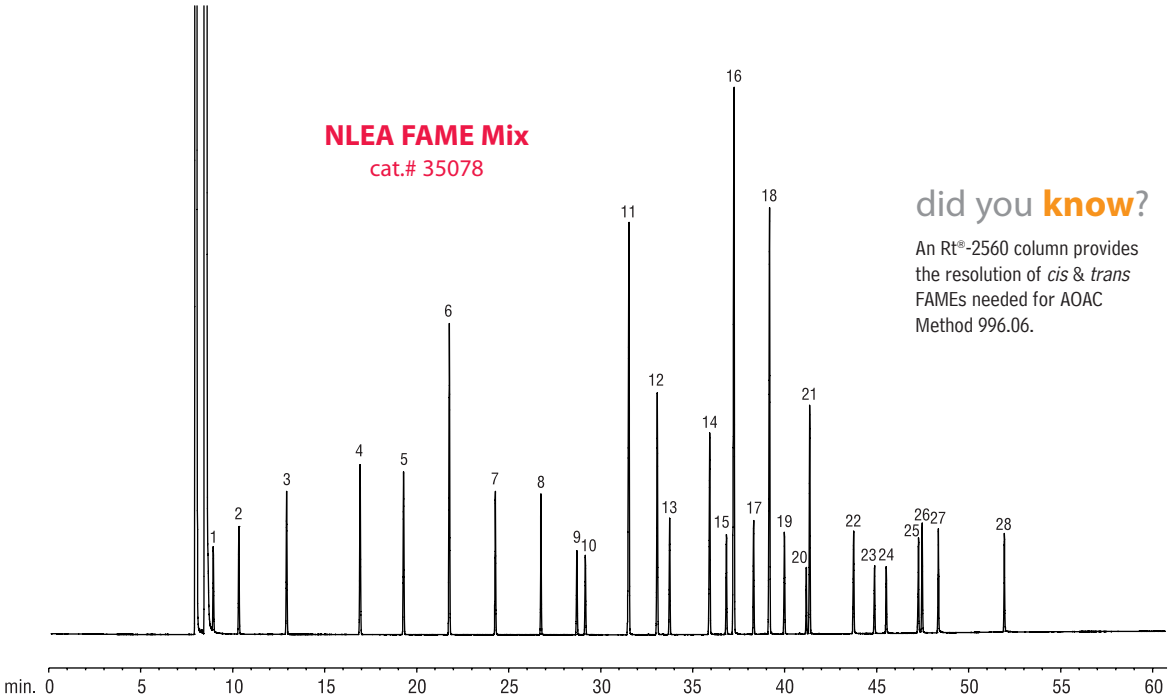


Compound	% in Mix
1. C4:0 methyl butyrate	4.0
2. C6:0 methyl hexanoate	4.0
3. C8:0 methyl octanoate	4.0
4. C10:0 methyl decanoate	4.0
5. C11:0 methyl undecanoate	2.0
6. C12:0 methyl laurate	4.0
7. C13:0 methyl tridecanoate	2.0
8. C14:0 methyl myristate	4.0
9. C14:1 methyl myristoleate (*cis*-9)	2.0
10. C15:0 methyl pentadecanoate	2.0
11. C15:1 methyl pentadecenoate (*cis*-10)	2.0
12. C16:0 methyl palmitate	6.0
13. C16:1 methyl palmitoleate (*cis*-9)	2.0
14. C17:0 methyl heptadecanoate	2.0
15. C17:1 methyl heptadecenoate (*cis*-10)	2.0
16. C18:0 methyl stearate	4.0
17. C18:1 methyl elaidate (*trans*-9)	2.0
18. C18:1 methyl oleate (*cis*-9)	4.0
19. C18:2 methyl linoleaidate (*trans*-9,12)	2.0
20. C18:2 methyl linoleate (*cis*-9,12)	2.0
21. C20:0 methyl arachidate	4.0
22. C18:3 methyl γ-linolenate (*cis*-6,9,12)	2.0
23. C20:1 methyl eicosenoate (*cis*-11)	2.0
24. C18:3 methyl linolenate (*cis*-9,12,15)	2.0
25. C21:0 methyl heneicosanoate	2.0
26. C20:2 methyl eicosadienoate (*cis*-11,14)	2.0
27. C22:0 methyl behenate	4.0
28. C20:3 methyl eicosatrienoate (*cis*-8,11,14)	2.0
29. C22:1 methyl erucate (*cis*-13)	2.0
30. C20:3 methyl eicosatrienoate (*cis*-11,14,17)	2.0
31. C20:4 methyl arachidonate (*cis*-5,8,11,14)	2.0
32. C23:0 methyl tricosanoate	2.0
33. C22:2 methyl docosadienoate (*cis*-13,16)	2.0
34. C24:0 methyl lignocerate	4.0
35. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)	2.0
36. C24:1 methyl nervonate (*cis*-15)	2.0
37. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)	2.0

Column:	Rt®-2560, 100m, 0.25mm ID, 0.2μm (cat.# 13199)
Sample:	Food Industry FAME Mix (cat.# 35077), 30mg/mL total FAMEs in methylene chloride
Inj.:	2.0μL split (split ratio 200:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	225°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (4 min. hold) to 240°C @ 3°C/min. (10 min. hold)
Det.:	FID @ 250°C

Searching for a chromatogram?
www.restek.com

FAMEs (NLEA Mix)
Rt®-2560



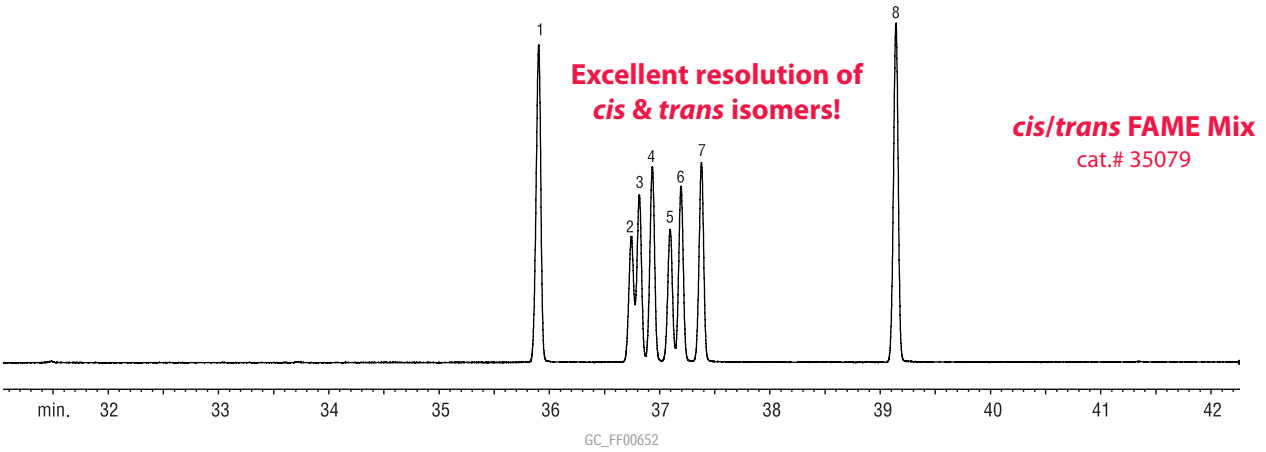
did you **know**?

An Rt®-2560 column provides the resolution of *cis* & *trans* FAMEs needed for AOAC Method 996.06.

Column:	Rt®-2560, 100m, 0.25mm ID, 0.20µm (cat.# 13199)
Sample:	NLEA FAME Mix (cat.# 35078), 30mg/mL total FAMEs in methylene chloride
Inj.:	1.0µL split (split ratio 100:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	225°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (4 min. hold) to 240°C @ 3°C/min. (10 min. hold)
Det.:	FID @ 250°C

1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

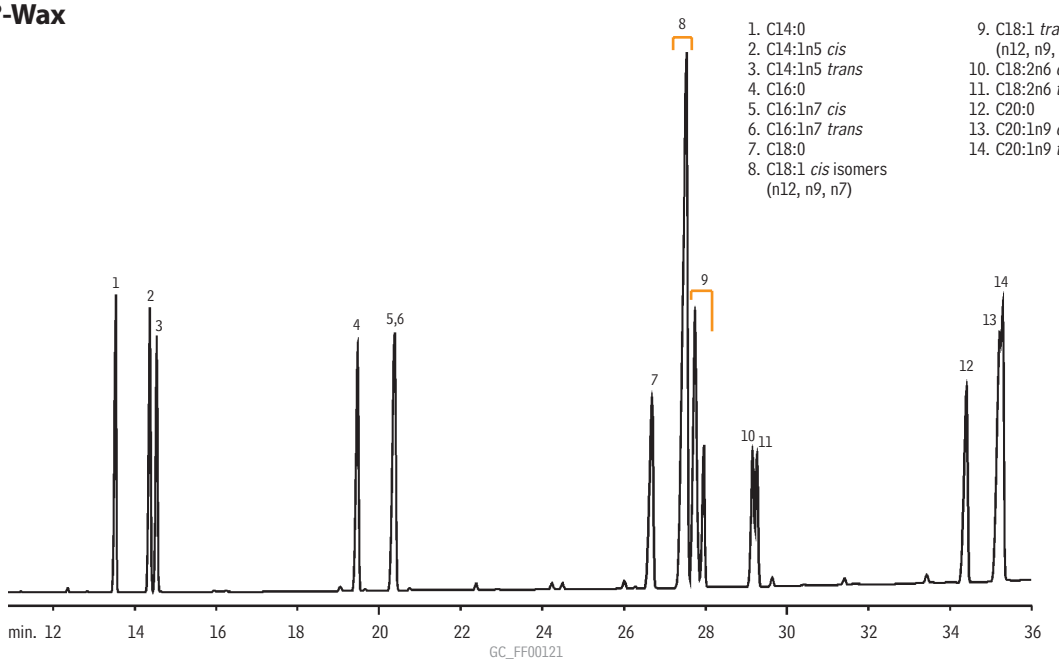
FAMEs (*cis*/*trans* isomers)
Rt®-2560



Column:	Rt®-2560, 100m, 0.25mm ID, 0.2µm (cat.# 13199)
Sample:	*cis*/*trans* FAME Mix (cat.# 35079), 10mg/mL total FAMEs in methylene chloride
Inj.:	1.0µL split (split ratio 20:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	225°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (4 min. hold) to 240°C @ 3°C/min. (10 min. hold)
Det.:	FID @ 250°C

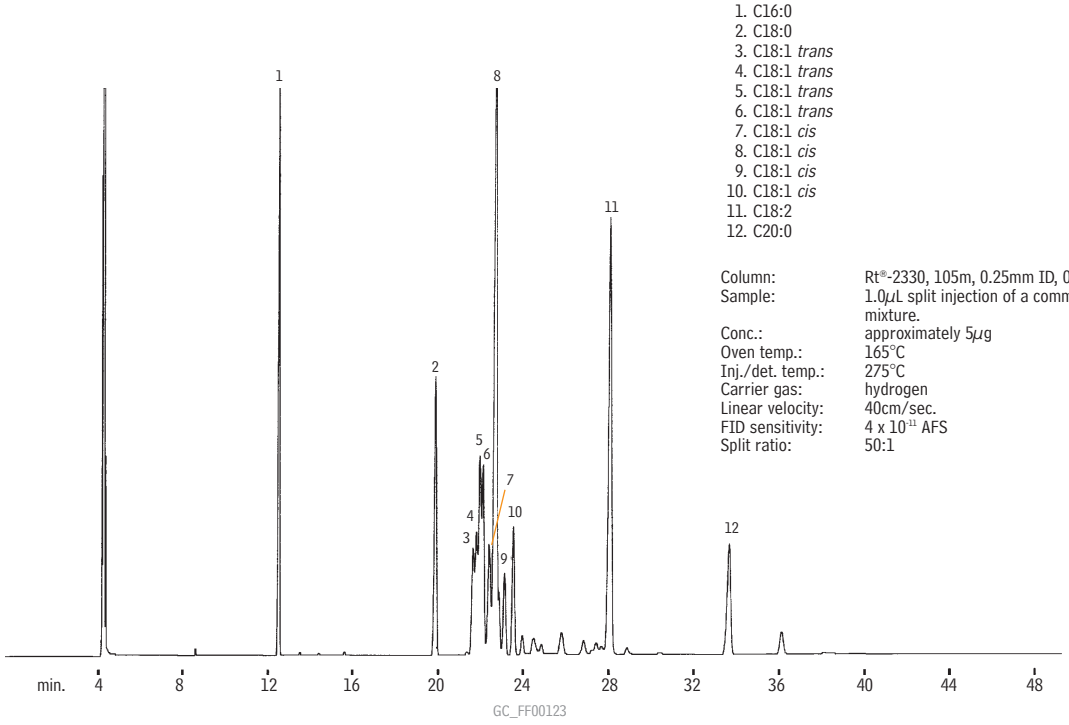
Compound	% in Mix
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselaidate (*trans*-6)	8.0
3. C18:1 methyl elaidate (*trans*-9)	10.0
4. C18:1 methyl transvaccenate (*trans*-11)	12.0
5. C18:1 methyl petroselinate (*cis*-6)	8.0
6. C18:1 methyl oleate (*cis*-9)	10.0
7. C18:1 methyl vaccenate (*cis*-11)	12.0
8. C18:2 methyl linoleate (*cis*-9,12)	20.0

FAMEs (*cis*/*trans* isomers)
Rtx®-Wax



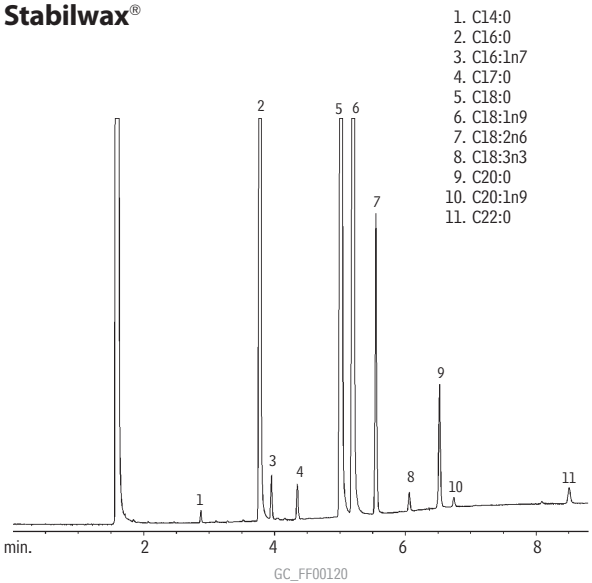
Column:	Rtx®-Wax, 60m, 0.25mm ID, 0.25µm (cat.#12426)
On-column conc.:	40–75ng
Oven temp.:	165°C to 250°C @ 2°C/min.
Inj./det. temp.:	220°C/250°C
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 165°C
Split ratio:	50:1

FAMEs (Commercial Margarine)
Rt®-2330



Column:	Rt®-2330, 105m, 0.25mm ID, 0.20µm (cat.# 10729)
Sample:	1.0µL split injection of a commercial margarine mixture.
Conc.:	approximately 5µg
Oven temp.:	165°C
Inj./det. temp.:	275°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	50:1

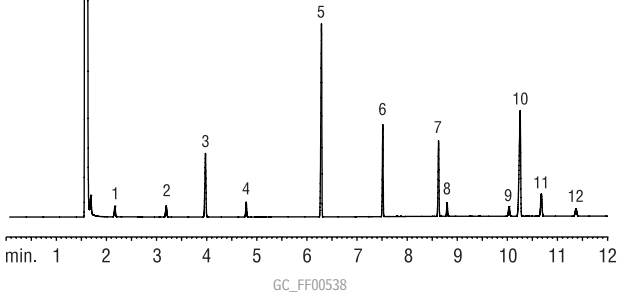
FAMEs (Cocoa Butter)
Stabilwax®



Column:	Stabilwax®, 30m, 0.25mm ID, 0.25µm (cat.# 10623)
Sample:	1.0µL split injection of a FAME reference standard for cocoa butter.
Oven temp.:	200°C to 250°C @ 8°C/min. (hold 3 min.)
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	31.4cm/sec. set @ 200°C
FID sensitivity:	8 x 10^{-11} AFS
Split ratio:	45:1

FAMEs (Saw Palmetto)
Rtx®-Wax

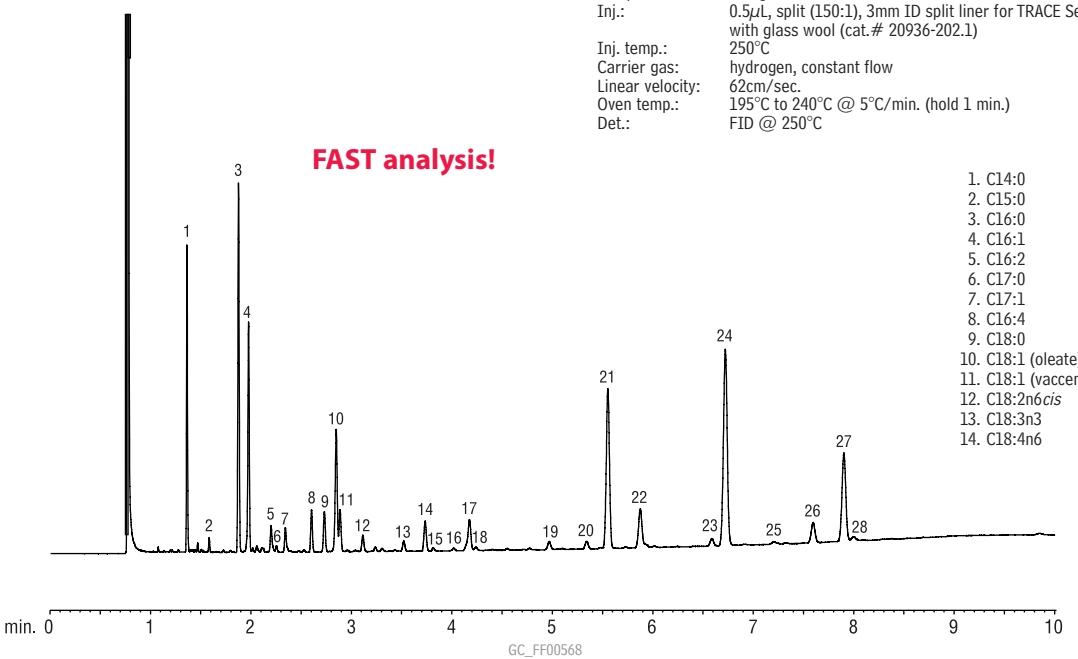
Peak List	Conc. (mg/mL)
1. methyl caproate (C6:0)	0.4
2. methyl caprylate (C8:0)	0.4
3. methyl nonanoate (C9:0)	2.0
4. methyl caprate (C10:0)	0.4
5. methyl laurate (C12:0)	5.0
6. methyl myristate (C14:0)	2.0
7. methyl palmitate (C16:0)	2.0
8. methyl palmitoleate (C16:1)	0.4
9. methyl stearate (C18:0)	0.4
10. methyl oleate (C18:1)	5.0
11. methyl linoleate (C18:2)	1.0
12. methyl linolenate (C18:3)	0.4



Column:	Rtx®-Wax, 30m, 0.25mm, 0.25µm (cat.# 12423)
Sample:	1µL split injection of saw palmetto standard
Conc.:	see peak list
Oven temp.:	120°C (hold 3 min.) to 220°C at 20°C/min. (hold 12 min.)
Inj./det. temp.:	250°C/300°C
Carrier gas:	helium
Linear velocity:	1mL/min. (34 cm/sec.)
Split ratio:	100:1

FAMEs (Marine Oil Standard)
FAMEWAX

Column:	FAMEWAX, 30m, 0.32mm ID, 0.25µm (cat.# 12498)
Sample:	12mg/mL total FAMEs
Inj.:	0.5µL, split (150:1), 3mm ID split liner for TRACE Series GCs, packed with glass wool (cat.# 20936-202.1)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow
Linear velocity:	62cm/sec.
Oven temp.:	195°C to 240°C @ 5°C/min. (hold 1 min.)
Det.:	FID @ 250°C

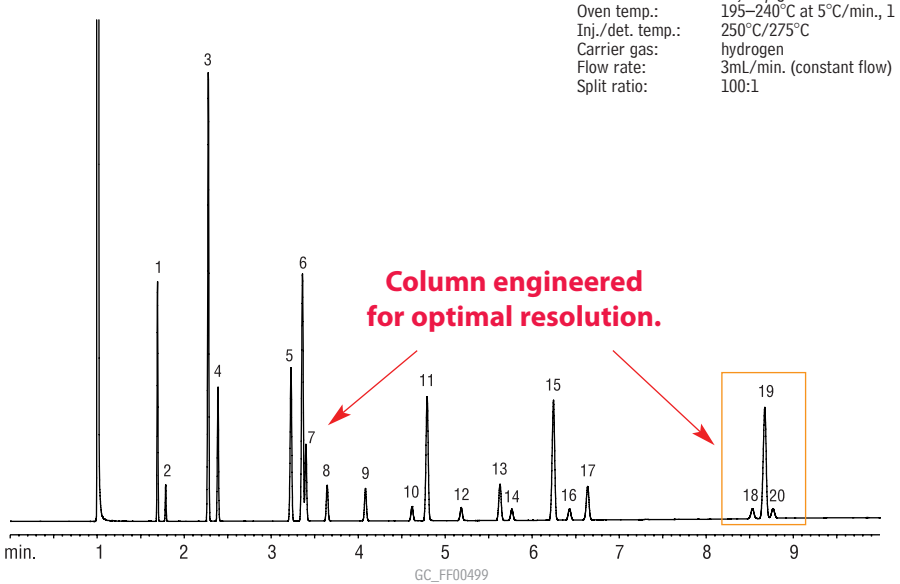


GC_FF00568

1. C14:0
2. C15:0
3. C16:0
4. C16:1
5. C16:2
6. C17:0
7. C17:1
8. C16:4
9. C18:0
10. C18:1 (oleate)
11. C18:1 (vaccenate)
12. C18:2n6*cis*
13. C18:3n3
14. C18:4n6
15. C18:4n3
16. C20:0
17. C20:1n7
18. C20:1n9
19. C20:4n6
20. C20:4n3
21. C20:5n3
22. C22:1n7
23. C21:5n3
24. C23:0 (IS)
25. C22:5n6
26. C22:5n3
27. C22:6n3
28. C24:1

FAMEs (Marine Oil Standard)
FAMEWAX

Column:	FAMEWAX, 30m, 0.32mm ID, 0.25µm (cat.# 12498)
Inj.:	1µL
Conc.:	10,000µg/mL in isooctane (total FAMES; see breakdown in peak list)
Oven temp.:	195–240°C at 5°C/min., 1 min. hold
Inj./det. temp.:	250°C/275°C
Carrier gas:	hydrogen
Flow rate:	3mL/min. (constant flow)
Split ratio:	100:1

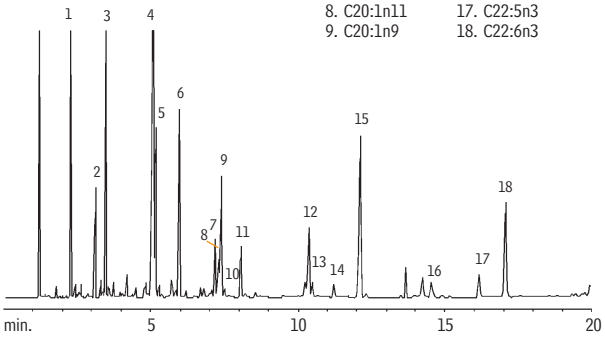


GC_FF00499

Peak List	Conc. (µg/mL)
1. C14:0	600
2. C14:1	100
3. C16:0	1,600
4. C16:1	500
5. C18:0	800
6. C18:1 (oleate)	1,300
7. C18:1 (vaccenate)	400
8. C18:2	200
9. C18:3	200
10. C20:0	100
11. C20:1	900
12. C20:2	100
13. C20:4	300
14. C20:3	100
15. C20:5	1,000
16. C22:0	100
17. C22:1	300
18. C24:0	100
19. C22:6	1,200
20. C24:1	100

FAMEs (PUFA, marine source)
Rt®-2330

1. C14:0
2. C16:0
3. C16:1n7
4. C18:1n9
5. C18:1n7
6. C18:2n6
7. C18:3n3
8. C20:1n11
9. C20:1n9
10. C20:1n7
11. C18:4n3
12. C22:1n11
13. C22:1n9
14. C20:4n3
15. C20:5n3
16. C21:5n3
17. C22:5n3
18. C22:6n3

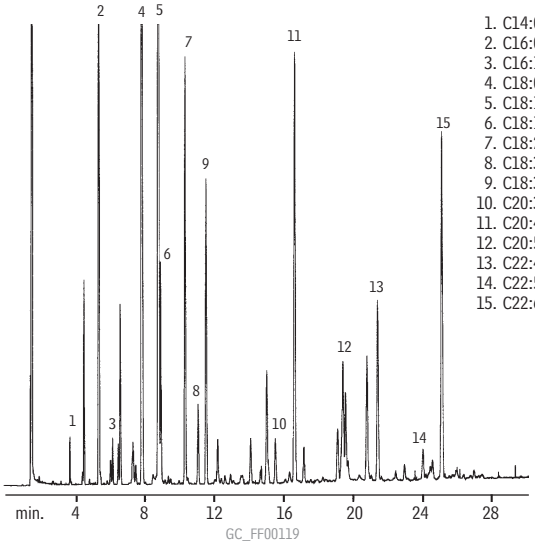


GC_FF00118

Column:	Rt®-2330, 30m, 0.25mm ID, 0.20µm (cat.# 10723)
Sample:	0.5µL split injection of a PUFA mix
Oven temp.:	160°C to 225°C @ 2°C/min.
Inj./det. temp.:	225°C/250°C
Carrier gas:	hydrogen
Linear velocity:	45cm/sec. set @ 160°C
FID sensitivity:	8 x 10^{-11} AFS
Split ratio:	35:1

FAMEs (PUFA, animal source)
Rt®-2330

1. C14:0
2. C16:0
3. C16:1n7
4. C18:0
5. C18:1n9
6. C18:1n7
7. C18:2n6
8. C18:3n6
9. C18:3n3
10. C20:3n6
11. C20:4n6
12. C20:5n3
13. C22:4n6
14. C22:5n3
15. C22:6n3



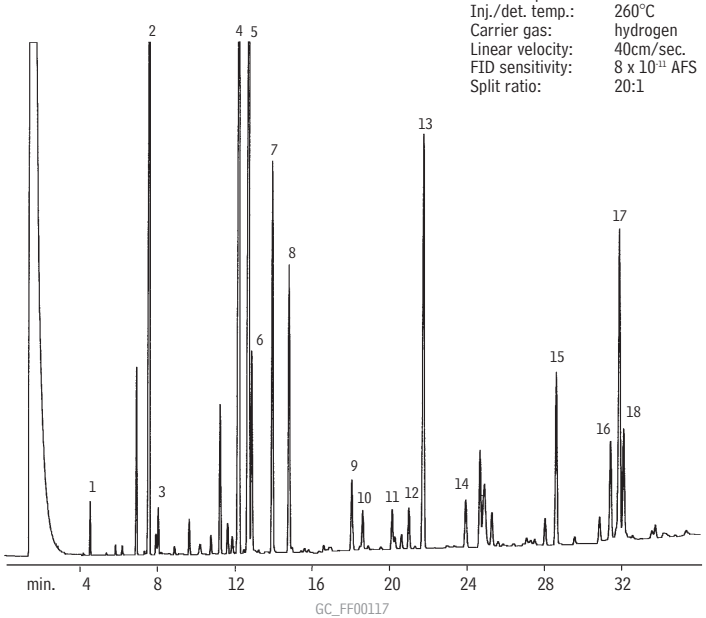
GC_FF00119

Column:	Rt®-2330, 30m, 0.32mm ID, 0.20µm (cat.# 10724)
Sample:	0.1µL split injection of PUFA 2 mix
Oven temp.:	160°C to 250°C @ 2°C/min. (hold 10 min.)
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	8 x 10^{-11} AFS
Split ratio:	20:1

FAMEs (Polyunsaturated Fatty Acids, animal source)
MXT®-WAX

Column:	MXT®-WAX, 30m, 0.28mm ID, 0.25µm (cat.# 70624)
Sample:	0.1µL split injection of PUFA 2 mix
Oven temp.:	160°C to 250°C @ 2°C/min. (hold 10 min.)
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	8 x 10^{-11} AFS
Split ratio:	20:1

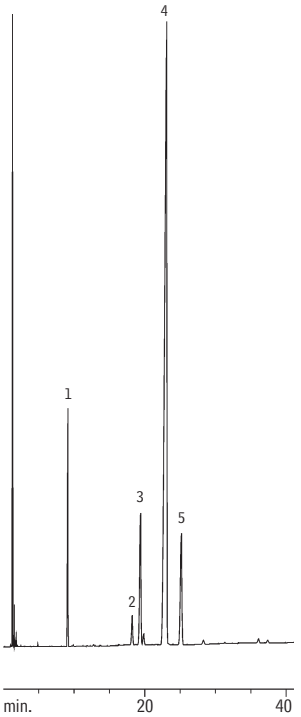
1. C14:0
2. C16:0
3. C16:1n7
4. C18:0
5. C18:1n9
6. C18:1n7
7. C18:2n6
8. C18:3n3
9. C18:4n3
10. C20:1n9
11. C20:2n6
12. C20:3n6
13. C20:4n6
14. C20:5n3
15. C22:4n6
16. C22:5n3
17. C22:6n3
18. C24:1n9



GC_FF00117

FAMEs (Evening Primrose Oil)
FAMEWAX

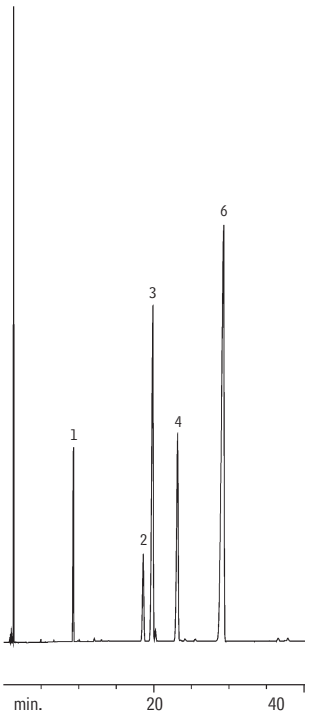
1. C16:0
2. C18:0
3. C18:1n9
4. C18:2n6
5. C18:3n6



GC_FF00363

FAMEs (Flax Seed Oil)
FAMEWAX

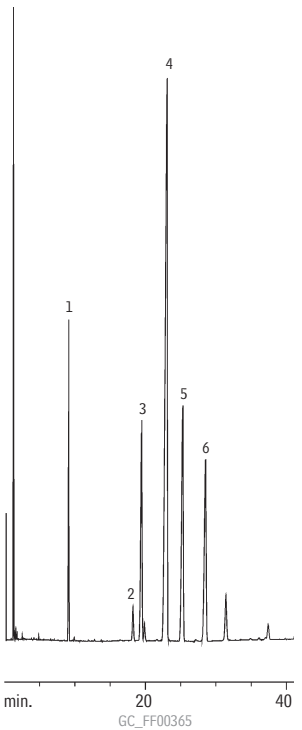
1. C16:0
2. C18:0
3. C18:1n9
4. C18:2n6
5. C18:3n6
6. C18:3n3



GC_FF00364

FAMEs (Black Currant Seed Oil)
FAMEWAX

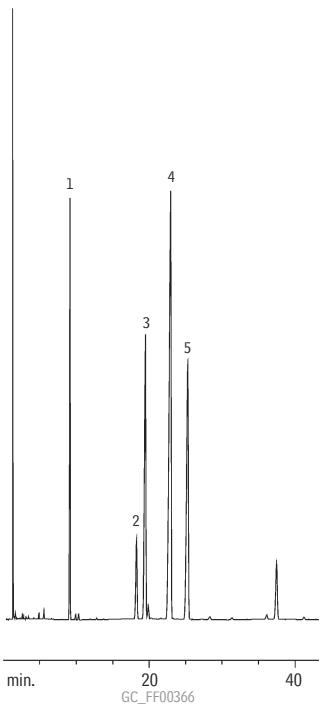
1. C16:0
2. C18:0
3. C18:1n9
4. C18:2n6
5. C18:3n6
6. C18:3n3



GC_FF00365

FAMEs (Borage Seed Oil)
FAMEWAX

1. C16:0
2. C18:0
3. C18:1n9
4. C18:2n6
5. C18:3n6

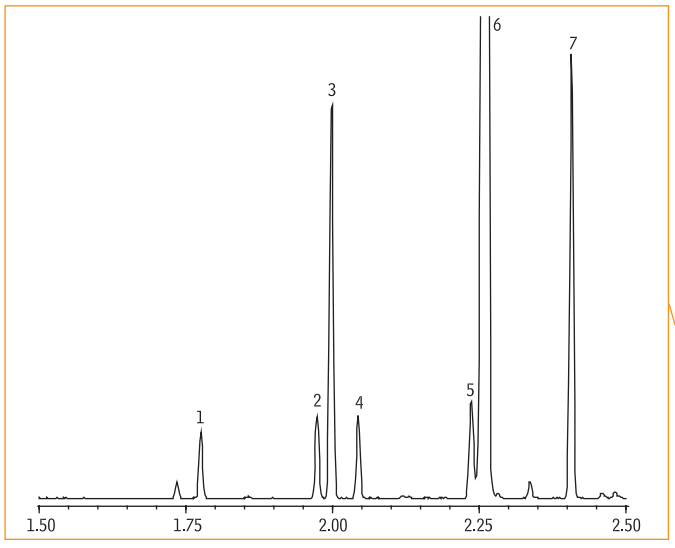


GC_FF00366

Column and conditions for all four oils analyses:

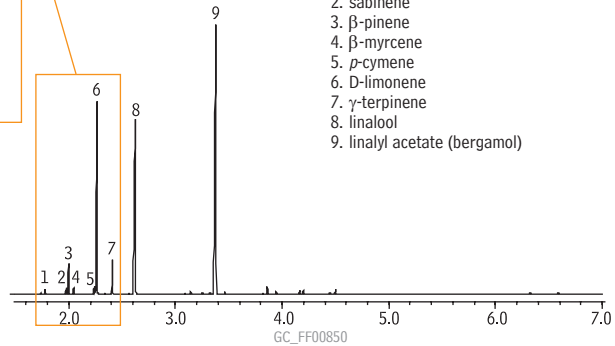
Column:	FAMEWAX, 30m, 0.25mm ID, 0.25µm (cat.# 12497)
Oven temp.:	165°C (hold 30 min.) to 220°C @ 1.5°C/min. (hold 15 min.)
Inj. temp.:	225°C
Det. temp.:	230°C
Carrier gas:	helium @ 40cm/sec.

Bergamot Oil
Fast GC/MS
Rtx®-5



Column:	Rtx®-5, 10m, 0.10mm ID, 0.10µm (cat.# 41201)
Sample:	bergamot oil, 5% in acetone, 0.2µL injection
Instrument:	Shimadzu GCMS-QP2010
Inj.:	split/splitless, 280°C
Injection mode:	split, split ratio = 800:1
Carrier gas:	helium
Flow control mode:	constant linear velocity (60.0cm/sec.)
Column inlet pressure:	421.5kPa @ 40°C
Column oven:	40°C – 30°C/min. – 300°C
Det.:	Shimadzu QP 2010 MSD
Interface:	direct, 280°C
Ionization:	electron impact
Mass range:	40-500amu

1. α-pinene
2. sabinene
3. β-pinene
4. β-myrcene
5. *p*-cymene
6. D-limonene
7. γ-terpinene
8. linalool
9. linalyl acetate (bergamol)



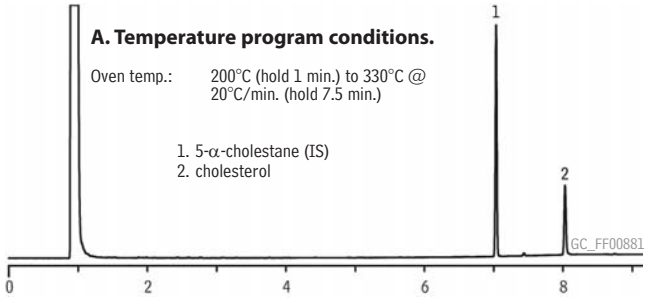
GC_FF00850

Underivatized Cholesterol
Rxi®-5ms

A. Temperature program conditions.

Oven temp.: 200°C (hold 1 min.) to 330°C @ 20°C/min. (hold 7.5 min.)

1. 5-α-cholestane (IS)
2. cholesterol

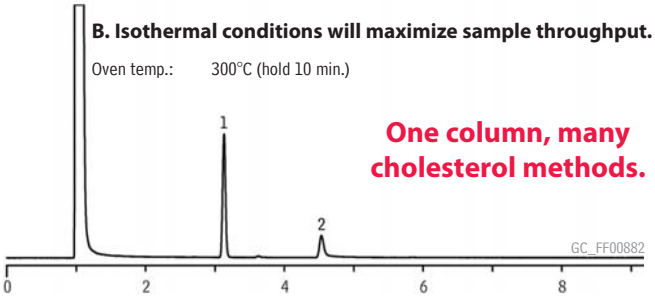


GC_FF00881

B. Isothermal conditions will maximize sample throughput.

Oven temp.: 300°C (hold 10 min.)

One column, many cholesterol methods.



GC_FF00882

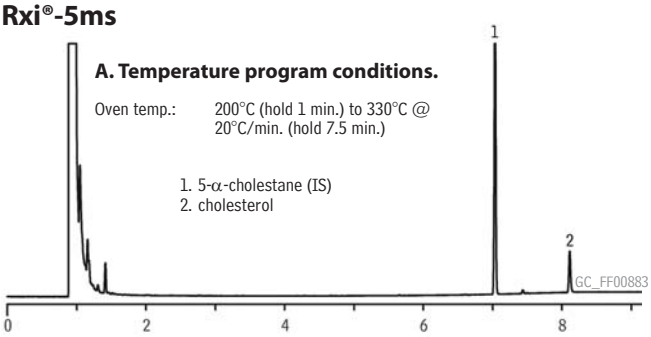
Column:	Rxi®-5ms, 15m, 0.25mm ID, 0.25µm (cat.# 13420)
Sample:	1,000µg/mL cholesterol in DMF, 1000µg/mL 5-α-cholestane in hexane; 25ng cholesterol, 150ng 5-α-cholestane on column
Inj.:	1.0µL, split (20:1), single gooseneck inlet liner w/wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant pressure (9.7psi @ 200°C)
Linear velocity:	24cm/sec.
Oven temp.:	see above
Det.:	FID @ 340°C

Derivatized Cholesterol
Rxi®-5ms

A. Temperature program conditions.

Oven temp.: 200°C (hold 1 min.) to 330°C @ 20°C/min. (hold 7.5 min.)

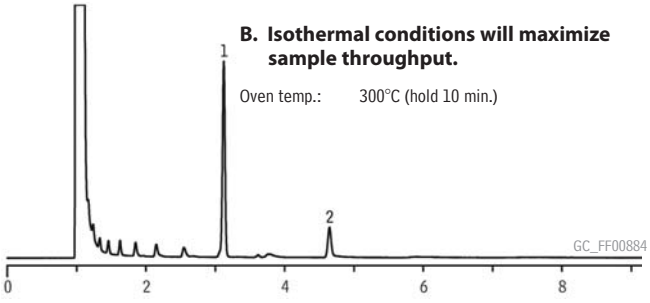
1. 5-α-cholestane (IS)
2. cholesterol



GC_FF00883

B. Isothermal conditions will maximize sample throughput.

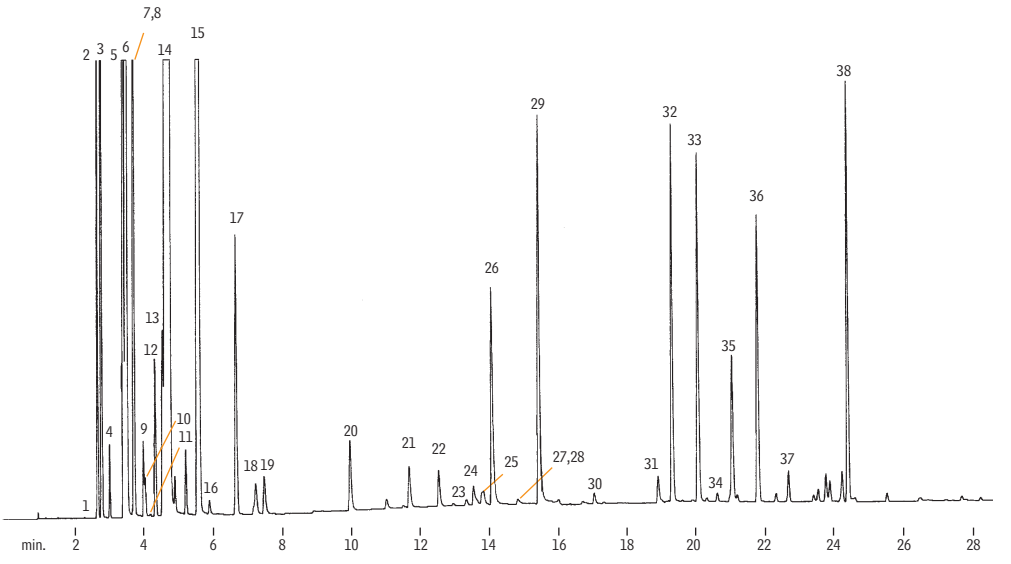
Oven temp.: 300°C (hold 10 min.)



GC_FF00884

Column:	Rxi®-5ms, 15m, 0.25mm ID, 0.25µm (cat.# 13420)
Sample:	1,000µg/mL cholesterol in hexane, 1000µg/mL 5-α-cholestane in hexane; 50ng derivatized cholesterol, 150ng 5-α-cholestane on column
Inj.:	1.0µL, split (20:1), single gooseneck inlet liner w/wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant pressure (9.7psi @ 200°C)
Linear velocity:	24cm/sec.
Oven temp.:	see above
Det.:	FID @ 340°C

Lemon Oil
Rtx®-5

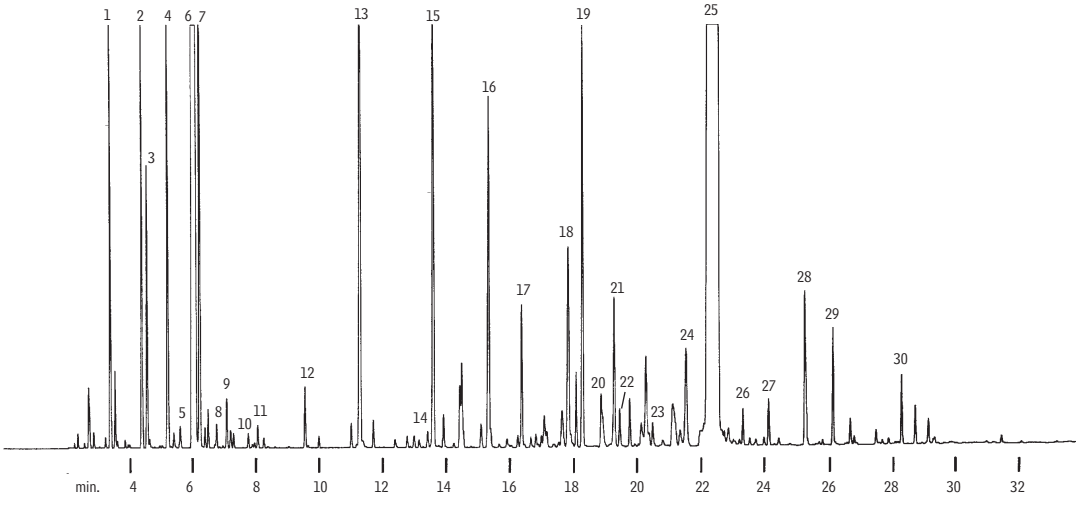


GC_FF00138

Column:	Rtx®-5, 30m, 0.32mm ID, 0.25µm (cat.# 10224)
Sample:	Wet needle split injection of a neat lemon oil
Oven temp.:	75°C (hold 8 min.) to 250°C @ 4°C/min.
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 3.2cc/min.)
FID sensitivity:	2 x 10^{-11} AFS
Split ratio:	100:1

1. heptanol
2. α-thujene
3. α-pinene
4. camphene
5. sabinene
6. β-pinene
7. 6-methyl-5-hepten-2-one
8. myrcene
9. octanal
10. α-phellandrene
11. 3-carene
12. α-terpinene
13. *p*-cymene
14. limonene
15. γ-terpinene
16. octanol
17. terpinolene
18. linalool
19. nonanal
20. citronellal
21. terpinene-4-ol
22. α-terpineol
23. decanol
24. octyl acetate
25. nerol
26. neral
27. carvone
28. geraniol
29. geranial
30. nonyl acetate
31. citronellyl acetate
32. neryl acetate
33. geranyl acetate
34. dodecanal
35. β-caryophyllene
36. *trans*-α-bergamotene
37. α-humulene
38. β-bisabolene

Spearmint Oil (Native)
Stabilwax®

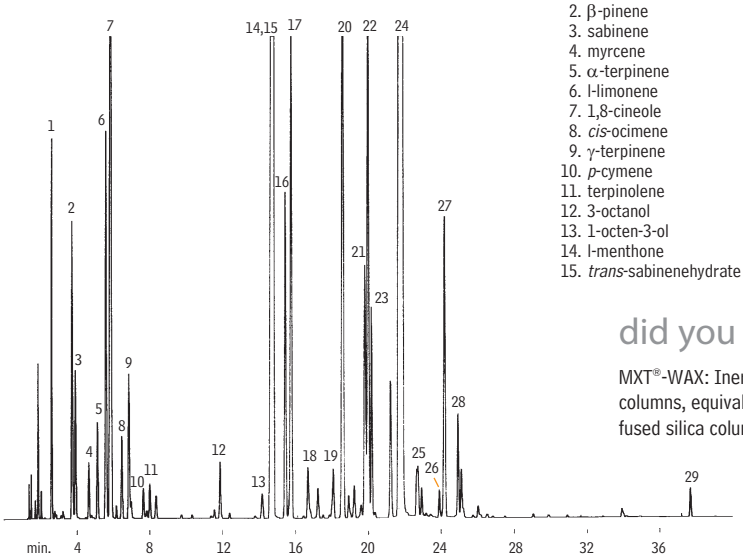


GC_FF00140

Column:	Stabilwax®, 60m, 0.25mm ID, 0.25µm (cat.# 10626)
Sample:	0.2µL split injection of a neat spearmint oil
Oven temp.:	75°C (hold 4 min.) to 200°C @ 4°C/min. (hold 10 min.)
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 160°C
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	100:1

1. α-pinene
2. β-pinene
3. sabinene
4. myrcene
5. α-terpinene
6. l-limonene
7. 1,8-cineole
8. *cis*-ocimene
9. γ-terpinene
10. *p*-cymene
11. terpinolene
12. 3-octyl acetate
13. 3-octanol
14. l-menthone
15. *trans*-sabinenehydrate
16. β-bourbonene
17. linalool
18. terpinene-4-ol
19. β-caryophyllene
20. dihydrocarvone
21. *trans*-dihydrocarvyl acetate
22. β-farnesene
23. α-terpineol
24. germacrene-Δ
25. carvone
26. *cis*-carvyl acetate
27. *trans*-carveol
28. *cis*-carveol
29. *cis*-jasmone
30. viridiflorol

Peppermint Oil
MXT®-WAX



GC_FF00141

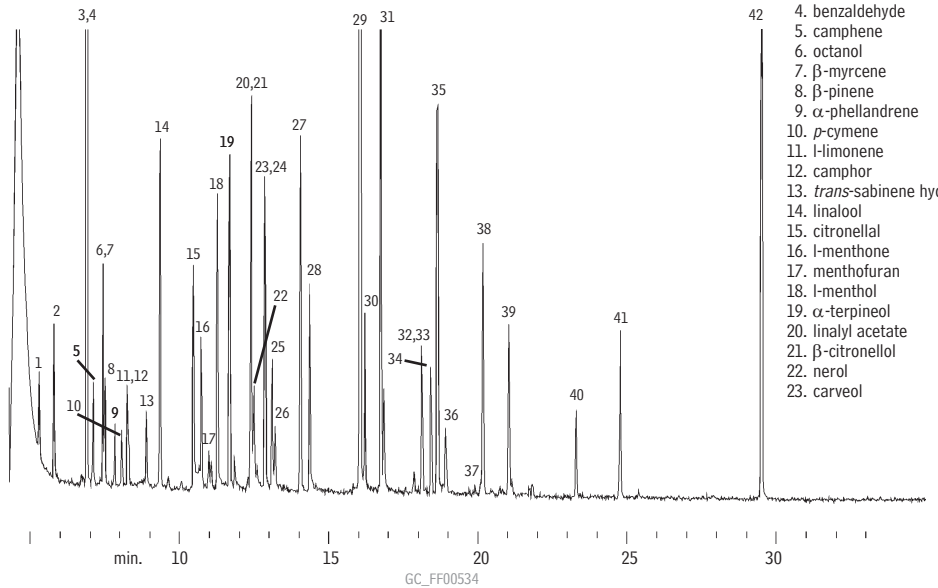
1. α-pinene
2. β-pinene
3. sabinene
4. myrcene
5. α-terpinene
6. l-limonene
7. 1,8-cineole
8. *cis*-ocimene
9. γ-terpinene
10. *p*-cymene
11. terpinolene
12. 3-octanol
13. 1-octen-3-ol
14. l-menthone
15. *trans*-sabinenehydrate
16. menthofuran
17. d-isomenthone
18. β-bourbonene
19. linalool
20. menthyl acetate
21. neo-menthol
22. β-caryophyllene
23. terpinene-4-ol
24. l-menthol
25. pulegone
26. α-terpineol
27. germacrene-Δ
28. piperitone
29. viridiflorol

did you **know**?

MXT®-WAX: Inert stainless steel columns, equivalent to Stabilwax® fused silica columns!

Column:	MXT®-WAX, 30m, 0.28mm ID, 0.50µm (cat.# 70639)
Sample:	1.0µL split injection of peppermint oil
Oven temp.:	75°C (hold 4 min.) to 240°C @ 4°C/min.
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 75°C
FID sensitivity:	16 x 10^{-11} AFS
Split ratio:	50:1

Synthetic Essential Oil Mixture
Rtx®-1



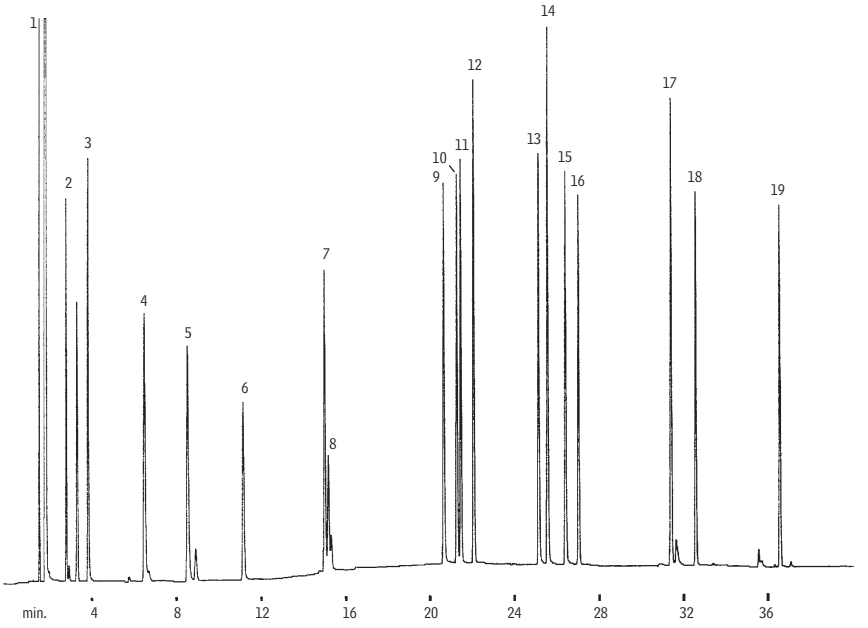
GC_FF00534

1. ethyl butyrate
2. *trans*-2-hexenol
3. α-pinene
4. benzaldehyde
5. camphene
6. octanol
7. β-myrcene
8. β-pinene
9. α-phellandrene
10. *p*-cymene
11. l-limonene
12. camphor
13. *trans*-sabinene hydrate
14. linalool
15. citronellal
16. l-menthone
17. menthofuran
18. l-menthol
19. α-terpineol
20. linalyl acetate
21. β-citronellol
22. nerol
23. carveol
24. anisaldehyde
25. carvone
26. geraniol
27. anethole
28. cinnamic alcohol
29. eugenol
30. neryl acetate
31. geranyl acetate
32. vanillin
33. coumarin
34. α-ionone
35. ethyl vanillin
36. β-caryophyllene
37. α-caryophyllene
38. β-ionone
39. valencene
40. ethyl laurate
41. amyl cinnamic aldehyde
42. nootketone

Column:	Rtx®-1, 60m, 0.25mm ID, 0.25µm (cat.# 10126)
Sample:	1.0µL split injection of 42 flavor components
Oven temp.:	100°C to 260°C @ 4°C/min. (hold 1 min.)
Inj./det. temp.:	250°C/280°C
Det. type:	MSD
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 50°C
FID sensitivity:	2 x 10^{-11} AFS
Split vent:	100cc/min.

Mushroom Aroma (Synthetic)
Rtx®-20

1. acetone
2. ethyl acetate
3. 1-butanol
4. 3-methyl-1-butanol
5. 1-pentanol
6. hexanal
7. furfural
8. amyl acetate
9. 1-octen-3-ol
10. 3-octanol
11. 3-octanone
12. benzaldehyde
13. octyl alcohol
14. benzyl alcohol
15. phenylacetaldehyde
16. nonanal
17. α-terpineol
18. 2,4-nonadienal
19. 2,4-decadienal

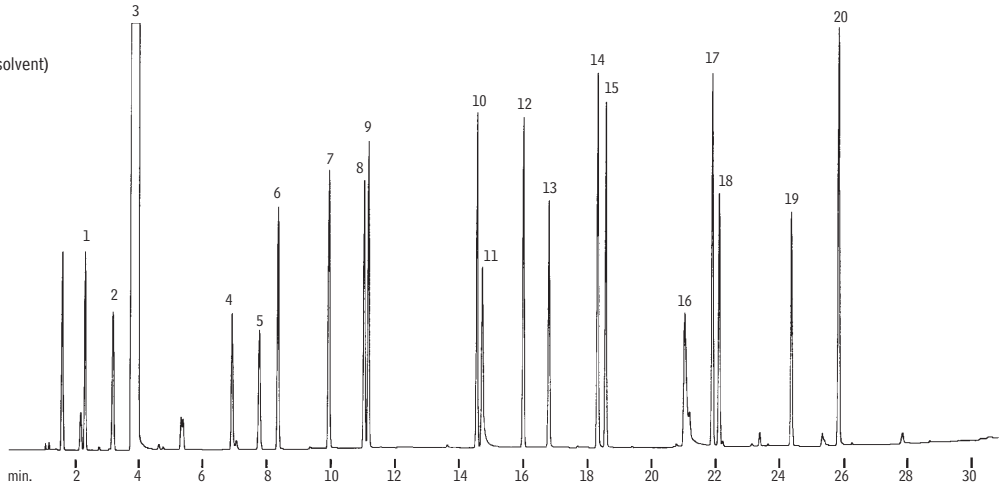


GC_FF00142

Column:	Rtx®-20, 30m, 0.32mm ID, 1.0μm (cat.# 10354)
Sample:	1.0μL split injection of a synthetic mushroom aroma
Conc.:	10ng per component
Oven temp.:	45°C (hold 8 min.) to 250°C @ 4°C/min.
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	100:1

Mushroom Aroma (Synthetic)
Stabilwax®

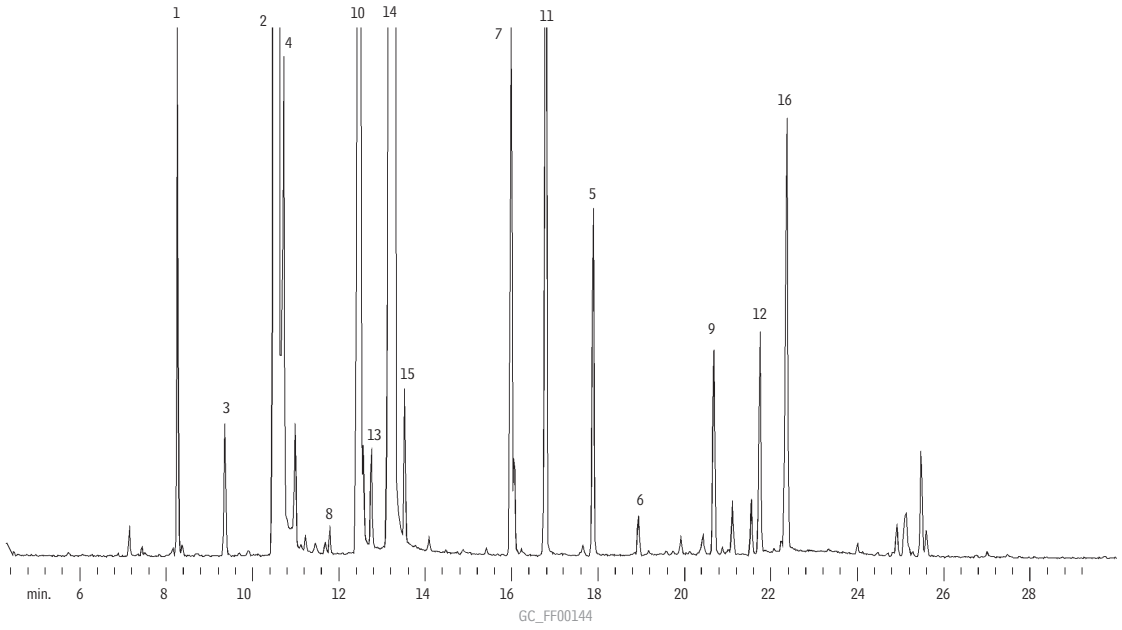
1. acetone
2. ethyl acetate
3. methylene chloride (solvent)
4. hexanal
5. amyl acetate
6. 1-butanol
7. 3-methyl-1-butanol
8. 1-pentanol
9. 3-octanone
10. 3-octanol
11. nonanal
12. 1-octen-3-ol
13. furfural
14. benzaldehyde
15. octyl alcohol
16. phenylacetaldehyde
17. α-terpineol
18. 2,4-nonadienal
19. 2,4-decadienal
20. benzyl alcohol



GC_FF00143

Column:	Stabilwax®, 30m, 0.32mm ID, 1.0μm (cat.# 10654)
Sample:	1.0μL split injection of a synthetic mushroom aroma
Conc.:	10ng per component
Oven temp.:	40°C to 220°C @ 6°C/min.
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split ratio:	100:1

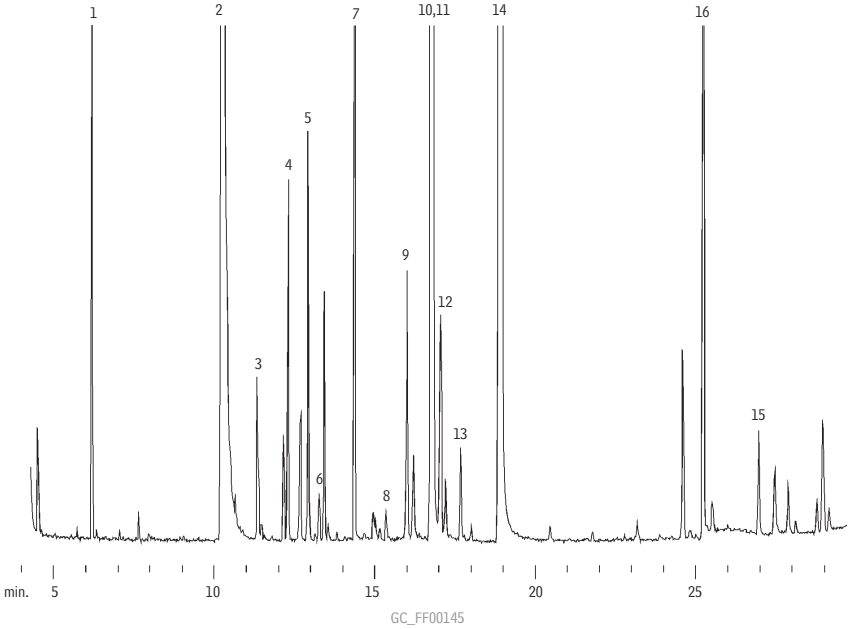
Citronella Java Oil
Rtx®-1



Column:	Rtx®-1, 60m, 0.25mm ID, 0.25µm (cat.# 10126)
Sample:	1.0µL split injection of citronella Java oil
Oven temp.:	100°C to 260°C @ 4°C/min. (hold 1 min.)
Inj./det. temp.:	250°C/280°C
Det. type:	MSD
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 50°C
Split vent:	100cc/min.

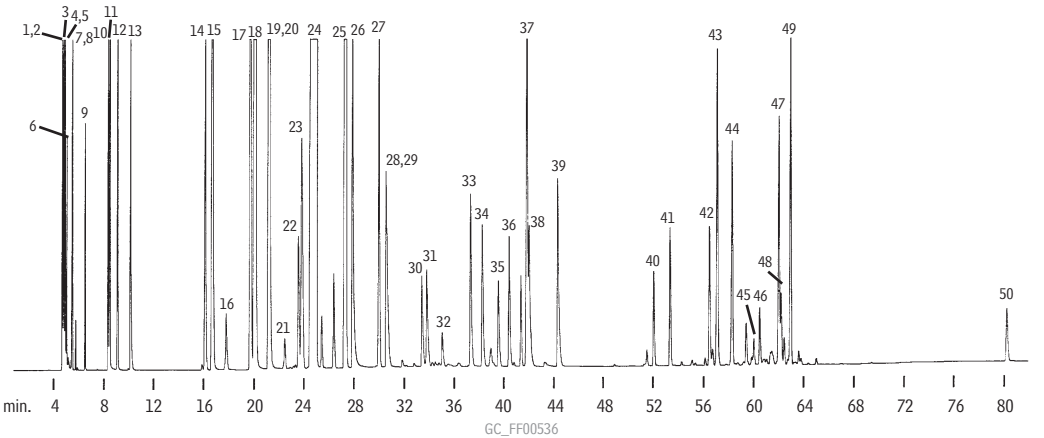
1. limonene
2. citronellal
3. linalool
4. borneol
5. γ-elemene
6. β-caryophyllene
7. neryl acetate
8. α-terpineol
9. germancrene-Δ
10. β-citronellol
11. geranyl acetate
12. δ-cadenene
13. nerol
14. geraniol
15. eugenol
16. α-bergamotene

Citronella Java Oil
Stabilwax®



Column:	Stabilwax®, 60m, 0.25mm ID, 0.25µm (cat.# 10626)
Sample:	1.0µL split injection of citronella Java oil
Oven temp.:	100°C to 260°C @ 4°C/min. (hold 1 min.)
Inj./det. temp.:	250°C/280°C
Det. type:	MSD
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 50°C
Split vent:	100cc/min.

Flavor Volatiles
Rtx®-1

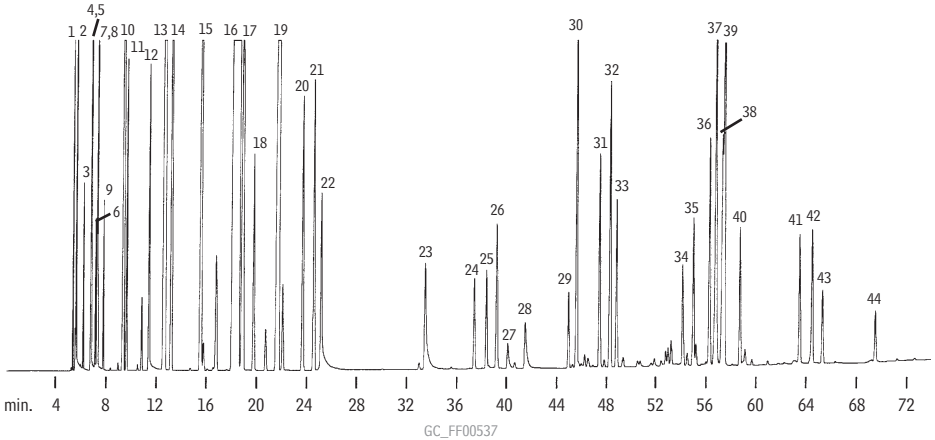


GC_FF00536

1. methanol
2. acetaldehyde
3. ethanol
4. acetone
5. isopropyl alcohol
6. methylene chloride
7. hexane
8. ethyl acetate
9. ethyl propionate
10. *n*-hexanal
11. ethyl butyrate
12. furfural
13. *trans*-2-hexenal
14. α-thujene
15. α-pinene
16. camphene
17. sabinene
18. β-pinene
19. octanal
20. myrcene
21. α-phellandrene
22. α-terpinene
23. *p*-cymene
24. δ-limonene
25. γ-terpinene
26. octanol
27. terpinolene
28. nonanal
29. linalool
30. *cis*-limonene monoxide
31. *trans*-limonene monoxide
32. citronellal
33. terpinene-4-ol
34. α-terpineol
35. decanal
36. d & l carveol
37. neral
38. carvone
39. geranial
40. neryl acetate
41. geranyl acetate
42. α-ionone
43. β-caryophyllene
44. *trans*-α-bergamotene
45. BHA
46. β-ionone
47. valencene
48. γ-elemene
49. β-bisabolene
50. nootketone

Column:	Rtx®-1, 60m, 0.53mm ID, 0.50μm (cat.# 10143)
Sample:	0.8μL split injection of a flavor volatiles test mix
Oven temp.:	70° (hold 15 min.) to 190°C @ 2°C/min. (hold 5 min.)
Inj./det. temp.:	220°C/260°C
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 70°C
FID sensitivity:	64 x 10^{-11} AFS
Split ratio:	20:1

Flavor Volatiles
Stabilwax®

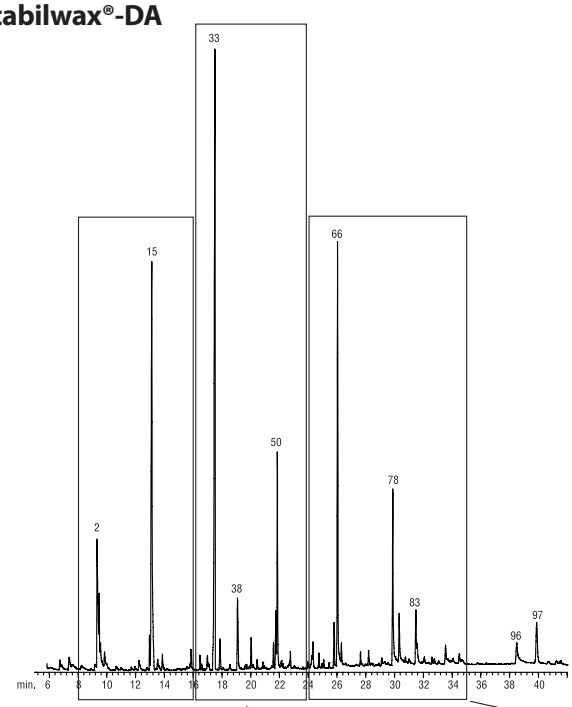


GC_FF00537

1. hexane
2. acetaldehyde
3. acetone
4. methanol
5. ethyl acetate
6. isopropyl alcohol
7. ethanol
8. methylene chloride
9. ethyl propionate
10. α-pinene
11. ethylbutyrate
12. *n*-hexanal
13. β-pinene
14. sabinene
15. myrcene
16. δ-limonene
17. 1,8-cineole
18. *trans*-2-hexenal
19. γ-terpinene
20. *p*-cymene
21. terpinolene
22. octanal
23. nonanal
24. *cis*-limonene monoxide
25. *trans*-limonene
26. furfural
27. citronellal
28. decanal
29. linalool
30. octanol
31. *trans*-α-bergamotene
32. β-caryophyllene
33. terpinene-4-ol
34. neral
35. α-terpineol
36. neryl acetate
37. valencene
38. geranial
39. carvone
40. geranyl acetate
41. d/l carveol
42. α-ionone
43. d/l carveol
44. β-ionone

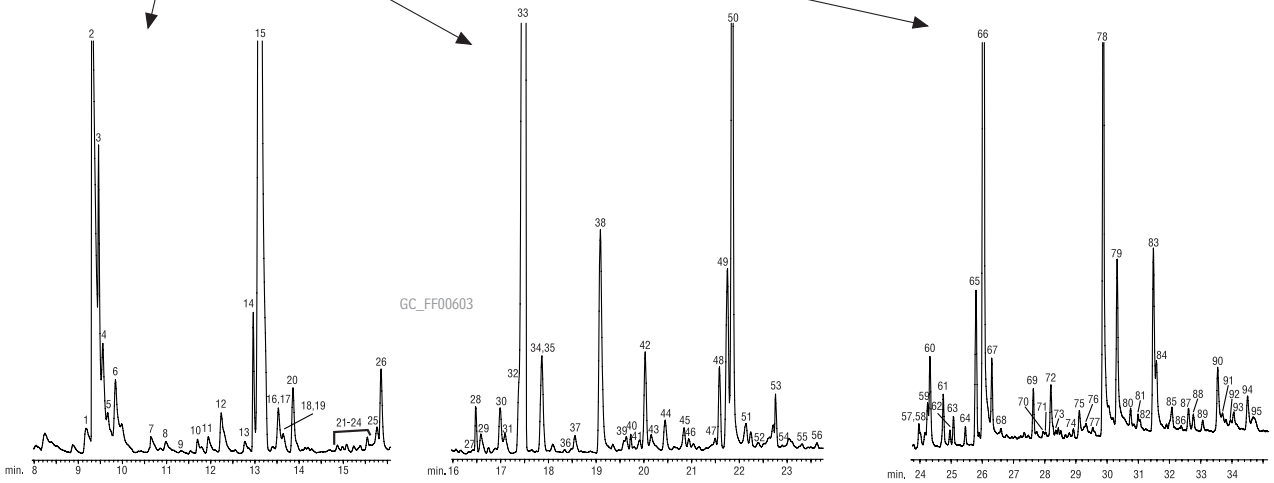
Column:	Stabilwax®, 60m, 053mm ID, 0.50μm (cat.# 10643)
Sample:	0.8μL split injection of a flavor volatiles test mix
Oven temp.:	70°C (hold 15 min.) to 190°C @ 2°C/min. (hold 5 min.)
Inj./det. temp.:	220°C/260°C
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 70°C
FID sensitivity:	64 x 10^{-11} AFS
Split ratio:	20:1

Malt Whiskey
Stabilwax®-DA



Column:	Stabilwax®-DA, 30m, 0.18mm ID, 0.18μm (cat.# 550752)
Inj.:	10μL large volume injection (splitless), at 10μL/min.
Std. conc.:	neat
Gerstel CIS Injector:	35°C (hold 2 min.), to 300°C @ 10°C/sec. (hold 5 min.)
Helium vent flow:	600mL/min. with 1.8 min. vent end time
Carrier gas:	helium
Linear velocity:	45cm/sec.
Oven temp.:	60°C (hold 2 min.) to 100°C @ 20°C/min., to 240°C @ 5°C/min. (hold 10 min.)
Det.:	MSD
Transfer line temp.:	240°C
Quadrupole temp.:	150°C
MS source temp.:	230°C
Scan range:	30–400amu
Ionization:	70eV
Mode:	EI

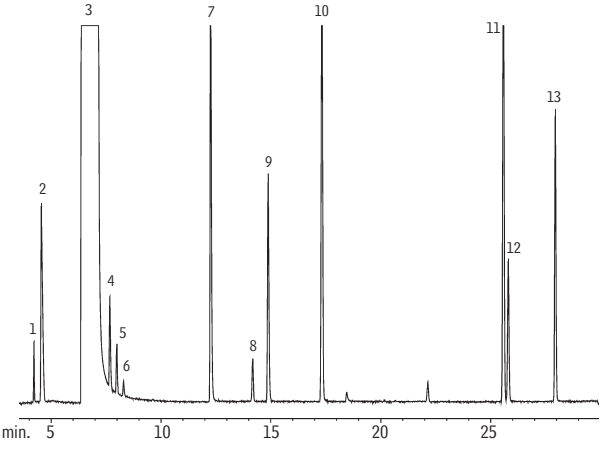
Chromatogram courtesy of Kevin MacNamara, Ph.D., Irish Distilleries, Ltd.



1. ethyl octanoate
2. acetic acid
3. siloxane
4. 1-hydroxy-2,3-butadione
5. 1-hydroxy-2-propanone acetate
6. furfural
7. formic acid
8. propionic acid
9. isobutyric acid
10. dimethyl sulfoxide
11. 5-methyl furfural
12. methyl decanoate + unknown
13. butyric acid
14. siloxane
15. ethyl decanoate
16. furfuryl alcohol
17. isoamyl octanoate
18. isovaleric acid
19. 2-methylbutyric acid
20. diethyl succinate
21. 3-methyl-2(5H)-furanone (possible)
22. valeric acid
23. ethyl undecanoate
24. isobutyl decanoate
25. 2(5H)-furanone
26. unknown
27. di(ethyleneglycol) butyl ether
28. siloxane
29. methyl dodecanoate
30. 2-phenylethyl acetate
31. methylcyclopentenolone
32. hexanoic acid
33. ethyl dodecanoate
34. isoamyl decanoate
35. guaiacol
36. dodecyl acetate (possible)
37. whiskey lactone (1)
38. 2-phenylethanol
39. heptanoic acid
40. siloxane
41. dimethoxybenzene or 4-methyl-guaiacol
42. whiskey lactone (2)
43. dodecanol
44. unknown
45. phenol
46. methyl tetradecanoate
47. nerolidol
48. diethyl malate
49. ethyl tetradecanoate
50. octanoic acid
51. unknown
52. *p*-cresol
53. siloxane
54. diethyl octanedioate
55. monomethyl succinate (possible)
56. 3,5-dimethyl-2,4(5H)furandione
57. nonanoic acid
58. diethyl 2-hydroxyglutarate
59. unknown
60. tetradecanol
61. 4-vinylguaiacol
62. diethyl nonanedioate
63. methyl hexadecanoate
64. ethyl γ-lactone 2-hydroxyglutarate
65. ethyl hexadecanoate
66. decanoic acid
67. ethyl 9-hexadecanoate
68. triacosan
69. unknown
70. phthalide
71. diethyl phthalate
72. hexadecanol
73. 4-hydroxycinnamic acid (decomp.)
74. methyl stearate
75. benzoic acid
76. methyl 8-octadecenoate
77. ethyl stearate
78. dodecanoic acid
79. hydroxymethylfurfural
80. ethyl linoleate
81. 4-allyl-2,6-dimethoxyphenol
82. diisobutyl phthalate
83. vanillin
84. sinapic acid (decomp.)
85. 2-phenylethyl decanoate +2 unknowns
86. 4-propenyl-2,6-dimethoxyphenol
87. ethyl vanillate
88. acetovanillone
89. vanillin methyl ketone
90. tetradecanoic acid
91. ethyl homovanillate
92. propiovanillone
93. fatty acid ester
94. (similar to 4-allyl-2,6-dimethoxyphenol)
95. unknown
96. hexadecanoic acid
97. syringealdehyde

Rum
Rtx®-1301

1. acetaldehyde
2. methanol
3. ethanol
4. acetone
5. ethyl formate
6. isopropanol
7. *n*-propanol
8. ethyl acetate
9. *sec*-butanol
10. isobutanol
11. isoamyl alcohol
12. active amyl alcohol
13. *n*-amyl alcohol



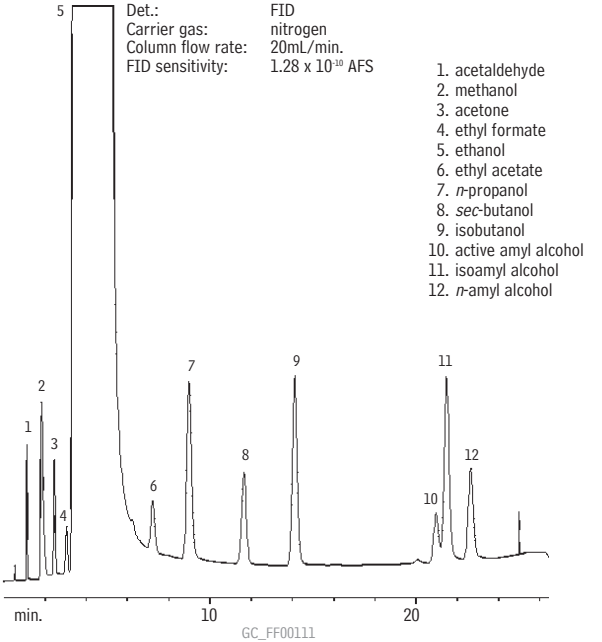
GC_FF00110

Column:	Rtx®-1301, 60m, 0.25mm ID, 1.4µm (cat.# 16016)
Inj.:	1.0µL split injection using a Cyclosplitter® inlet liner (cat.# 20706)
Conc.:	neat
Oven temp.:	35°C (hold 5 min.) to 100°C @ 1°C/min.
Inj./det. temp.:	150°C/200°C
Carrier gas:	hydrogen @ 40cm/sec.
Split ratio:	100:1

Rum
CarboBlack B

Column:	5% Carbowax® 20M 80/120 CarboBlack B, 2m, 1/8" OD, 2mm ID SilcoSmooth™ tubing (cat.# 80105)
Inj.:	0.5µL on-column injection, neat
Oven temp.:	65°C (hold 5 min.) to 150°C @ 4°C/min.
Inj./det. temp.:	200°C/250°C
Det.:	FID
Carrier gas:	nitrogen
Column flow rate:	20mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS

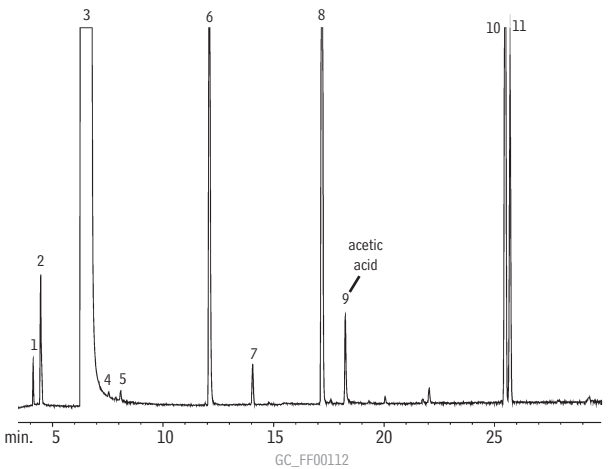
1. acetaldehyde
2. methanol
3. acetone
4. ethyl formate
5. ethanol
6. ethyl acetate
7. *n*-propanol
8. *sec*-butanol
9. isobutanol
10. active amyl alcohol
11. isoamyl alcohol
12. *n*-amyl alcohol



GC_FF00111

Scotch
Rtx®-1301

1. acetaldehyde
2. methanol
3. ethanol
4. acetone
5. isopropanol
6. *n*-propanol
7. ethyl acetate
8. isobutanol
9. acetic acid
10. isoamyl alcohol
11. active amyl alcohol

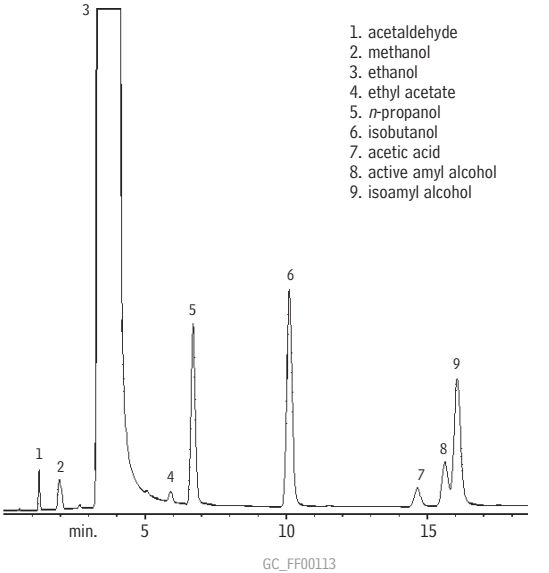


GC_FF00112

Column:	Rtx®-1301, 60m, 0.25mm ID, 1.4µm (cat.# 16016)
Inj.:	1.0µL split injection using a Cyclosplitter® inlet liner (cat.# 20706)
Conc.:	neat
Oven temp.:	35°C (hold 5 min.) to 100°C @ 1°C/min.
Inj./det. temp.:	150°C/200°C
Carrier gas:	hydrogen @ 40cm/sec.
Split ratio:	100:1

Scotch
CarboBlack B

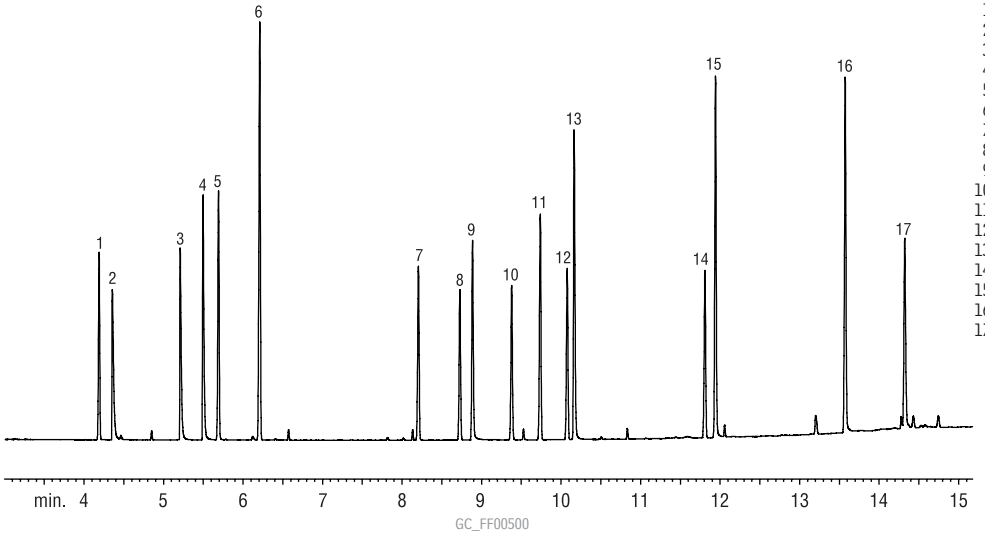
1. acetaldehyde
2. methanol
3. ethanol
4. ethyl acetate
5. *n*-propanol
6. isobutanol
7. acetic acid
8. active amyl alcohol
9. isoamyl alcohol



GC_FF00113

Column:	5% Carbowax® 20M 80/120 CarboBlack B, 2m, 1/8" OD, 2mm ID SilcoSmooth™ tubing (cat.# 80105)
Inj.:	0.5µL on-column injection, neat
Oven temp.:	70°C to 150°C @ 4°C/min.
Inj./det. temp.:	200°C/250°C
Det.:	FID
Carrier gas:	nitrogen
Column flow rate:	20mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS

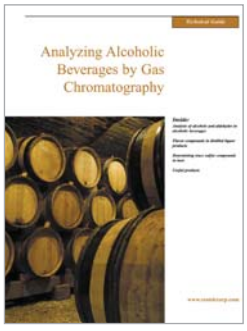
Alcoholic Beverage Standard: Acids and Esters
Stabilwax®-DA



GC_FF00500

Peak List	Conc. (ppm)
1. ethyl octanoate	100
2. acetic acid	100
3. propionic acid	100
4. isobutyric acid	100
5. 3-decanol	50
6. ethyl decanoate	50
7. ethyl laurate	50
8. *cis*-lactone	100
9. 2-phenylethanol	50
10. *trans*-lactone	100
11. methyl myristate	50
12. ethyl myristate	50
13. octanoic acid	100
14. ethyl palmitate	50
15. decanoic acid	100
16. dodecanoic acid	100
17. vanillin	100

Column:	Stabilwax®-DA, 30m, 0.18mm ID, 0.18µm (cat.# 550752)
Inj.:	1µL splitless (hold 0.5 min.) at conc. shown in peak list, in ethyl acetate, 4mm ID splitless liner w/wool (cat.# 20814-202.1)
Inj. temp.:	240°C
Carrier gas:	hydrogen
Make-up gas:	nitrogen
Linear velocity:	28psi @ 240°C
Oven temp.:	70°C to 240°C at 12°C/min. (hold 3 min.)
Det.:	FID



free literature

Analyzing Alcoholic Beverages by Gas Chromatography

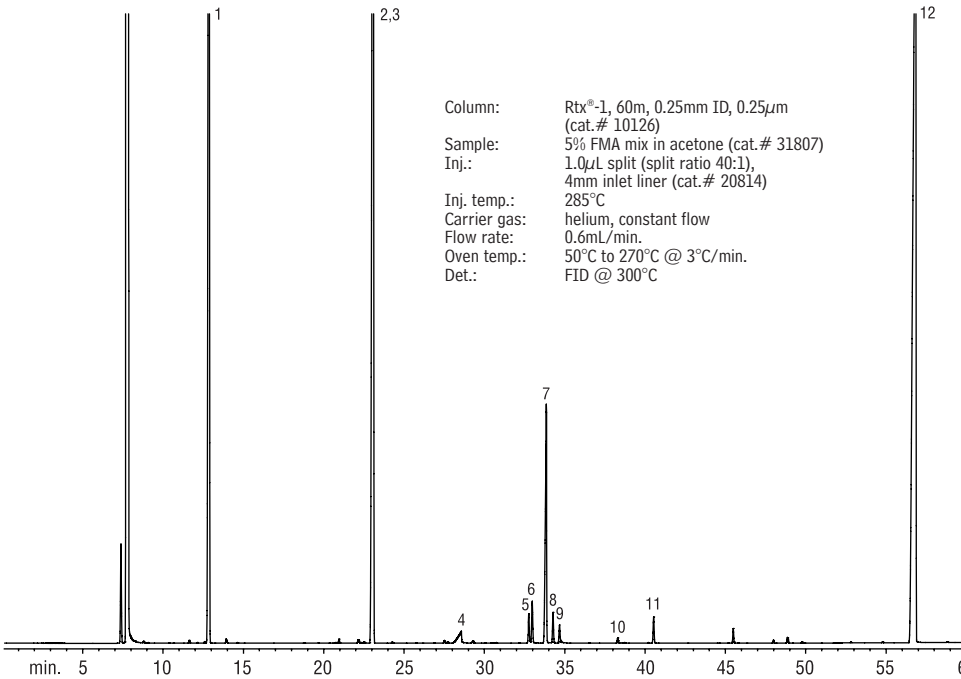
Selectivity, sensitivity, and minimal sample preparation make GC a powerful tool for monitoring alcoholic beverage composition

Volatile component profiles of alcoholic beverages reveal a wide range of compounds: acids, alcohols, aldehydes, and others. This 16-page guide describes packed column GC and capillary GC approaches to monitoring these complex mixtures of analytes. A separate section is devoted to detailed information about quantifying trace sulfur compounds in beer.

Technical Guide
lit. cat.# 59462

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5% Fragrance Materials Association Mix
Rtx®-1



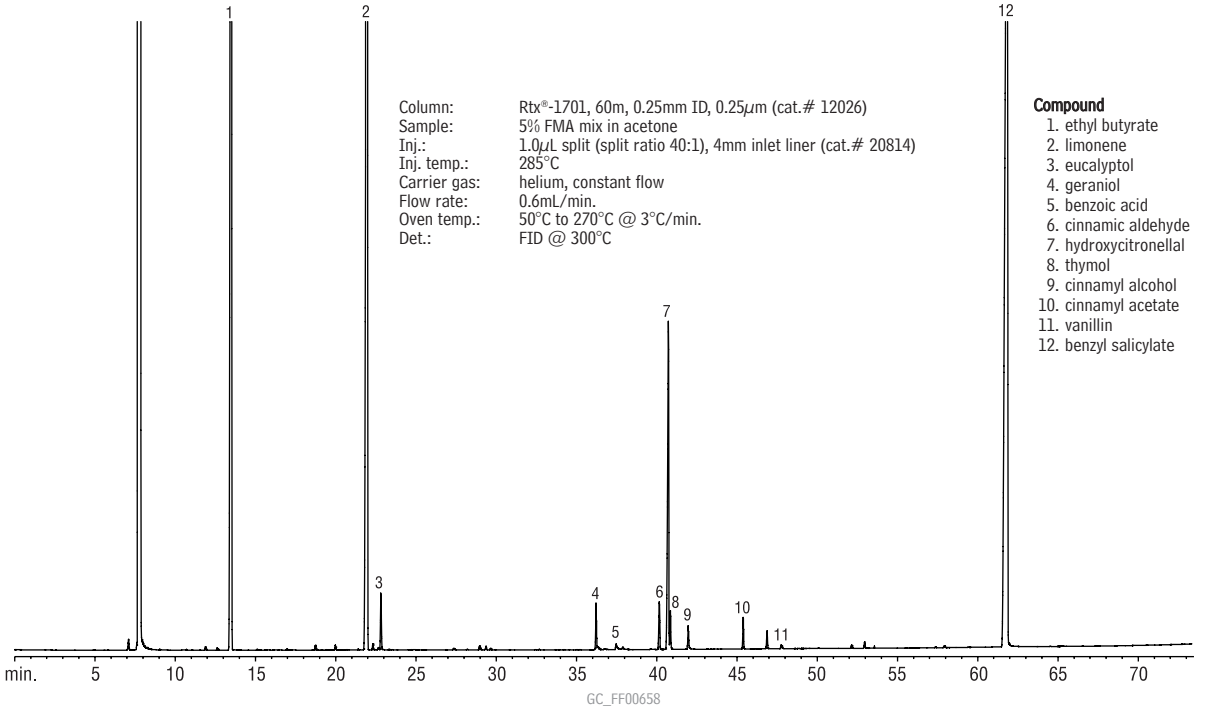
GC_FF00657

Column:	Rtx®-1, 60m, 0.25mm ID, 0.25µm (cat.# 10126)
Sample:	5% FMA mix in acetone (cat.# 31807)
Inj.:	1.0µL split (split ratio 40:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	285°C
Carrier gas:	helium, constant flow
Flow rate:	0.6mL/min.
Oven temp.:	50°C to 270°C @ 3°C/min.
Det.:	FID @ 300°C

FMA Reference Mix
cat.# 31807

Compound	% in the FMA mix
1. ethyl butyrate	35.7
2. limonene	20.0
3. eucalyptol	0.5
4. benzoic acid	1.0
5. cinnamic aldehyde	0.5
6. geraniol	0.6
7. hydroxycitronellal	5.0
8. thymol	0.3
9. cinnamyl alcohol	0.3
10. vanillin	0.1
11. cinnamyl acetate	0.3
12. benzyl salicylate	35.7

5% Fragrance Materials Association Mix
Rtx®-1701



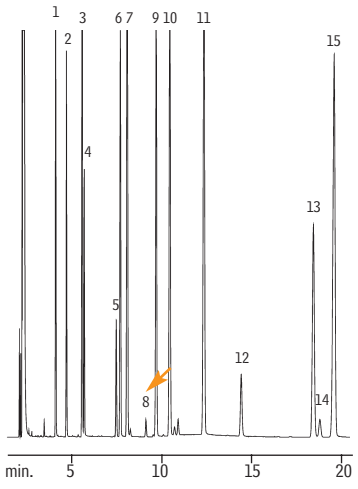
GC_FF00658

Column:	Rtx®-1701, 60m, 0.25mm ID, 0.25µm (cat.# 12026)
Sample:	5% FMA mix in acetone
Inj.:	1.0µL split (split ratio 40:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	285°C
Carrier gas:	helium, constant flow
Flow rate:	0.6mL/min.
Oven temp.:	50°C to 270°C @ 3°C/min.
Det.:	FID @ 300°C

Compound	% in FMA Mix
1. ethyl butyrate	35.7
2. limonene	20.0
3. eucalyptol	0.5
4. geraniol	0.6
5. benzoic acid	1.0
6. cinnamic aldehyde	0.5
7. hydroxycitronellal	5.0
8. thymol	0.3
9. cinnamyl alcohol	0.3
10. cinnamyl acetate	0.3
11. vanillin	0.1
12. benzyl salicylate	35.7

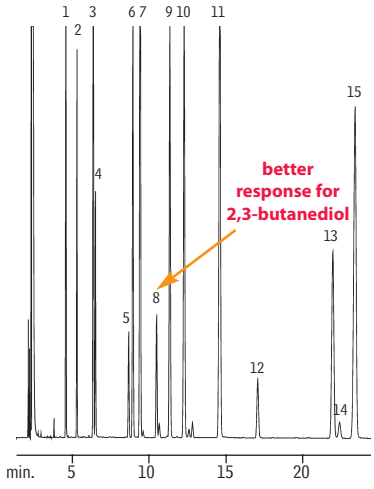
Flavor & Fragrance Compounds
Rt®-CW20M F&F

Carbowax®



1. methyl heptanoate
2. hexanol
3. methyl octanoate
4. nonanal
5. menthone
6. citronellal
7. methyl nonanoate
8. 2,3-butanediol
9. linalool
10. linalyl acetate
11. methyl decanoate
12. menthol
13. α-terpineol
14. γ-terpineol
15. methyl undecanoate

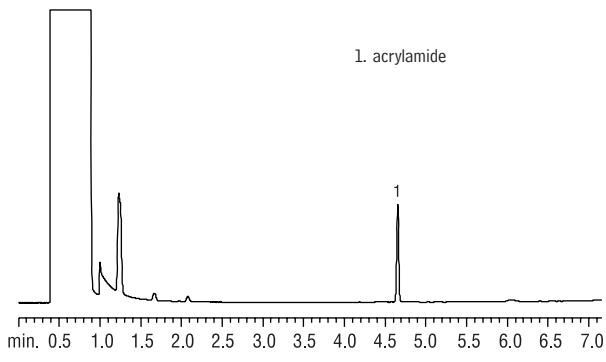
Rt®-CW20M F&F



GC_FF00433

Columns:	traditional Carbowax® 20M or Rt®-CW20M F&F, 50m, 0.32mm ID, 0.33μm, (cat.# 12539)
Inj.:	on-column injection of 5ng to 150ng each compound in methylene chloride, split 10:1
Carrier gas:	hydrogen, 40cm/sec.
Inj./det. temp.:	220°C
Oven temp.:	110°C

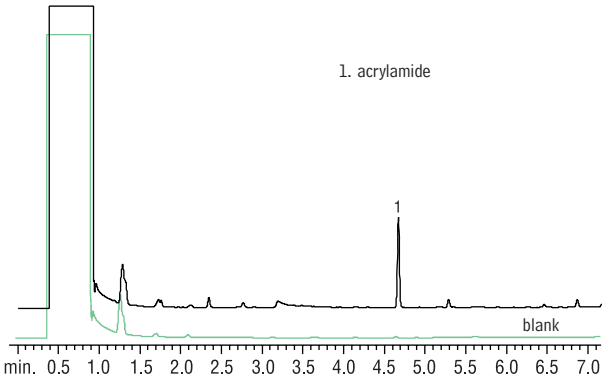
Acrylamide (Reference Standard)
Stabilwax®



GC_FF00642

Column:	Stabilwax®, 15m, 0.53mm ID, 0.50μm (cat.# 10637)
Sample:	25μg/mL acrylamide standard in water
Inj.:	1.0μL, 0.5 min hold
Liner:	2mm splitless with wool (cat.# 20830)
Inj. temp.:	260°C
Carrier gas:	helium, constant pressure
Linear velocity:	62cm/sec. @ 100°C
Oven temp.:	100°C (hold 0.5 min.) to 200°C @ 15°C/min.
Det.:	FID @ 260°C

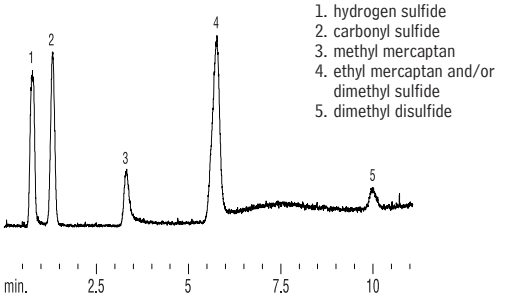
Acrylamide (Potato Chip Extract)
Stabilwax®



GC_FF00643

Column:	Stabilwax®, 15m, 0.53mm ID, 0.50μm (cat.# 10637)
Sample:	1g of potato chips spiked with 100μg acrylamide
Inj.:	1.0μL, 0.5 min. hold
Liner:	2mm splitless with wool (cat.# 20830)
Inj. temp.:	260°C
Carrier gas:	helium, constant pressure
Linear velocity:	62cm/sec. @ 100°C
Oven temp.:	100°C (hold 0.5 min.) to 200°C @ 15°C/min.
Det.:	FID @ 260°C

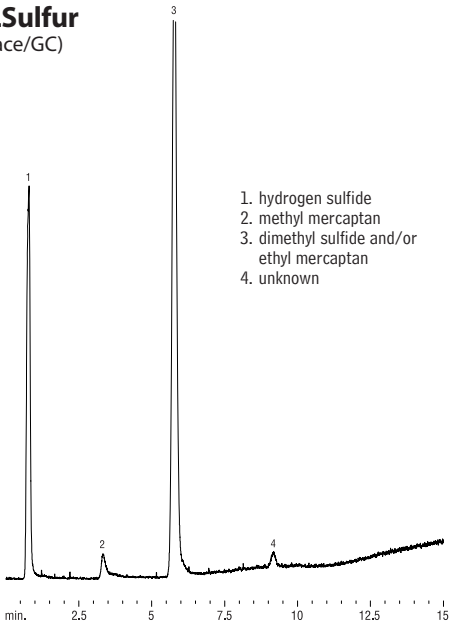
Sulfur Compounds in Beverage Grade CO_2
Rt®-XLSulfur



GC_FF00491

Column:	Rt®-XLSulfur, 100/120 mesh, 1m, 0.75mm ID Sulfinert® tubing (cat.# 19806)
Conc.:	sulfur standard @ 20ppb each in CO_2
Inj.:	1cc sample loop, 6-port Valco® valve
Carrier gas:	helium
Flow rate:	10mL/min. @ ambient temp.
Oven temp.:	60°C to 260°C @ 15°C/min. (hold 5 min.)
Det. sensitivity:	SCD, attn. x 1
Det. temp.:	800°C

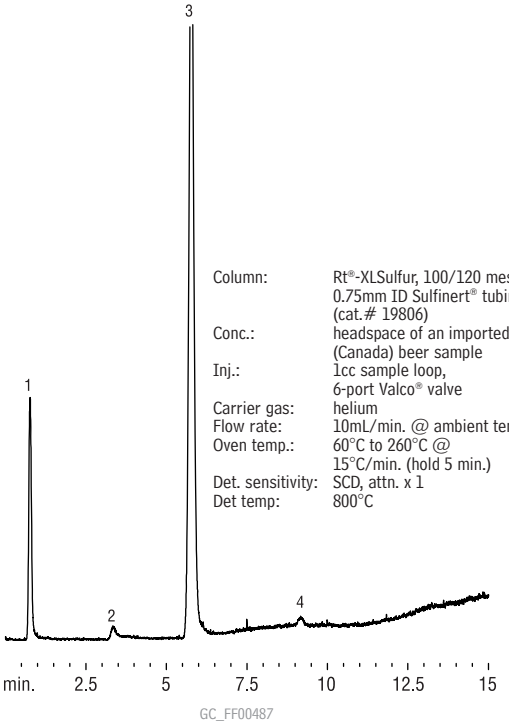
Sulfur Compounds in Beer
Rt®-XLSulfur
(Headspace/GC)



GC_FF00494

Column:	Rt®-XLSulfur, 100/120 mesh, 1m, 0.75mm ID Sulfinert® tubing (cat.# 19806)
Conc.:	headspace of a domestic (US) beer sample
Inj.:	1cc sample loop, 6-port Valco® valve
Carrier gas:	helium
Flow rate:	10mL/min. @ ambient temp.
Oven temp.:	60°C to 260°C @ 15°C/min. (hold 5 min.)
Det. sensitivity:	SCD, attn. x 1
Det. temp.:	800°C

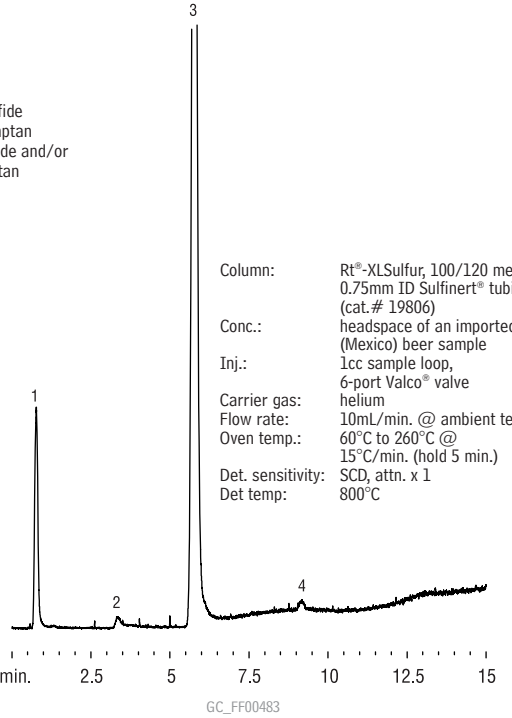
Sulfur Compounds in Beer
Rt®-XLSulfur
(Headspace/GC)



GC_FF00487

Column:	Rt®-XLSulfur, 100/120 mesh, 1m, 0.75mm ID Sulfinert® tubing (cat.# 19806)
Conc.:	headspace of an imported (Canada) beer sample
Inj.:	1cc sample loop, 6-port Valco® valve
Carrier gas:	helium
Flow rate:	10mL/min. @ ambient temp.
Oven temp.:	60°C to 260°C @ 15°C/min. (hold 5 min.)
Det. sensitivity:	SCD, attn. x 1
Det temp:	800°C

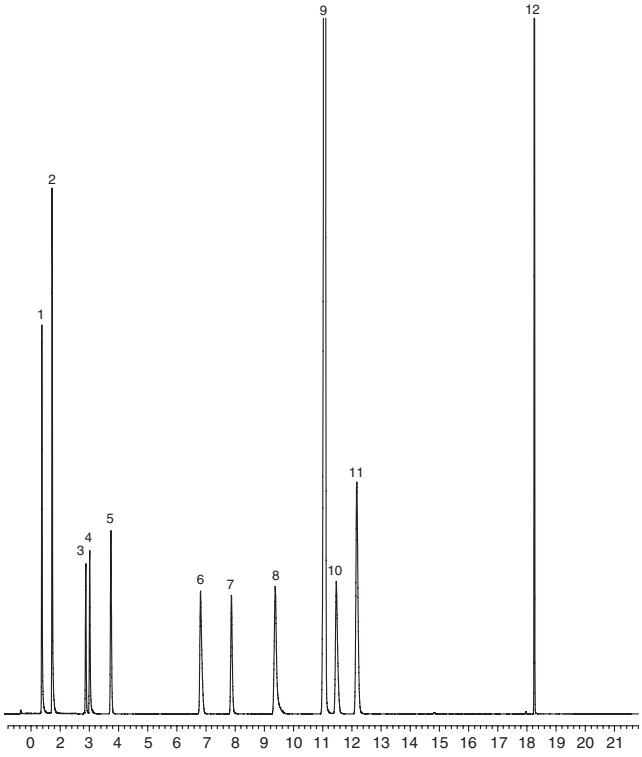
Sulfur Compounds in Beer
Rt®-XLSulfur
(Headspace/GC)



GC_FF00483

Column:	Rt®-XLSulfur, 100/120 mesh, 1m, 0.75mm ID Sulfinert® tubing (cat.# 19806)
Conc.:	headspace of an imported (Mexico) beer sample
Inj.:	1cc sample loop, 6-port Valco® valve
Carrier gas:	helium
Flow rate:	10mL/min. @ ambient temp.
Oven temp.:	60°C to 260°C @ 15°C/min. (hold 5 min.)
Det. sensitivity:	SCD, attn. x 1
Det temp:	800°C

Food Packaging Volatiles
Rtx®-5MS



GC_FF00457

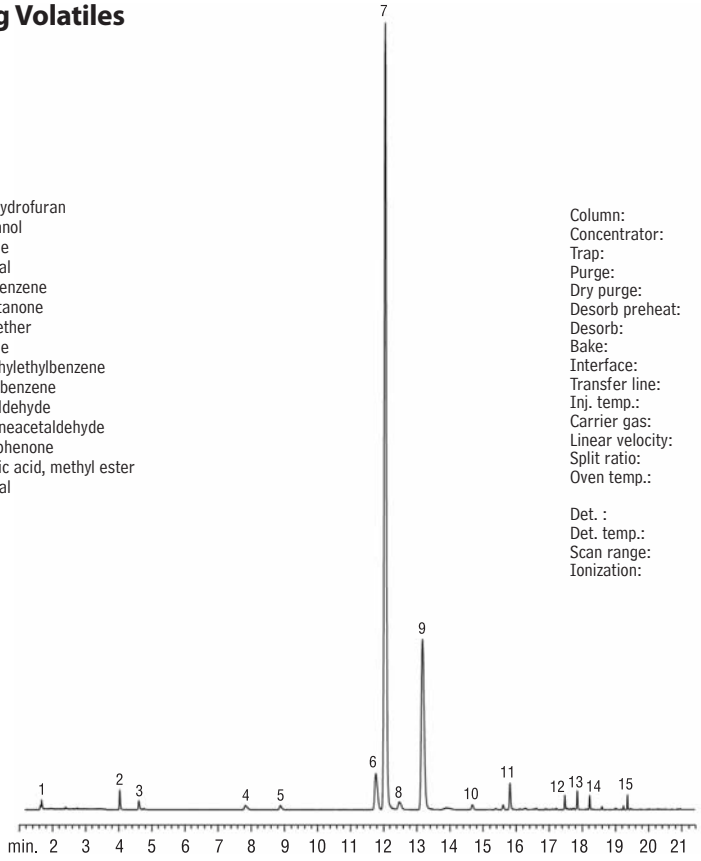
Volatiles Standard

1. isopropanol
2. methylene chloride
3. 2-methyl-1-propanol
4. tetrahydrofuran
5. benzene
6. toluene
7. hexanal
8. furfural
9. 4-heptanone (IS)
10. butyl ether
11. styrene
12. dodecane

Column:	Rtx®-5MS, 30m, 0.25mm ID, 1µm (cat.# 12653)
Concentrator:	Tekmar LSC-3100 purge & trap
Trap:	Vocarb 3000, type K
Purge:	10 min. @ 40mL/min. @ 60°C
Dry purge:	3 min. @ 40mL/min.
Desorb preheat:	220°C
Desorb:	245°C, 2 min., 40mL/min.
Bake:	230°C, 6 min.
Interface:	1:20 split at injection port with 1mm ID liner
Transfer line:	0.53mm ID Silcosteel® MXT® tubing (cat.# 20591)
Oven temp.:	50°C to 92°C @ 3°C/min., to 220°C @ 20°C/min., hold 1 min.
Inj. temp.:	250°C
Carrier gas:	helium
Linear velocity:	36cm/sec. (1mL/min.)
Split ratio:	20:1
Det.:	MSD
Det. temp.:	280°C
Scan range:	35–260amu
Ionization:	EI @ 70 eV

Food Packaging Volatiles
Rtx®-5MS

1. tetrahydrofuran
2. 1-butanol
3. toluene
4. hexanal
5. ethylbenzene
6. 4-heptanone
7. butyl ether
8. styrene
9. 1-methylethylbenzene
10. propylbenzene
11. benzaldehyde
12. benzeneacetaldehyde
13. acetophenone
14. benzoic acid, methyl ester
15. decanal

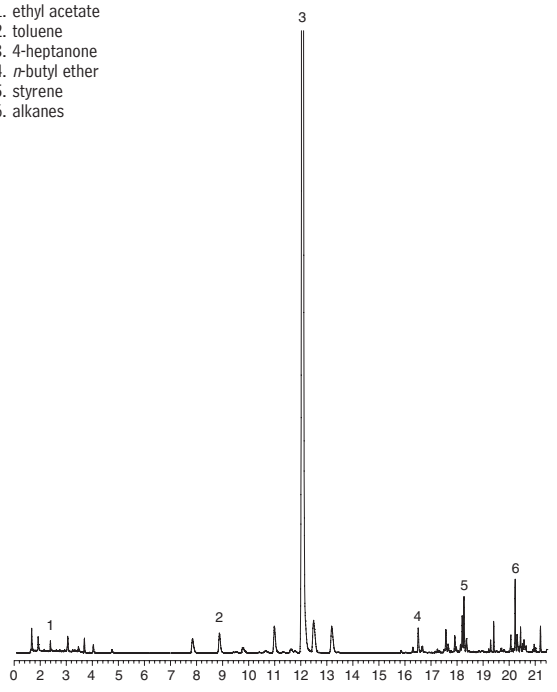


GC_FF00459

Column:	Rtx®-5MS, 30m, 0.25mm ID, 1µm (cat.# 12653)
Concentrator:	Tekmar LSC-3100 purge & trap
Trap:	Vocarb 3000, type K
Purge:	10 min. @ 40mL/min. @ 60°C
Dry purge:	3 min. @ 40mL/min.
Desorb preheat:	220°C
Desorb:	245°C, 2 min., 40mL/min.
Bake:	230°C, 6 min.
Interface:	1:20 split at injection with 1mm ID liner
Transfer line:	0.53mm ID Silcosteel® MXT® tubing (cat.# 20591)
Inj. temp.:	250°C
Carrier gas:	helium
Linear velocity:	36cm/sec. (1mL/min.)
Split ratio:	20:1
Oven temp.:	50°C to 92°C @ 3°C/min., to 220°C @ 20°C/min, hold for 1 min.
Det. :	MSD (Agilent 5973)
Det. temp.:	280°C
Scan range:	35-260amu
Ionization:	EI @ 70eV

Food Packaging Volatiles by Purge & Trap GC/MS
Rtx®-5MS
(Purge & Trap GC/MS)

1. ethyl acetate
2. toluene
3. 4-heptanone
4. *n*-butyl ether
5. styrene
6. alkanes



GC_FF00462

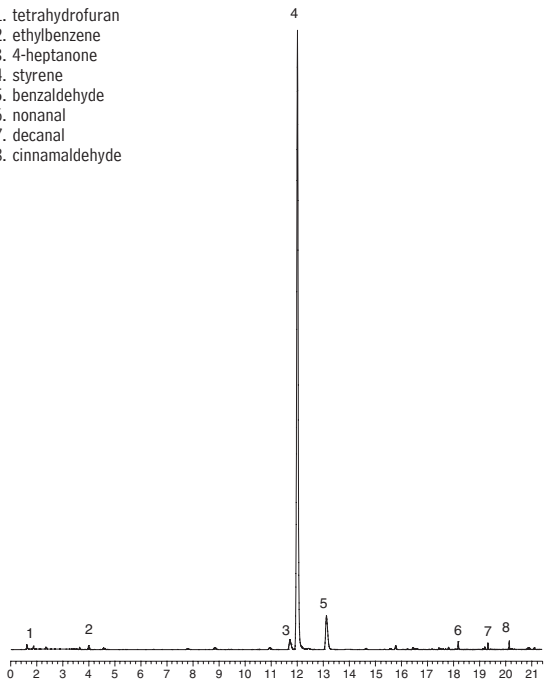
Column:	Rtx®-5MS, 30m, 0.25mm ID, 1µm (cat.# 12653)
GC:	Agilent 6890
Oven temp.:	50°C to 92°C @ 3°C/min., to 220°C @ 20°C/min. (hold 1 min.)
Injector temp.:	250°C
Carrier gas:	helium
Linear velocity:	36cm/sec. (1mL/min.)
Det. sensitivity:	NA
Split ratio:	20:1
Det.:	MSD (Agilent 5973)
Det. temp.:	280°C
Scan range:	35-260amu
Ionization:	EI @ 70eV
Mode:	

Sample Conditions:

Sample:	Overwrap, inner bowl
Concentrator:	Tekmar LSC-3100 purge & trap
Trap:	Vocarb 3000, type K
Purge:	10 min. @ 40mL/min., at 60°C
Dry purge:	3 min. @ 40mL/min.
Desorb preheat:	220°C
Desorb:	245°C, 2 min., 40mL/min.
Bake:	230°C, 6 min.
Interface:	1:20 split at injection port with 1mm ID inlet liner
Transfer line:	0.53mm ID Silcosteel® MXT® tubing (cat.# 20591)

Food Packaging Volatiles by Purge & Trap GC/MS
Rtx®-5MS
(Purge & Trap GC/MS)

1. tetrahydrofuran
2. ethylbenzene
3. 4-heptanone
4. styrene
5. benzaldehyde
6. nonanal
7. decanal
8. cinnamaldehyde



GC_FF00461

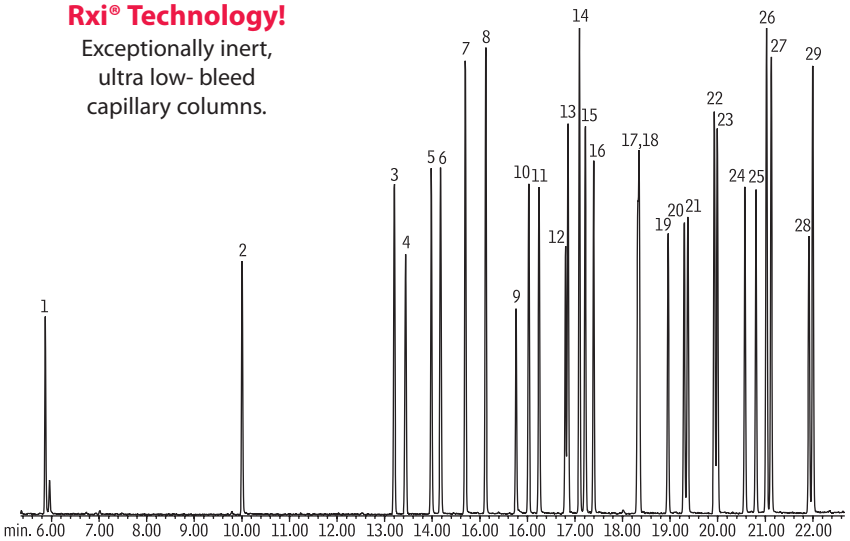
Column:	Rtx®-5MS, 30m, 0.25mm ID, 1µm (cat.# 12653)
GC:	Agilent 6890
Oven temp.:	50°C to 92°C @ 3°C/min., to 220°C @ 20°C/min. (hold 1 min.)
Inj. temp.:	250°C
Carrier gas:	helium
Linear velocity:	36cm/sec. (1mL/min.)
Det. sensitivity:	NA
Split ratio:	20:1
Det.:	MSD (Agilent 5973)
Det. temp.:	280°C
Scan range:	35-260amu
Ionization:	EI @ 70eV
Mode:	

Sample Conditions:

Sample:	Overwrap, lid of bowl
Concentrator:	Tekmar LSC-3100 purge & trap
Trap:	Vocarb 3000, type K
Purge:	10 min. @ 40mL/min., at 60°C
Dry purge:	3 min. @ 40mL/min.
Desorb preheat:	220°C
Desorb:	245°C, 2 min., 40mL/min.
Bake:	230°C, 6 min.
Interface:	1:20 split at injection port with 1mm ID inlet liner
Transfer line:	0.53mm ID Silcosteel® MXT® tubing (cat.# 20591)

Organochlorine and Organophosphorus Pesticides
FAPAS® Proficiency Testing
Rxi®-5ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.



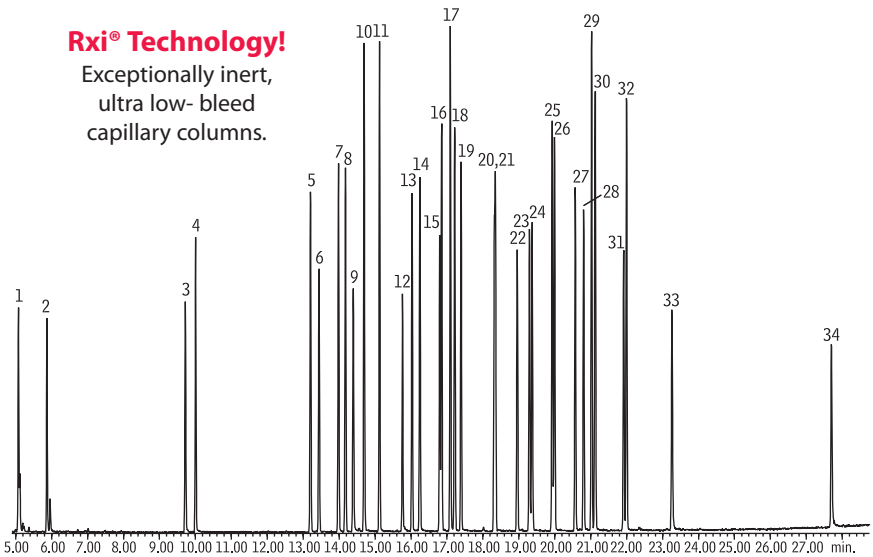
GC_FF00826

1. dichlorvos
2. methacrifos
3. α-BHC
4. hexachlorobenzene
5. δ-BHC (lindane)
6. β-BHC
7. diazinon
8. etrimphos
9. phosphamidon
10. chlorpyrifos-methyl
11. heptachlor
12. fenitrothion
13. pirimiphos methyl
14. malathion
15. aldrin
16. chlorpyrifos
17. heptachlor epoxide
18. oxychlordane
19. *trans*-chlordane
20. endosulfan I
21. *cis*-chlordane
22. 2,4'-DDT
23. dieldrin
24. endrin
25. endosulfan II
26. 4,4'-DDE
27. 4,4'-DDD
28. endosulfan sulfate
29. 4,4'-DDT

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	FAPAS Series 5 OC Pesticide Mix 1 (cat.# 32412), FAPAS Series 9 OP Pesticide Mix 1 (cat.# 32413)
Inj.:	1.0µL, 10ppm each analyte, split (10:1) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	290°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (hold 0.5 min.) to 300°C @ 7°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	4 min.
Tune:	DFTPP
Ionization:	EI

Organochlorine and Organophosphorus Pesticides
FAPAS® Proficiency Testing
Rxi®-5ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.



GC_FF00827

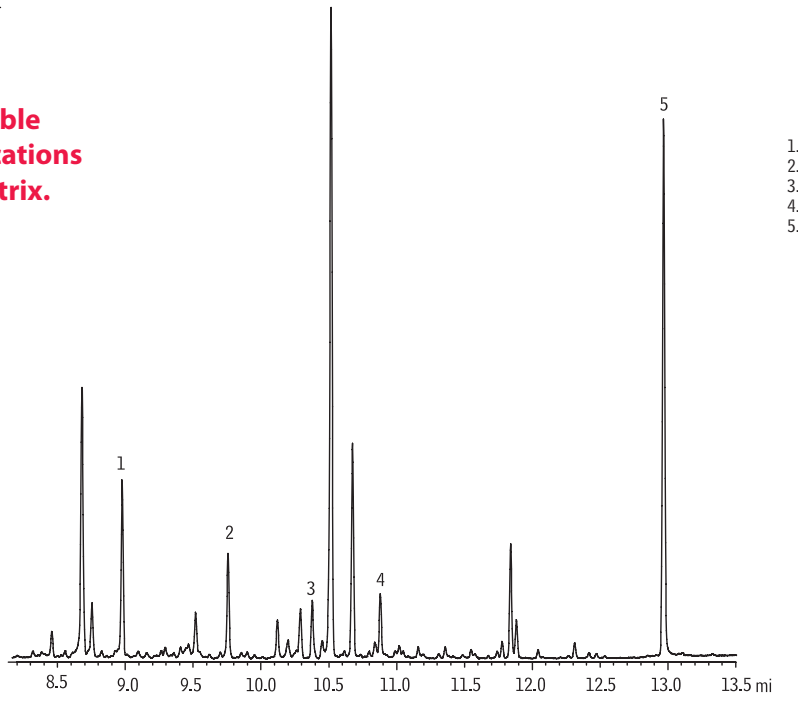
1. naphthalene-d8
2. dichlorvos
3. acenaphthene-d10
4. methacrifos
5. α-BHC
6. hexachlorobenzene
7. δ-BHC (lindane)
8. β-BHC
9. phenanthrene-d10
10. diazinon
11. etrimphos
12. phosphamidon
13. chlorpyrifos-methyl
14. heptachlor
15. fenitrothion
16. pirimiphos methyl
17. malathion
18. aldrin
19. chlorpyrifos
20. heptachlor epoxide
21. oxychlordane
22. *trans*-chlordane
23. endosulfan I
24. *cis*-chlordane
25. 2,4'-DDT
26. dieldrin
27. endrin
28. endosulfan II
29. 4,4'-DDE
30. 4,4'-DDD
31. endosulfan sulfate
32. 4,4'-DDT
33. chrysene-d12
34. perylene-d12

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	FAPAS Series 5 OC Pesticide Mix 1 (cat.# 32412), FAPAS Series 9 OP Pesticide Mix 1 (cat.# 32413), SV Internal Standard Mix (cat.# 31206)
Inj.:	1.0µL, 10ppm each analyte, split (10:1) 4mm Drilled Uniliner® inlet liner (hole near bottom) (cat.# 20771)
Instrument:	Agilent 6890
Inj. temp.:	290°C
Carrier gas:	helium, constant flow
Flow rate:	1.2mL/min.
Oven temp.:	100°C (hold 0.5 min.) to 300°C @ 7°C/min. (hold 1 min.)
Det.:	Agilent 5973 GC/MS
Transfer line temp.:	280°C
Scan range:	35-550amu
Solvent delay:	4 min.
Tune:	DFTPP
Ionization:	EI

Melamine Spike in Cat Food
Rtx®-5MS

NEW!

Reliable identifications in matrix.



1. cyanuric acid
2. ammelide
3. ammeline
4. melamine
5. benzoguanamine

GC_FF00977

Column:	Rtx®-5MS, 30m, 0.25mm ID, 0.25µm (cat.# 12623)
Sample:	melamine, cyanuric acid, ammelide, ammeline, benzoguanamine in dry cat food (10µg/mL prederivatized)
Inj.:	1µL, splitless (hold 1 min.), 3.5mm splitless inlet liner (cat.# 22286)
Inj. temp.:	280°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	75°C to 320°C @ 15°C/min. (hold 4 min.)
Det:	MS
Transfer line temp.:	290°C
Ionization:	EI
Mode:	SIM

Get More!

High Sensitivity Melamine GC/MS Analysis of Cat Food

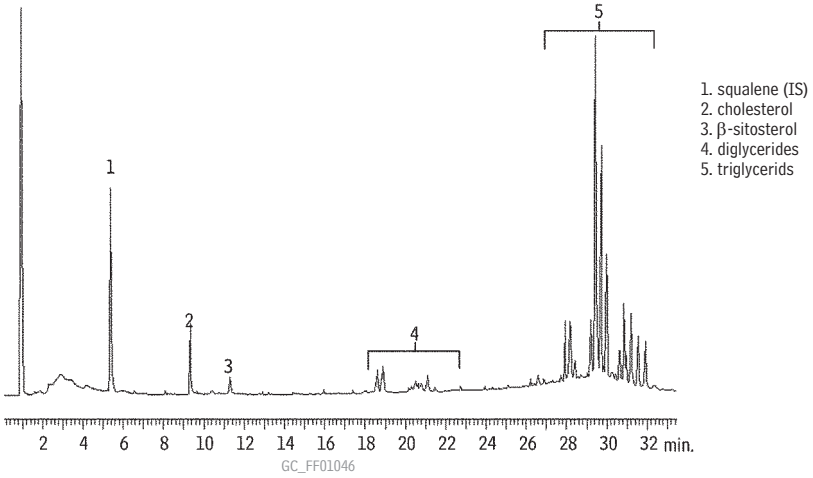
Modified Conditions Save Costs and Reduce Maintenance

read the full article at **www.restek.com/FFF**



Egg Pasta: Sterols & Glycerides
Rtx®-65TG

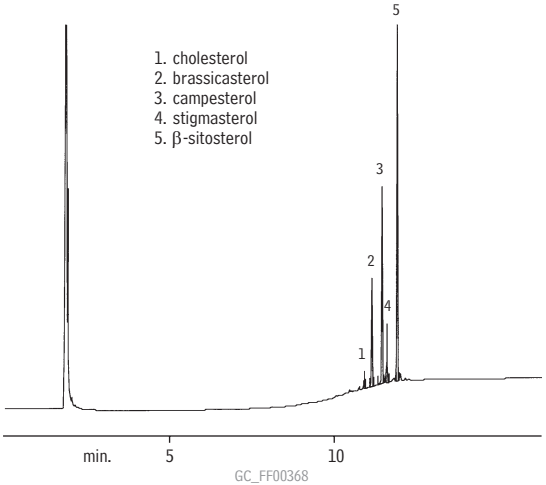
NEW!



1. squalene (IS)
2. cholesterol
3. β-sitosterol
4. diglycerides
5. triglycerids

Column:	Rtx®-65TG, 30m, 0.25mm ID, 0.10μm (cat.# 17008)
Sample:	50μg/mL fat extract from egg pasta in diethyl ether solution with 3,000ppm squalene (IS)
Inj.:	0.5μL, split (1:80), 70°C (hold 12 sec.) at 99°C up to 370°C (hold 5 min.)
Carrier gas:	hydrogen
Flow rate:	1.5mL/min.
Oven temp.:	220°C (hold 2.0 min.) to 360°C @ 5°C/min. (hold 5 min.)
Det:	FID @ 370°C

Phytosterols (Saw Palmetto)
Rtx®-5

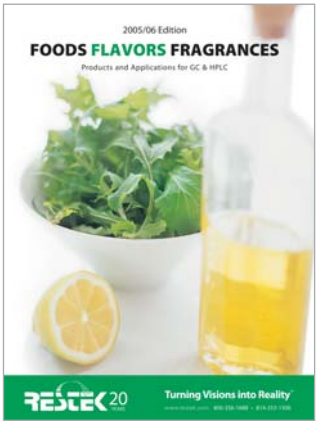


1. cholesterol
2. brassicasterol
3. campesterol
4. stigmasterol
5. β-sitosterol

Column:	Rtx®-5, 60m, 0.25mm ID, 0.25μm (cat.# 10226)
Inj.:	1μL splitless injection*
Oven temp.:	200°C (hold 1 min.) to 340°C @ 15°C/min. (hold 10 min.)
Inj./FID temp.:	345°C/355°C

*Split injection may be used, but results can have greater variability. A split flow of 112mL/min. is suggested.

Chromatogram provided by the Institute for Nutraceutical Advancement (INA)



free literature

Foods, Flavors, and Fragrances Catalog!

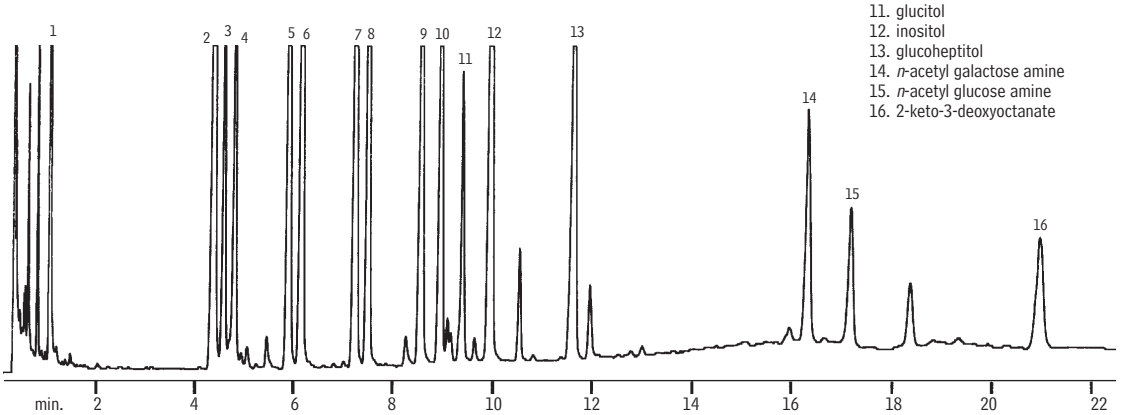
Includes important analysis tips, and chromatograms for analysis of fats and oils, carbohydrates, vitamins, amino acids, organic acids, preservatives, flavors and fragrances, essential oils, and chiral separations. Retention time indices and complete product listings for all relevant GC and HPLC products also are included.
lit. cat.# 59260A

Also available—**Monitoring Volatile Compounds in Food Contact Packaging, Using Purge and Trap GC/MS and an Rtx®-5MS Capillary Column**

Applications Note
lit. cat.# 59348

Sugars (Alditol Acetates)
Rt®-2330

1. glyceraldehyde
2. deoxyribitol
3. rhamnitol
4. fucitol
5. ribitol
6. arabinitol
7. xylitol
8. deoxyglucitol
9. mannitol
10. galactitol
11. glucitol
12. inositol
13. glucoheptitol
14. *n*-acetyl galactose amine
15. *n*-acetyl glucose amine
16. 2-keto-3-deoxyoctanate

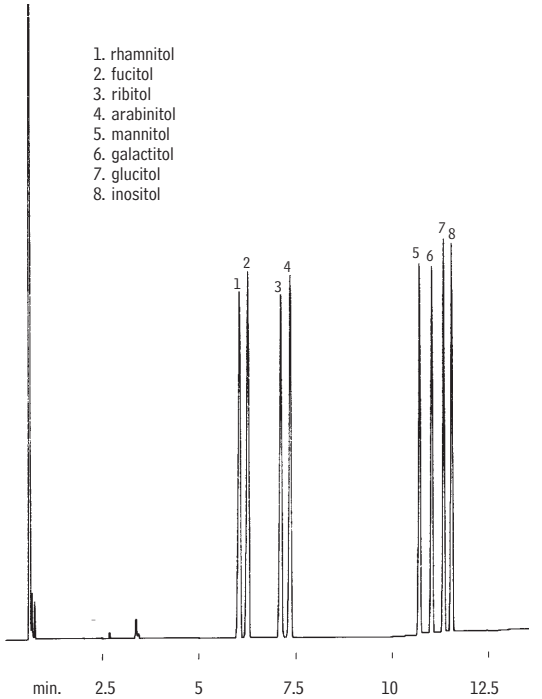


GC_FF00127

Column:	Rt®-2330, 15m, 0.32mm ID, 0.20µm (cat.# 10721)
Inj.:	0.6µL split injection
Oven temp.:	175°C (hold 2 min.) to 240°C @ 8°C/min. (hold 1 min.) to 265°C @ 8°C/min. (hold 12 min.)
Inj./det. temp.:	275°C
Carrier gas:	helium
Linear velocity:	80cm/sec. (flow rate: 10cc/min.)
FID sensitivity:	2 x 10^{-11} AFS
Split ratio:	20:1

Sugars (Alditol Acetates)
Rtx®-225

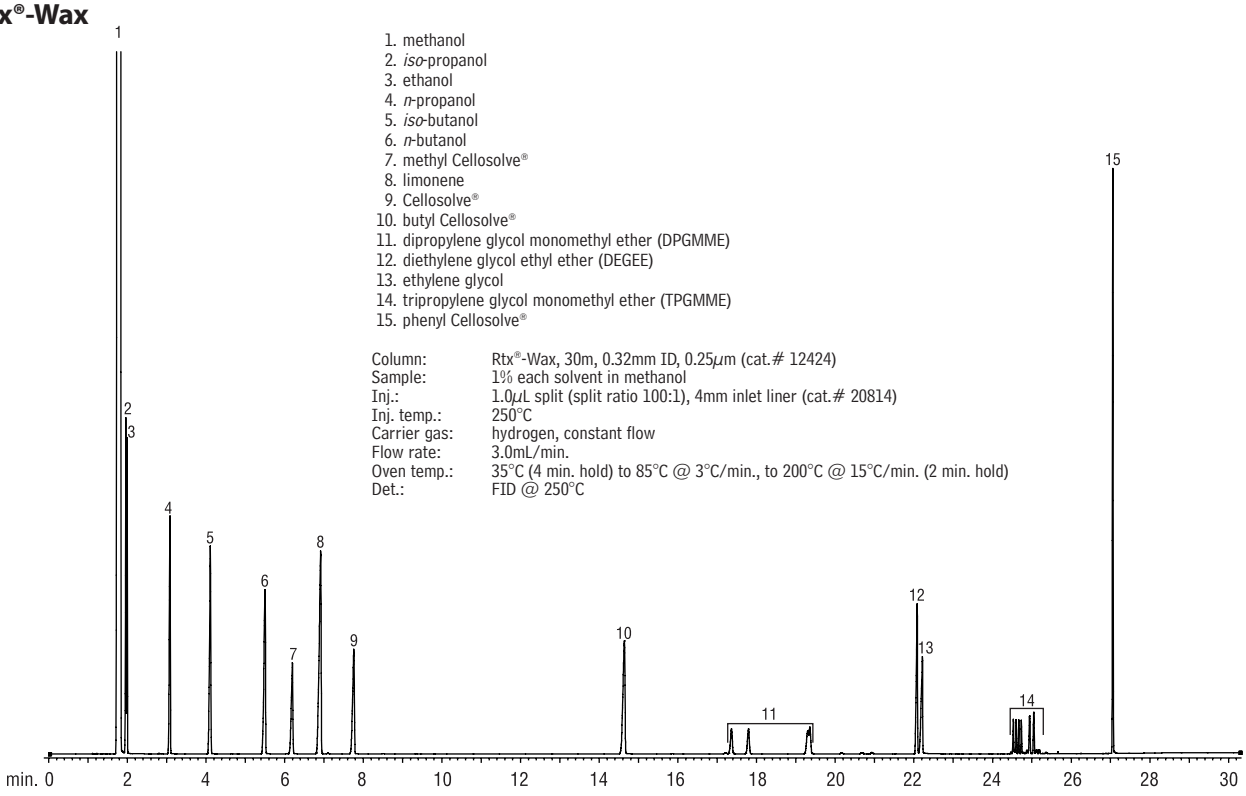
1. rhamnitol
2. fucitol
3. ribitol
4. arabinitol
5. mannitol
6. galactitol
7. glucitol
8. inositol



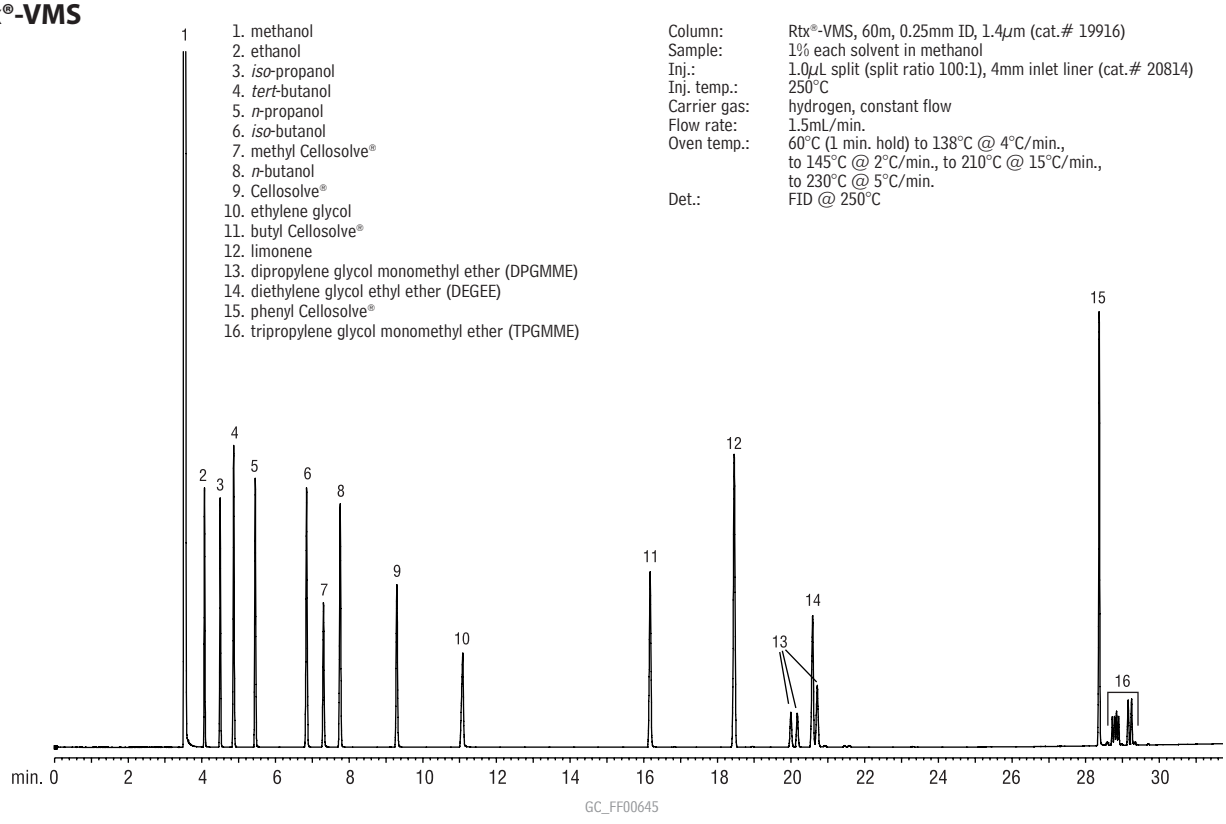
GC_FF00128

Column:	Rtx®-225, 15m, 0.25mm ID, 0.25µm (cat.# 14020)
Inj.:	0.5µL split injection
Oven temp.:	190°C (hold 5 min.) to 250°C @ 8°C/min. (hold 5 min.)
Inj./det. temp.:	260°C
Carrier gas:	hydrogen
Linear velocity:	42cm/sec. set @ 40°C
FID sensitivity:	16 x 10^{-11} AFS
Split ratio:	50:1

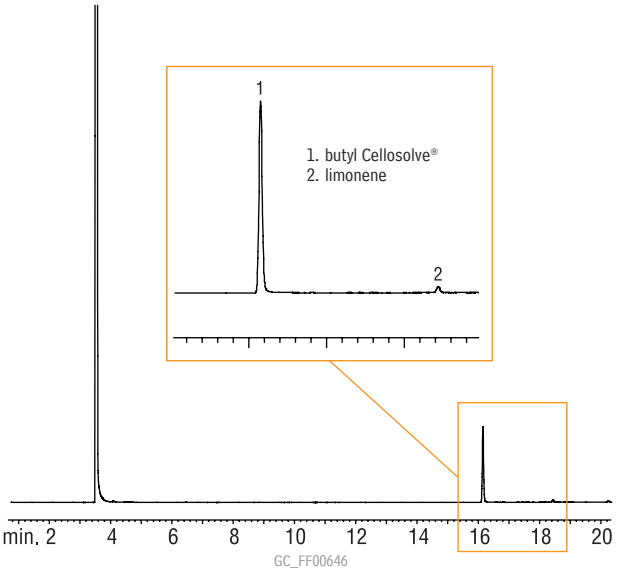
Cleaning Solvents
Rtx®-Wax



Cleaning Solvents
Rtx®-VMS



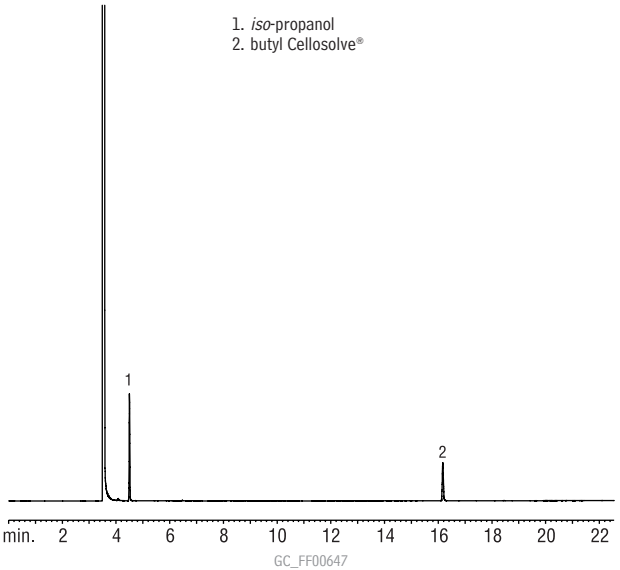
Cleaning Solvents (All-Purpose Cleaner) Rtx®-VMS



GC_FF00646

Column:	Rtx®-VMS, 60m, 0.25mm ID, 1.4µm (cat.# 19916)
Sample:	approx. 5% cleaner in methanol
Inj.:	1.0µL split (split ratio 100:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.5mL/min.
Oven temp.:	60°C (1 min. hold) to 138°C @ 4°C/min. to 145°C @ 2°C/min. to 210°C @ 15°C/min. to 230°C @ 5°C/min.
Det.:	FID @ 250°C

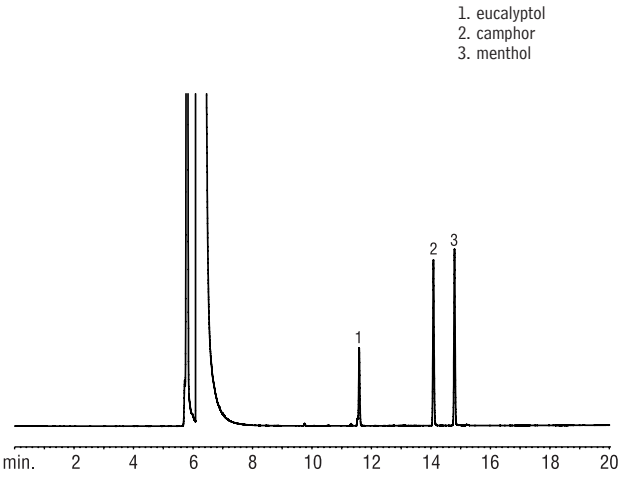
Cleaning Solvents (Glass Cleaner) Rtx®-VMS



GC_FF00647

Column:	Rtx®-VMS, 60m, 0.25mm ID, 1.4µm (cat.# 19916)
Sample:	approx. 5% cleaner in methanol
Inj.:	1.0µL split (split ratio 100:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow
Flow rate:	1.5mL/min.
Oven temp.:	60°C (1 min. hold) to 138°C @ 4°C/min. to 145°C @ 2°C/min. to 210°C @ 15°C/min. to 230°C @ 5°C/min.
Det.:	FID @ 250°C

Personal Care Product Fragrances Rtx®-1



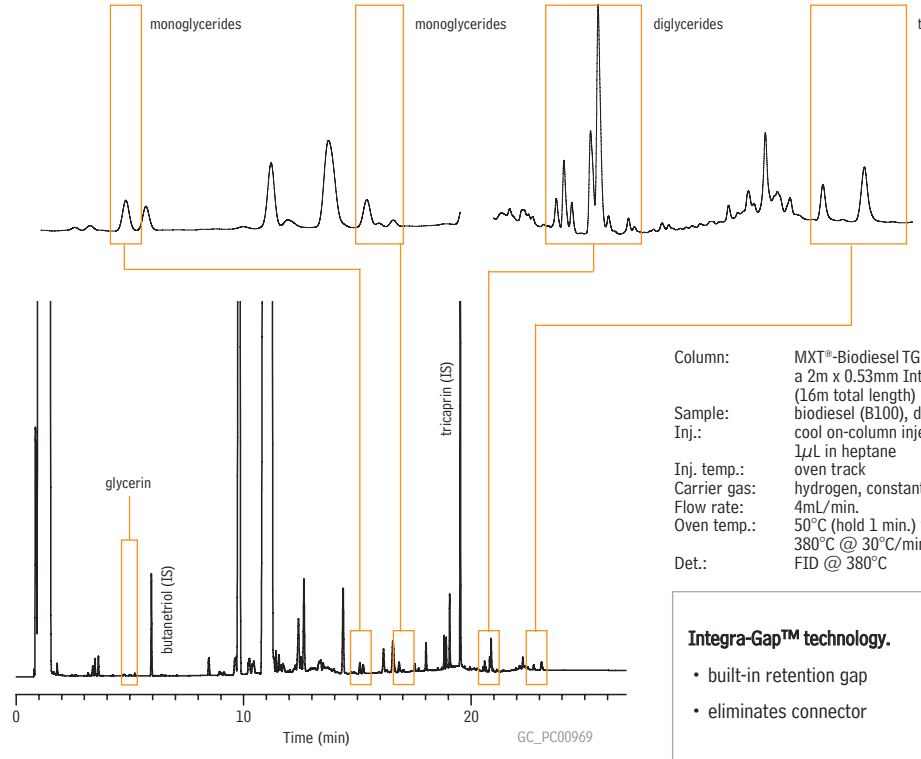
GC_FF00633

Column:	Rtx®-1, 60m, 0.25mm ID, 0.25µm (cat.# 10126)
Sample:	130ppm eucalyptus oil, 250ppm camphor, 260ppm menthol in methanol
Inj.:	1.0µL split (split ratio 20:1), 4mm inlet liner (cat.# 20814)
Inj. temp.:	275°C
Carrier gas:	helium, constant flow
Flow rate:	0.6mL/min.
Oven temp.:	80°C to 180°C @ 5°C/min.
Det.:	FID @ 300°C

Searching for a chromatogram?
www.restek.com

Total Glycerin in Biodiesel
MXT®-Biodiesel TG

NEW!

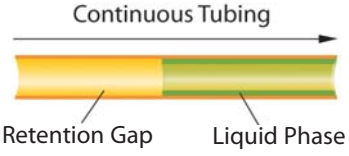


The best solution for analyzing total glycerin in biodiesel!

Column:	MXT®-Biodiesel TG, 14m, 0.53mm ID, 0.16µm (cat.# 70289) with a 2m x 0.53mm Integra-Gap™ retention gap (16m total length)
Sample:	biodiesel (B100), derivatized
Inj.:	cool on-column injection 1µL in heptane
Inj. temp.:	oven track
Carrier gas:	hydrogen, constant flow
Flow rate:	4mL/min.
Oven temp.:	50°C (hold 1 min.) to 180°C @ 15°C/min. to 230°C @ 7°C/min. to 380°C @ 30°C/min. (hold 5 min.)
Det.:	FID @ 380°C

Integra-Gap™ technology.

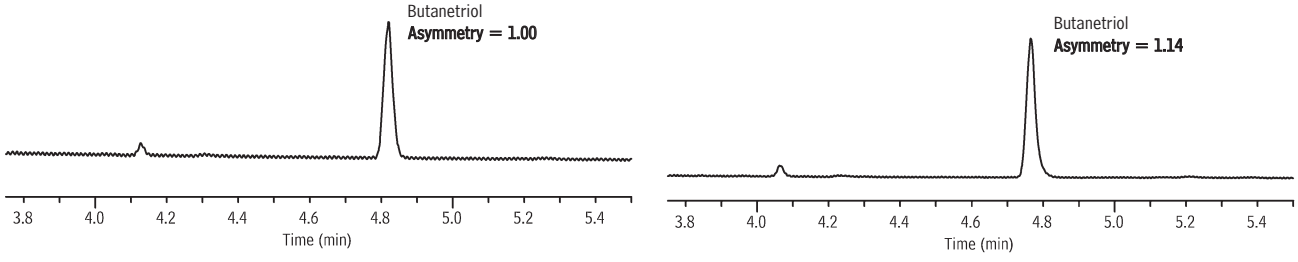
- built-in retention gap
- eliminates connector



Biodiesel Oil (B100)
Rtx®-Biodiesel TG

A. Rtx®-Biodiesel TG with Alumaseal™ connector and 2 meters of 0.53mm ID Hydroguard™ tubing

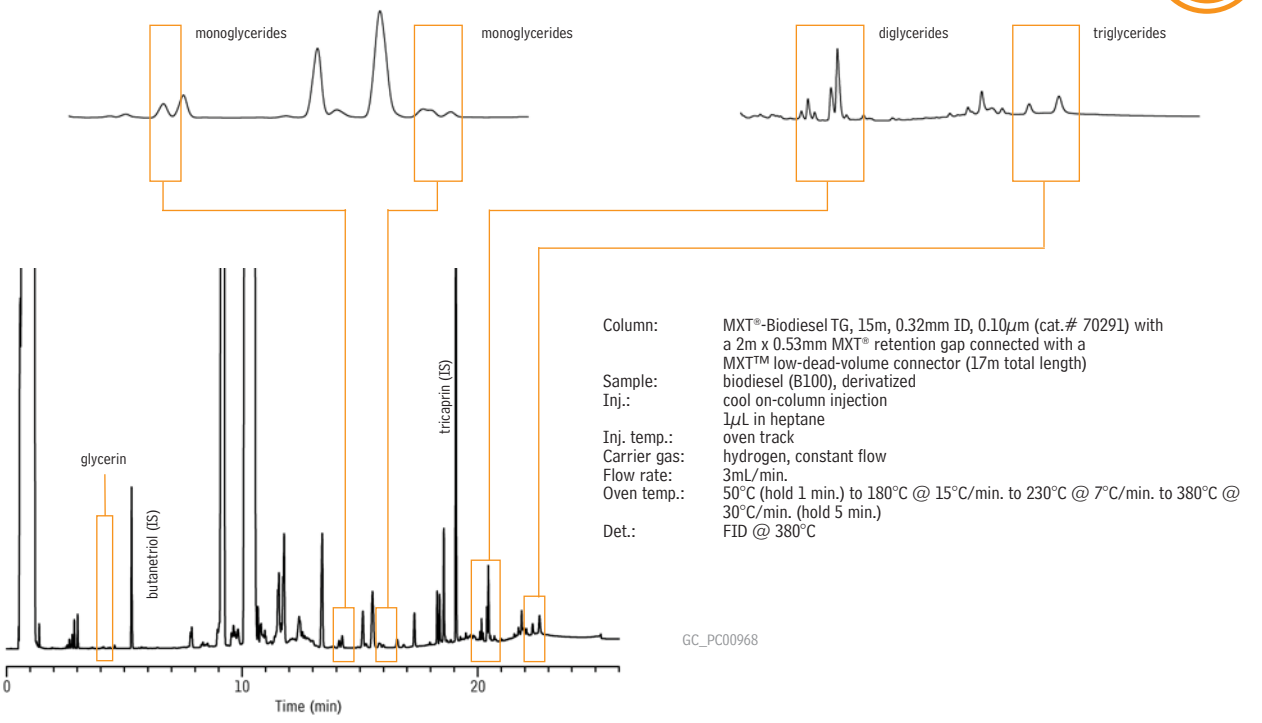
B. Rtx®-Biodiesel TG with Universal Press-Tight®Connector and 2 meters of 0.53mm ID Hydroguard™ tubing



Columns:	A. Rtx®-Biodiesel TG, 10m, 0.32mm ID, 0.10µm connected to 2m x 0.53mm Hydroguard™ tubing using Alumaseal™ connector B. Rtx®-Biodiesel TG, 10m, 0.32mm ID, 0.10µm connected to 2m x 0.53mm Hydroguard™ tubing using Universal Press-Tight® connector
Sample:	biodiesel (B100) with butanetriol at 12.5ppm (12.5ng on-column)
Inj.:	1µL, cool on-column injection
Inj. temp.:	oven track mode
Carrier gas:	hydrogen, constant flow 4cc/min.
Linear velocity:	79cm/sec.
Oven temp.:	50°C (hold 1min.) to 180°C @ 15°C/min. to 230°C @ 7°C/min. to 380°C @ 30°C/min. (hold 5 min.)
Det.:	FID @ 380°C

B100
MXT®-Biodiesel TG

NEW!

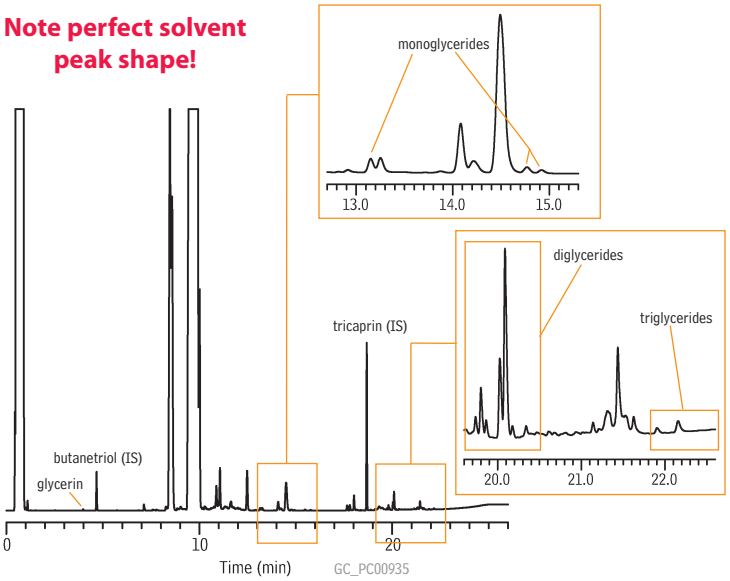


GC_PC00968

Column:	MXT®-Biodiesel TG, 15m, 0.32mm ID, 0.10µm (cat.# 70291) with a 2m x 0.53mm MXT® retention gap connected with a MXT™ low-dead-volume connector (17m total length)
Sample:	biodiesel (B100), derivatized
Inj.:	cool on-column injection 1µL in heptane
Inj. temp.:	oven track
Carrier gas:	hydrogen, constant flow
Flow rate:	3mL/min.
Oven temp.:	50°C (hold 1 min.) to 180°C @ 15°C/min. to 230°C @ 7°C/min. to 380°C @ 30°C/min. (hold 5 min.)
Det.:	FID @ 380°C

Derivatized B100 and Internal Standards
MXT®-Biodiesel TG with 2m x 0.53mm ID Retention Gap

Note perfect solvent peak shape!



GC_PC00935

Column:	MXT®-Biodiesel TG, 10m, 0.32mm ID, 0.1µm with 2m x 0.53mm retention gap (cat.# 70290)
Sample:	B100 + IS butanetriol & tricaprin derivatized with MSTFA as per ASTM D-6584
Inj.:	1.0µL cool on-column
Inj. temp.:	oven track
Carrier gas:	hydrogen, constant flow
Flow rate:	4mL/min.
Oven temp.:	50°C (hold 1 min.) to 180°C @ 15°C/min., to 230°C @ 7°C/min., to 430°C @ 30°C/min. (hold 5 min.)
Det.:	FID @ 430°C

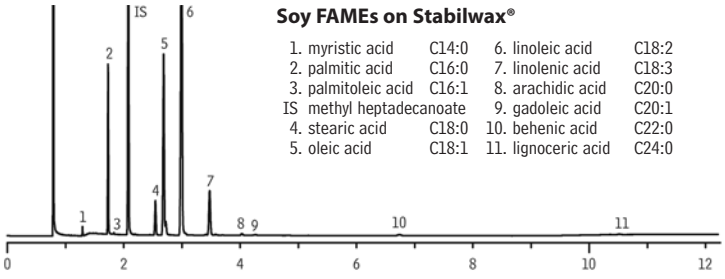
Get More!

Biodiesel Related Articles Online

www.restek.com/biodiesel



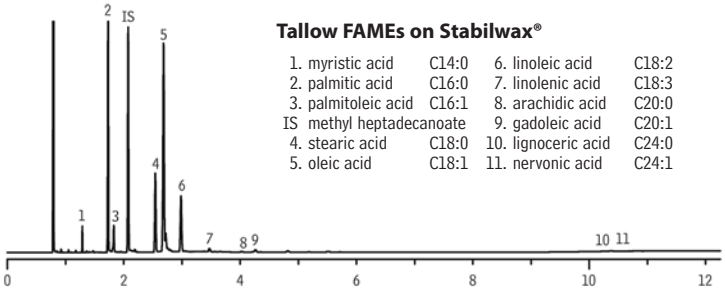
FAMEs in Biodiesel Oils
Stabilwax®



Soy FAMEs on Stabilwax®

1. myristic acid	C14:0	6. linoleic acid	C18:2
2. palmitic acid	C16:0	7. linolenic acid	C18:3
3. palmitoleic acid	C16:1	8. arachidic acid	C20:0
IS methyl heptadecanoate		9. gadoleic acid	C20:1
4. stearic acid	C18:0	10. behenic acid	C22:0
5. oleic acid	C18:1	11. lignoceric acid	C24:0

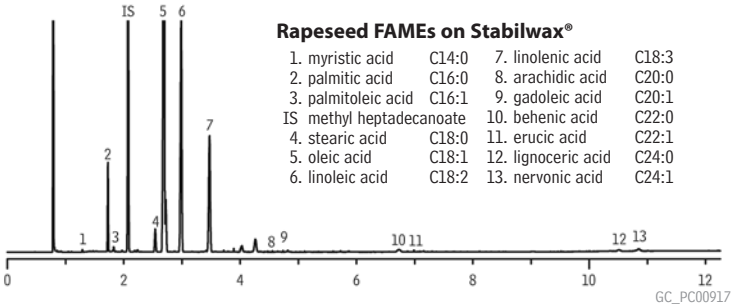
GC_PC00915



Tallow FAMEs on Stabilwax®

1. myristic acid	C14:0	6. linoleic acid	C18:2
2. palmitic acid	C16:0	7. linolenic acid	C18:3
3. palmitoleic acid	C16:1	8. arachidic acid	C20:0
IS methyl heptadecanoate		9. gadoleic acid	C20:1
4. stearic acid	C18:0	10. lignoceric acid	C24:0
5. oleic acid	C18:1	11. nervonic acid	C24:1

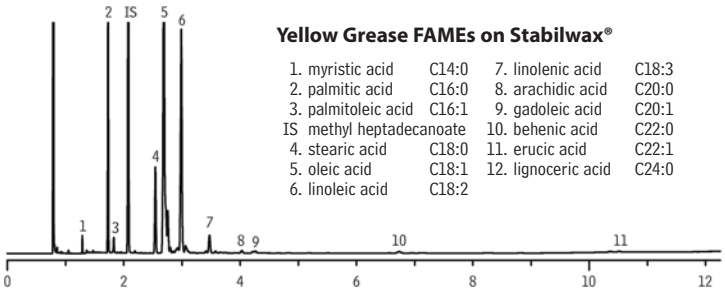
GC_PC00916



Rapeseed FAMEs on Stabilwax®

1. myristic acid	C14:0	7. linolenic acid	C18:3
2. palmitic acid	C16:0	8. arachidic acid	C20:0
3. palmitoleic acid	C16:1	9. gadoleic acid	C20:1
IS methyl heptadecanoate		10. behenic acid	C22:0
4. stearic acid	C18:0	11. erucic acid	C22:1
5. oleic acid	C18:1	12. lignoceric acid	C24:0
6. linoleic acid	C18:2	13. nervonic acid	C24:1

GC_PC00917



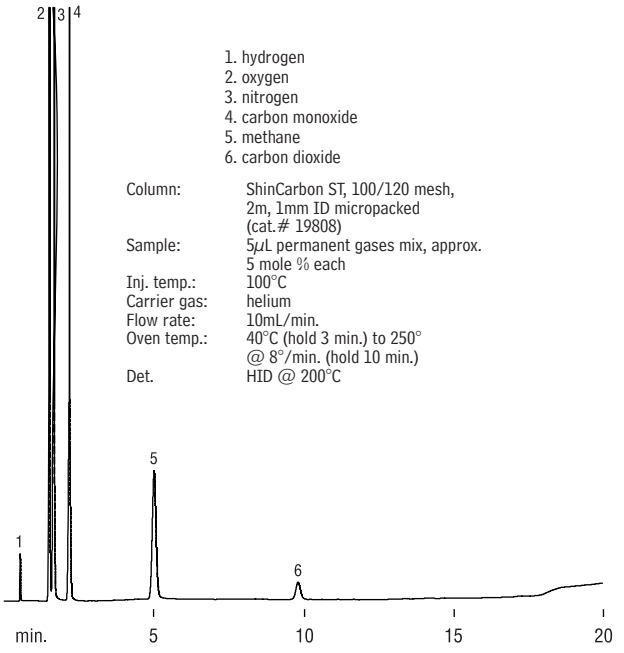
Yellow Grease FAMEs on Stabilwax®

1. myristic acid	C14:0	7. linolenic acid	C18:3
2. palmitic acid	C16:0	8. arachidic acid	C20:0
3. palmitoleic acid	C16:1	9. gadoleic acid	C20:1
IS methyl heptadecanoate		10. behenic acid	C22:0
4. stearic acid	C18:0	11. erucic acid	C22:1
5. oleic acid	C18:1	12. lignoceric acid	C24:0
6. linoleic acid	C18:2		

GC_PC00918

Column:	Stabilwax®, 30m, 0.32mm ID, 0.25μm (cat.# 10624)
Sample:	various sources of biodiesel (B100), prepared according to European Method EN 14103
Inj.:	1.0μL split (split ratio 100:1), Cyclosplitter® inlet liner (cat.# 20706)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow, 3mL/min.
Linear velocity:	60cm/sec.
Oven temp.:	210°C (hold 5 min.) to 230°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 250°C

Permanent Gases
ShinCarbon ST
(micropacked)

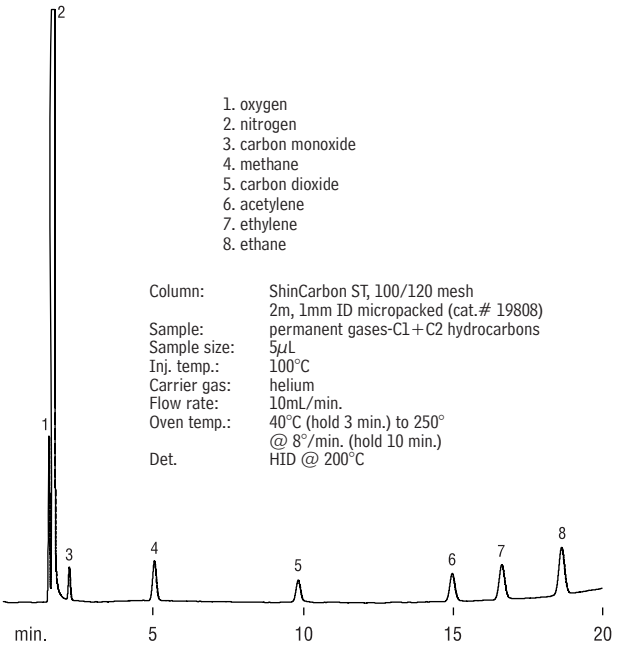


1. hydrogen
2. oxygen
3. nitrogen
4. carbon monoxide
5. methane
6. carbon dioxide

Column:	ShinCarbon ST, 100/120 mesh, 2m, 1mm ID micropacked (cat.# 19808)
Sample:	5µL permanent gases mix, approx. 5 mole % each
Inj. temp.:	100°C
Carrier gas:	helium
Flow rate:	10mL/min.
Oven temp.:	40°C (hold 3 min.) to 250° @ 8°/min. (hold 10 min.)
Det.	HID @ 200°C

GC_PC00666

Permanent Gases, C1+C2 hydrocarbons
ShinCarbon ST
(micropacked)



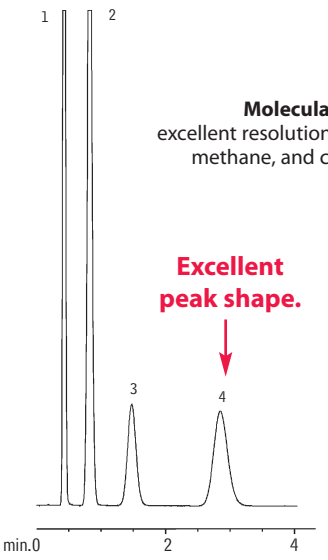
1. oxygen
2. nitrogen
3. carbon monoxide
4. methane
5. carbon dioxide
6. acetylene
7. ethylene
8. ethane

Column:	ShinCarbon ST, 100/120 mesh 2m, 1mm ID micropacked (cat.# 19808)
Sample:	permanent gases-C1+C2 hydrocarbons
Sample size:	5µL
Inj. temp.:	100°C
Carrier gas:	helium
Flow rate:	10mL/min.
Oven temp.:	40°C (hold 3 min.) to 250° @ 8°/min. (hold 10 min.)
Det.	HID @ 200°C

GC_PC00665

Permanent Gases
Molecular Sieve 5A and Molecular Sieve 13X
(packed)

1. oxygen
2. nitrogen
3. methane
4. carbon monoxide

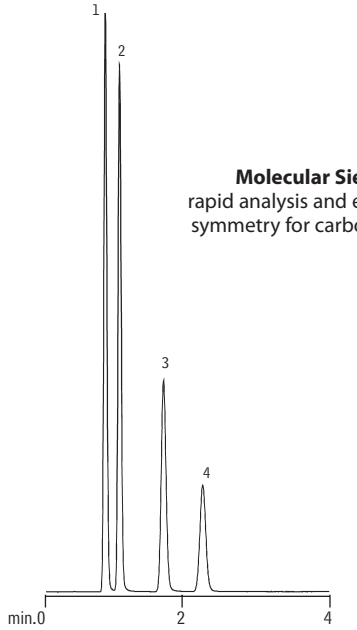


Molecular Sieve 5A:
excellent resolution of oxygen, nitrogen, methane, and carbon monoxide.

Excellent peak shape.

10µL helium, 5–10% each component

Oven temp.:	50°C
Inj./det. temp.:	150°C/200°C
Carrier gas:	hydrogen
Flow:	30mL/min., helium
Det.:	TCD



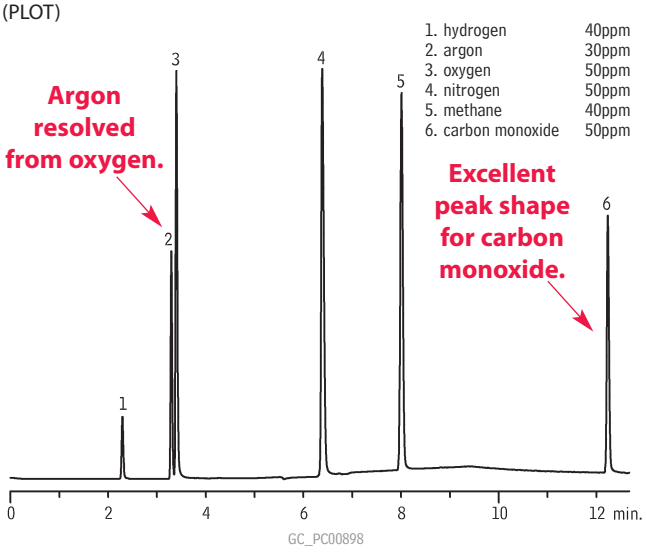
Molecular Sieve 13X:
rapid analysis and excellent peak symmetry for carbon monoxide.

GC_PC00166

Molecular Sieve 5A 80/100 mesh
1m x 1/8" x 2mm ID SilcoSmooth™ tubing (cat.# 80440-800)

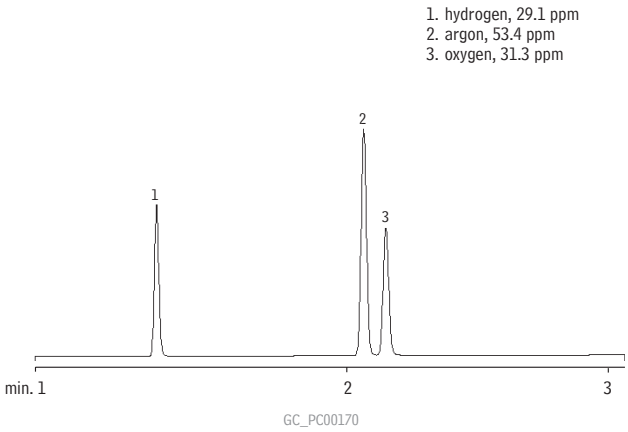
Molecular Sieve 13X 80/100 mesh
2m x 1/8" x 2mm (ID) SilcoSmooth™ tubing (cat.# 80439-800)

Permanent Gases
Rt®-Msieve 5A
(PLOT)



Column:	Rt®-Msieve 5A, 30m, 0.53mm ID, 50µm (cat.# 19723)
Sample:	permanent gases (ppm)
Inj.:	5µL sample loop, 6-port Valco® valve, valve temp.: ambient
Inj. temp.:	200°C
Carrier gas:	helium, constant flow
Linear velocity:	5mL/min.
Oven temp.:	27°C (hold 5 min.) to 100°C @ 10°C/min. (hold 5 min.)
Det.:	Valco® helium ionization detector @ 150°C

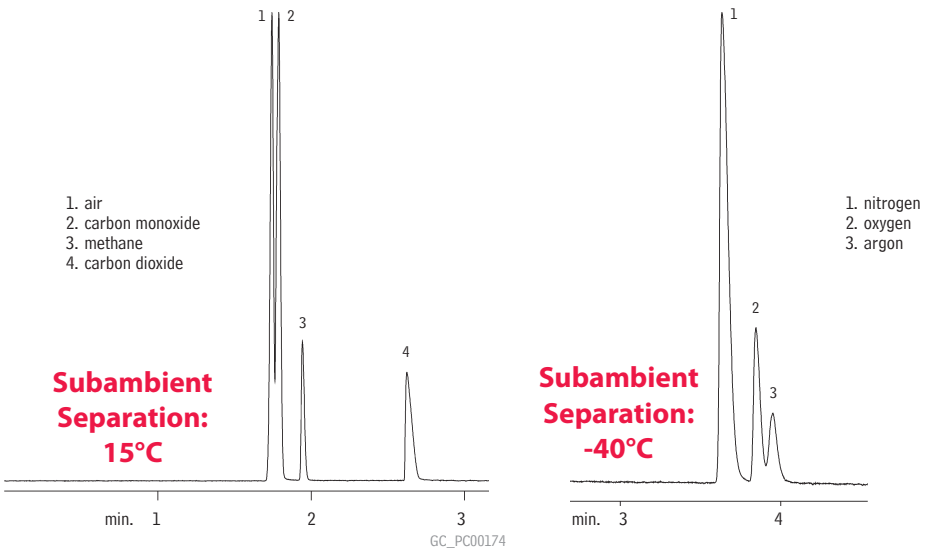
Permanent Gases
Rt®-MSieve 5A
(PLOT)



Column:	Rt®-Msieve 5A, 30m, 0.53mm ID, 50µm (cat.# 19723)
Sample:	0.5mL (sample loop injection)
Column temp.:	27°C
Carrier gas:	helium
Linear velocity:	34cm/sec.
Det.:	Valco® HID

Chromatogram courtesy of Larry McElmurry, Mobile Analytical Labs.

Permanent Gases
Rt®-QPLOT
(PLOT)



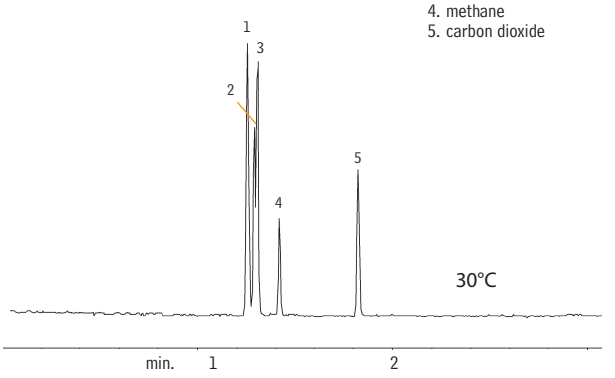
Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)

Sample conc.:	2-5 mole%
Det.:	TCD
Inj./det. temp.:	100°C/150°C
Carrier gas:	hydrogen
Linear velocity:	34cm/sec.
Split flow:	40:1

Sample conc.:	2-5 mol%
Det.:	TCD
Inj./det. temp.:	100°C/150°C
Carrier gas:	hydrogen
Linear velocity:	20cm/sec.
Split flow:	40:1

Permanent Gases
Rt®-QPLOT
(PLOT)

1. helium
2. air
3. carbon monoxide
4. methane
5. carbon dioxide



GC_PC00169

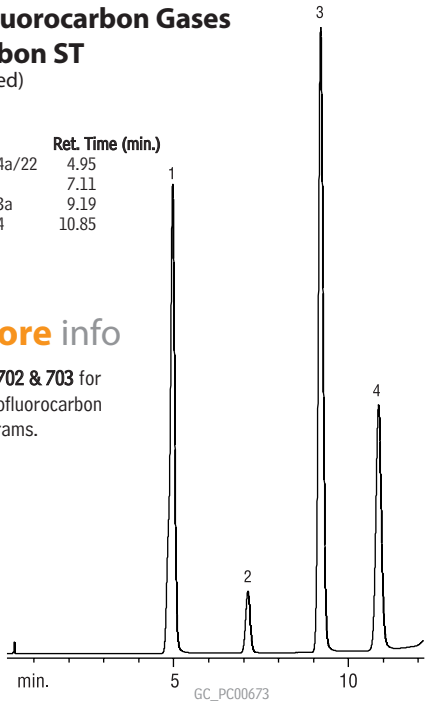
Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Sample:	30µL split injection (40:1), 2-5 mole %
Column temp.:	30°C
Inj. temp.:	30°C
Det.:	HP µTCD
Det. temp.:	200°C
Carrier gas:	hydrogen
Linear velocity:	38cm/sec.
Split flow:	40:1

Chlorofluorocarbon Gases
ShinCarbon ST
(micropacked)

Peak	Ret. Time (min.)
1. Freon® 134a/22	4.95
2. Freon® 12	7.11
3. Freon® 133a	9.19
4. Freon® 114	10.85

for **more** info

see **pages 702 & 703** for more chlorofluorocarbon chromatograms.

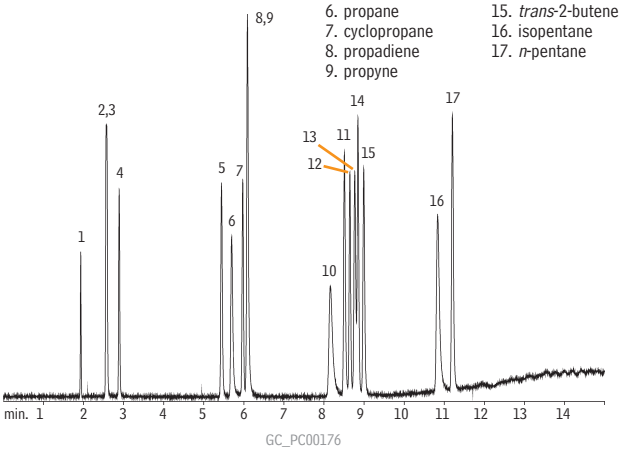


GC_PC00673

Column:	ShinCarbon ST, 100/120 mesh, 1m, 1mm ID Silcosteel® micropacked column (cat.# 19809)
Sample:	fluorocarbon blend, 5µL ~1-3% each
Inj. temp.:	200°C
Det.:	FID @ 250°C
Carrier gas:	helium
Linear velocity:	10mL/min.
Oven temp.:	125°C to 320°C @ 16°C/min.

Hydrocarbon Gases
Rt®-QPLOT
(PLOT)

1. methane
2. ethylene
3. acetylene
4. ethane
5. propylene
6. propane
7. cyclopropane
8. propadiene
9. propyne
10. isobutane
11. 1,3-butadiene
12. 1-butene
13. *n*-butane
14. *cis*-2-butene
15. *trans*-2-butene
16. isopentane
17. *n*-pentane

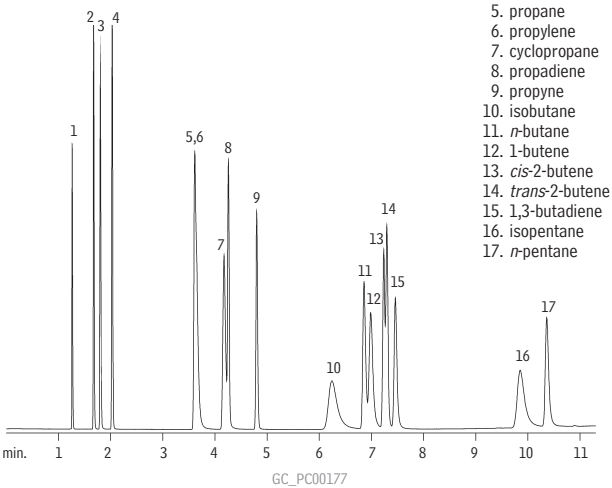


GC_PC00176

Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Inj.:	300µL split injection (40:1), 1,000ppm
Oven temp.:	50°C (2 min.) to 220°C @ 15°C/min.
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	42cm/sec. set @ 80°C (5.6mL/min.)
Split flow:	40mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS

Hydrocarbon Gases
Rt®-UPLOT
(PLOT)

1. methane
2. ethylene
3. ethane
4. acetylene
5. propane
6. propylene
7. cyclopropane
8. propadiene
9. propyne
10. isobutane
11. *n*-butane
12. 1-butene
13. *cis*-2-butene
14. *trans*-2-butene
15. 1,3-butadiene
16. isopentane
17. *n*-pentane



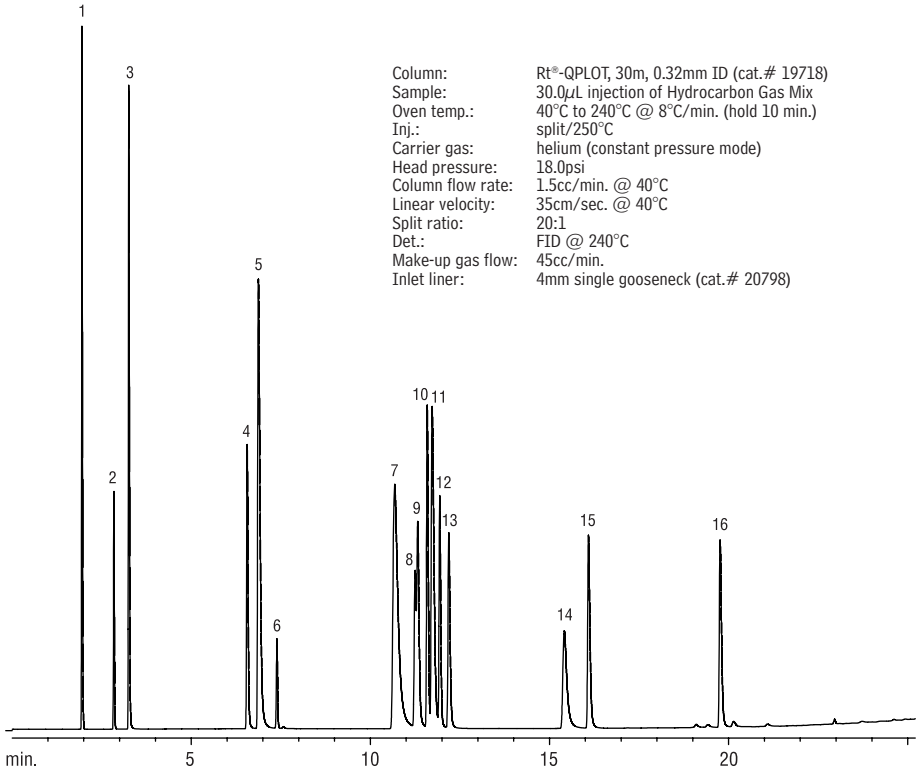
GC_PC00177

Column:	Rt®-UPLOT, 30m, 0.32mm ID (cat.# 19724)
Inj.:	300µL split injection (40:1), 1,000ppm
Oven temp.:	50°C to 190°C @ 10°C/min.
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	42cm/sec. set @ 80°C (5.6mL/min.)
Split flow:	40mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS

Hydrocarbon Gases
Rt®-QPLOT
(PLOT)

1. methane
2. ethene
3. ethane
4. propene
5. propane
6. propadiene
7. isobutane
8. 1,3-butadiene
9. 1-butene
10. isobutene
11. *n*-butane
12. *cis*-2-butene
13. *trans*-2-butene
14. isopentane
15. *n*-pentane
16. *n*-hexane

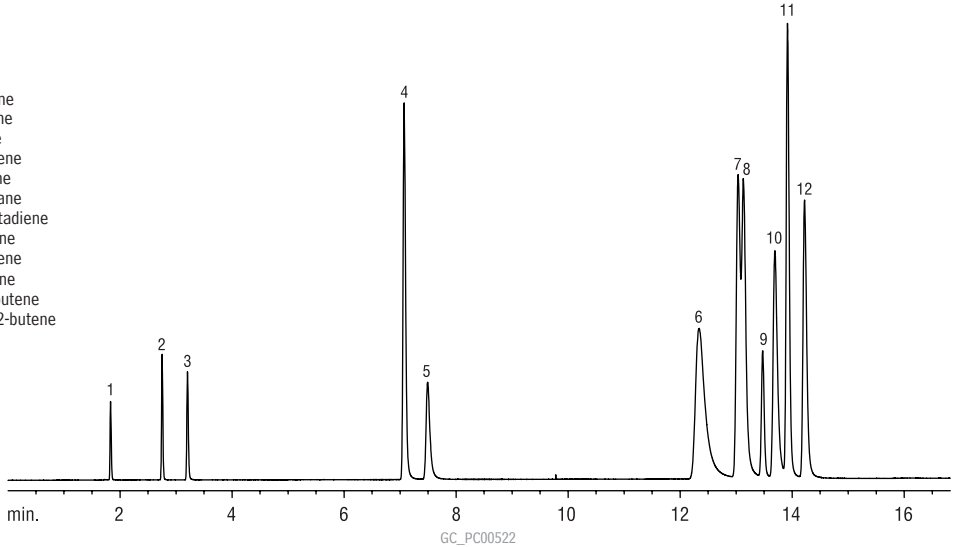
Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Sample:	30.0µL injection of Hydrocarbon Gas Mix
Oven temp.:	40°C to 240°C @ 8°C/min. (hold 10 min.)
Inj.:	split/250°C
Carrier gas:	helium (constant pressure mode)
Head pressure:	18.0psi
Column flow rate:	1.5cc/min. @ 40°C
Linear velocity:	35cm/sec. @ 40°C
Split ratio:	20:1
Det.:	FID @ 240°C
Make-up gas flow:	45cc/min.
Inlet liner:	4mm single gooseneck (cat.# 20798)



GC_PC00521

Hydrocarbon Gases
Rt®-QPLOT
(PLOT)

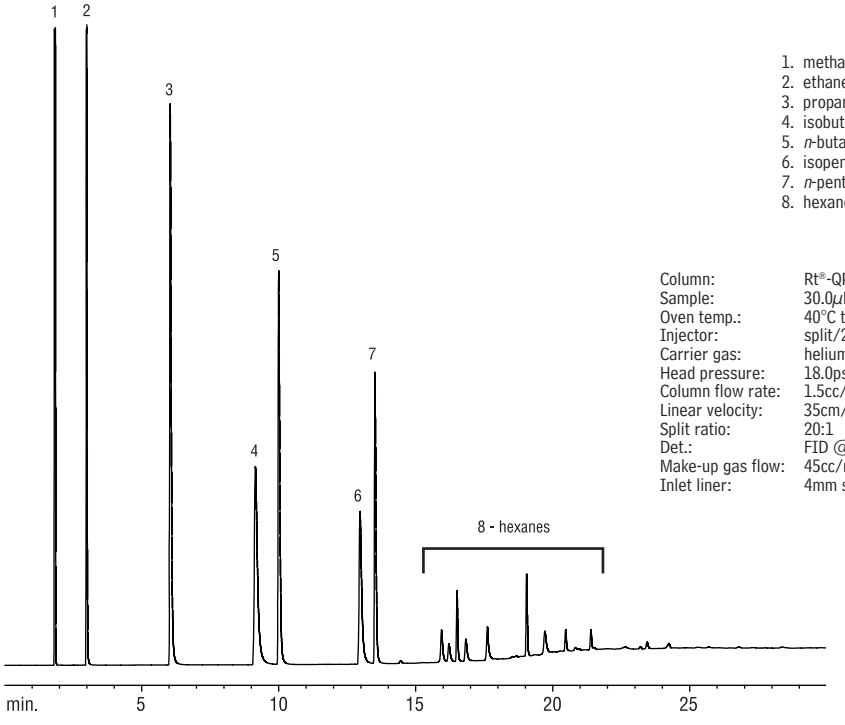
1. methane
2. ethylene
3. ethane
4. propylene
5. propane
6. isobutane
7. 1,3-butadiene
8. 1-butene
9. isobutene
10. *n*-butane
11. *cis*-2-butene
12. *trans*-2-butene



GC_PC00522

Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Sample:	30.0µL injection of Hydrocarbon Gas Mix
Oven temp.:	35°C to 240°C @ 10°C/min. (hold 10 min.)
Injector:	split/250°C
Carrier gas:	helium (constant pressure mode)
Head pressure:	18.0psi
Column flow rate:	1.5cc/min. @ 40°C
Linear velocity:	35cm/sec. @ 40°C
Split ratio:	20:1
Det.:	FID @ 240°C
Make-up gas flow:	45cc/min.
Inlet liner:	4mm single gooseneck (cat.# 20798)

Hydrocarbon Gases
Rt®-QPLOT
(PLOT)

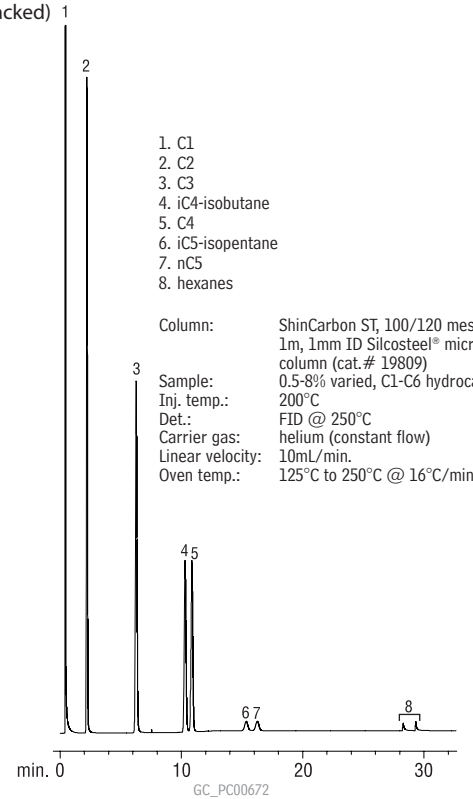


GC_PC00523

1. methane
2. ethane
3. propane
4. isobutane
5. *n*-butane
6. isopentane
7. *n*-pentane
8. hexanes

Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Sample:	30.0µL injection of Hydrocarbon Gas Mix
Oven temp.:	40°C to 240°C @ 10°C/min. (hold 10 min.)
Injector:	split/250°C
Carrier gas:	helium (constant pressure mode)
Head pressure:	18.0psi
Column flow rate:	1.5cc/min. @ 40°C
Linear velocity:	35cm/sec. @ 40°C
Split ratio:	20:1
Det.:	FID @ 240°C
Make-up gas flow:	45cc/min.
Inlet liner:	4mm single gooseneck (cat.# 20798)

Natural Gas
ShinCarbon ST
(micropacked)



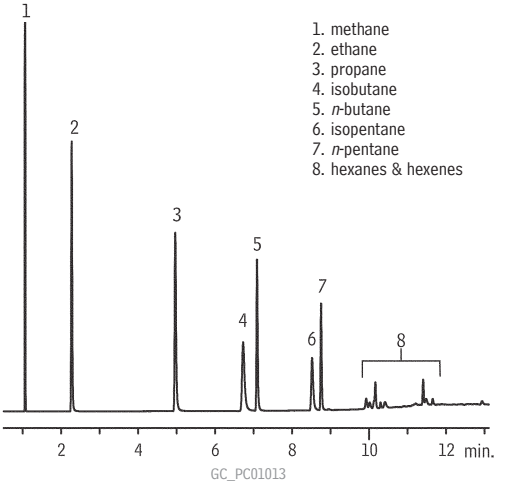
GC_PC00672

1. C1
2. C2
3. C3
4. iC4-isobutane
5. C4
6. iC5-isopentane
7. nC5
8. hexanes

Column:	ShinCarbon ST, 100/120 mesh 1m, 1mm ID Silcosteel® micropacked column (cat.# 19809)
Sample:	0.5-8% varied, C1-C6 hydrocarbons
Inj. temp.:	200°C
Det.:	FID @ 250°C
Carrier gas:	helium (constant flow)
Linear velocity:	10mL/min.
Oven temp.:	125°C to 250°C @ 16°C/min.

Natural Gas #2
Rt®-QS-BOND

NEW!

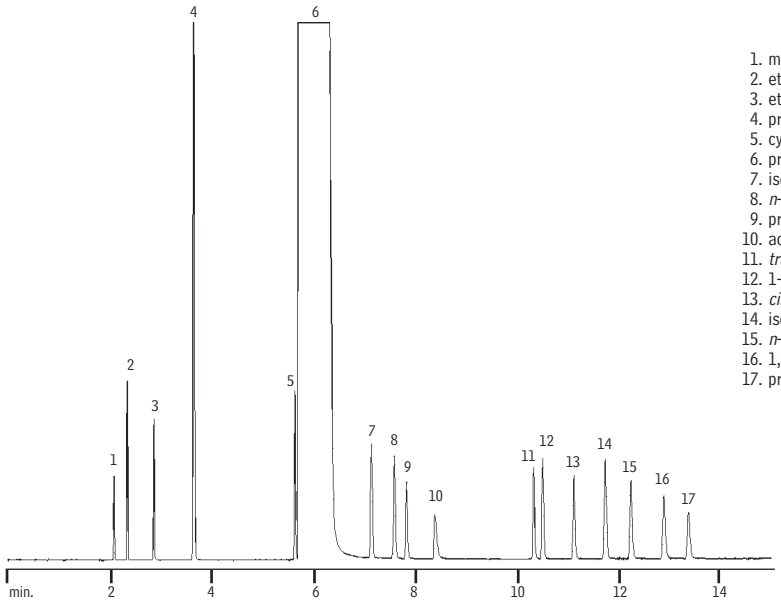


GC_PC01013

1. methane
2. ethane
3. propane
4. isobutane
5. *n*-butane
6. isopentane
7. *n*-pentane
8. hexanes & hexenes

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	natural gas mix (mole%)
Inj.:	20µL split (split ratio 10:1), 4mm Siltek® single gooseneck liner (cat.# 20798-214.1)
Inj. temp.:	240°C
Carrier gas:	helium, constant flow
Flow rate:	5.7mL/min. @ 40°C
Oven temp.:	40°C (hold 2 min.) to 225°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 240°C

Propylene Purity
Rt®-Alumina
(PLOT)

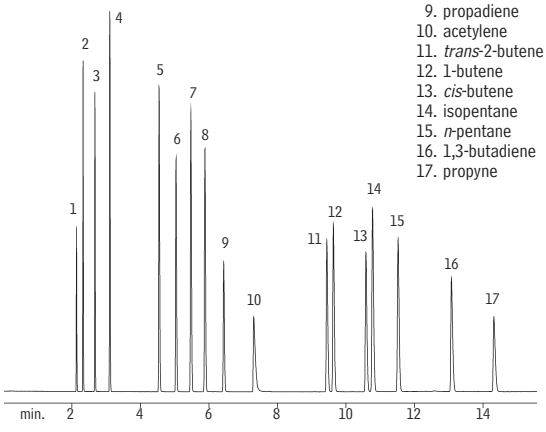


GC_PC00185

1. methane
2. ethane
3. ethylene
4. propane
5. cyclopropane
6. propylene
7. isobutane
8. *n*-butane
9. propadiene
10. acetylene
11. *trans*-2-butene
12. 1-butene
13. *cis*-2-butene
14. isopentane
15. *n*-pentane
16. 1,3-butadiene
17. propyne

Column:	Rt®-Alumina, 50m, 0.53mm ID (cat.# 19701)
Inj.:	100µL hydrocarbon mix (gas-tight syringe)
Oven temp.:	40°C (hold 3 min.) to 120°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	37.5cm/sec. set @ 80°C
Split flow:	60mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS

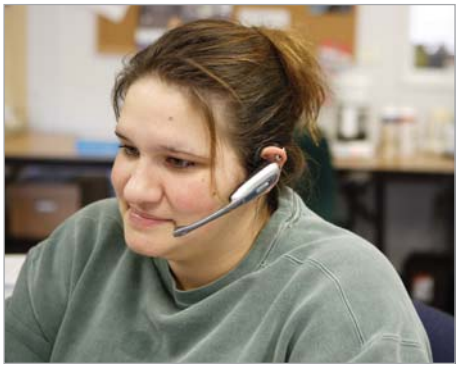
Refinery Gas
Rt®-Alumina
(PLOT)



GC_PC00183

1. methane
2. ethane
3. ethylene
4. propane
5. cyclopropane
6. propylene
7. isobutane
8. *n*-butane
9. propadiene
10. acetylene
11. *trans*-2-butene
12. 1-butene
13. *cis*-butene
14. isopentane
15. *n*-pentane
16. 1,3-butadiene
17. propyne

Column:	Rt®-Alumina, 50m, 0.53mm ID (cat.# 19701)
Inj.:	100µL hydrocarbon mix split injection, 1,000ppm (gas-tight syringe)
Oven temp.:	40°C to 120°C @ 5°C/min. (hold 5 min.)
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	37.5cm/sec. set @ 80°C (5.0mL/min.)
Split flow:	60mL/min.
FID sensitivity:	1.28 x 10^{-10} AFS



Jamie Hubler, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

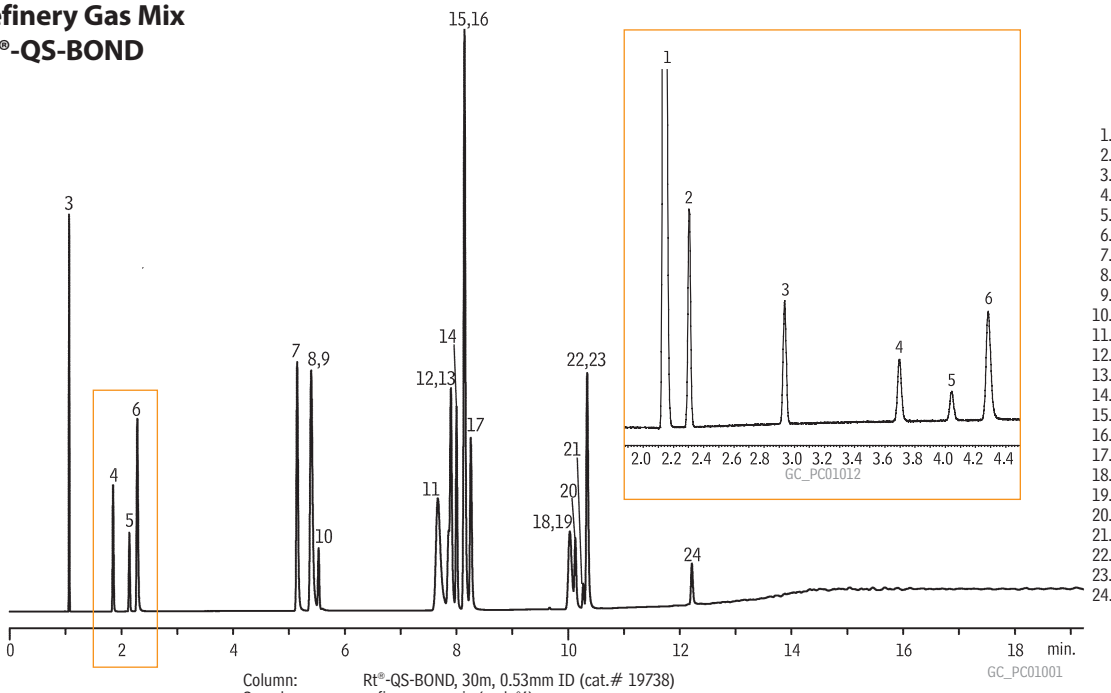
Online: www.restek.com—24-hours a day

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Refinery Gas Mix
Rt®-QS-BOND

NEW!

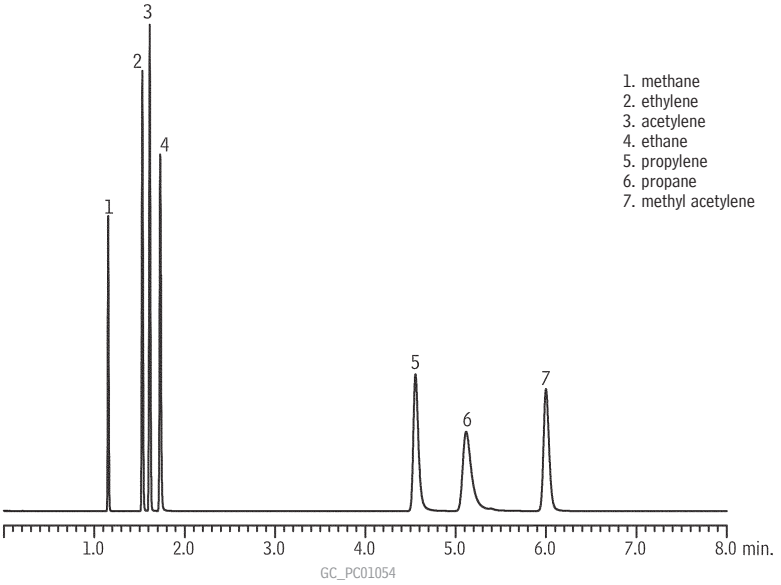


1. air
2. CO_2
3. methane
4. ethylene
5. acetylene
6. ethane
7. propylene
8. propane
9. 1,2-propadiene
10. cyclopropane
11. isobutene
12. 1,3-butadiene
13. 1-butene
14. isobutane
15. n-butane
16. cis-2-butene
17. trans-2-butene
18. isopentene
19. 1-pentene
20. *n*-pentane
21. *cis*-2-pentene
22. *trans*-2-pentene
23. 2-methyl-2-butene
24. *n*-hexane

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	refinery gas mix (mole%)
Inj.:	FID: 2µL split (split ratio 10:1), 4mm single gooseneck liner (cat.# 20798)
TCD:	20µL split (split ratio 10:1), 4mm Siltek® single gooseneck liner (cat.# 20798-214.1)
Inj. temp.:	FID: 250°C TCD: 240°C
Carrier gas:	FID: helium, constant flow, 5.7mL/min. @ 40°C TCD: helium, constant pressure, 5.5mL/min. @ 40°C
Oven temp.:	40°C (hold 2 min.) to 225°C @ 15°C/min. (hold 5 min.)
Det.:	FID @ 250°C TCD @ 240°C

Refinery Gas Mix
Rt®-QS-BOND

NEW!



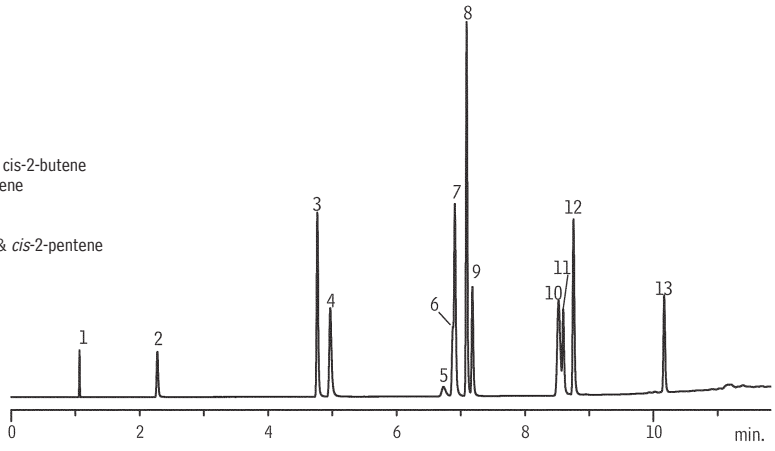
1. methane
2. ethylene
3. acetylene
4. ethane
5. propylene
6. propane
7. methyl acetylene

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	refinery gas mix (mole%)
Inj.:	2µL split (split ratio 10:1), 4mm single gooseneck liner (cat.# 20798)
Inj. temp.:	240°C
Carrier gas:	hydrogen, constant flow
Flow rate:	3.6mL/min. @ 60°C
Oven temp.:	60°C (hold 15 min.) to 240°C @ 25°C/min. (hold 2 min.)
Det.:	FID @ 240°C

Refinery Gas #6
Rt®-QS-BOND

NEW!

1. methane
2. ethane
3. propylene
4. propane
5. isobutane
6. 1-butene
7. isobutylene
8. *n*-butane & cis-2-butene
9. *trans*-2-butene
10. isopentene
11. 1-pentene
12. *n*-pentane & *cis*-2-pentene
13. *n*-hexane



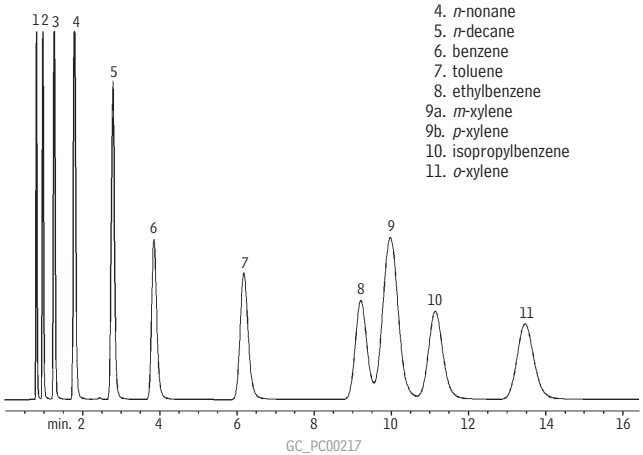
GC_PC01014

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	refinery gas mix (mole%)
Inj.:	20µL split (split ratio 10:1), 4mm Siltek® single gooseneck liner (cat.# 20798-214.1)
Inj. temp.:	240°C
Carrier gas:	helium, constant flow
Flow rate:	5.7mL/min. @ 40°C
Oven temp.:	40°C (hold 2 min.) to 225°C @ 15°C/min. (hold 5 min.)
Det.:	FID @ 240°C

Aromatics, Aliphatics
10% TCEP 100/120 Chromosorb® PAW
(packed)

1. *n*-hexane
2. *n*-heptane
3. *n*-octane
4. *n*-nonane
5. *n*-decane
6. benzene
7. toluene
8. ethylbenzene

9a. *m*-xylene
9b. *p*-xylene
10. isopropylbenzene
11. *o*-xylene

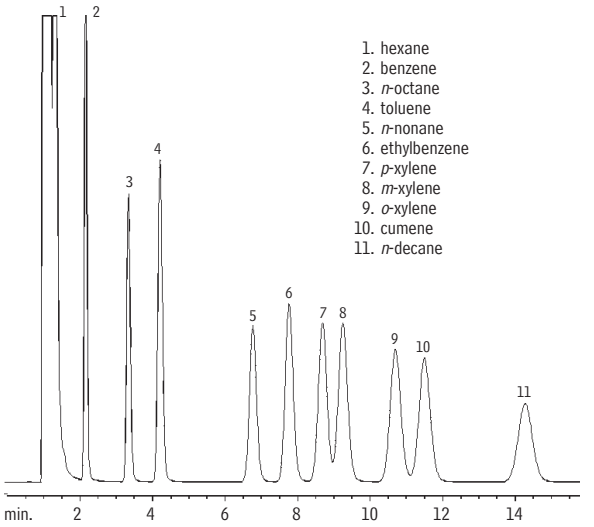


GC_PC00217

Column:	10% TCEP on 100/120 Chromosorb® PAW, 2.5m, 1/8" OD, 2mm ID SilcoSmooth™ tubing (cat.# 80126)
Sample size:	0.1mL neat
Oven temp.:	80°C
Inj./det. temp.:	200°C/250°C
Carrier gas:	nitrogen
Flow rate:	20mL/min.
FID sensitivity:	128 x 10^{-10} AFS

Searching for a chromatogram?
www.restek.com

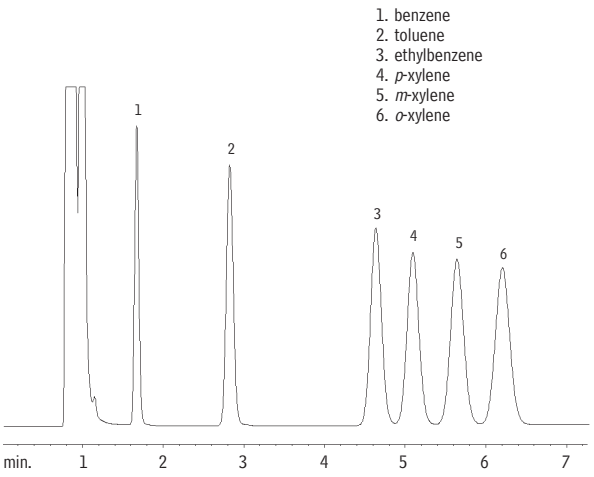
Aromatics (Xylene Isomers plus Cumene)
5% Rt®-1200/1.75% Bentone® 34
(packed)



GC_PC00192

Column:	5% Rt®-1200/1.75% Bentone® 34 on 100/120 Silcoport™, 1.8m, 1/8" OD, 2mm ID SilcoSmooth™ tubing (cat.# 80125)
Sample size:	0.1µL
Conc.:	0.5µg/µL in hexane
Oven temp.:	75°C
Inj./det. temp.:	200°C
Carrier gas:	nitrogen
Flow rate:	20mL/min.
FID sensitivity:	32 x 10^{-11} AFS

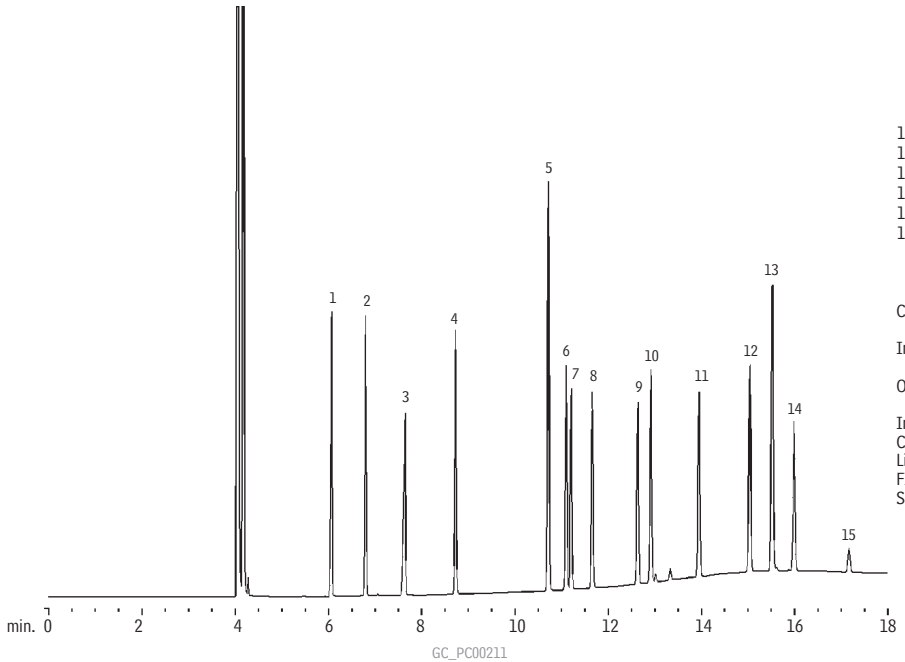
Aromatics (Xylene Isomers /BTEX)
5% Rt®-1200/5% Bentone® 34
(packed)



GC_PC00193

Column:	5% Rt®-1200/5% Bentone® 34 100/120 Silcoport™, 2m, 1/8" OD, 2mm ID SilcoSmooth™ tubing (cat.# 80129)
Sample size:	0.1µL
Conc.:	0.5µg/µL in hexane
Oven temp.:	100°C
Inj./det. temp.:	200°C
Carrier gas:	nitrogen
Flow rate:	20mL/min.
FID sensitivity:	32 x 10^{-11} AFS

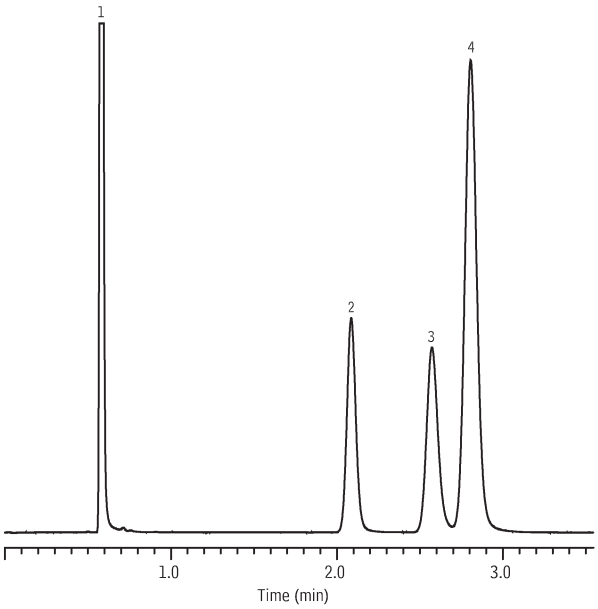
Aromatics
Rt®-TCEP



GC_PC00211

Column:	Rt®-TCEP, 60m, 0.25mm ID, 0.40µm (cat.# 10999)
Inj.:	1.0µL split injection, components @ 500ppm (ethylbenzene @ 1000ppm)
Oven temp.:	60°C (hold 5 min.) to 100°C @ 5°C/min. (hold 10 min.)
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 80°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split flow:	46mL/min.

Motor Oil & Aviation Gas
ASTM Method D3606-99
10% Rtx®-1 & 20% TCEP
(micropacked)



GC_PC00775

1. nonaromatics
2. benzene
3. methyl ethyl ketone (IS)
4. toluene

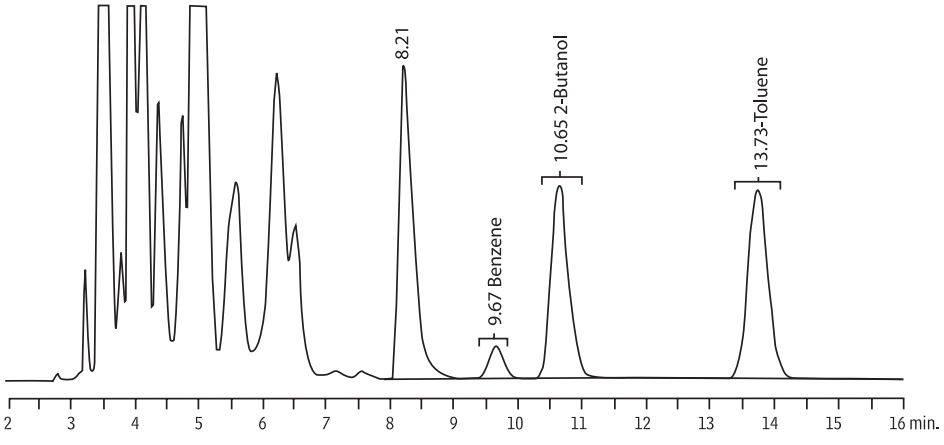
Column:
A: 10% Rtx®-1 on 60/80 Chromosorb® WAW, 0.8m, 1/16 inch, 1mm ID Silcosteel® tubing

B: 20% TCEP on 80/100 Chromosorb® PAW, 4.0m, 1/16 inch, 1mm ID Silcosteel® tubing connected in series and using Micropacked Column On-Column Injection Kit (cat.# 22425)

Sample:	benzene, toluene, methyl ethyl ketone in pentane
Inj.:	1.0µL, on-column, 4mm ID splitless inlet liner (cat.# 20772)
Carrier gas:	hydrogen, constant flow
Flow rate:	9.0mL/min.
Inj. temp.:	200°C
Oven temp.:	145°C
Det.:	FID @ 200°C

Gasoline
ASTM D3606-06 Modified

NEW!

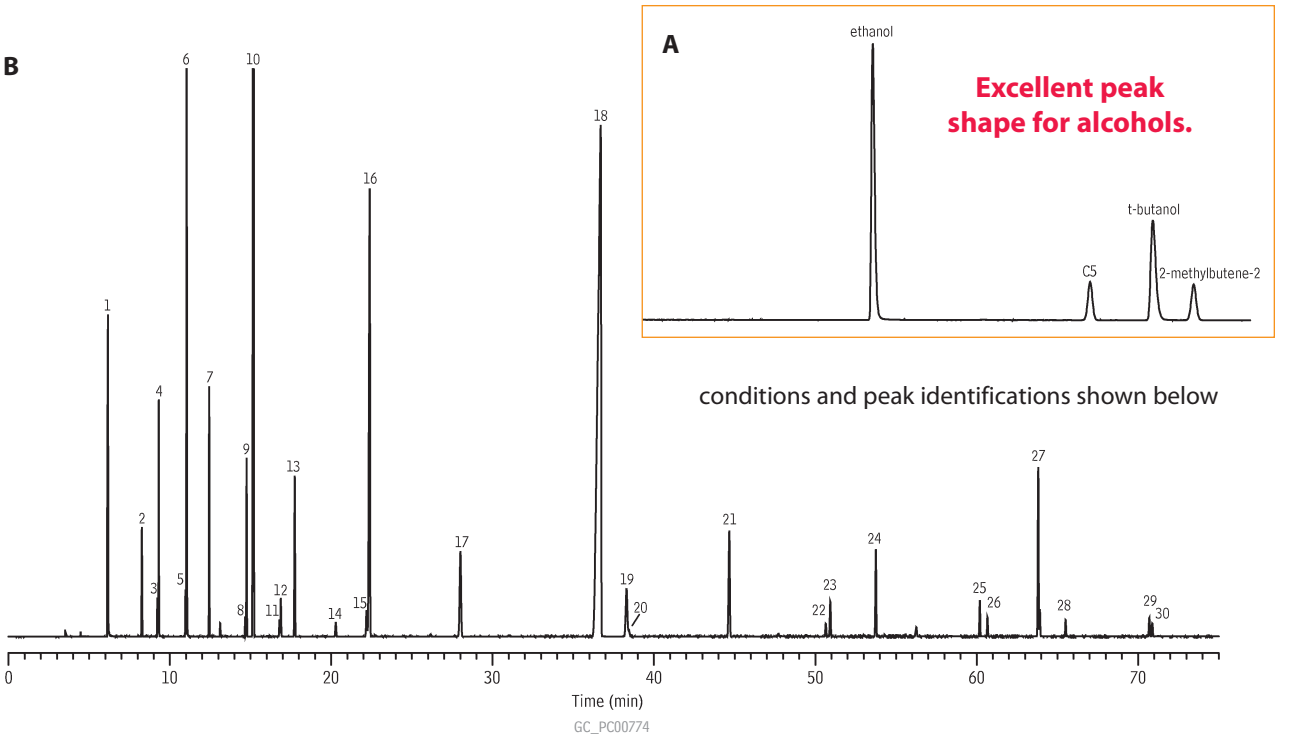


GC_PC01079

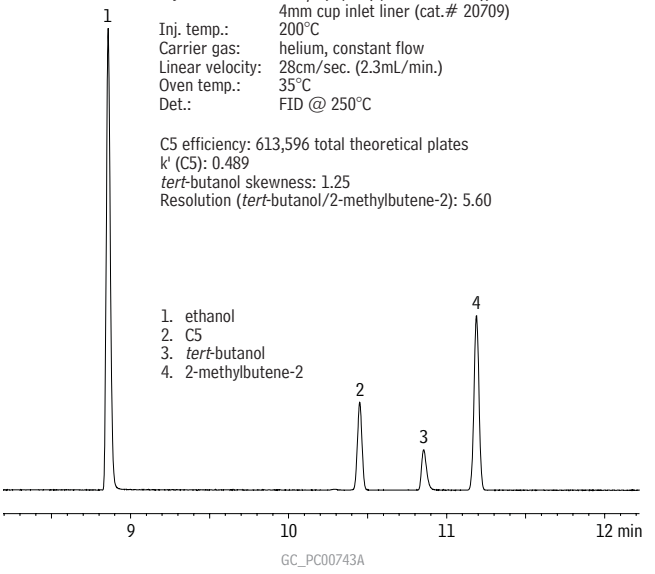
Column:	D3606 Application Column (2 column set, cat.# 83606-800) Column 1: nonpolar Rtx®-1, 6' (1.8m), 1/8" OD, 2.0mm ID Column 2: proprietary packing material, 16' (4.9m), 1/8" OD, 2.0mm ID
Sample:	1.5µL gasoline
Inj.:	200°C
Backflush:	~1 minute
Carrier gas:	helium, constant flow
Flow rate:	25mL/min.
Oven temp.:	135°C, isothermal
Det.:	TCD @ 200°C

Chromatogram courtesy of Boguslaw Dudek, Conoco Phillips, Linden, NJ.

Fast Detailed Hydrocarbons Analysis (DHA) Rtx®-1PONA/Rtx®-5PONA Tuning Column



Detailed Hydrocarbons Analysis (DHA) Rtx®-1PONA/Rtx®-5PONA Tuning Column



Column: Rtx®-1PONA, 100m, 0.25mm ID, 0.5µm (cat.# 10195) plus Rtx®-5PONA tuning column, 2.62m, 0.25mm ID, 1.0µm, connected via Press-Tight® connector (cat.# 20446)
Sample: custom detailed hydrocarbons analysis (DHA) mix, neat
Inj.: 0.01µL, split (split ratio 150:1), 4mm cup inlet liner (cat.# 20709)
Inj. temp.: 200°C
Carrier gas: helium, constant flow
Linear velocity: 28cm/sec. (2.3mL/min.)
Oven temp.: 35°C
Det.: FID @ 250°C

C5 efficiency: 613,596 total theoretical plates
k' (C5): 0.489
tert-butanol skewness: 1.25
Resolution (*tert*-butanol/2-methylbutene-2): 5.60

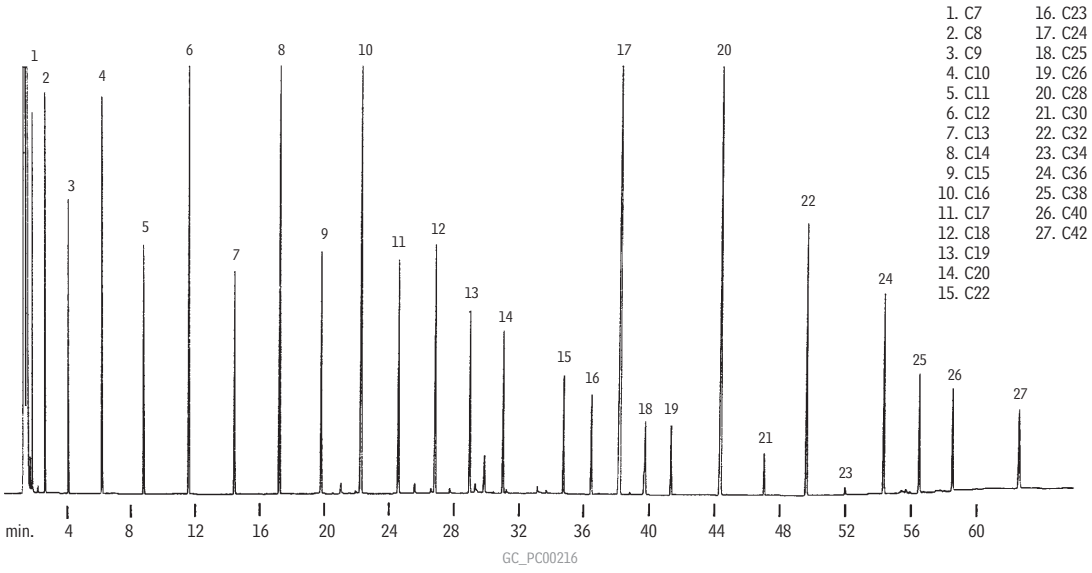
Column: Rtx®-1PONA 100m, 0.25mm ID, 0.5µm (cat.# 10195) plus Rtx®-5PONA tuning column (cat.# 10196), connected via angled Press-Tight® connector (cat.# 20446)
Sample: DHA/oxygenates setup blend
Inj.: 0.01µL, split (split ratio 150:1), 4mm ID cup inlet liner (cat.# 20709)
A: front slice of DHA/oxygenates setup blend
B: DHA/oxygenates setup blend
Carrier gas: hydrogen, constant flow (3.62cc/min.)
Linear velocity: 55cm/sec.
Inj. temp.: 250°C
Oven temp.: A: 35°C
B: 5°C (hold 8.32 min.) (elute C5) to 48°C @ 22°C/min. (hold 26.32 min.) (elute ethylbenzene) to 141°C @ 3.20°C/min. (no hold) (elute C12) to 300°C @ 1°C/min.
Det.: FID @ 300°C

A: Front end of DHA/oxygenates setup blend
C5 efficiency: 586,825 plates
C5 k': 0.476
tert-butanol skew: 2.10
Resolution *tert*-butanol/2-methylbutene-2: 5.39

B: DHA/oxygenates setup blend
1. ethanol
2. C5
3. *tert*-butanol
4. 2-methylbutene-2
5. 2,3-dimethylbutane
6. methyl *tert*-butyl ether (MTBE)
7. C6
8. 1-methylcyclopentene
9. benzene
10. cyclohexane
11. 3-ethylpentane
12. 1,2-dimethylcyclopentane
13. C7
14. 2,2,3-trimethylpentane
15. 2,3,3-trimethylpentane
16. toluene
17. C8
18. ethylbenzene
19. *p*-xylene
20. 2,3-dimethylheptane
21. C9
22. 5-methylnonane
23. 1,2-methylethylbenzene
24. C10
25. C11
26. 1,2,3,5-tetramethylbenzene
27. naphthalene
28. C12
29. 1-methylnaphthalene
30. C13

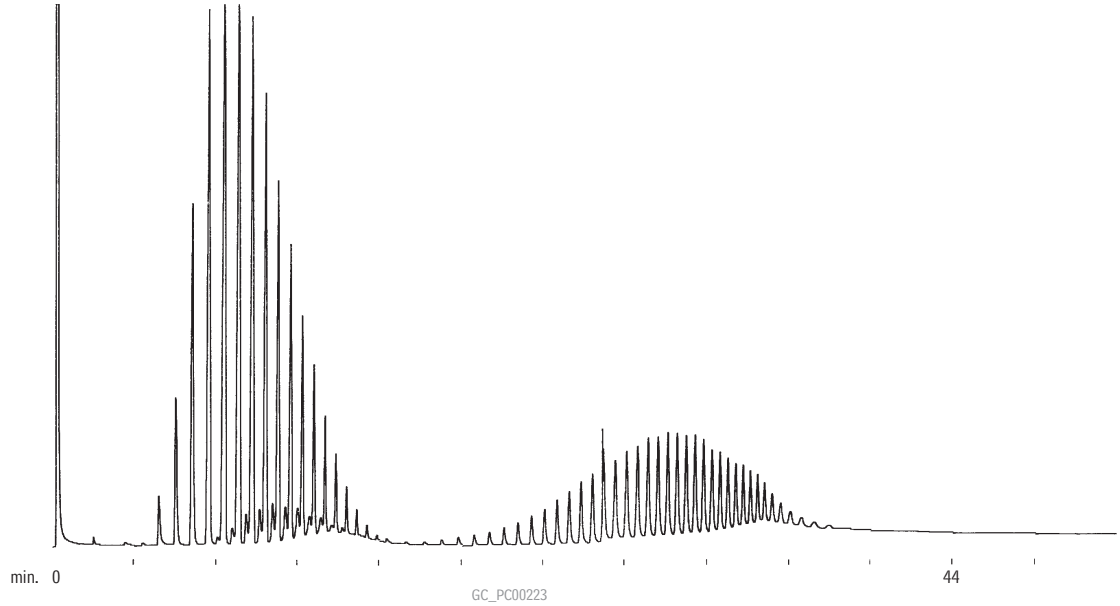
Chromatogram courtesy of Neil Johansen, Inc., Aztec, New Mexico, in association with Envantage Analytical Software, Inc., Cleveland, Ohio.

Hydrocarbons, C7-C42
Rtx®-1



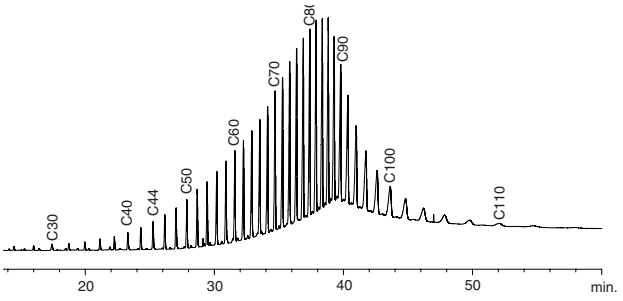
Column:	Rtx®-1, 30m, 0.53mm ID, 0.25µm (cat.# 10125)
Sample:	0.2µL injection of a synthetic hydrocarbon mix, ~ 0.1mg/mL per component
Inj.:	Direct injection using a Uniliner® inlet liner
Oven temp.:	40°C to 340°C @ 5°C/min.
Inj./det. temp.:	340°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. set @ 40°C
FID sensitivity:	64 x 10^{-11} AFS

Hydrocarbons (High Temperature Petroleum Wax)
MXT®-1



Column:	MXT®-1, 15m, 0.53mm ID, 0.20µm (cat.# 70108)
Sample:	1.0µL on-column injection of paraffin wax in methylene chloride
Oven temp.:	100°C to 400°C @ 10°C/min. (hold 20 min.)
Inj./det. temp.:	103°C/430°C
Injector type:	HP cool on-column pressure programmable
Carrier gas:	hydrogen
Linear velocity:	30cm/sec.
FID sensitivity:	2.56 x 10^{-11} AFS

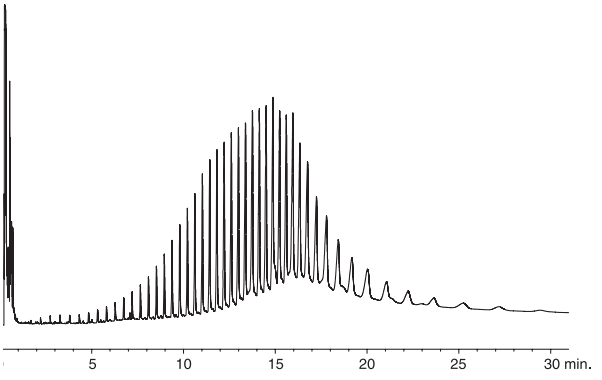
Hydrocarbons (C30-C110)
MXT®-1HT Sim Dist



GC_PC00530

Column:	MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.10µm (cat.# 70100)
Sample:	0.2µL Polywax® 1000 standard (cat.# 36227)
Solvent:	carbon disulfide
Oven temp.:	40°C to 430°C @ 10°C/min. (hold 30 min.)
Injector:	on-column (track oven)
Carrier gas:	helium (constant pressure)
Head pressure:	1.0psi
Linear velocity:	60cm/sec.
Flow rate:	7.8mL/min.
Det.:	FID @ 430°C
Make-up gas flow:	40cc/min.

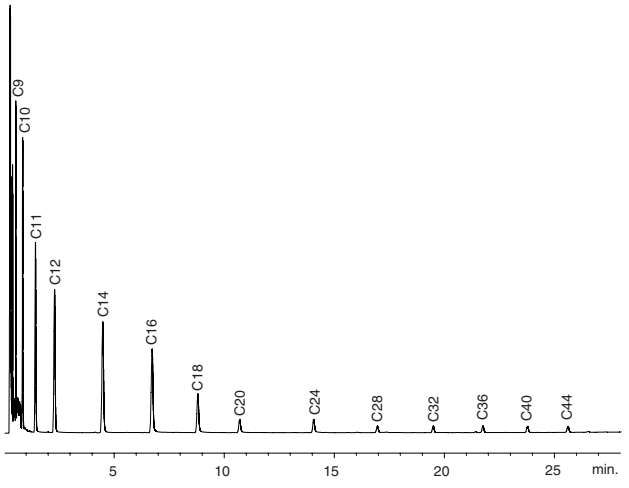
Hydrocarbons (C44-C100)
MXT®-1HT Sim Dist
(fast GC)



GC_PC00531

Column:	MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.10µm (cat.# 70100)
Sample:	0.2µL injection of Polywax® 1000
Solvent:	carbon disulfide
Oven temp.:	40°C to 430°C @ 60°C/min. (hold 25 min.)
Injector:	on-column (track oven)
Carrier gas:	helium (constant pressure)
Head pressure:	1.0psi
Linear velocity:	60cm/sec.
Flow rate:	7.8mL/min.
Det.:	FID @ 430°C
Make up gas flow:	40cc/min.

Hydrocarbons (C10-C44)
MXT®-1HT Sim Dist



GC_PC00529

Column:	MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.10µm (cat.# 70100)
Sample:	0.2µL hydrocarbon standard (cat.# 31222)
Solvent:	carbon disulfide
Oven temp.:	40°C to 430°C @ 10°C/min. (hold 30 min.)
Injector:	on-column (track oven)
Carrier gas:	helium (constant pressure)
Head pressure:	1.0psi
Linear velocity:	60cm/sec.
Flow rate:	7.8mL/min.
Det.:	FID @ 430°C
Make-up gas flow:	40cc/min.



Diane Thompson, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

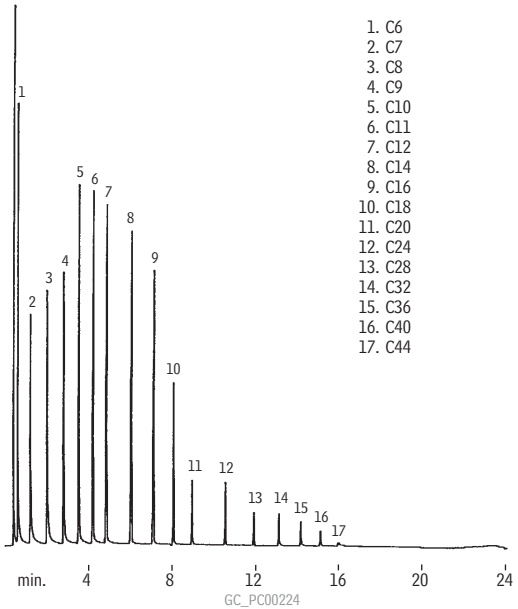
Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com

Simulated Distillation (Standard Calibration) MXT®-1 Sim Dist

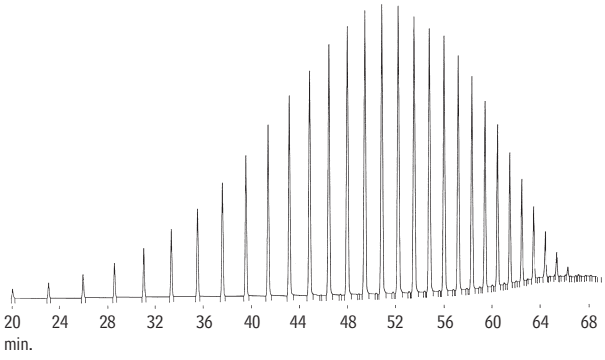


1. C6
2. C7
3. C8
4. C9
5. C10
6. C11
7. C12
8. C14
9. C16
10. C18
11. C20
12. C24
13. C28
14. C32
15. C36
16. C40
17. C44

GC_PC00224

Column:	MXT®-1 Sim Dist, 6m, 0.53mm ID, 0.15µm (cat.# 70101)
Sample:	wet needle on-column injection of ASTM D2887 standard
Oven temp.:	-12°C to 430°C @ 20°C/min.
Inj./det. temp.:	-17°C to 433°C/430°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	128 x 10^{-11} AFS

Simulated Distillation (High-Temperature) MXT®-500 Sim Dist

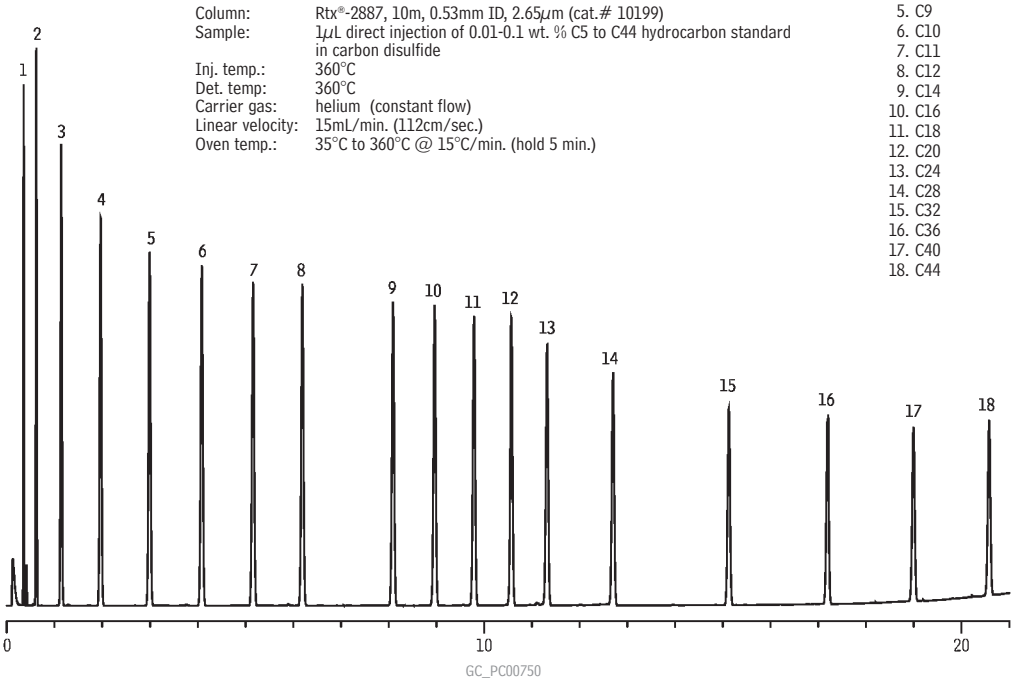


GC_PC00225

Column:	MXT®-500 Sim Dist, 6m, 0.53mm ID, 0.15µm (cat.# 70104)
Sample:	cold on-column injection of Polywax® 655 in CS_2
Oven temp.:	40°C to 430°C @ 6°C/min.
Carrier gas:	helium
Linear velocity:	40cm/sec.
FID sensitivity:	2 x 10^{-11}AFS

Simulated Distillation Rtx®-2887

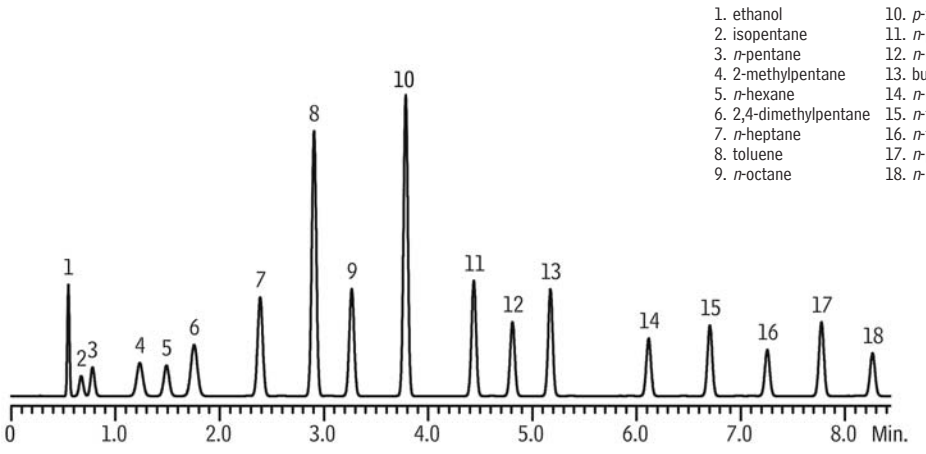
Column:	Rtx®-2887, 10m, 0.53mm ID, 2.65µm (cat.# 10199)
Sample:	1µL direct injection of 0.01-0.1 wt. % C5 to C44 hydrocarbon standard in carbon disulfide
Inj. temp.:	360°C
Det. temp:	360°C
Carrier gas:	helium (constant flow)
Linear velocity:	15mL/min. (112cm/sec.)
Oven temp.:	35°C to 360°C @ 15°C/min. (hold 5 min.)



1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

GC_PC00750

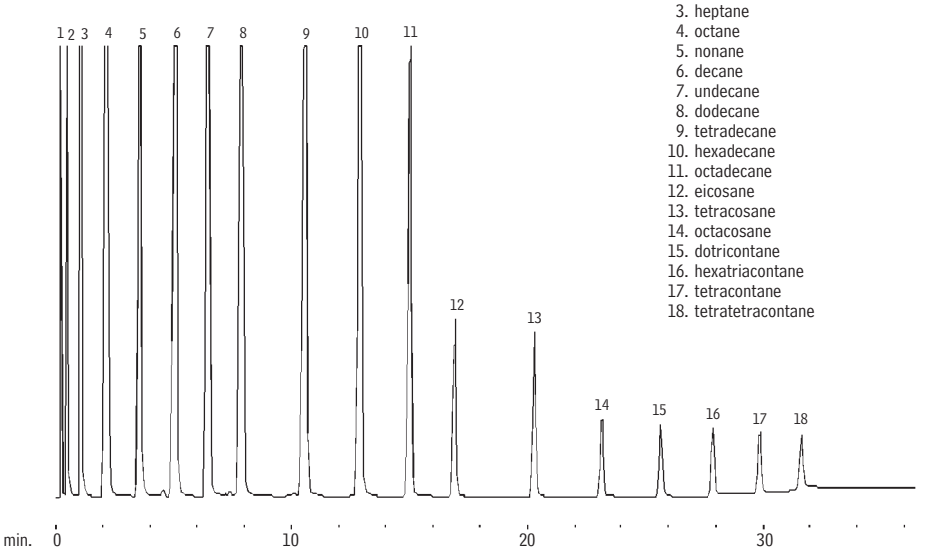
Simulated Distillation
Rtx®-1 (Hydrogen Carrier Gas)



GC_PC00852

Column:	Rtx®-1, 30m, 0.53mm ID, 5.0µm (cat.# 10179)
Sample:	custom paraffin mix, neat, 2.7-12.9% each component
Inj.:	0.1µL splitless (hold 1 min.), 4mm single gooseneck inlet liner (cat.# 20904)
Inj. temp.:	250°C
Carrier gas:	hydrogen, constant flow (Parker ChromGas® hydrogen generator)
Linear velocity:	184cm/sec. @ 40°C
Oven temp.:	40°C (1 min.) to 265°C @ 25°C/min. (hold 4 min.)
Det.:	FID @ 280°C

Simulated Distillation (ASTM D-2887)
Rtx®-1 SimDist 2887
(packed)

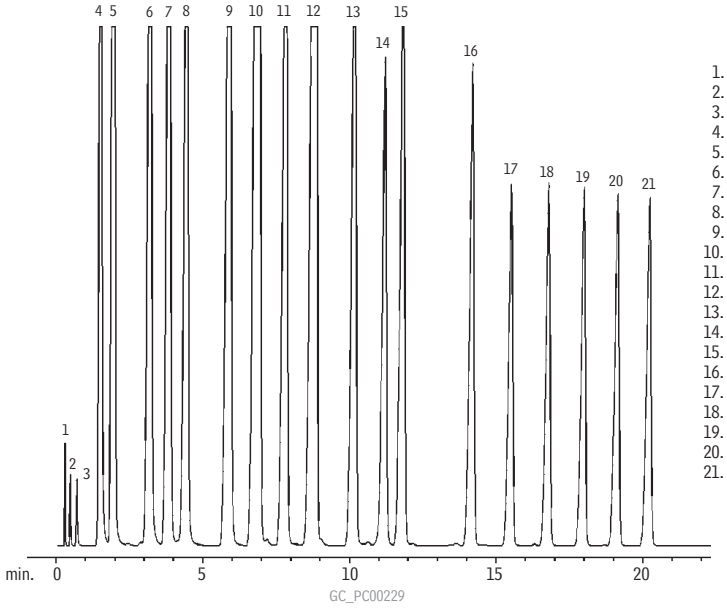


GC_PC00228

Column:	Rtx®-1 SimDist 2887, SilcoSmooth™ stainless steel, 25", 1/8", 2mm ID (cat.# 80000)
Inj.:	1.0µL direct injection, 1–12% (w/w) each component
Oven temp.:	35°C to 350°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	350°C
Carrier gas:	helium @ 25mL/min.
FID sensitivity:	256 x 10^{-11} AFS

cat.# 31674 (1% each listed analyte in CS_2) and cat.# 31675 (5% each, neat) meet requirements of ASTM D2887-01.

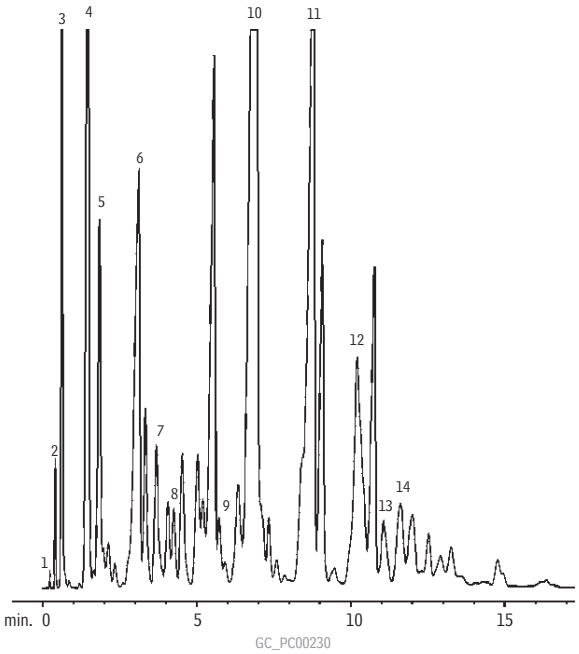
Simulated Distillation (ASTM D-3710 Calibration)
Rtx®-1 SimDist 2887
(packed)



1. *n*-propane
2. 2-methyl propane
3. *n*-butane
4. 2-methylbutane
5. *n*-pentane
6. 2-methylpentane
7. *n*-hexane
8. 2,4-dimethylpentane
9. *n*-heptane
10. toluene
11. *n*-octane
12. *p*-xylene
13. *n*-propylbenzene
14. *n*-decane
15. *n*-butylbenzene
16. *n*-dodecane
17. *n*-tridecane
18. *n*-tetradecane
19. *n*-pentadecane
20. *n*-hexadecane
21. *n*-heptadecane

Column:	Rtx®-1 SimDist 2887, SilcoSmooth™ stainless steel, 25", 1/8", 2mm ID (cat.# 80000)
Sample:	D-3710 Calibration Mix, C3, C4, C16, & C17 added
Oven temp:	-30°C to 250°C @ 10°C/min.
Inj./det. temp.:	250°C/300°C
Carrier gas:	helium @ 25mL/min.
FID sensitivity:	256 x 10^{-11} AFS

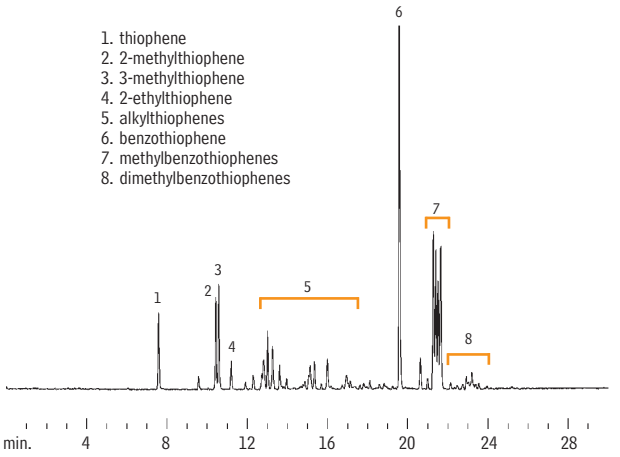
Simulated Distillation (ASTM D-3710, Gasoline)
Rtx®-1 SimDist 2887
(packed)



1. *n*-propane
2. 2-methyl propane
3. *n*-butane
4. 2-methylbutane
5. *n*-pentane
6. 2-methylpentane
7. *n*-hexane
8. 2,4-dimethylpentane
9. *n*-heptane
10. toluene
11. *p*-xylene
12. *n*-propylbenzene
13. *n*-decane
14. *n*-butylbenzene

Column:	Rtx®-1 SimDist 2887, SilcoSmooth™ stainless steel, 25", 1/8", 2mm ID (cat.# 80000)
Sample:	1.0µL direct injection of unleaded gasoline (ASTM D-2887)
Oven temp:	-30°C to 250°C @ 10°C/min.
Inj./det. temp.:	250°C/300°C
Carrier gas:	helium @ 25mL/min.
FID sensitivity:	256 x 10^{-11} AFS

Sulfur in Gasoline
Rtx®-1



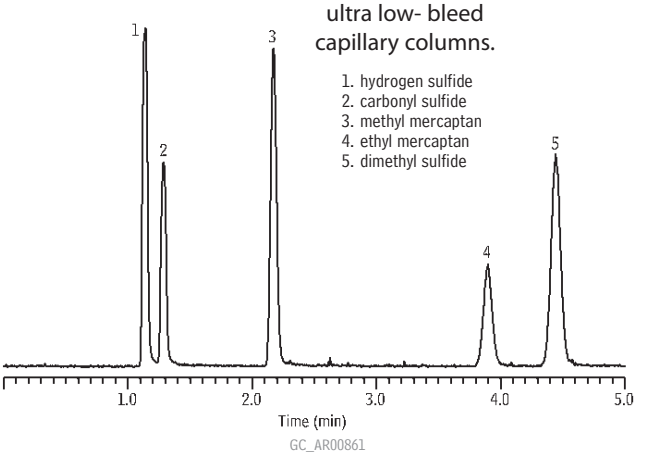
GC_PC00198

Column:	Rtx®-1, 30m, 0.32mm ID, 4.0µm (cat.# 10198)
Sample:	1.0µL split injection of gasoline containing 300ppm total sulfur
Oven temp.:	40°C (hold 3 min.) to 275°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	275°C
Det.:	SCD
Carrier gas:	helium
Linear velocity:	70cm/sec. (flow rate: 2.5mL/min.)
Split ratio:	10:1

Sulfur Compounds
Rxi®-1ms

Rxi® Technology!

Exceptionally inert, ultra low- bleed capillary columns.

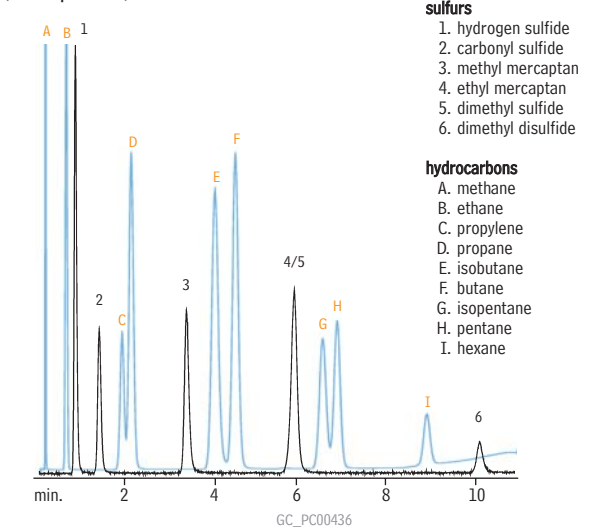


GC_AR00861

Column:	Rxi®-1ms, 30m, 0.32mm ID, 4.00µm (cat.# 13396)
Sample:	hydrogen sulfide, carbonyl sulfide, methyl mercaptan, ethyl mercaptan, dimethyl sulfide, 100 ppbv each in helium
Inj.:	1mL splitless, direct
Sample loop temp.:	30°C
Carrier gas:	helium, constant pressure
Linear velocity:	48cm/sec. @ 30°C
Oven temp.:	30°C
Det.:	sulfur chemiluminescence detector
Det. temp.:	800°C

Sample storage & transfer:
SilcoCan™ air monitoring canister with Siltek® treated 1/4" valve (cat.# 24182-650); Sulfinert® treated gas sample loop, 1cc (cat.# 22848); Sulfinert® treated gas sample loop, 10cc (custom order)

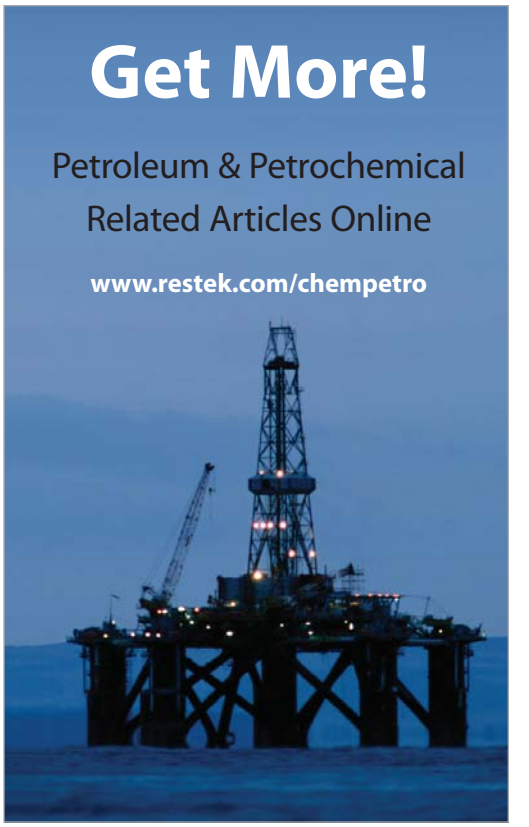
Sulfur Compounds
Rt®-XLSulfur
(micropacked)



GC_PC00436

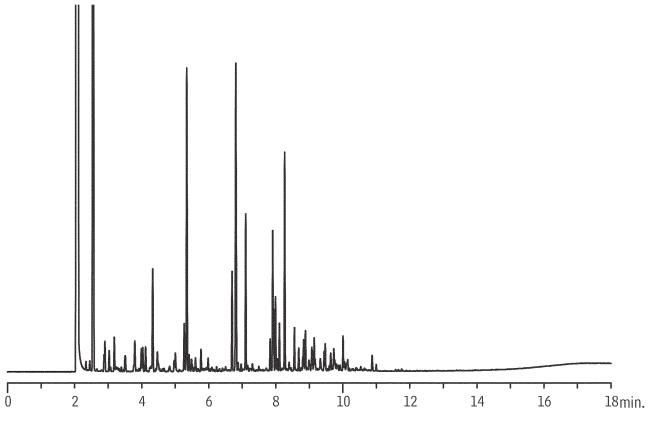
Column:	Rt®-XLSulfur micropacked column, 1m, 0.75mm ID (cat.# 19806)
Conc.:	50ppb each
Oven temp.:	60°C to 230°C @ 15°C/min.
Carrier gas:	helium
Flow rate:	9mL/min.
Det.:	SCD/FID

Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.



Unleaded Gasoline
Rxi®-1ms

NEW!

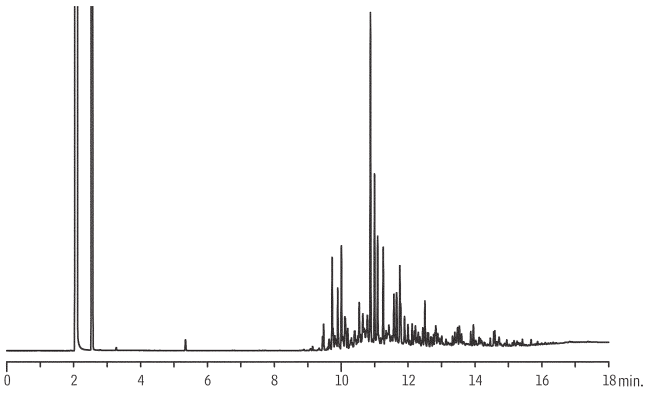


GC_PC01071

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	5,000µg/mL unleaded gasoline, unweathered, in methanol (cat.# 30096)
Inj.:	1µL split (split ratio 20:1), 4mm single gooseneck liner w/ wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min. to 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°C

99% Weathered Unleaded Gasoline
Rxi®-1ms

NEW!

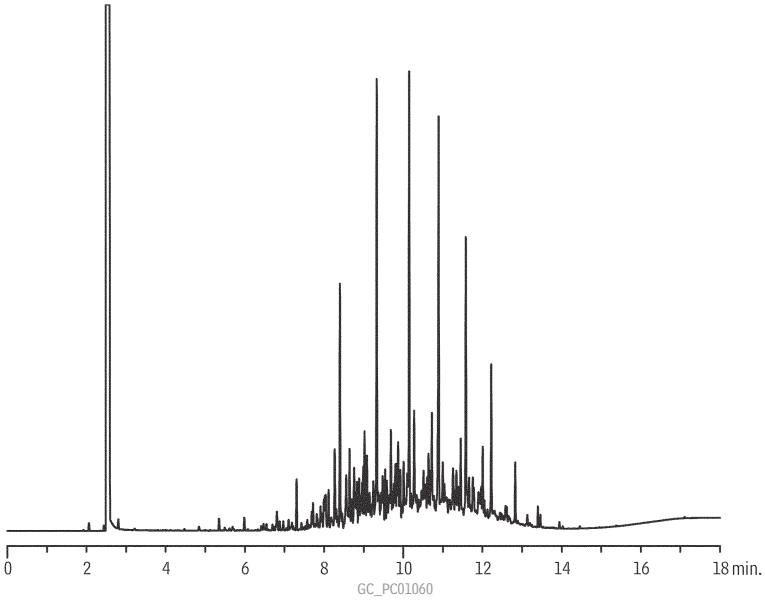


GC_PC01070

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	5,000µg/mL unleaded gasoline, 99% weathered, in methanol (cat.# 30436)
Inj.:	1µL split (split ratio 20:1), 4mm single gooseneck liner w/ wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min. to 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°

Unweathered Kerosene
Rxi®-1ms

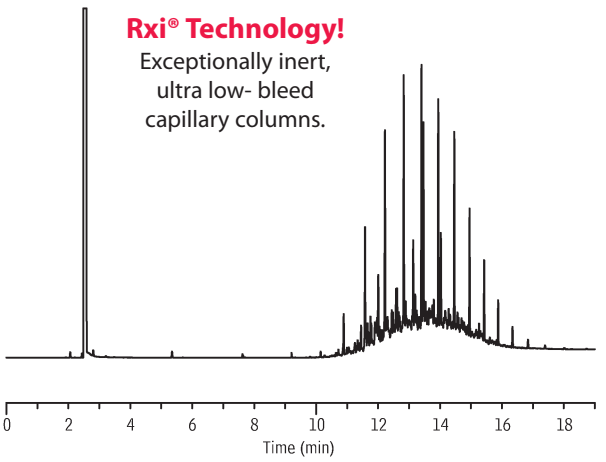
NEW!



GC_PC01060

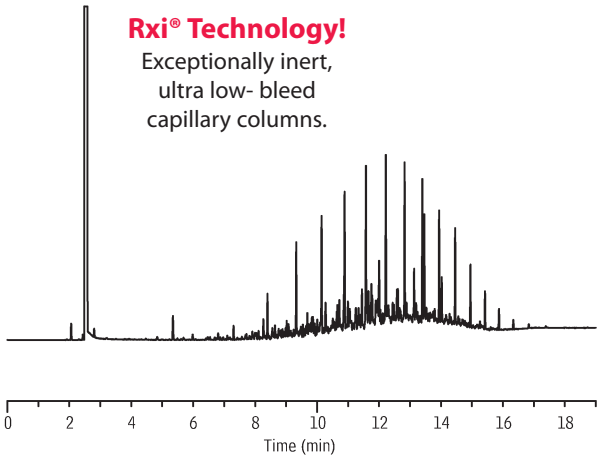
Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	5,000µg/mL kerosene, unweathered, in methylene chloride (cat.# 31229)
Inj.:	1µL split (split ratio 20:1), 4mm single gooseneck liner w/ wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min. to 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°C

50% Weathered Diesel Fuel #2
Rxi®-1ms



Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.50µm (cat.# 13338)
Sample:	5,000µg/mL diesel fuel #2, 50% weathered (cat.# 31235) in methylene chloride
Inj.:	1.0µL split (split ratio 20:1), 4mm single gooseneck w/wool inlet liner (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min., 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°C

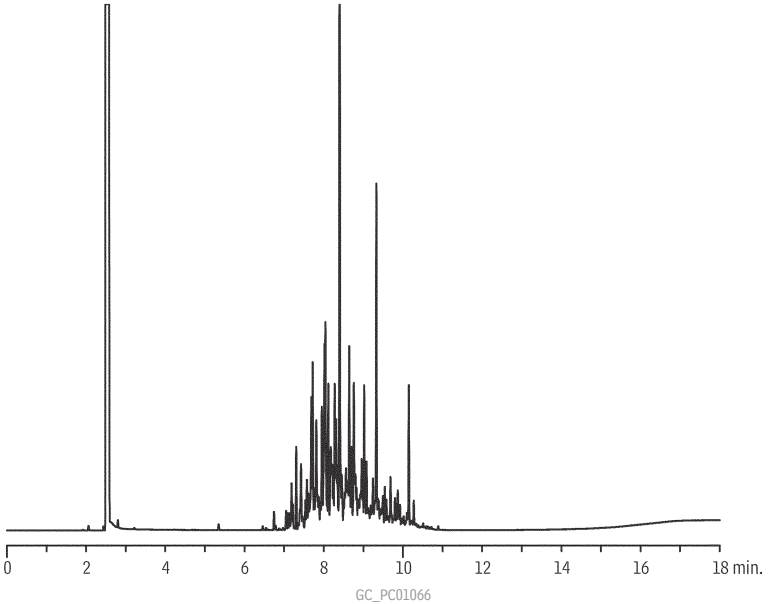
Unweathered Diesel Fuel #2
Rxi®-1ms



Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.50µm (cat.# 13338)
Sample:	5,000µg/mL diesel fuel #2, unweathered (cat.# 31233) in methylene chloride
Inj.:	1.0µL split (split ratio 20:1), 4mm single gooseneck w/wool inlet liner (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min., 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°C

Mineral Spirits
Rxi®-1ms

NEW!



Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	5,000µg/mL mineral spirits, unweathered, in methylene chloride (cat.# 31225)
Inj.:	1µL split (split ratio 20:1), 4mm single gooseneck liner w/ wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Linear velocity:	28cm/sec. @ 50°C
Oven temp.:	50°C (hold 2 min.) to 75°C @ 10°C/min. to 300°C @ 20°C/min. (hold 5 min.)
Det.:	FID @ 300°C

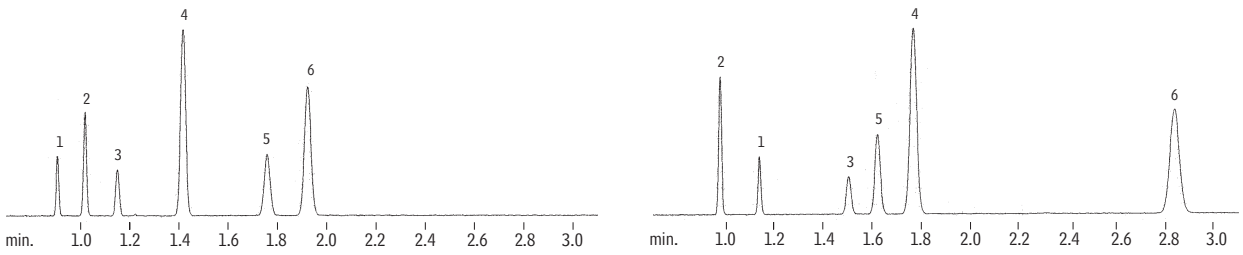
Blood Alcohol
Rtx®-BAC1 & Rtx®-BAC2 (0.32mm ID Columns)

(headspace analysis)

	Conc. w/v
1. methanol	0.1%
2. acetaldehyde	0.2%
3. ethanol	0.2%
4. isopropanol	0.1%
5. acetone	0.01%
6. *n*-propanol	0.1%

Rtx®-BAC1,
30m, 0.32mm ID, 1.8µm (cat.# 18003)

Rtx®-BAC2,
30m, 0.32mm ID, 1.2µm (cat.# 18002)



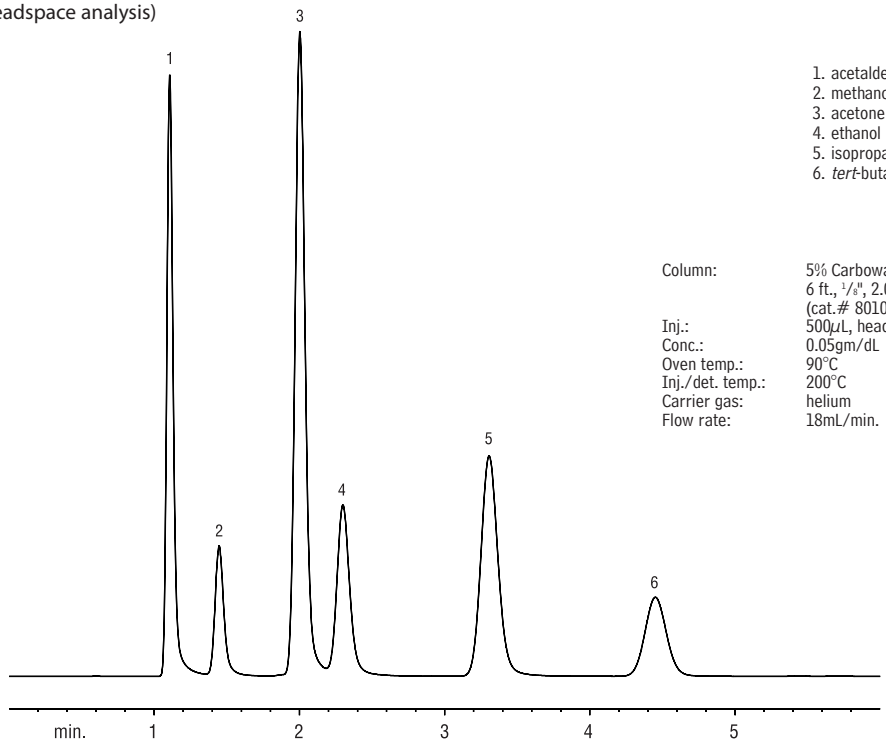
GC_PH00241

Dual-column analysis using a two-hole ferrule.

Sample:	1.0mL headspace sample of a blood alcohol mix on a PerkinElmer HS 40 headspace autosampler
Oven temp.:	40°C
Inj. temp.:	200°C
Carrier gas:	helium
Sample equilibration:	70°C, 15 min.
Vial pressure:	30psi
Vial pressurization time:	0.15 min.
Vial sampling time:	0.01 min.
Transfer line:	0.32mm ID Hydroguard™ fused silica tubing
Transfer line temp.:	200°C
Injection port sleeve:	2mm ID
Split flow:	20mL/min.

Blood Alcohol
5% Carbowax® 20M on CarboBlack B

(packed; headspace analysis)



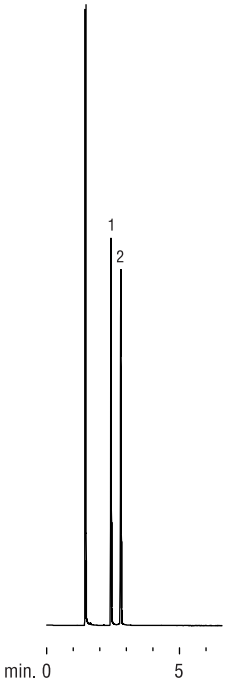
GC_PH00478

1. acetaldehyde
2. methanol
3. acetone
4. ethanol
5. isopropanol
6. *tert*-butanol

Column:	5% Carbowax® 20M on 80/120 CarboBlack B, 6 ft., 1/8", 2.0mm ID SilcoSmooth™ tubing (cat.# 80105)
Inj.:	500µL, headspace
Conc.:	0.05gm/dL
Oven temp.:	90°C
Inj./det. temp.:	200°C
Carrier gas:	helium
Flow rate:	18mL/min.

Glycols
Rtx®-BAC1 & Rtx®-BAC2

Rtx®-BAC1

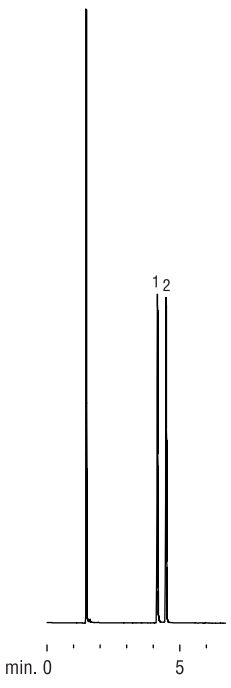


1. ethylene glycol
2. propylene glycol

Columns:	Rtx®-BAC1, 30m, 0.32mm ID, 1.8µm (cat.# 18003) Rtx®-BAC2, 30m, 0.32mm ID, 1.2µm (cat.# 18002)
Inj.:	0.5µL split injection
Conc.:	1%
Solvent:	methanol
Oven temp.:	100°C to 240°C @ 5°C/min. (hold 5 min.)
Inj. temp.:	240°C
Inj. mode:	100:1 split
Inlet liner:	4mm single gooseneck (cat.# 20798)
Septa purge:	5.0cc/min.
Carrier gas:	helium, constant pressure
Pressure:	12psi
Linear velocity:	37cm/sec.
Column flow rate:	2.1mL/min.
Det.:	FID @ 240°C
Make-up gas flow:	40cc/min.

GC_EV00474

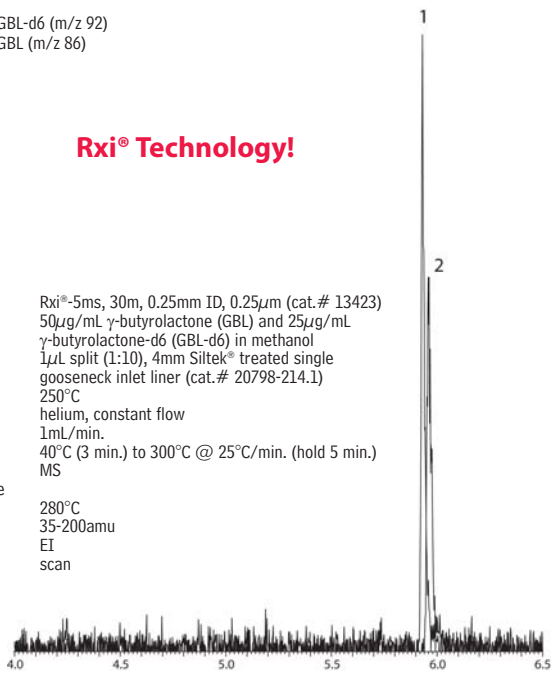
Rtx®-BAC2



γ-butyrolactone and γ-butyrolactone-d6
Rxi®-5ms

1. GBL-d6 (m/z 92)
2. GBL (m/z 86)

Rxi® Technology!



Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	50µg/mL γ-butyrolactone (GBL) and 25µg/mL γ-butyrolactone-d6 (GBL-d6) in methanol
Inj.:	1µL split (1:10), 4mm Siltek® treated single gooseneck inlet liner (cat.# 20798-214.1)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	40°C (3 min.) to 300°C @ 25°C/min. (hold 5 min.)
Det:	MS
Transfer line temp.:	280°C
Scan range:	35-200amu
Ionization:	EI
Mode:	scan

GC_PH00869

Get More!

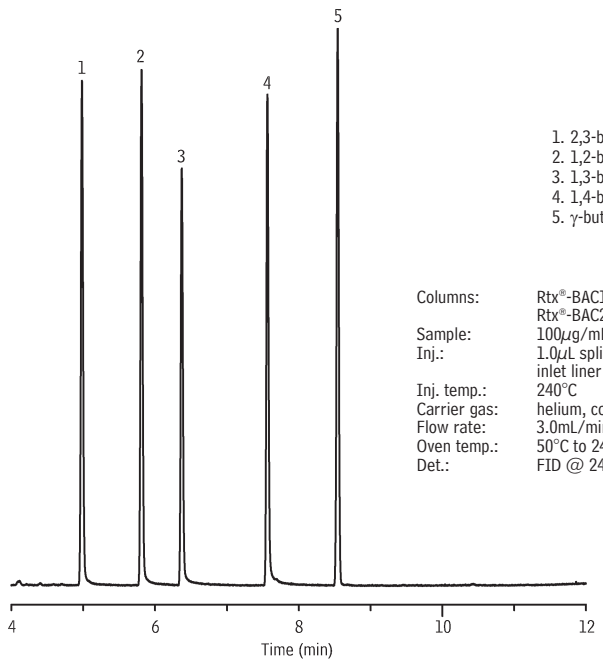
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www.restek.com/CFT

γ-butyrolactone & 1,4-butanediol

Rtx®-BAC1

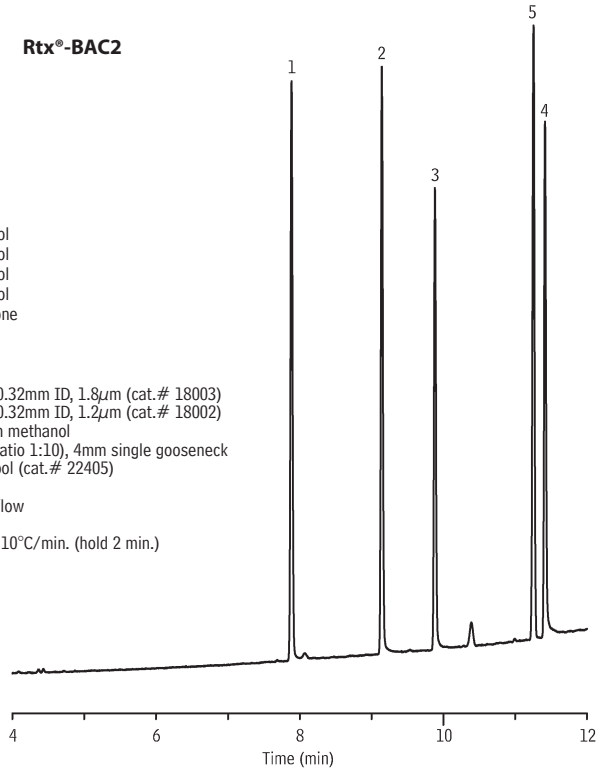


GC_PH00808

1. 2,3-butanediol
2. 1,2-butanediol
3. 1,3-butanediol
4. 1,4-butanediol
5. γ-butyrolactone

Columns:	Rtx®-BAC1, 30m, 0.32mm ID, 1.8µm (cat.# 18003) Rtx®-BAC2, 30m, 0.32mm ID, 1.2µm (cat.# 18002)
Sample:	100µg/mL each in methanol
Inj.:	1.0µL split (split ratio 1:10), 4mm single gooseneck inlet liner with wool (cat.# 22405)
Inj. temp.:	240°C
Carrier gas:	helium, constant flow
Flow rate:	3.0mL/min.
Oven temp.:	50°C to 240°C @ 10°C/min. (hold 2 min.)
Det.:	FID @ 240°C

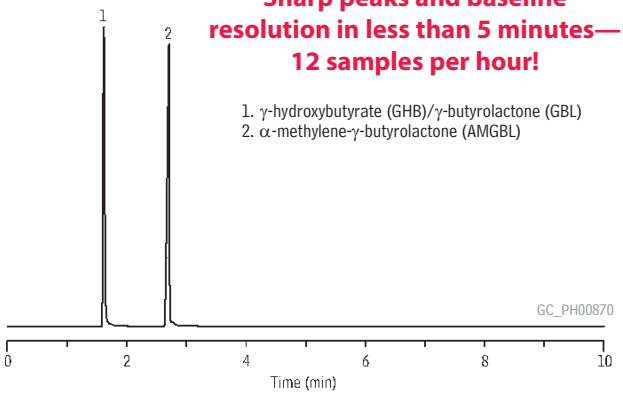
Rtx®-BAC2



GC_PH00809

γ-hydroxybutyrate (GHB) and γ-butyrolactone (GBL) Rtx®-BAC1 and Rtx®-BAC2 (dual column analysis)

Rtx®-BAC1

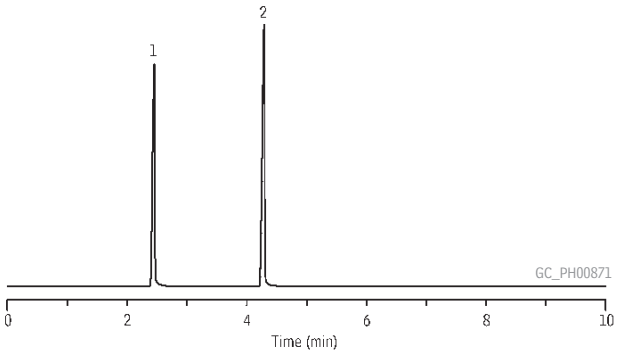


GC_PH00870

Sharp peaks and baseline resolution in less than 5 minutes—12 samples per hour!

1. γ-hydroxybutyrate (GHB)/γ-butyrolactone (GBL)
2. α-methylene-γ-butyrolactone (AMGBL)

Rtx®-BAC2

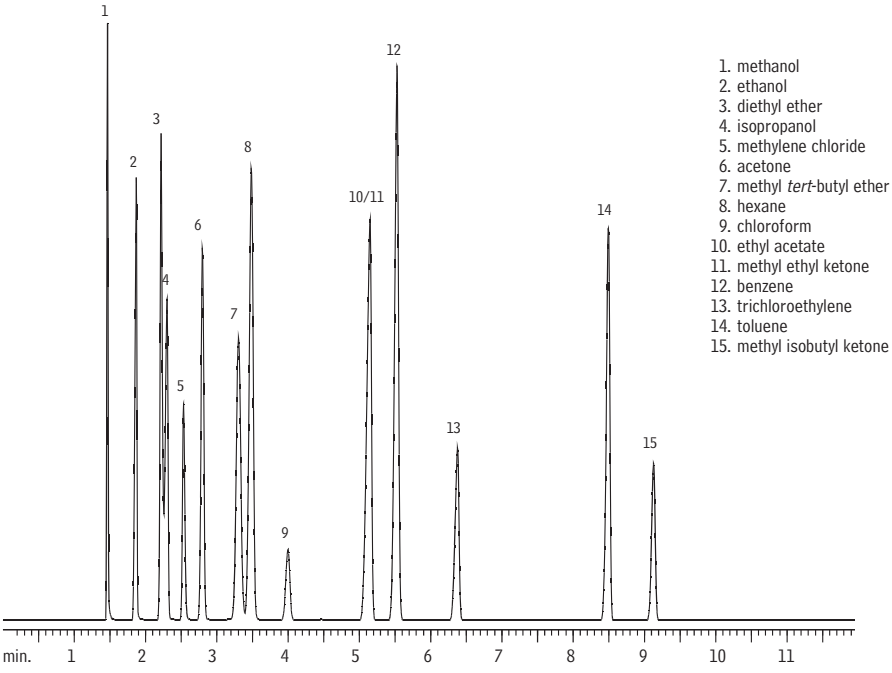


GC_PH00871

Columns:	Rtx®-BAC1, 30m, 0.32mm ID, 1.8µm (cat.# 18003) and Rtx®-BAC2, 30m, 0.32mm ID, 1.2µm (cat.# 18002), connected via universal "Y" Press-Tight® connector (cat.# 20405)
Sample:	GHB, GBL, α-methylene-γ-butyrolactone (AMGBL), 10µg/mL each in water
Inj.:	1.0mL headspace, split (split ratio 1:10), 1mm split inlet liner (cat.# 20972)
Inj. temp.:	200°C
Carrier gas:	helium, constant pressure
Linear velocity:	44cm/sec. @ 50°C
Oven temp.:	50°C (3 min.) to 150°C @ 20°C/min. (hold 7 min.)
Det:	FID @ 240°C
Headspace autosampler:	Teledyne/Tekmar HT3
Sample/platen temp.:	100°C
Sample equilibration:	15 min.
Mixing time:	5 min.
Vial pressure:	10psig
Vial pressurization time:	2 min.
Loop fill time:	2 min.
Transfer line temp.:	120°C

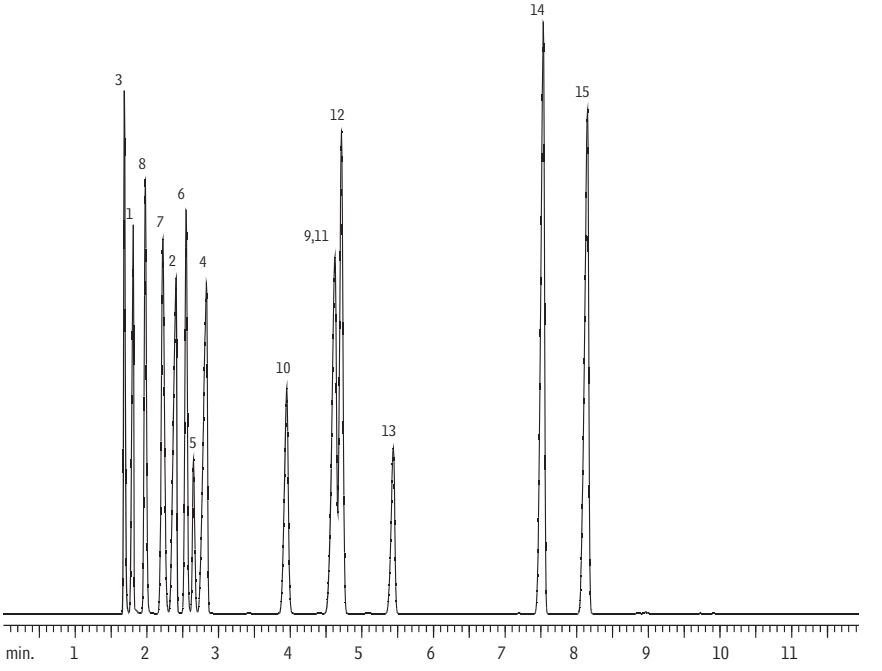
Abused Inhalants
Rtx®-BAC1 & Rtx®-BAC2

Rtx®-BAC1



1. methanol
2. ethanol
3. diethyl ether
4. isopropanol
5. methylene chloride
6. acetone
7. methyl *tert*-butyl ether
8. hexane
9. chloroform
10. ethyl acetate
11. methyl ethyl ketone
12. benzene
13. trichloroethylene
14. toluene
15. methyl isobutyl ketone

Rtx®-BAC2

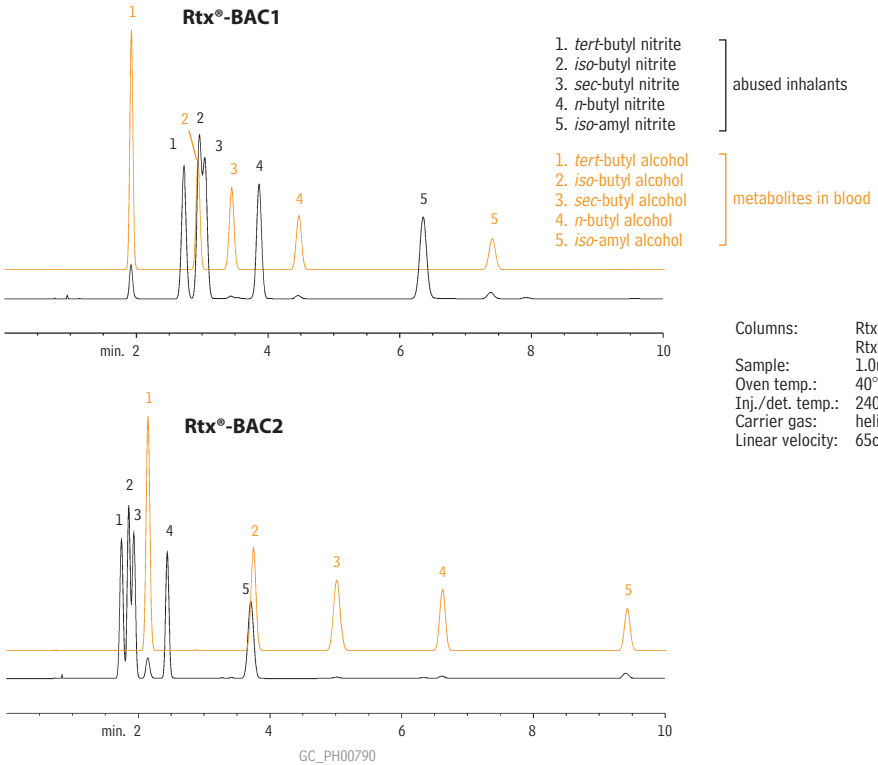


GC_PH00446

Columns:	Rtx®-BAC1, 30m, 0.32mm ID, 1.80µm (cat.# 18003) Rtx®-BAC2, 30m, 0.32mm ID, 1.20µm (cat.# 18002)
Oven temp.:	40°C (hold 4 min.) to 120°C @ 10°C/min.
Carrier gas:	helium
Linear velocity:	50cm/sec.
Det.:	FID
Sample:	250µL headspace
Transfer line temp.:	125°C
Sample loop temp.:	125°C
Vial temp.:	70°C

Acknowledgement: Analyses performed using a Tekmar 7000 Headspace Autosampler on loan courtesy of Tekmar-Dohrmann.

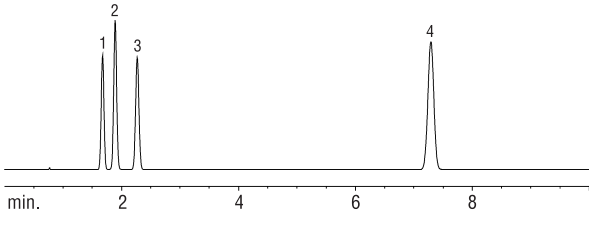
Alkyl Nitrites
Rtx®-BAC1 & Rtx®-BAC2



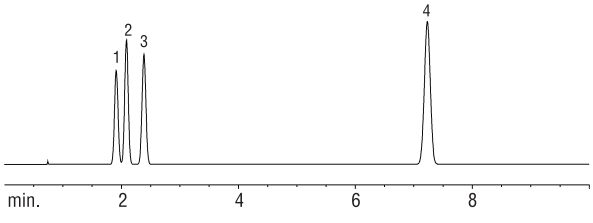
Columns: Rtx®-BAC1, 30m, 0.53mm ID, 3.0µm (cat.# 18001)
Rtx®-BAC2, 30m, 0.53mm ID, 2.0µm (cat.# 18000)
Sample: 1.0mL headspace sample
Oven temp.: 40°C (hold 5 min.) to 240°C @ 5°C/min.
Inj./det. temp.: 240°C
Carrier gas: helium
Linear velocity: 65cm/sec.

Anesthetics
Rtx®-BAC1 & Rtx®-BAC2
(headspace analysis)

Rtx®-BAC1,
30m, 0.53mm ID, 3.0µm (cat.# 18001)



Rtx®-BAC2,
30m, 0.53mm ID, 2.0µm (cat.# 18000)

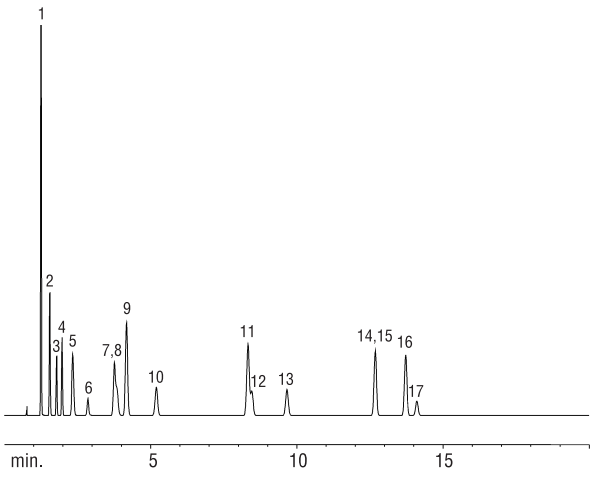


Sample: 1.0mL headspace sample
Oven temp.: 40°C (hold 5 min.) to 240°C @ 5°C/min.
Inj./det. temp.: 240°C
Carrier gas: helium
Linear velocity: 65cm/sec.

1. isoflurane
2. enflurane
3. halothane
4. methoxyflurane

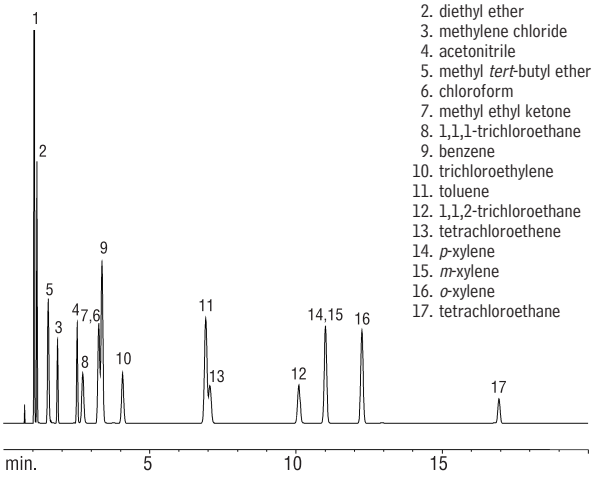
Solvents
Rtx®-BAC1 & Rtx®-BAC2
(headspace analysis)

Rtx®-BAC1,
30m, 0.53mm ID, 3.0µm (cat.# 18001)



GC_PH00509

Rtx®-BAC2,
30m, 0.53mm ID, 2.0µm (cat.# 18000)

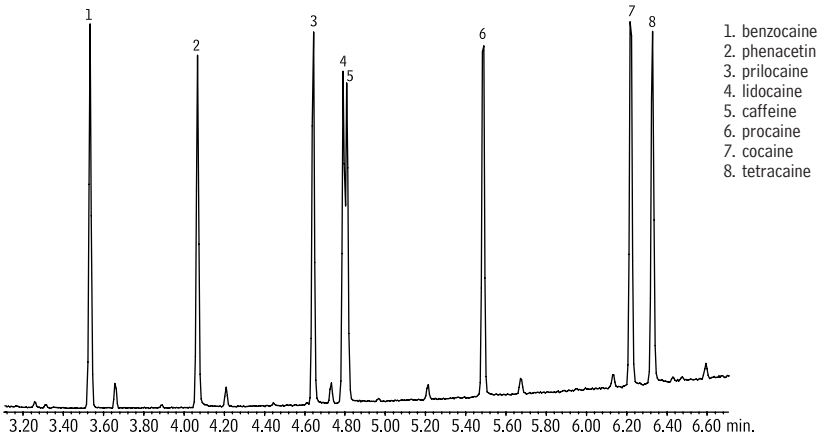


GC_PH00510

1. ethyl chloride
2. diethyl ether
3. methylene chloride
4. acetonitrile
5. methyl *tert*-butyl ether
6. chloroform
7. methyl ethyl ketone
8. 1,1,1-trichloroethane
9. benzene
10. trichloroethylene
11. toluene
12. 1,1,2-trichloroethane
13. tetrachloroethene
14. *p*-xylene
15. *m*-xylene
16. *o*-xylene
17. tetrachloroethane

Sample:	1.0mL headspace sample
Oven temp.:	40°C (hold 5 min.) to 240°C @ 5°C/min.
Inj./det. temp.:	240°C
Carrier gas:	helium
Linear velocity:	65cm/sec.

Cocaine & Cocaine Adulterants
Rtx®-440

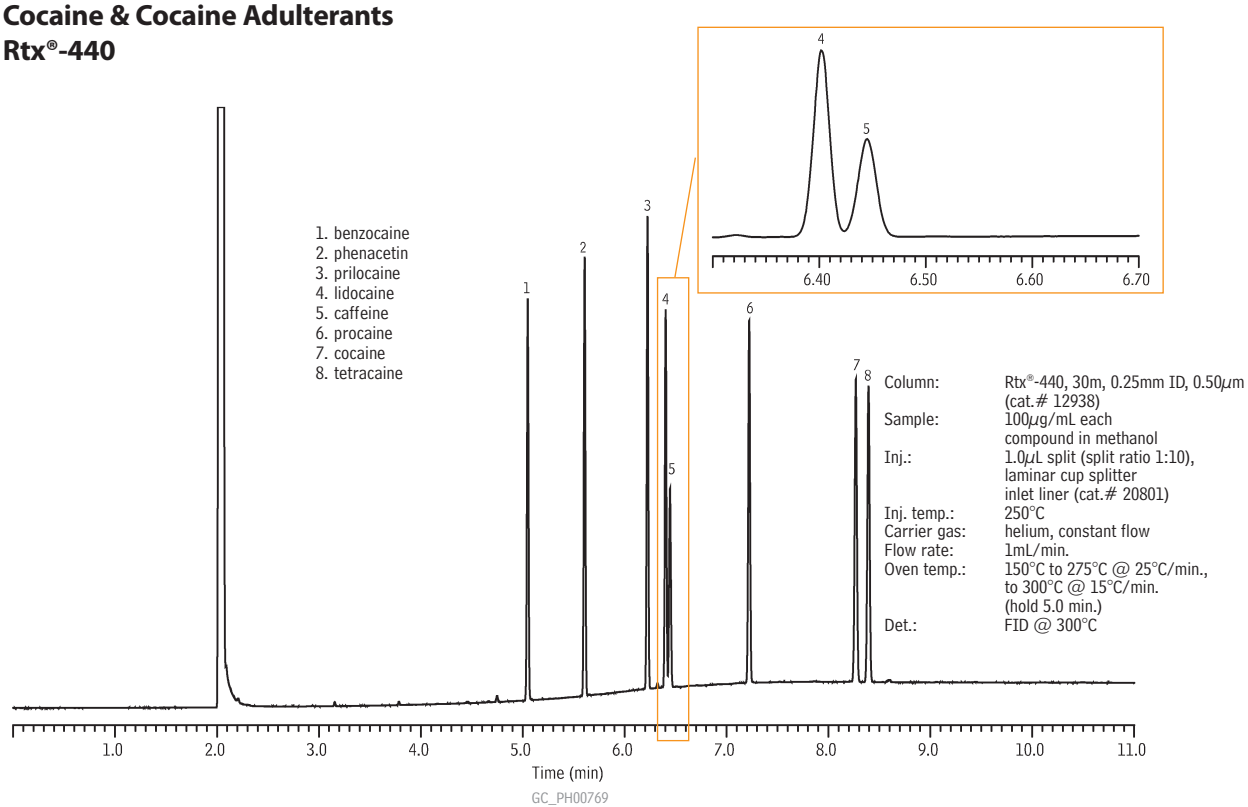


GC_PH00770

1. benzocaine
2. phenacetin
3. prilocaine
4. lidocaine
5. caffeine
6. procaine
7. cocaine
8. tetracaine

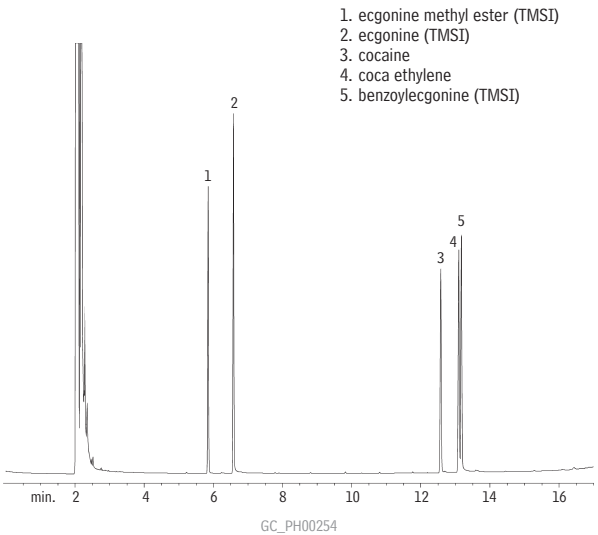
Column:	Rtx®-440, 30m, 0.25mm ID, 0.50µm (cat.# 12938)
Sample:	100µg/mL each compound in methanol
Inj.:	1.0µL split (split ratio 1:10), laminar cup splitter inlet liner (cat.# 20801)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	150°C to 275°C @ 25°C/min., to 300°C @ 15°C/min. (hold 5.0 min.)
Det.:	MS
Transfer line temp.:	180°C
Scan range:	35-550amu
Ionization:	EI
Mode:	scan

Cocaine & Cocaine Adulterants
Rtx®-440



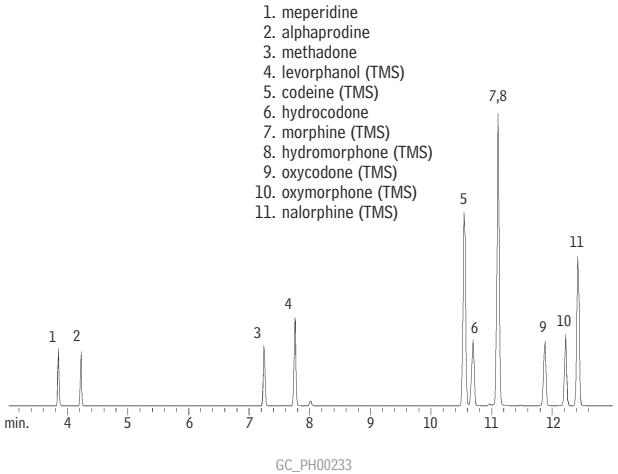
Column:	Rtx®-440, 30m, 0.25mm ID, 0.50µm (cat.# 12938)
Sample:	100µg/mL each compound in methanol
Inj.:	1.0µL split (split ratio 1:10), laminar cup splitter inlet liner (cat.# 20801)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	150°C to 275°C @ 25°C/min., to 300°C @ 15°C/min. (hold 5.0 min.)
Det.:	FID @ 300°C

Cocaine & Metabolites (TMS Derivatives)
Rtx®-5



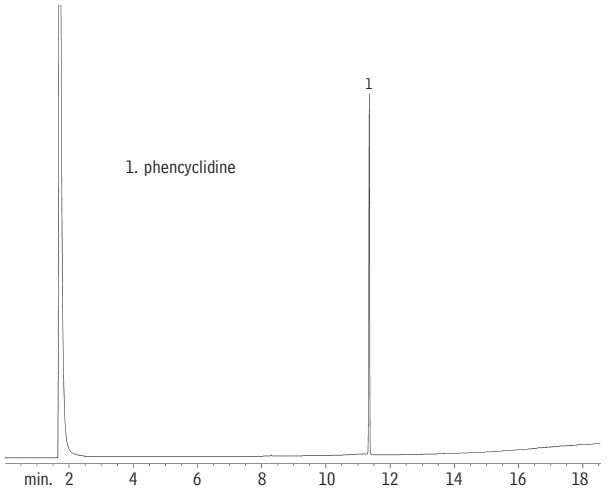
Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	1.0µL split injection of cocaine and cocaine metabolites
Oven temp.:	150°C to 320°C @ 10°C/min.
Inj./det. temp.:	250°C/300°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 50°C
FID sensitivity:	2.56 x 10^{-10} AFS
Split ratio:	30:1

Opiates (TMS Derivatives)
Rtx®-5



Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	2.0µL split injection of opiates
Conc:	2,000ng/µL
Oven temp.:	200°C to 325°C @ 7°C/min.
Inj./det. temp.:	250°C/300°C
Det. type:	MS
Ionization:	EI
Carrier gas:	helium
Mode:	full scan
Linear velocity:	30cm/sec. set @ 200°C
Split ratio:	50:1

Phencyclidine (PCP)
Rtx®-5

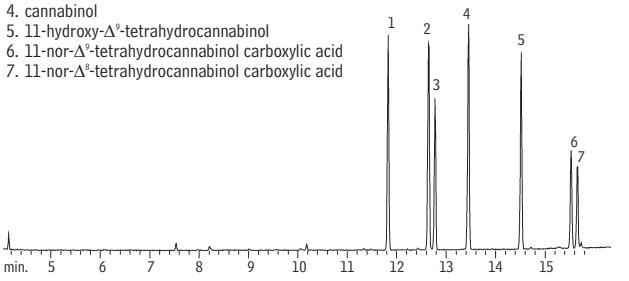


GC_PH00234

Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	1.0µL split injection of phencyclidine
Conc.:	1,000ng/µL
Oven temp.:	50°C (hold 1 min.) to 250°C @ 25°C/min., then to 325°C @ 10°C/min. (hold 2 min.)
Inj./det. temp.:	250°C/325°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 50°C
FID sensitivity:	2.56 x 10^{-10} AFS
Split ratio:	30:1

Cannabinoids (TMS Derivatives)
Rtx®-5

1. cannabidiol
2. Δ^8-tetrahydrocannabinol
3. Δ^9-tetrahydrocannabinol
4. cannabinol
5. 11-hydroxy-Δ^9-tetrahydrocannabinol
6. 11-nor-Δ^9-tetrahydrocannabinol carboxylic acid
7. 11-nor-Δ^8-tetrahydrocannabinol carboxylic acid

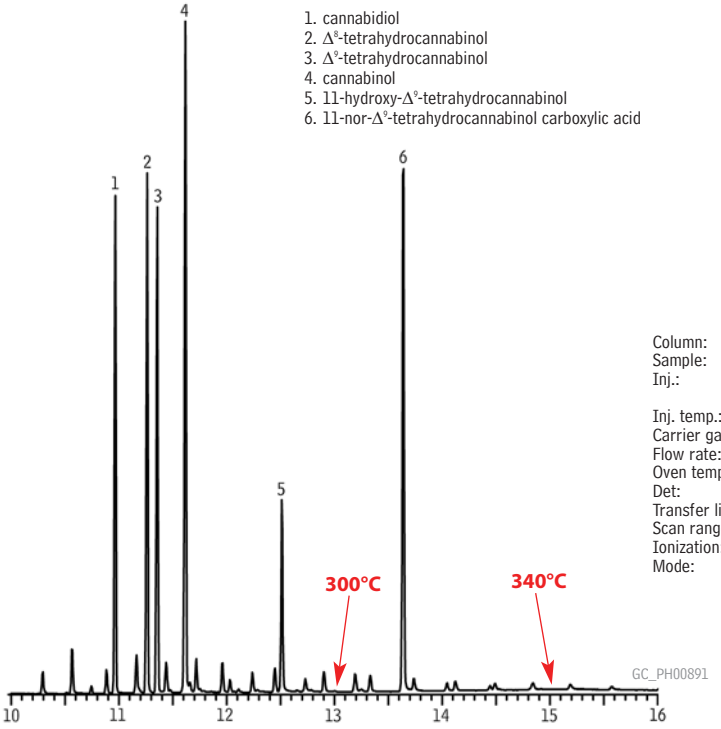


GC_PH00253

Column:	Rtx®-5, 15m, 0.25mm ID, 0.25µm (cat.# 10220)
Sample:	1.0µL splitless injection of cannabinoids
Conc.:	100µg/mL
Oven temp.:	50°C (hold 0.5 min.) to 225°C @ 30°C/min., to 325°C @ 10°C/min.
Inj. temp.:	225°C
Interface temp.:	320°C
Det.:	MSD
Ionization:	EI
Carrier gas:	helium
Scan range:	40-500amu
Linear velocity:	40cm/sec. set @ 50°C
Splitless hold time:	0.75 min.

Cannabinoids
Rxi®-5ms

1. cannabidiol
2. Δ^8-tetrahydrocannabinol
3. Δ^9-tetrahydrocannabinol
4. cannabinol
5. 11-hydroxy-Δ^9-tetrahydrocannabinol
6. 11-nor-Δ^9-tetrahydrocannabinol carboxylic acid



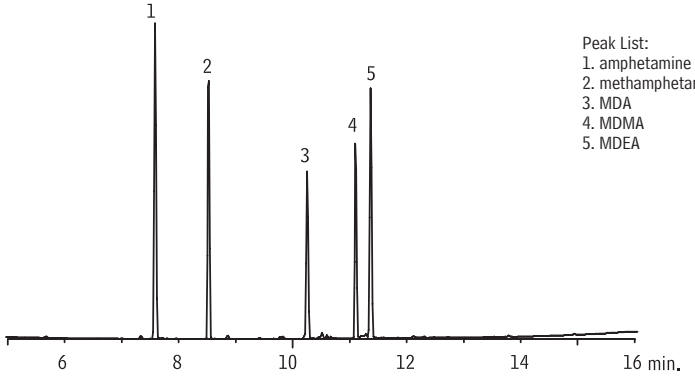
GC_PH00891

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Column:	Rxi®-5ms, 12m, 0.20mm ID, 0.33µm (cat.# 13497)
Sample:	1,000µg/mL each component in methanol
Inj.:	1.0µL, split, split ratio 25:1, 4mm ID base-deactivated single gooseneck inlet liner w/wool (cat.# 20798-211.1)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	40°C to 340°C @ 20°C/min. (hold 5 min.)
Det:	MS
Transfer line temp.:	280°C
Scan range:	100-550amu
Ionization:	EI
Mode:	scan

Amphetamines
Rtx®-5MS

NEW!

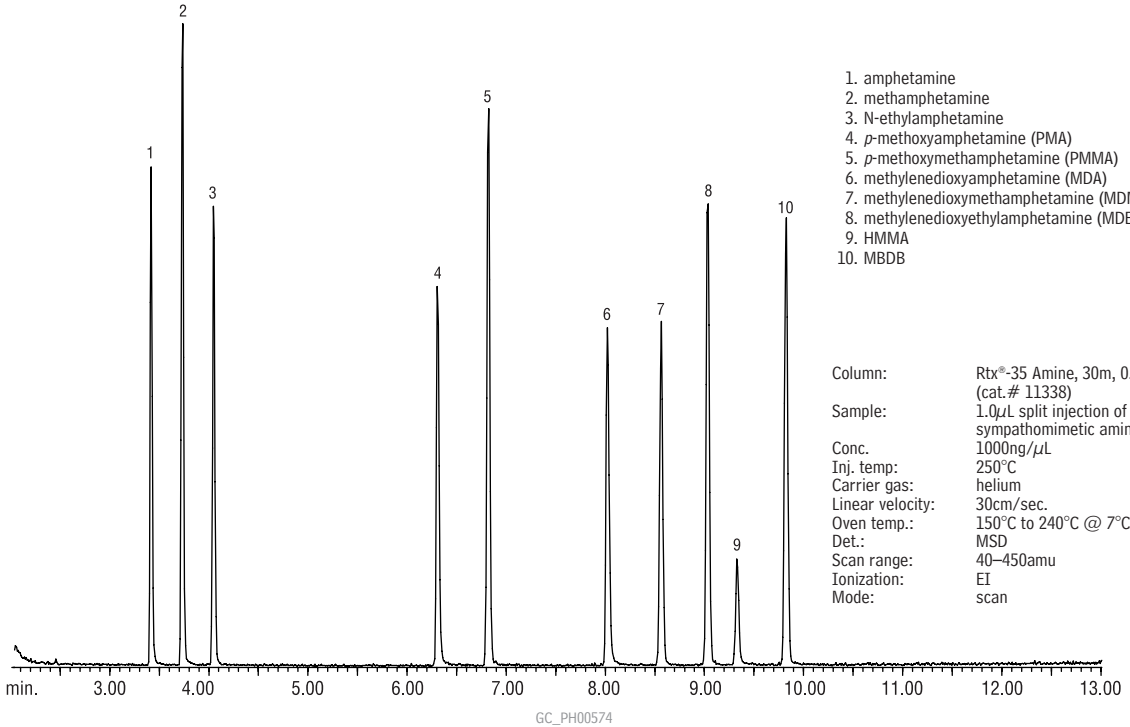


GC_PH00972

Peak List:	Tailing Factor:
1. amphetamine	1.109
2. methamphetamine	0.992
3. MDA	1.106
4. MDMA	1.068
5. MDEA	1.113

Column:	Rtx®-5MS, 30m, 0.25mm ID, 0.25µm (cat.# 12623)
Sample:	100µg/mL each amphetamine, methamphetamine, MDA, MDMA, and MDEA extracted from methanol and HFAA derivatized
Inj.:	1µL, splitless (hold 0.5 min.), 3.5mm custom splitless inlet liner w/IP deactivated wool
Inj. temp.:	220°C
Carrier gas:	helium, constant flow
Flow rate:	1.25mL/min.
Oven temp.:	70°C (hold 1 min.) to 290°C @ 15°C/min. (hold 4 min.)
Det:	MS
Transfer line temp.:	280°C
Scan range:	43-450amu
Ionization:	EI
Mode:	scan

Sympathomimetic Amines (Basic Drugs) (Underivatized)
Rtx®-35 Amine

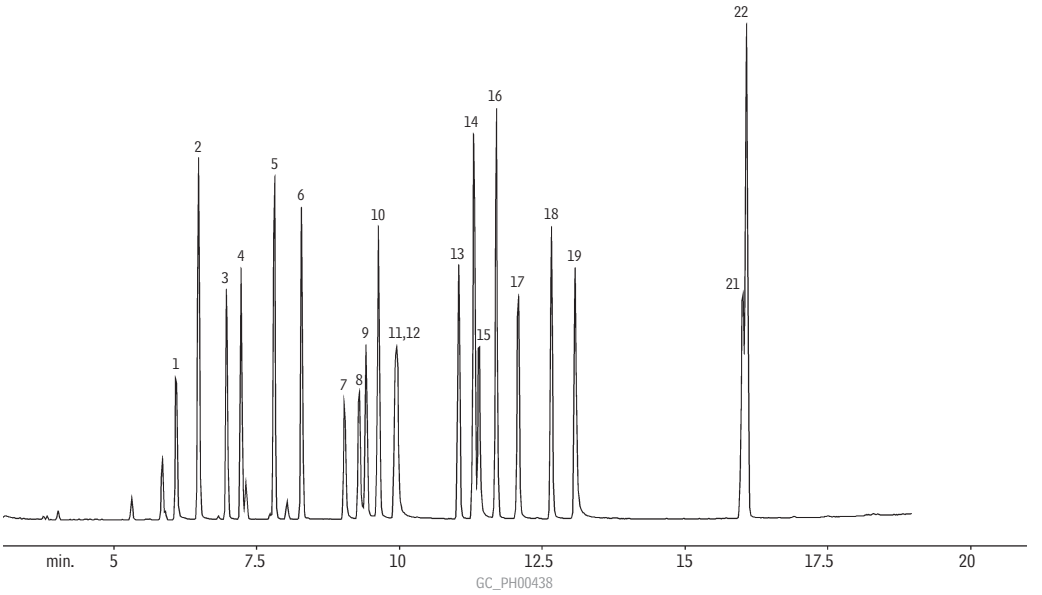


GC_PH00574

1. amphetamine
2. methamphetamine
3. N-ethylamphetamine
4. *p*-methoxyamphetamine (PMA)
5. *p*-methoxymethamphetamine (PMMA)
6. methylenedioxyamphetamine (MDA)
7. methylenedioxymethamphetamine (MDMA)
8. methylenedioxyethylamphetamine (MDEA)
9. HMMA
10. MBDB

Column:	Rtx®-35 Amine, 30m, 0.25mm ID, 0.50µm (cat.# 11338)
Sample:	1.0µL split injection of underivatized sympathomimetic amines
Conc.	1000ng/µL
Inj. temp:	250°C
Carrier gas:	helium
Linear velocity:	30cm/sec.
Oven temp.:	150°C to 240°C @ 7°C/min.
Det.:	MSD
Scan range:	40–450amu
Ionization:	EI
Mode:	scan

Sympathomimetic Amines (Basic Drugs) (Underivatized)
Rtx®-5 Amine



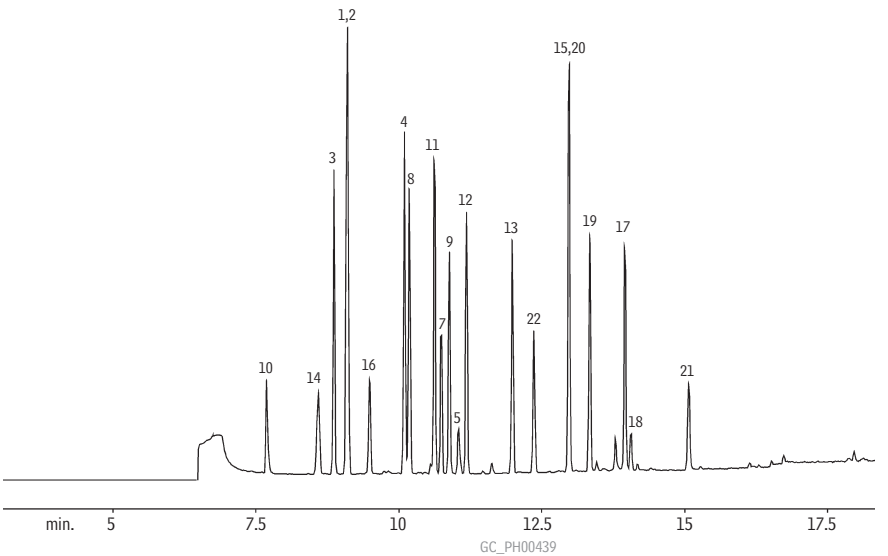
GC_PH00438

Column:	Rtx®-5 Amine, 30m, 0.25mm ID, 0.50µm (cat.# 12338)
Instrument:	Varian 3400 GC coupled with Varian Saturn 2000 MS detector
Inj.:	1µL, split, split vent flow rate 45mL/min.
Inj. temp.:	250°C
Carrier gas:	helium
Det.:	mass spectroscopy data collected using a scan range of 40 amu through 600 amu.
Oven temp.:	100°C to 310°C @ 10°C/min.

Ionization performed in the EI Auto mode.

1. phenylethylamine
2. amphetamine
3. phentermine
4. methamphetamine
5. fenfluramine
6. mephentermine
7. cathinone
8. phenylpropanolamine
9. methcathinone
10. nicotine
11. ephedrine
12. pseudoephedrine
13. phenmetrazine
14. phendimetrazine
15. methylenedioxyamphetamine
16. diethylpropion
17. methylenedioxymethamphetamine
18. methylenedioxyethylamphetamine
19. 4-methyl-2,5-dimethoxyamphetamine
20. phenylephrine
21. caffeine
22. benzphetamine

Sympathomimetic Amines (Basic Drugs) (Underivatized)
Rtx®-200

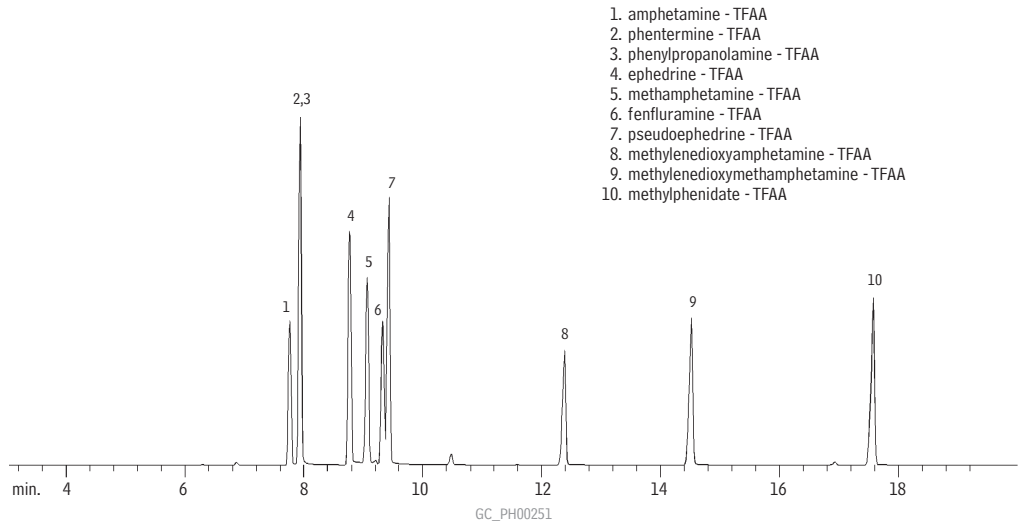


GC_PH00439

Column:	Rtx®-200, 30m, 0.25mm ID, 0.50µm (cat.# 15038)
Instrument:	Varian 3400 GC coupled with Varian Saturn 2000 MS detector
Inj.:	1µL, split, split vent flow rate 45mL/min.
Inj. temp.:	250°C
Carrier gas:	helium
Det.:	mass spectroscopy data collected using a scan range of 40 amu through 600 amu.
Oven temp.:	100°C to 310°C @ 10°C/min.

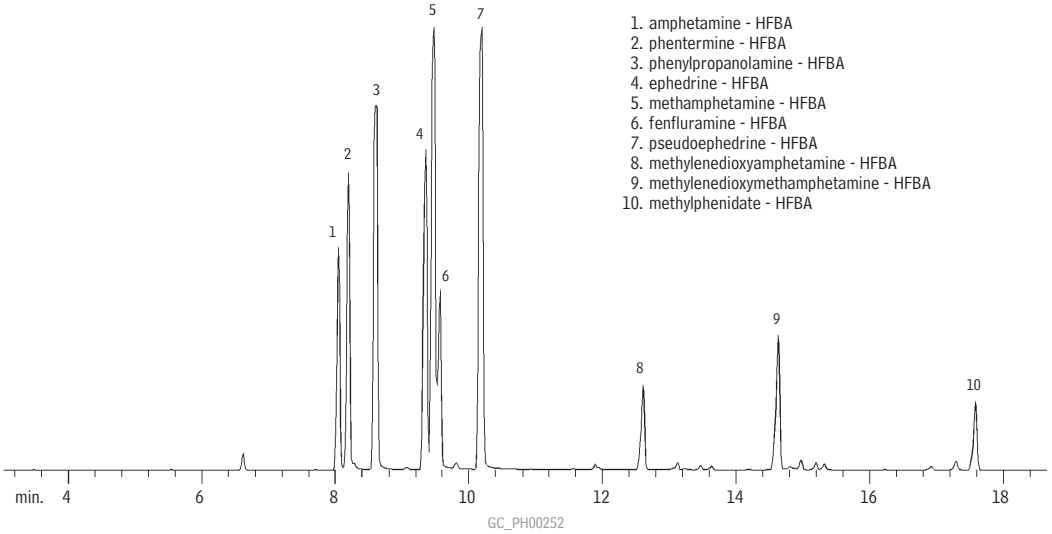
Ionization performed in the EI Auto mode.

Sympathomimetic Amines (Basic Drugs) (TFAA Derivatives)
Rtx®-5



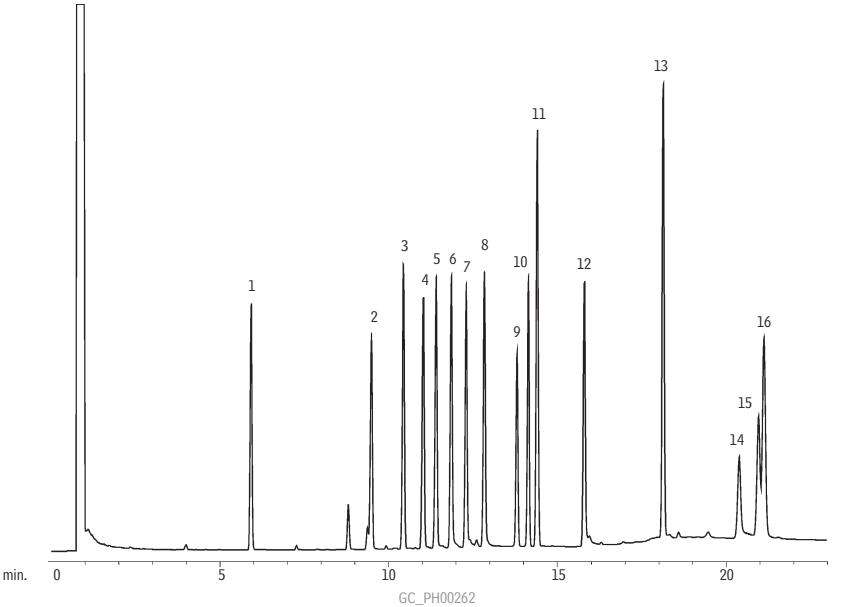
Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	1.0µL splitless injection of derivatized sympathomimetic amines
Conc.:	approximately 2.5ng/µL
Oven temp.:	40°C (hold 1 min.) to 150°C @ 30°C/min., to 300°C @ 5°C/min.
Inj. temp.:	225°C
Interface temp.:	275°C
Det.:	MSD
Ionization:	EI
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 100°C
Splitless hold time:	1 min.

Sympathomimetic Amines (Basic Drugs) (HFBA Derivatives)
Rtx®-5



Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	1.0µL splitless injection of sympathomimetic amines
Conc.:	approximately 2.5ng/µL.
Oven temp.:	40°C (hold 1 min.) to 150°C @ 30°C/min., to 300°C @ 5°C/min.
Inj. temp.:	225°C
Interface temp.:	275°C
Det.:	MSD
Ionization:	EI
Carrier gas:	helium
Linear velocity:	20cm/sec. set @ 100°C
Splitless hold time:	1 min.

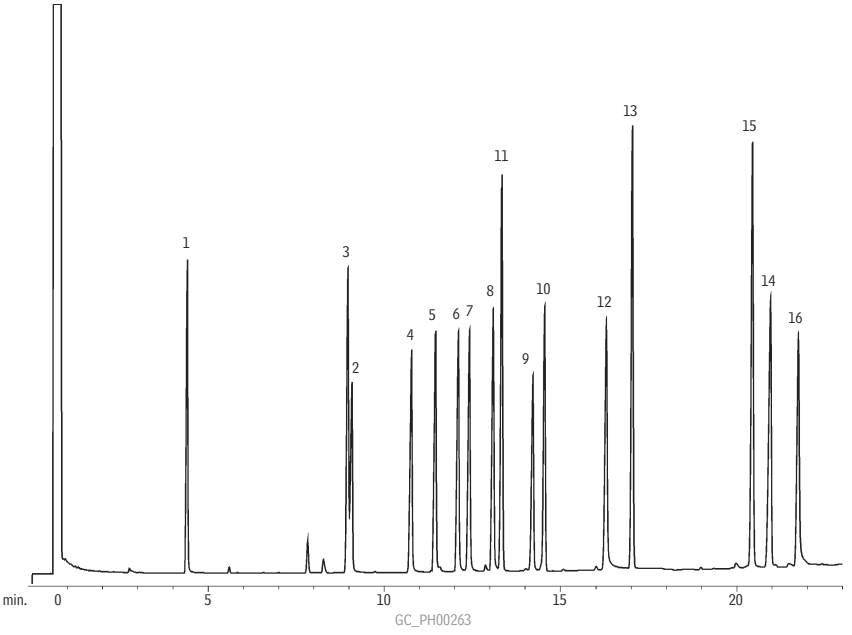
Barbiturates (Acidic/Neutral Drugs) (Underivatized)
Rtx®-35



Column:	Rtx®-35, 30m, 0.53mm ID, 1.0µm (cat.# 10455)
Sample:	1.0µL splitless injection of acidic/neutral drugs
Conc.:	50µg/mL
Oven temp.:	100°C to 280°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	250°C
Carrier gas:	helium
Linear velocity:	40cm/sec. set @ 100°C
FID sensitivity:	5.12 x 10^{-10} AFS
Splitless hold time:	0.5 min.

1. ethosuximide
2. barbital
3. methyprylon
4. aprobarbital
5. butalbital
6. amobarbital
7. pentobarbital
8. secobarbital
9. meprobamate
10. carisoprodal
11. glutethimide
12. phenobarbital
13. methaqualone
14. primidone
15. carbamazepine
16. diphenylhydantoin

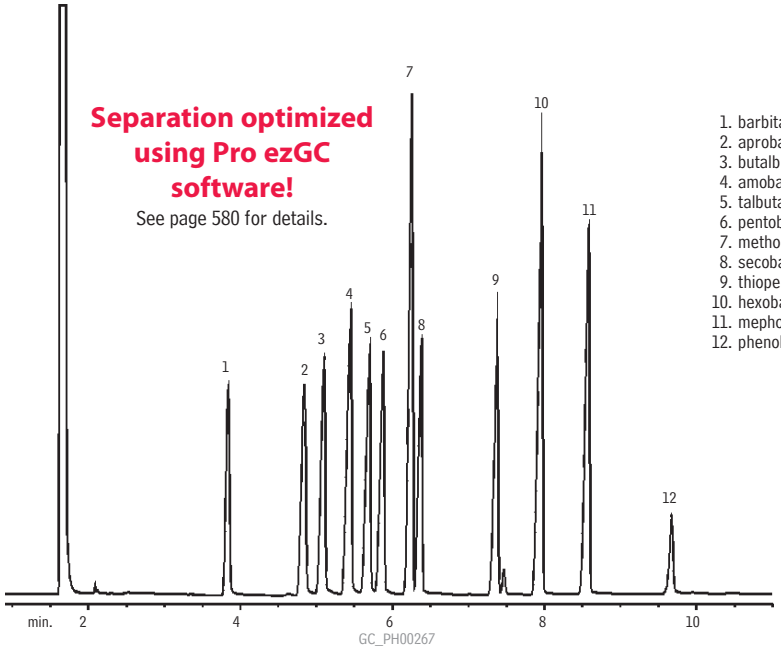
Barbiturates (Acidic/Neutral Drugs) (Underivatized)
Rtx®-1701



Column:	Rtx®-1701, 15m, 0.53mm ID, 0.50µm (cat.# 12037)
Sample:	1.0µL splitless injection of acidic/neutral drugs
Conc.:	50µg/mL concentration
Oven temp.:	100°C to 280°C @ 7°C/min.
Inj./det. temp.:	250°C/275°C
Carrier gas:	helium
Linear velocity:	40cm/sec. set @ 100°C
FID sensitivity:	5.12 x 10^{-10} AFS
Splitless hold time:	0.5 min.

Barbiturates (Acidic/Neutral Drugs) (Underivatized)
Rtx®-35

Separation optimized using Pro ezGC software!
See page 580 for details.



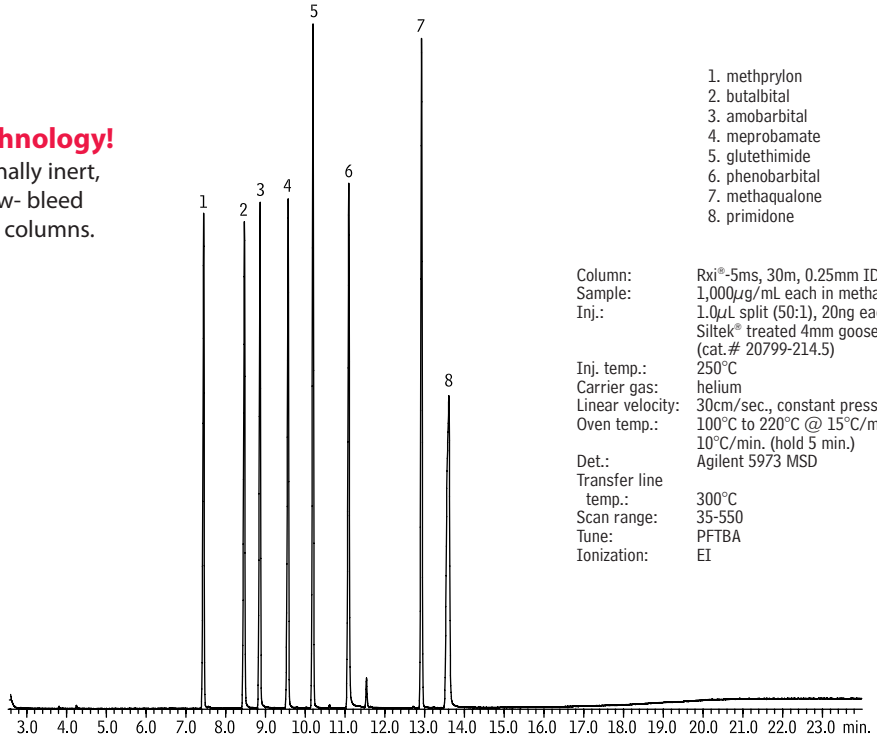
GC_PH00267

1. barbital
2. aprobarbital
3. butalbital
4. amobarbital
5. talbutal
6. pentobarbital
7. methohexital
8. secobarbital
9. thiopental
10. hexobarbital
11. mephobarbital
12. phenobarbital

Column:	Rtx®-35, 30m, 0.32mm ID, 0.50µm (cat.# 10439)
Sample:	1.0µL split injection of barbiturates
Oven temp.:	210°C (hold 2 min.) to 300°C @ 7°C/min. (hold 2 min.)
Inj./det. temp.:	300°C
Carrier gas:	helium
Linear velocity:	35cm/sec. set @ 210°C
FID sensitivity:	5.12 x 10^{-10} AFS
Split vent:	30:1

Acidic/Neutral Drugs
Rxi®-5ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

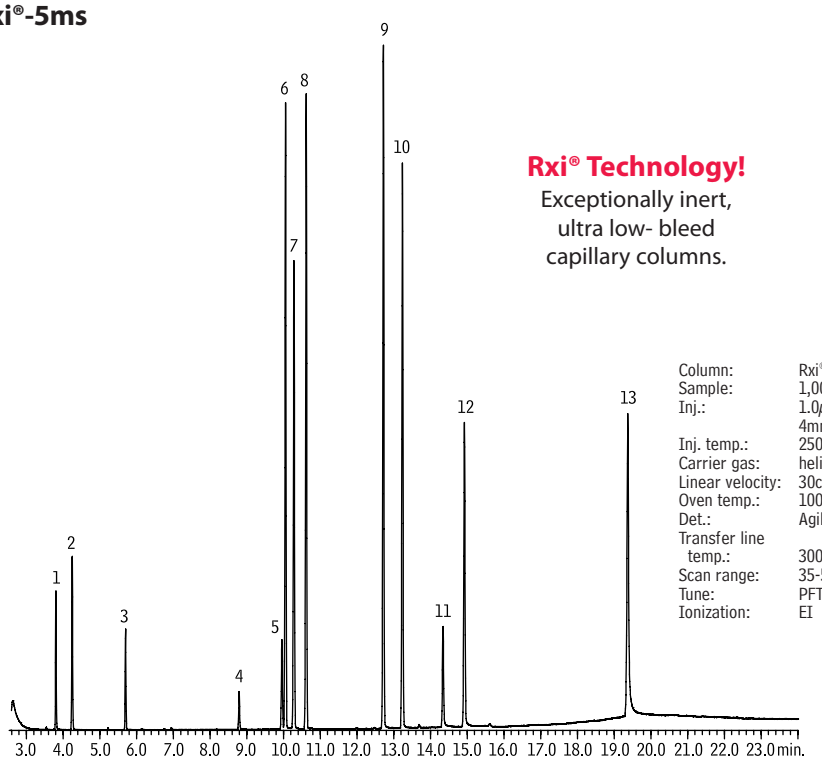


GC_PH00815

1. methprylon
2. butalbital
3. amobarbital
4. meprobamate
5. glutethimide
6. phenobarbital
7. methaqualone
8. primidone

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	1,000µg/mL each in methanol
Inj.:	1.0µL split (50:1), 20ng each compound on column; Siltek® treated 4mm gooseneck splitless inlet liner (cat.# 20799-214.5)
Inj. temp.:	250°C
Carrier gas:	helium
Linear velocity:	30cm/sec., constant pressure
Oven temp.:	100°C to 220°C @ 15°C/min., to 330°C @ 10°C/min. (hold 5 min.)
Det.:	Agilent 5973 MSD
Transfer line temp.:	300°C
Scan range:	35-550
Tune:	PFTBA
Ionization:	EI

Basic Drugs (Underivatized)
Rxi®-5ms



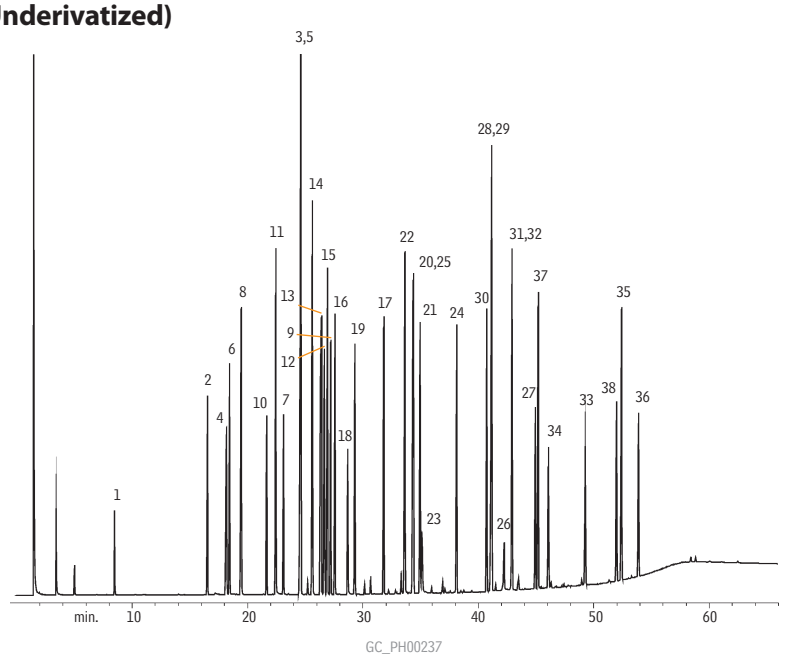
Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

1. amphetamine
2. methamphetamine
3. nicotine
4. cotinine
5. caffeine
6. benzphetamine
7. ketamine
8. phencyclidine
9. methadone
10. cocaine
11. codeine
12. scopolamine
13. alprazolam

Column:	Rxi®-5ms, 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample:	1,000µg/mL each in methanol
Inj.:	1.0µL split (50:1), 20ng each compound on column; Siltek® treated 4mm gooseneck splitless inlet liner (cat.# 20799-214.5)
Inj. temp.:	250°C
Carrier gas:	helium
Linear velocity:	30cm/sec., constant pressure
Oven temp.:	100°C to 220°C @ 15°C/min., to 330°C @ 10°C/min. (hold 5 min.)
Det.:	Agilent 5973 MSD
Transfer line temp.:	300°C
Scan range:	35-550
Tune:	PFTBA
Ionization:	EI

Basic Drugs (Underivatized)
Rtx®-200

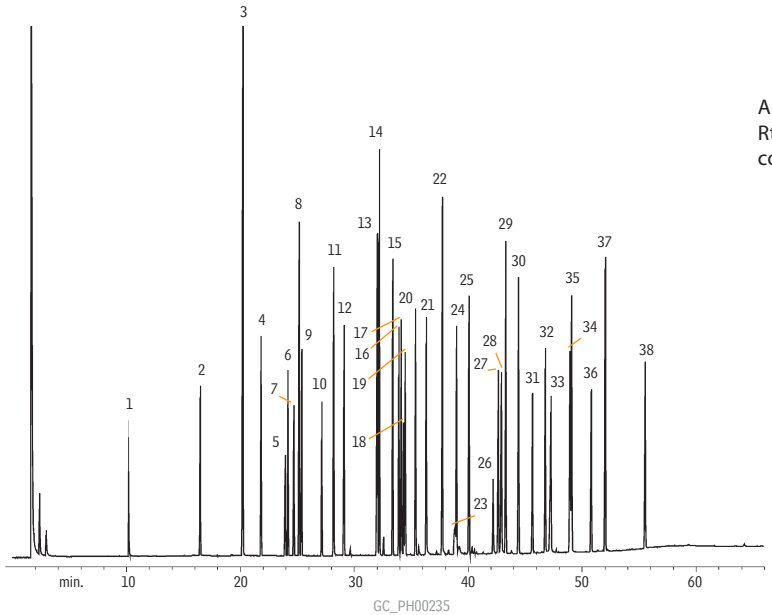
Analysis on Rtx®-5 and Rtx®-35 columns: page 683.



1. nicotine
2. benzocaine
3. cotinine
4. meperidine
5. caffeine
6. benzphetamine
7. ketamine
8. diphenhydramine
9. lidocaine
10. phenyltoloxamine
11. tripelennamine
12. phenothiazine
13. dextromethorphan
14. methadone
15. amitriptyline
16. trimipramine
17. tetracaine
18. pyrilamine
19. medazepam
20. bupivacaine
21. scopolamine
22. codeine
23. morphine
24. diazepam
25. chlorpromazine
26. temazepam
27. flunitrazepam
28. bromazepam
29. prazepam
30. acetopromazine
31. flurazepam
32. papaverine
33. clonazepam
34. haloperidol
35. alprazolam
36. triazolam
37. thioridazine
38. trazodone

Column:	Rtx®-200, 30m, 0.25mm ID, 0.25µm (cat.# 15023)
Sample:	1.0µL split injection of a basic drug sample (1mg/mL)
Conc.:	1,000ng/µL
Oven temp.:	100°C to 325°C @ 4°C/min. (hold 10 min.)
Inj./det. temp.:	250°C/320°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 100°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	50:1

Basic Drugs (Underivatized)
Rtx®-5

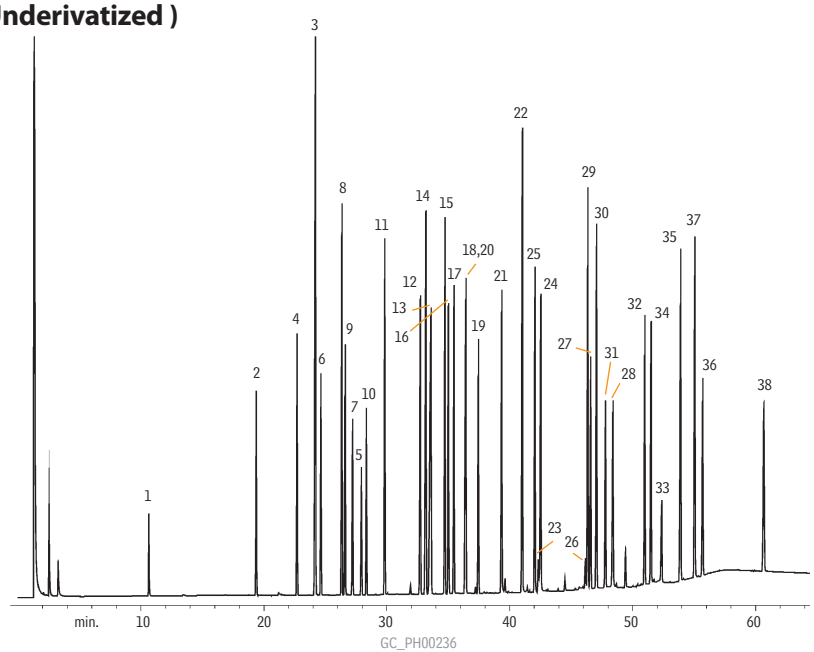


Analysis on
Rtx®-200
column: page 682

Column:	Rtx®-5, 30m, 0.25mm ID, 0.25µm (cat.# 10223)
Sample:	1.0µL split injection of a basic drug sample
Conc.:	1,000ng/µL
Oven temp.:	100°C to 325°C @ 4°C/min. (hold 10 min.)
Inj./det. temp.:	250°C/320°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 100°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	50:1

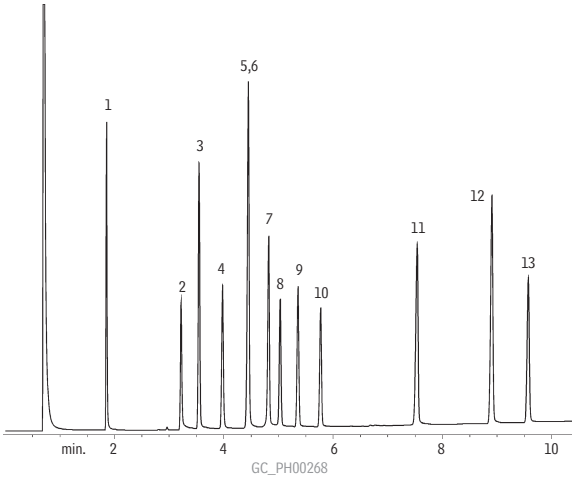
1. nicotine
2. benzocaine
3. cotinine
4. meperidine
5. caffeine
6. benzphetamine
7. ketamine
8. diphenhydramine
9. lidocaine
10. phenyltoloxamine
11. tripelennamine
12. phenothiazine
13. dextromethorphan
14. methadone
15. amitriptyline
16. trimipramine
17. tetracaine
18. pyrilamine
19. medazepam
20. bupivacaine
21. scopolamine
22. codeine
23. morphine
24. diazepam
25. chlorpromazine
26. temazepam
27. flunitrazepam
28. bromazepam
29. prazepam
30. acetopromazine
31. flurazepam
32. papaverine
33. clonazepam
34. haloperidol
35. alprazolam
36. triazolam
37. thioridazine
38. trazodone

Basic Drugs (Underivatized)
Rtx®-35



Column:	Rtx®-35, 30m, 0.25mm ID, 0.25µm (cat.# 10423)
Sample:	1.0µL split injection of a basic drug sample
Conc.:	1,000ng/µL
Oven temp.:	100°C to 325°C @ 4°C/min. (hold 10 min.)
Inj./det. temp.:	250°C/320°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 100°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	50:1

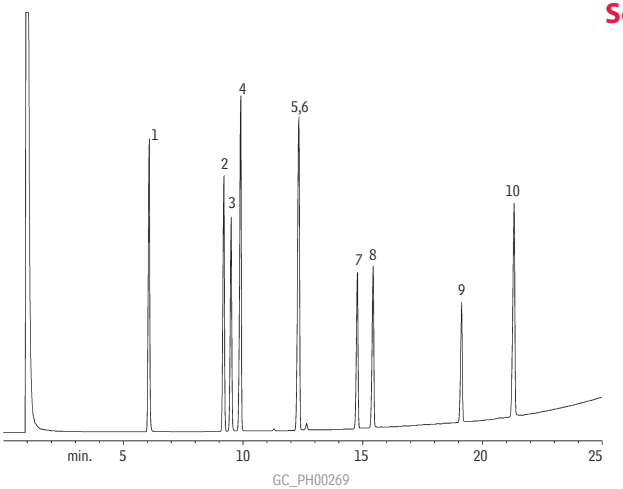
Benzodiazepines (Basic Drugs) (Underivatized)
Rtx®-200



1. medazepam
2. lorazepam
3. diazepam
4. desmethyl diazepam
5. bromazepam
6. prazepam
7. temazepam
8. flurazepam
9. clobazam
10. flunitrazepam
11. clonazepam
12. alprazolam
13. triazolam

Column:	Rtx®-200, 15m, 0.32mm ID, 0.25µm (cat.# 15021)
Sample:	1.0µL split injection of benzodiazepines
Conc.:	15ng/component
Oven temp.:	225°C to 325°C @ 8°C/min.
Inj./det. temp.:	250°C/320°C
Carrier gas:	helium
Linear velocity:	35cm/sec. set @ 225°C
FID sensitivity:	5.12 x 10^{10} AFS
Split ratio:	60:1

Phenothiazines (Basic Drugs) (Underivatized)
Rtx®-5



Separation optimized using Pro ezGC software!

1. phenothiazine
2. promethazine
3. trimeprazine
4. promazine
5. chlorprothixene
6. chlorpromazine
7. trifluoperazine
8. acetopromazine
9. prochlorperazine
10. thioridazine

Column:	Rtx®-5, 15m, 0.32mm ID, 0.50µm (cat.# 10236)
Sample:	1.0µL split injection of phenothiazines
Conc.:	2,000ng/µL
Oven temp.:	200°C to 325°C @ 5°C/min.
Inj./det. temp.:	250°C/315°C
Carrier gas:	helium
Linear velocity:	25cm/sec. set @ 200°C
FID sensitivity:	2.56 x 10^{10} AFS
Split ratio:	30:1



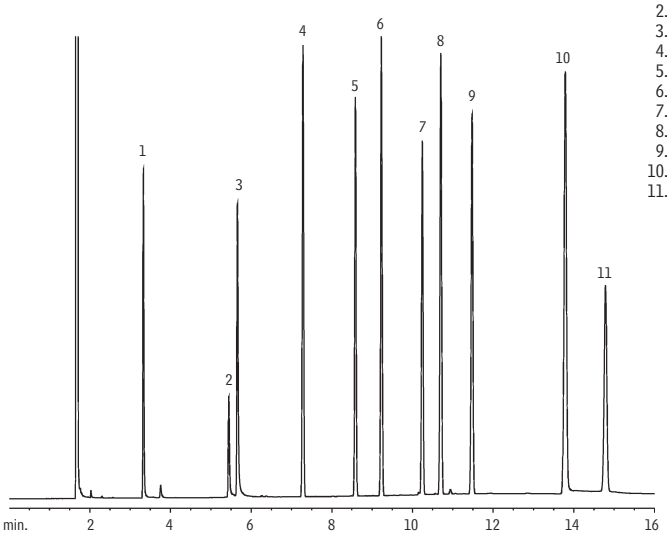
did you **know**?

Pro *ez*GC software will save you time and money by greatly enhancing your productivity and increasing sample throughput.

Pro *ez*GC™ Method Development Software (cat.# 21487)

See **page 580** for details.

Cold Medications (Basic Drugs) (Underivatized)
Rtx®-5 Amine

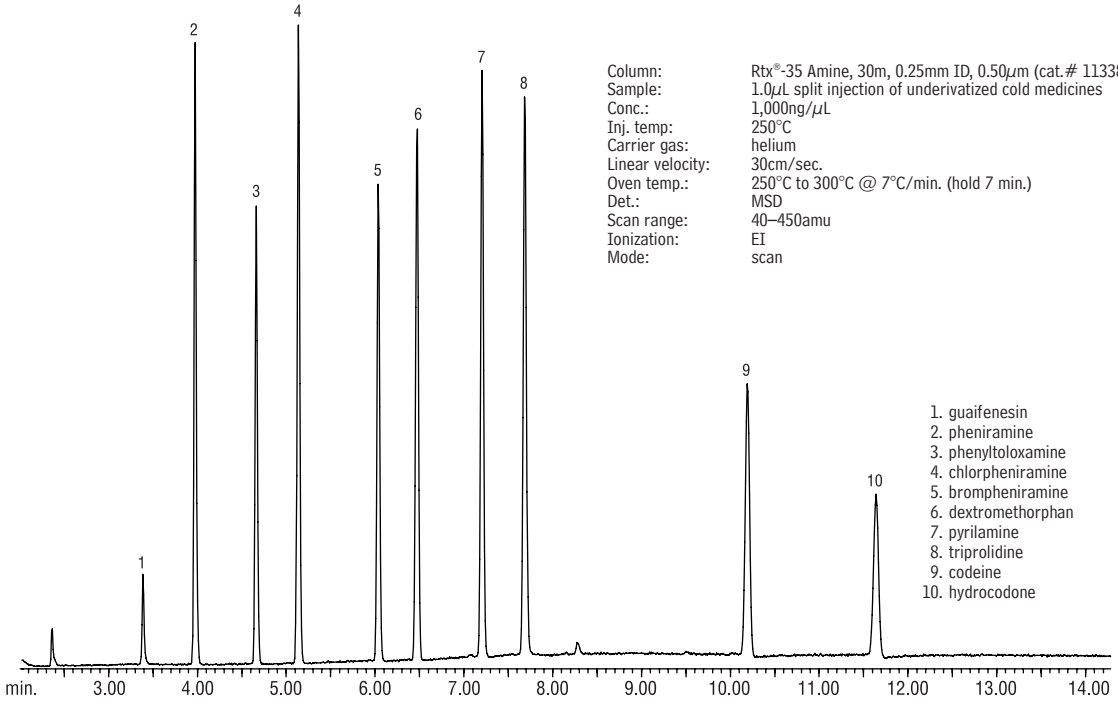


1. phenylpropanolamine
2. phenylephrine
3. guaifenesin
4. pheniramine
5. phenyltoloxamine
6. chlorpheniramine
7. brompheniramine
8. dextromethorphan
9. pyrilamine
10. codeine
11. hydrocodone

GC_PH00469

Column:	Rtx®-5 Amine, 30m, 0.53mm ID, 1.0µm (cat.# 12355)
Oven temp.:	175°C to 280°C @ 10°/min. (hold 5.5 min.)
Inj./det. temp.:	250°C/280°C
Carrier gas:	helium
Linear velocity:	40cm/sec.
Sample size:	1µL
Split vent flow:	88mL/min.
Split ratio:	20:1

Cold Medications (Basic Drugs) (Underivatized)
Rtx®-35 Amine

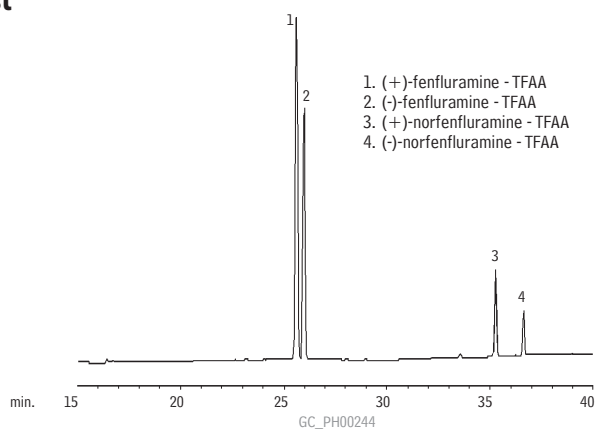


Column:	Rtx®-35 Amine, 30m, 0.25mm ID, 0.50µm (cat.# 11338)
Sample:	1.0µL split injection of underivatized cold medicines
Conc.:	1,000ng/µL
Inj. temp:	250°C
Carrier gas:	helium
Linear velocity:	30cm/sec.
Oven temp.:	250°C to 300°C @ 7°C/min. (hold 7 min.)
Det.:	MSD
Scan range:	40–450amu
Ionization:	EI
Mode:	scan

1. guaifenesin
2. pheniramine
3. phenyltoloxamine
4. chlorpheniramine
5. brompheniramine
6. dextromethorphan
7. pyrilamine
8. triprolidine
9. codeine
10. hydrocodone

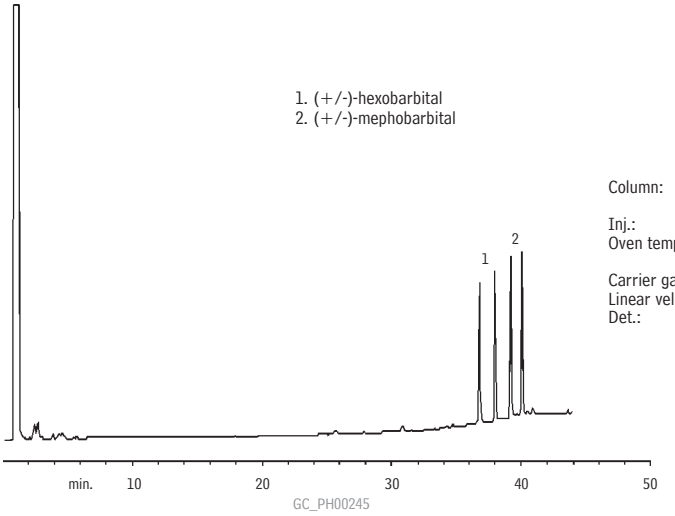
GC_PH00575

Fenfluramine (TFAA Derivative)
Rt®-βDEXcst



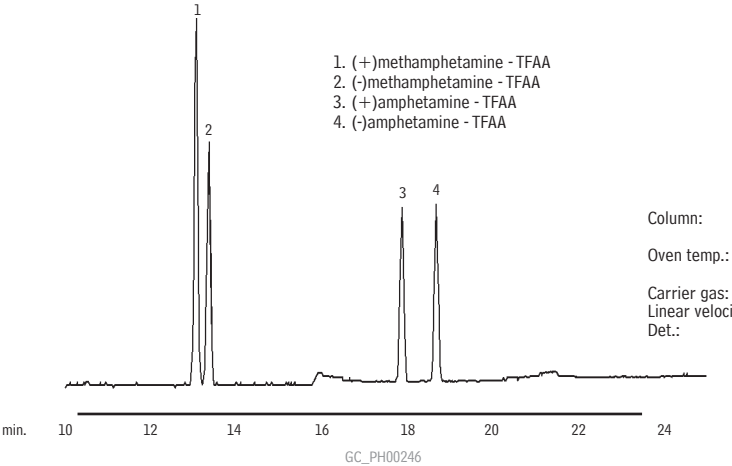
Column:	Rt®-βDEXcst, 30m, 0.32mm ID, 0.25µm (cat.# 13102)
Inj.:	on-column, 25ng/enantiomer
Oven temp.:	90°C (hold 1 min.) to 200°C @ 2°C/min. (hold 3 min.)
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 60°C
Det.:	FID @ 220°C

Barbiturates (Underivatized)
Rt®-βDEXcst



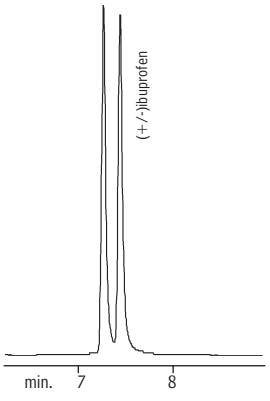
Column:	Rt®-βDEXcst, 30m, 0.32mm ID, 0.25µm (cat.# 13102)
Inj.:	on-column, 25ng/enantiomer
Oven temp.:	60°C (hold 1 min.) to 220°C @ 3°C/min.
Carrier gas:	hydrogen
Linear velocity:	80cm/sec. set @ 60°C
Det.:	FID @ 220°C

Amphetamine and Methamphetamine (TFAA Derivatives)
Rt®-βDEXcst



Column:	Rt®-βDEXcst, 30m, 0.25mm ID, 0.25µm (cat.# 13103)
Oven temp.:	120°C (hold 1 min.) to 175°C @ 1.5°C/min.
Carrier gas:	helium
Linear velocity:	25cm/sec. set @ 120°C
Det.:	MSD @ 220°C

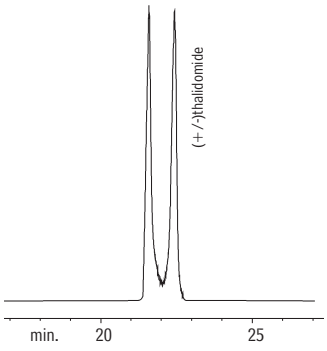
Ibuprofen (Underivatized)
Rt®-βDEXsm



GC_PH00242

Column:	Rt®-βDEXsm, 30m, 0.32mm ID, 0.25µm (cat.# 13104)
Inj.:	on-column, 125ng each enantiomer
Oven temp.:	175°C to 200°C @ 2°C/min.
Inj./det. temp.:	200°C/230°C
Carrier gas:	helium
Linear velocity:	60cm/sec.
Det.:	GC/FID
Split ratio:	13:1 using cup splitter inlet liner (cat.# 20709)

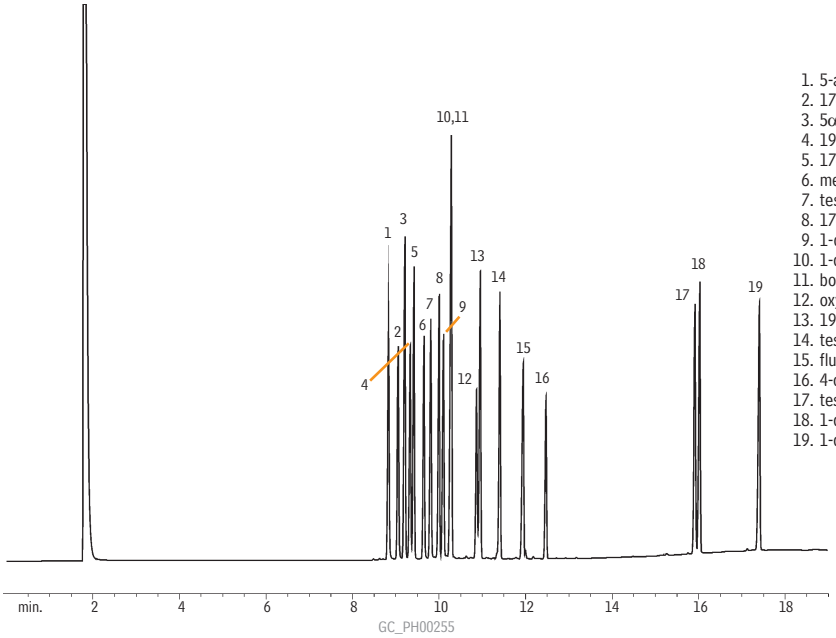
Thalidomide (Underivatized)
Rt®-βDEXcst



GC_PH00243

Column:	Rt®-βDEXcst, 30m, 0.32mm ID, 0.25µm (cat.# 13102)
Inj.:	on-column, approximately 15ng each enantiomer
Oven temp.:	200°C to 230°C @ 1°C/min.
Inj./det. temp.:	200°C/230°C
Carrier gas:	hydrogen
Linear velocity:	80cm/sec.
Detector type:	GC/FID
Split ratio:	13:1 using cup splitter inlet liner (cat.# 20709)

Steroids, Anabolic (Underivatized)
Rtx®-5



1. 5-androstene-3β,17β-diol
2. 17α-methyl-5-androstene-3β,17β-diol
3. 5α-androstan-17β-ol-3-one
4. 19-nortestosterone
5. 17α-methylandrostan-17β-ol-3-one
6. mesterolone
7. testosterone
8. 17α-methyltestosterone
9. 1-dehydrotestosterone
10. 1-dehydro-17α-methyltestosterone
11. bolasterone
12. oxymethalone
13. 19-nortestosterone-17-propionate
14. testosterone propionate
15. fluoxymesterone
16. 4-chlorotestosterone-17-acetate
17. testosterone-17β-cypionate
18. 1-dehydrotestosterone benzoate
19. 1-dehydrotestosterone undecylenate

GC_PH00255

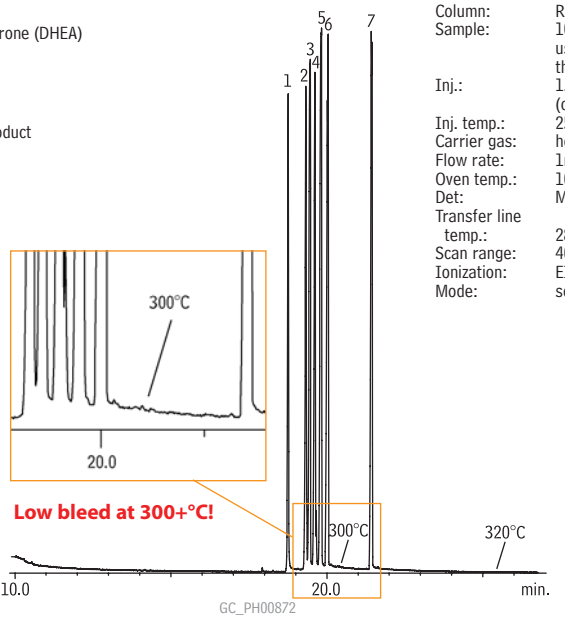
Column:	Rtx®-5, 30m, 0.25mm ID, 0.10µm (cat.# 10208)
Sample:	0.5µL split injection of anabolic steroids
Conc.:	1,000ng/µL
Oven temp.:	180°C to 340°C @ 10°C/min. (hold 3 min.)
Inj./det. temp.:	280°C/340°C
Carrier gas:	helium
Linear velocity:	35cm/sec. set @ 180°C
FID sensitivity:	1.28 x 10^{10} AFS
Split ratio:	50:1

Steroids: Sex Hormones
Rxi®-1ms

1. androsterone
2. dehydroepiandrosterone (DHEA)
3. 17-α-estradiol
4. estrone
5. 17-β-estradiol
6. testosterone
7. derivatization by-product

Column:	Rxi®-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample:	100µg/mL each hormone in methanol or ethanol; compounds derivatized using 2% methoxylamine HCl (CH_3ONH_2) in pyridine, then N-trimethylsilylimidazole (TMSI), then analyzed
Inj.:	1.0µL splitless (hold 0.5 min.), 3.5mm single gooseneck inlet liner (cat.# 20961)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1mL/min.
Oven temp.:	100°C to 320°C @ 10°C/min. (hold 10 min.)
Det:	MS: Shimadzu 17A with QP5000
Transfer line temp.:	280°C
Scan range:	40-700amu
Ionization:	EI
Mode:	scan

Excellent resolution of closely eluting hormones.



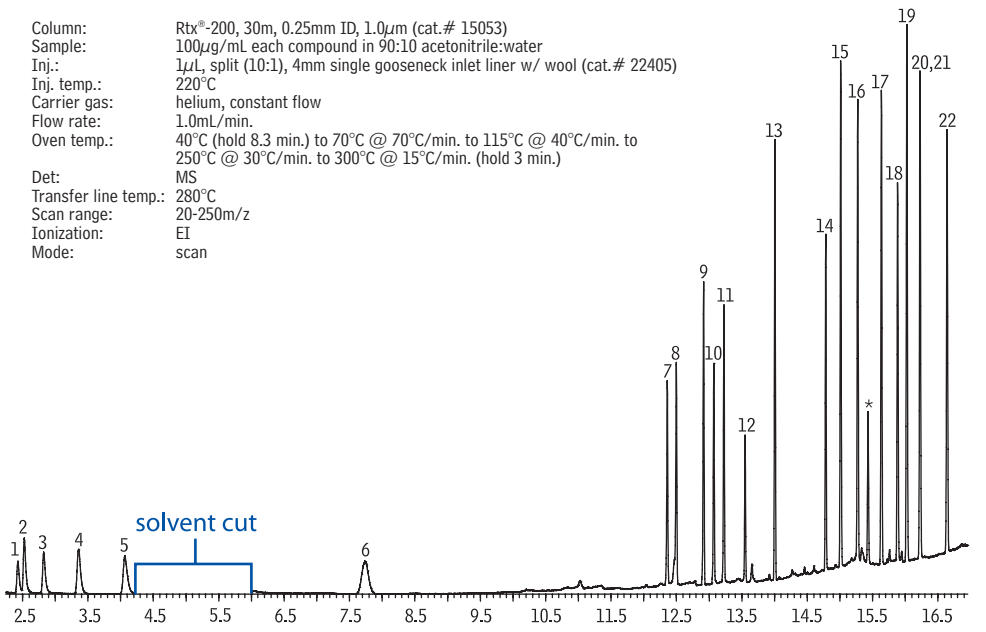
GC_PH00872

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

Potential Genotoxic Impurities (PGIs)
Rtx®-200

NEW!

Column:	Rtx®-200, 30m, 0.25mm ID, 1.0µm (cat.# 15053)
Sample:	100µg/mL each compound in 90:10 acetonitrile:water
Inj.:	1µL, split (10:1), 4mm single gooseneck inlet liner w/ wool (cat.# 22405)
Inj. temp.:	220°C
Carrier gas:	helium, constant flow
Flow rate:	1.0mL/min.
Oven temp.:	40°C (hold 8.3 min.) to 70°C @ 70°C/min. to 115°C @ 40°C/min. to 250°C @ 30°C/min. to 300°C @ 15°C/min. (hold 3 min.)
Det:	MS
Transfer line temp.:	280°C
Scan range:	20-250m/z
Ionization:	EI
Mode:	scan



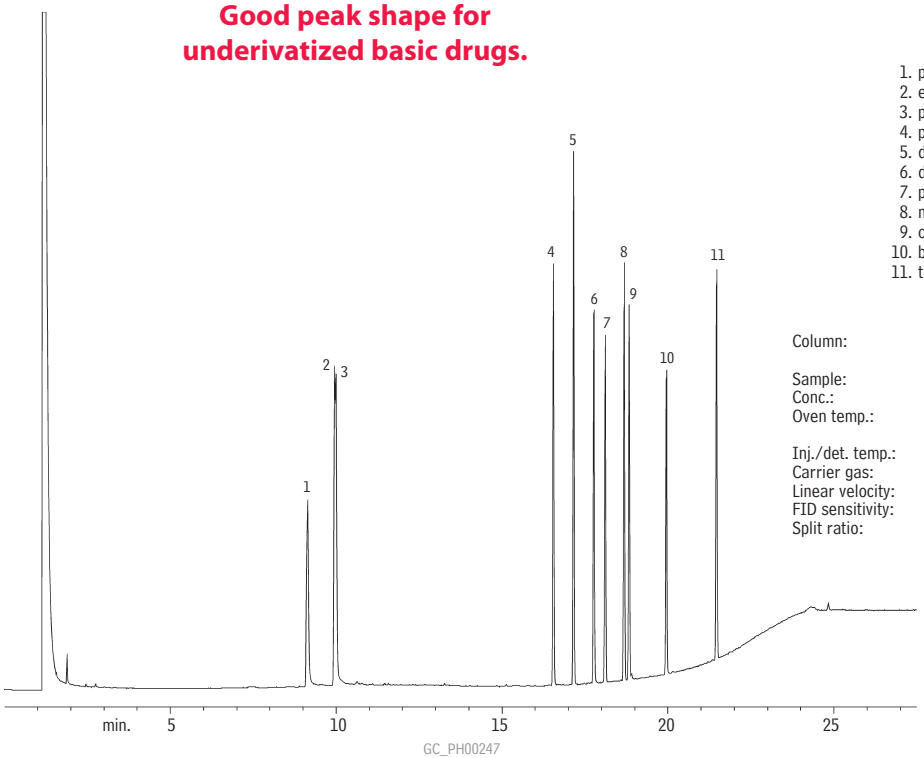
GC_PH01076

1. 1-chloropropane
2. bromoethane
3. 2-chloropropane
4. 1-bromopropane
5. 2-bromopropane
6. 1-bromobutane
7. dimethyl sulfate
8. methyl methanesulfonate
9. ethyl methanesulfonate
10. isopropyl methanesulfonate
11. diethyl sulfate
12. di-isopropyl sulfate
13. di-*n*-propyl sulfate
14. dibutyl sulfate
15. methylbenzene sulfonate
16. ethylbenzene sulfonate
17. methyl toluenesulfonate
18. ethyl toluenesulfonate
19. *n*-butyl benzenesulfonate
20. *n*-propyl toluenesulfonate
21. isopropyl toluenesulfonate
22. *n*-butyl toluenesulfonate

*ortho isomer of ethyl toluenesulfonate

Underivatized Antihistamines (Basic Drugs)
Rtx®-5 Amine

Good peak shape for underivatized basic drugs.

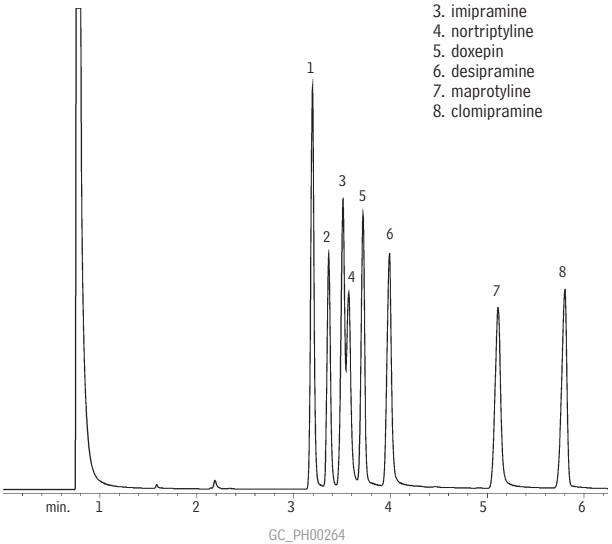


GC_PH00247

1. phenylpropanolamine
2. ephedrine
3. pseudoephedrine
4. pheniramine
5. diphenhydramine
6. doxylamine
7. phenyltoloxamine
8. methapyrilene
9. chlorpheniramine
10. brompheniramine
11. triprolidine

Column:	Rtx®-5 Amine, 30m, 0.32mm ID, 1.0µm (cat.# 12354)
Sample:	1.0µL split injection of antihistamines
Conc.:	1,000ng/µL
Oven temp.:	130°C (hold 5 min.) to 305°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	305°C
Carrier gas:	hydrogen
Linear velocity:	43cm/sec. set @ 130°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split ratio:	50:1

Antidepressants (Basic Drugs) (Underivatized)
Rtx®-1701



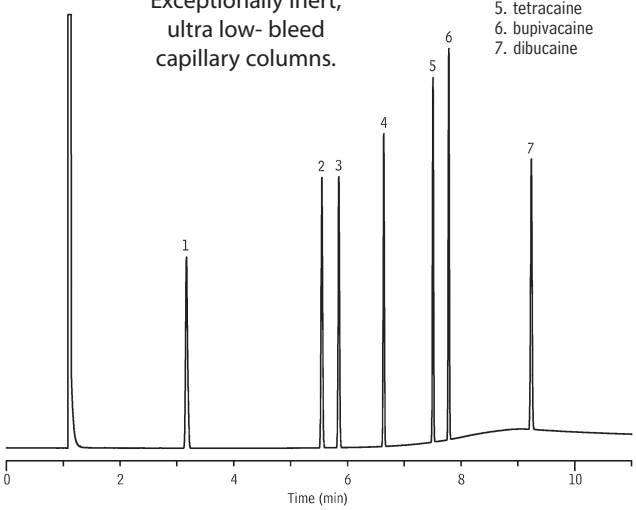
GC_PH00264

1. amitriptyline
2. trimipramine
3. imipramine
4. nortriptyline
5. doxepin
6. desipramine
7. maprotyline
8. clomipramine

Column:	Rtx®-1701, 15m, 0.25mm ID, 0.25µm (cat.# 12020)
Sample:	1.0µL split injection of antidepressants
Conc.:	25ng/component
Oven temp.:	225°C
Inj./det. temp.:	250°C/260°C
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 225°C
FID sensitivity:	2.56 x 10^{-10} AFS
Split ratio:	40:1

Local Anesthetics
Rxi®-5ms

Rxi® Technology!
Exceptionally inert, ultra low- bleed capillary columns.

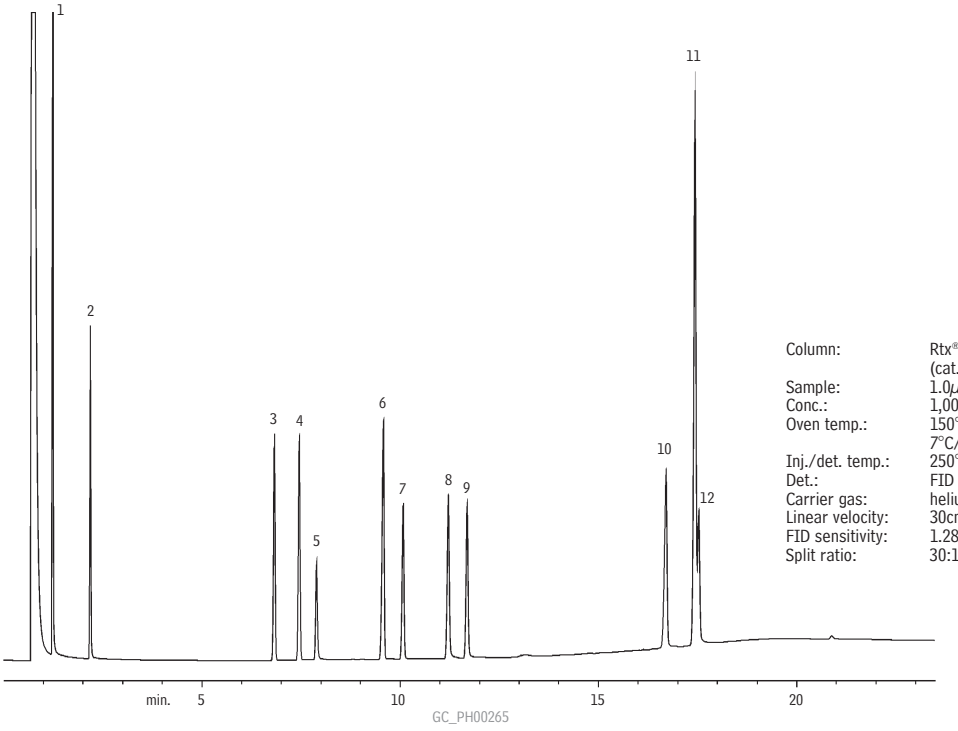


GC_PH00860

1. benzocaine
2. prilocaine
3. lidocaine
4. procaine
5. tetracaine
6. bupivacaine
7. dibucaine

Column:	Rxi®-5ms, 30m, 0.53mm ID, 1.00µm (cat.# 13455)
Sample:	50µg/mL each component in methanol
Inj.:	1.0µL split (10:1), 4mm split inlet liner with wool (cat.# 20781)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	5.0mL/min.
Oven temp.:	200°C (hold 4 min.) to 320°C @ 30°C/min. (hold 3 min.)
Det.:	FID @ 300°C

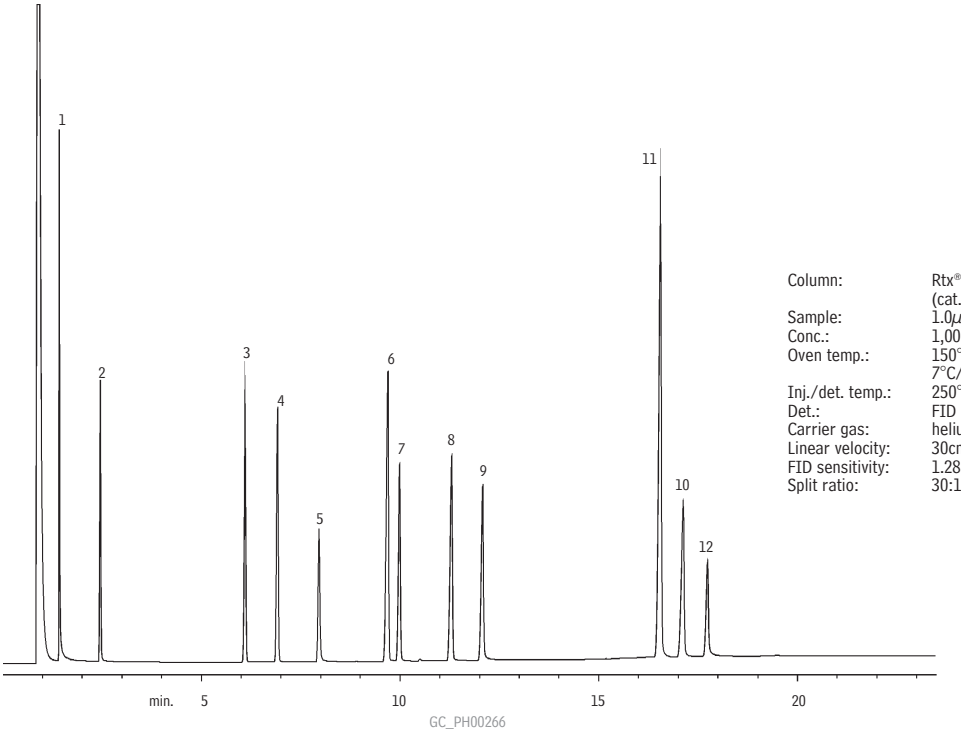
Antiepileptics (Underivatized)
Rtx®-20



Column:	Rtx®-20, 15m, 0.32mm ID, 0.50µm (cat.# 10336)
Sample:	1.0µL split injection of antiepileptic drugs
Conc.:	1,000ng/µL
Oven temp.:	150°C to 280°C @ 7°C/min. (hold 5 min.)
Inj./det. temp.:	250°C/270°C
Det.:	FID
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 150°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	30:1

1. valproic acid
2. ethosuximide
3. methsuximide
4. phensuximide
5. desmethyl methsuximide
6. mephenytoin
7. ethotoin
8. PEMA
9. phenobarbital
10. primidone
11. carbamazepine
12. diphenylhydantoin

Antiepileptics (Underivatized)
Rtx®-1701



Column:	Rtx®-1701, 15m, 0.32mm ID, 0.50µm (cat.# 12036)
Sample:	1.0µL split injection of antiepileptic drugs
Conc.:	1,000ng/µL
Oven temp.:	150°C to 280°C @ 7°C/min. (hold 5 min.)
Inj./det. temp.:	250°C/270°C
Det.:	FID
Carrier gas:	helium
Linear velocity:	30cm/sec. set @ 150°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	30:1

Organic Volatile Impurities: Retention Time Index

Reduce method development time—use a retention time index for column selection.

Retention time data collected using the following conditions:

G16 Stabilwax®: 30m, 0.25mm ID, 0.5µm df, Phase ratio: 125, Oven program: 40ºC, hold 1 min., to 190ºC @ 4ºC/min., hold 15 min., Carrier flow: 1.2mL/min., Dead time: 1.38 min. @ 45ºC
G16 Rtx®-WAX: 30m, 0.25mm ID, 0.5µm df, Phase ratio: 125, Oven program: 40ºC, hold 1 min., to 190ºC @ 4ºC/min., hold 15 min., Carrier flow: 1.2mL/min., Dead time: 1.40 min. @ 45ºC
G43 Rtx®-1301: 30m, 0.25mm ID, 1.0µm df, Phase ratio: 63, Oven program: 40ºC, hold 1 min., to 190ºC @ 4ºC/min., hold 15 min., Carrier flow: 1.2mL/min., Dead time: 1.40 min. @ 45ºC
G27 Rxi®-5ms: 30m, 0.25mm ID, 1.0µm df, Phase ratio: 63, Oven program: 40ºC, hold 1 min., to 190ºC @ 4ºC/min., hold 15 min., Carrier flow: 1.1mL/min., Dead time: 1.49 min. @ 45ºC
G1 Rtx®-1: 60m, 0.53mm ID, 3.00µm df, Phase ratio: 43, Oven program: 30ºC, hold 4 min., to 220ºC @ 4ºC/min., Carrier flow: 6.3mL/min., Dead time: 2.54 min. @ 35ºC
Rtx®-200: 60m, 0.53mm ID, 3.00µm df, Phase ratio: 43, Oven program: 30ºC, hold 4 min., to 220ºC @ 4ºC/min., Carrier flow: 7.8mL/min., Dead time: 2.22 min. @ 35ºC

Carrier gas: helium Compound	ICH Class	G16 Stabilwax® Retention Time	G16 Rtx®-WAX Retention Time	G43 Rtx®-1301 Retention Time	G27 Rxi®-5ms Retention Time	G1 Rtx®-1 Retention Time	NA Rtx®-200 Retention Time
1,1,1-trichloroethane	1	3.96	3.49	5.43	5.40	10.82	8.35
1,1,2-trichloroethene	2	15.72	14.28	10.99	9.77	16.75	14.94
1,1-dichloroethene	1	2.23	2.04	2.79	4.41	5.73	4.16
1,2-dichloroethane	1	8.80	7.68	6.15	5.46	10.38	9.74
cis-1,2-dichloroethene	2	6.50	5.65	4.79	2.88	8.71	7.11
trans-1,2-dichloroethene	2	3.63	3.20	3.55	3.54	7.17	5.16
1,2-dimethoxyethane	2	4.80	4.18	6.03	5.54	10.98	10.63
1,4-dioxane	2	8.55	7.49	7.86	7.26	13.54	14.34
1-butanol	3	11.13	10.08	7.18	5.76	11.49	10.13
1-pentanol	3	14.95	13.75	11.19	9.44	16.99	14.95
1-propanol	3	7.69	6.80	4.20	3.37	6.81	6.13
2-butanol	3	7.25	6.44	5.08	4.16	8.51	7.69
2-ethoxyethanol	2	13.99	12.70	8.69	7.36	13.91	13.99
2-methoxyethanol	2	12.42	11.11	6.02	5.14	9.83	10.74
2-methyl-1-propanol	3	9.32	8.40	6.00	4.79	*	*
2-propanol	3	4.81	4.25	3.00	2.55	4.91	4.69
3-methyl-1-butanol	3	13.42	12.25	9.86	8.26	15.28	13.55
acetic acid	3	22.47	20.34	6.52	4.61	8.84	8.96
acetone	3	3.02	2.64	2.89	2.50	4.64	7.68
acetonitrile	2	6.91	5.83	3.28	2.47	4.32	8.89
anisole	3	18.65	17.09	17.12	16.28	25.00	22.84
benzene	1	5.23	4.54	5.98	3.83	11.63	9.17
butyl acetate	3	8.86	7.88	12.12	11.38	19.43	19.63
carbon tetrachloride	1	3.96	3.49	5.61	5.90	11.89	7.42
chlorobenzene	2	13.91	12.54	13.55	13.14	21.56	18.48
chloroform	2	7.31	6.41	5.23	4.64	9.18	6.66
cumene	3	12.36	11.17	16.66	16.69	25.88	20.90
cyclohexane	2	2.16	2.01	5.37	5.89	*	*
dichloromethane	2	5.01	4.33	3.31	3.06	5.87	4.88
dimethylsulfoxide	3	26.47	24.43	16.62	13.01	18.81	30.95
ethanol	3	4.98	4.37	2.52	2.19	4.03	3.80
ethyl acetate	3	4.08	3.56	4.87	4.44	9.04	10.35
ethyl benzene	2	10.72	9.58	13.86	13.81	22.54	18.18
ethyl ether	3	1.72	1.63	2.58	2.67	5.34	3.87
ethyl formate	3	3.16	2.78	3.00	2.78	5.46	6.48
ethylene glycol	2	28.06	26.23	10.77	6.63	12.59	13.86
formamide	2	32.99	30.93	11.85	7.30	12.72	19.93
formic acid	3	24.64	22.09	5.19	2.60	5.59	5.06
heptane	3	1.98	1.86	6.34	6.98	14.18	7.84
hexane	2	1.65	1.58	3.77	4.11	9.06	4.86
isobutyl acetate	3	6.99	6.18	10.39	9.69	17.35	18.02
isopropyl acetate	3	4.26	3.74	6.19	5.71	11.47	12.38
methanol	2	4.23	3.64	1.96	1.80	3.14	2.93
methyl acetate	3	3.19	2.80	3.17	2.93	5.80	7.10
methylbutyl ketone	2	9.10	8.05	11.81	10.50	17.94	20.81
methylcyclohexane	2	2.50	2.30	7.31	7.95	15.49	9.21
methylethyl ketone	3	4.33	3.76	4.90	4.09	7.99	11.55
methylisobutyl ketone	3	6.84	5.97	9.64	8.49	15.35	18.41
m-xylene	2	11.21	10.04	14.29	14.17	23.01	18.78
N,N-dimethylacetamide	2	20.75	19.01	12.95	13.96	21.42	30.00
N,N-dimethylformamide	2	18.04	16.26	13.09	10.23	16.52	26.19
nitromethane	2	11.82	10.31	4.84	3.53	6.30	12.01
N-methylpyrrolidone	2	29.84	27.86	25.09	21.85	29.99	38.08
o-xylene	2	12.79	11.51	15.46	15.26	24.23	20.33
pentane	3	1.49	1.45	2.39	2.62	5.36	3.29
propyl acetate	3	5.98	5.29	8.03	7.44	*	*
p-xylene	2	10.98	9.82	14.29	14.17	22.99	18.69
pyridine	2	12.64	11.24	9.60	8.57	15.40	16.45
sulfolane	2	47.62	43.31	34.02	28.90	36.76	48.67
tert-butylmethyl ether	3	1.94	1.82	3.50	3.59	7.52	5.73
tetrahydrofuran	3	3.63	3.19	5.12	4.90	9.81	9.48
tetralin	2	25.12	23.48	27.49	27.44	37.27	31.72
toluene	2	7.86	6.91	9.80	9.66	17.36	14.00
1,1-diethoxypropane	—	5.42	4.84	11.39	11.38	19.82	15.08
2,2-dimethoxypropane	—	3.11	2.79	5.48	5.55	11.37	8.67
2-chloropropane	—	1.96	1.82	2.67	2.66	5.20	4.61
2-methylpentane	—	1.58	1.52	3.22	3.56	7.72	4.32
acetaldehyde	—	2.05	1.85	1.86	1.84	3.14	3.90
chloroethane	—	1.83	1.71	2.14	2.10	3.97	3.55
chloromethane	—	1.63	1.55	1.70	1.70	3.01	2.73
ethylene oxide	—	2.05	1.86	1.89	2.02	3.59	3.92
formaldehyde	—	2.25	1.57	1.68	1.58	2.66	2.59
isoamyl acetate	—	10.51	9.43	14.84	14.18	22.80	22.62
isooctane	—	1.85	1.75	5.84	6.59	13.66	8.07
isopropyl ether	—	1.86	1.76	4.03	4.23	9.03	5.83
methyl cyclopentane	—	1.91	1.79	4.50	4.93	10.41	5.81
methyl isopropyl ketone	—	4.93	4.29	6.58	5.69	11.04	14.47
methylal	—	2.26	2.06	2.84	2.82	5.65	5.09
trichloroethene	—	6.50	5.70	7.07	7.05	13.58	9.75
water	—	8.24	7.18	1.74	1.68	2.75	2.57

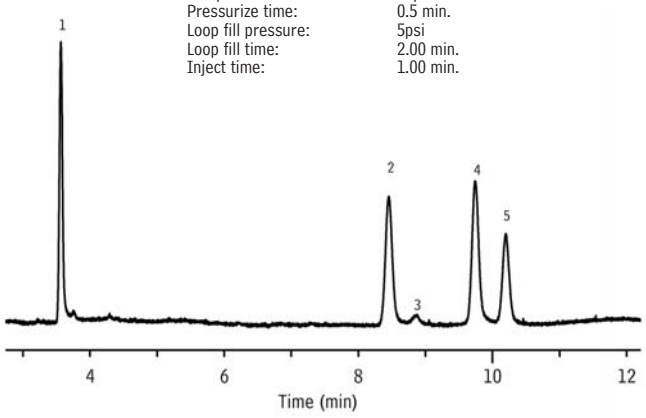
* Not determined

Residual Solvents Class 1
Rtx®-1301

Column:	Rtx®-1301, 30m, 0.32mm ID, 1.8µm (cat.# 16092)
Sample:	USP <467> Class 1 standard solution (cat.# 36279) in 20mL headspace vial
Inj.:	headspace injection (split ratio 1:5), 1mm split liner, Siltek® deactivated (cat.# 20972-214.1)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.16mL/min., 35.3cm/sec.
Oven temp.:	40°C for 20 min. to 240°C @ 10°C/min. (hold for 20 min.)
Det.:	FID @ 240°C

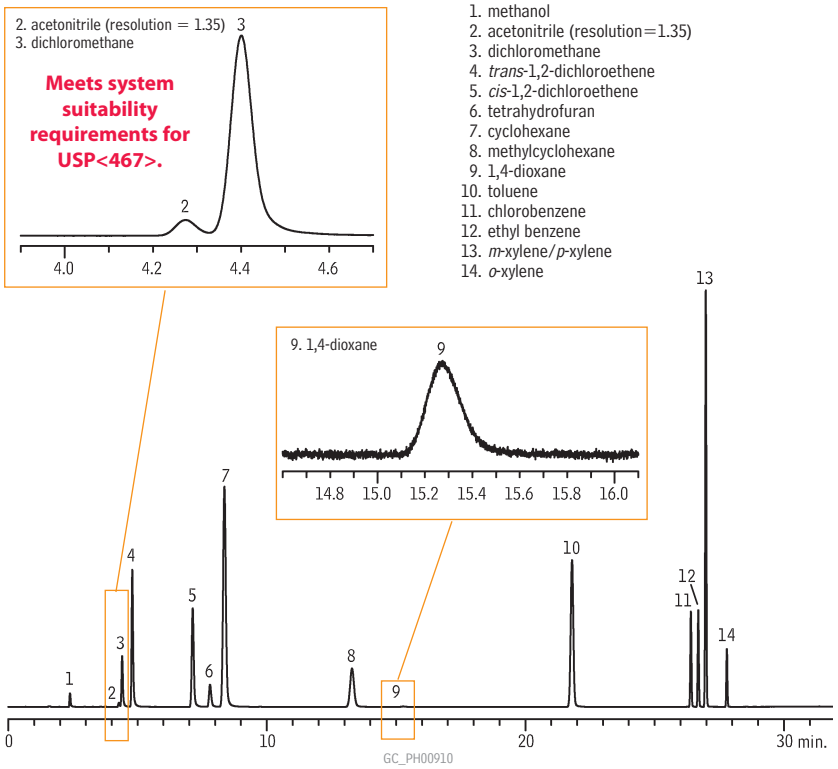
Headspace Conditions	
Instrument:	Tekmar HT3
Transfer line temp.:	105°C
Valve oven temp.:	105°C
Sample temp.:	80°C
Sample equil. time:	45 min.
Vial pressure:	10psi
Pressurize time:	0.5 min.
Loop fill pressure:	5psi
Loop fill time:	2.00 min.
Inject time:	1.00 min.

1. 1,1-dichloroethene
2. 1,1,1-trichloroethane
3. carbon tetrachloride
4. benzene
5. 1,2-dichloroethane



GC_PH00909

Residual Solvents Class 2 Mixture A
Rtx®-1301



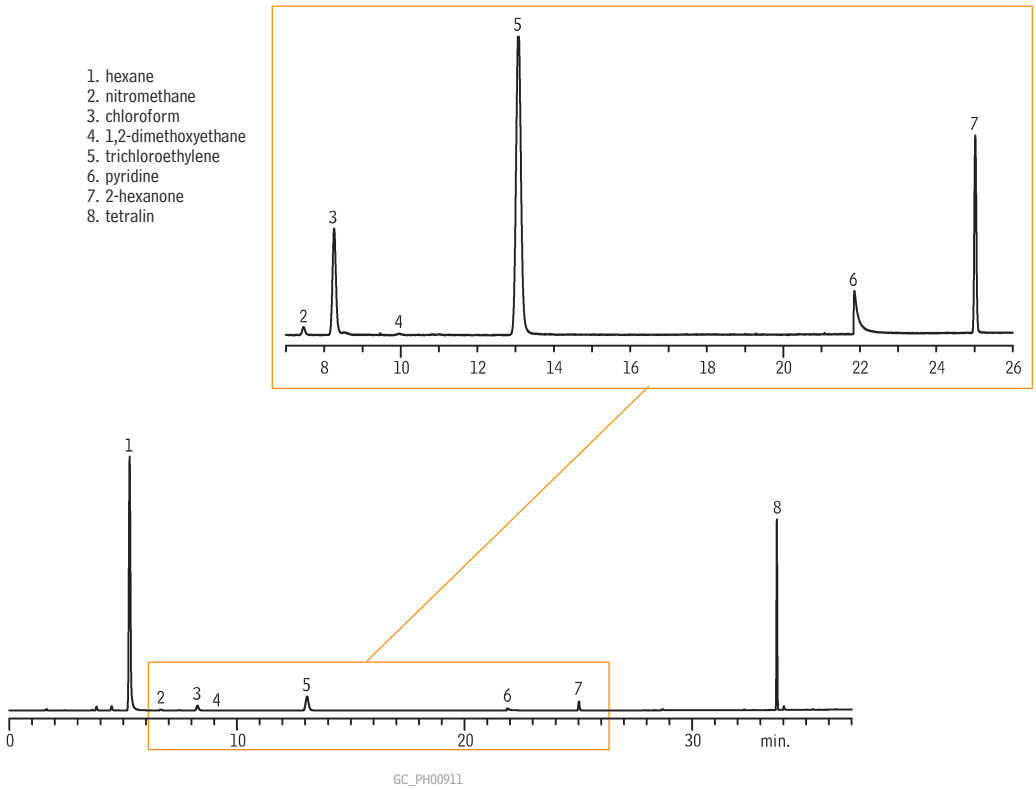
1. methanol
2. acetonitrile (resolution=1.35)
3. dichloromethane
4. *trans*-1,2-dichloroethene
5. *cis*-1,2-dichloroethene
6. tetrahydrofuran
7. cyclohexane
8. methylcyclohexane
9. 1,4-dioxane
10. toluene
11. chlorobenzene
12. ethyl benzene
13. *m*-xylene/*p*-xylene
14. *o*-xylene

GC_PH00910

Column:	Rtx®-1301, 30m, 0.32 ID, 1.8µm (cat.# 16092)
Sample:	USP <467> Class 2 Mixture A standard solution (cat.# 36271) in 20mL headspace vial
Inj.:	headspace injection (split ratio 1:5), 1mm split liner, Siltek® deactivated (cat.# 20972-214.1)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.16mL/min., 35.3cm/sec.
Oven temp.:	40°C for 20 min. to 240°C @ 10°C/min. (hold for 20 min.)
Det.:	FID @ 240°C

Headspace Conditions	
Instrument:	Tekmar HT3
Transfer line temp.:	105°C
Valve oven temp.:	105°C
Sample temp.:	80°C
Sample equil. time:	45 min.
Vial pressure:	10psi
Pressurize time:	0.5 min.
Loop fill pressure:	5psi
Loop fill time:	2.00 min.
Inject time:	1.00 min.

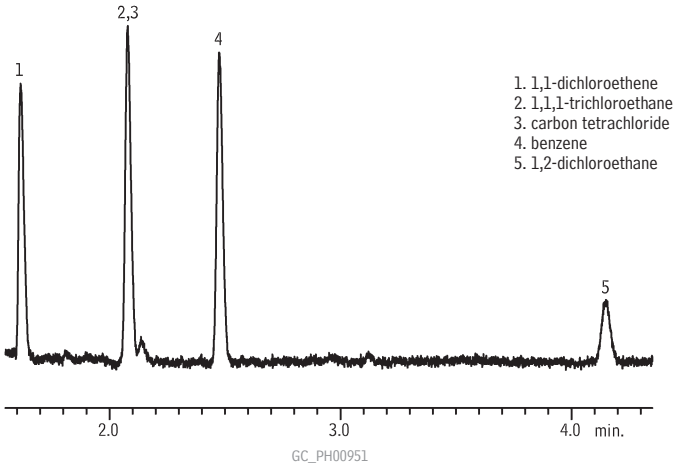
Residual Solvents Class 2 Mixture B
Rtx®-1301



Column:	Rtx®-1301, 30m, 0.32mm ID, 1.8µm (cat.# 16092)	Headspace Conditions	
Sample:	USP <467> Class 2 Mixture B standard solution (cat.# 36280) in 20mL headspace vial	Instrument:	Tekmar HT3
		Transfer line temp.:	105°C
Inj.:	headspace injection (split ratio 1:5), 1mm split liner Siltek® deactivated (cat.# 20972-214.1)	Valve oven temp.:	105°C
		Sample temp.:	80°C
Inj. temp.:	140°C	Sample equil. time:	45 min.
Carrier gas:	helium, constant flow	Vial pressure:	10psi
Flow rate:	2.16mL/min., 35.3cm/sec.	Pressurize time:	0.5 min.
Oven temp.:	40°C for 20 min. to 240°C @ 10°C/min. (hold for 20 min.)	Loop fill pressure:	5psi
		Loop fill time:	2.00 min.
Det.:	FID @ 240°C	Inject time:	1.00 min.

Searching for a chromatogram?
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Residual Solvents Class 1
Stabilwax® (G16)

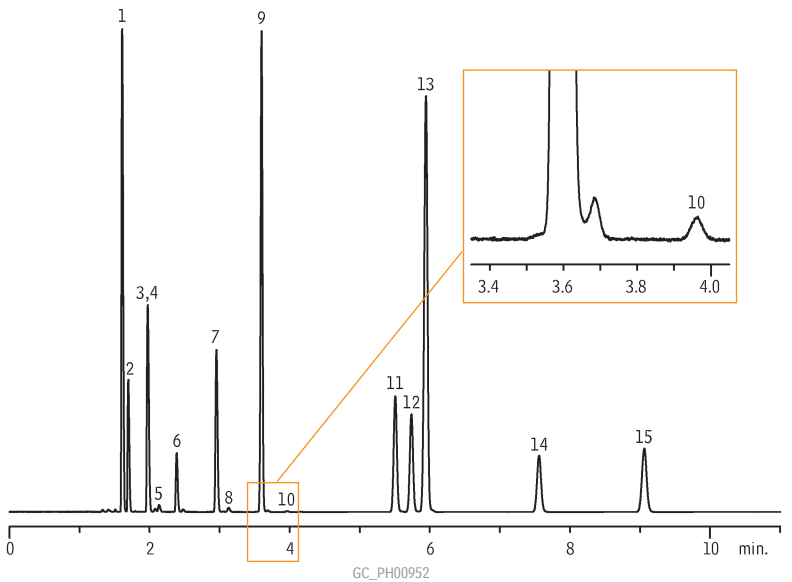


Column:	Stabilwax®, 30m, 0.32mm ID, 0.25µm (cat.# 10624)
Sample:	USP Stock Mixture USP<467> Residual Solvents Class 1 Mix (cat.# 36279) in 20mL headspace vial (cat.# 24685), water diluent
Inj.:	headspace injection (split ratio 1:5), 2mm splitless liner IP deactivated (cat.# 20712)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.15mL/min., 35.2cm/sec.
Oven temp.:	50°C for 20 min. to 165°C @ 6°C/min. (hold for 20 min.)
Det.:	FID @ 250°C

Headspace Conditions

Instrument:	Overbrook Scientific HT200H
Syringe temp.:	100°C
Sample temp.:	80°C
Sample equil. time.:	45 min.
Injection vol.:	1.0mL
Injection speed:	setting 8
Injection dwell:	5 sec.

Residual Solvents Class 2
Stabilwax® (G16)



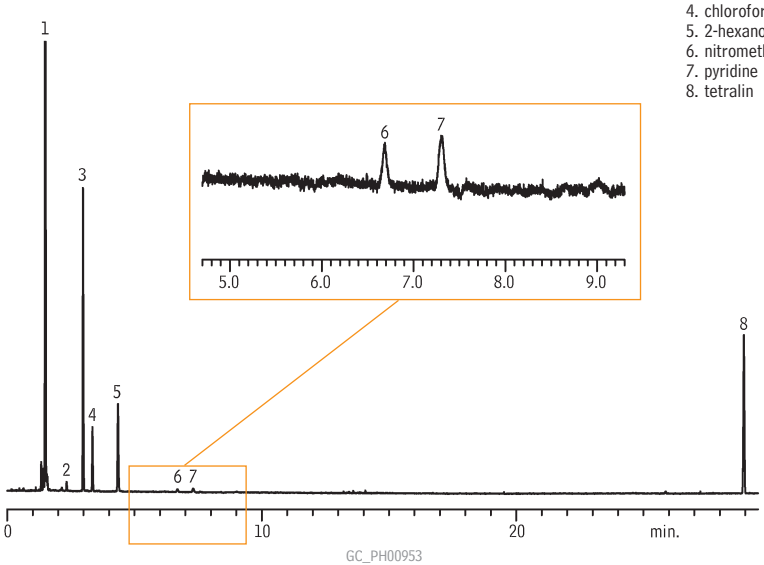
1. cyclohexane
2. methylcyclohexane
3. *trans*-1,2-dichloroethene
4. tetrahydrofuran
5. methanol
6. dichloromethane
7. *cis*-1,2-dichloroethene
8. acetonitrile
9. toluene
10. 1,4-dioxane
11. ethyl benzene
12. *p*-xylene
13. *m*-xylene
14. *o*-xylene
15. chlorobenzene

Column:	Stabilwax®, 30m, 0.32mm ID, 0.25µm (cat.# 10624)
Sample:	USP Stock Standard Residual Solvents Class 2 Mix A (cat.# 36271) in 20mL headspace vial (cat.# 24685), water diluent
Inj.:	headspace injection (split ratio 1:5), 2mm splitless liner IP deactivated (cat.# 20712)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.15mL/min., 35.2cm/sec.
Oven temp.:	50°C for 20 min. to 165°C @ 6°C/min. (hold for 20 min.)
Det.:	FID @ 250°C

Headspace Conditions

Instrument:	Overbrook Scientific HT200H
Syringe temp.:	100°C
Sample temp.:	80°C
Sample equil. time.:	45 min.
Injection vol.:	1.0mL
Injection speed:	setting 8
Injection dwell:	5 sec.

Residual Solvents Class 2
Stabilwax® (G16)



GC_PH00953

1. hexane
2. 1,2-dimethoxyethane
3. trichloroethylene
4. chloroform
5. 2-hexanone
6. nitromethane
7. pyridine
8. tetralin

Column:	Stabilwax®, 30m, 0.32mm ID, 0.25µm (cat.# 10624)
Sample:	USP Stock Standard Residual Solvents Class 2 Mix B (cat.# 36272) in 20mL headspace vial (cat.# 24685), water diluent
Inj.:	headspace injection (split ratio 1:5), 2mm splitless liner IP deactivated (cat.# 20712)
Inj. temp.:	140°C
Carrier gas:	helium, constant flow
Flow rate:	2.15mL/min., 35.2cm/sec.
Oven temp.:	50°C for 20 min. to 165°C @ 6°C/min. (hold for 20 min.)
Det.:	FID @ 250°C

Headspace Conditions

Instrument:	Overbrook Scientific HT200H
Syringe temp.:	100°C
Sample temp.:	80°C
Sample equil. time.:	45 min.
Injection vol.:	1.0mL
Injection speed:	setting 8
Injection dwell:	5 sec.



Stu Kline, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

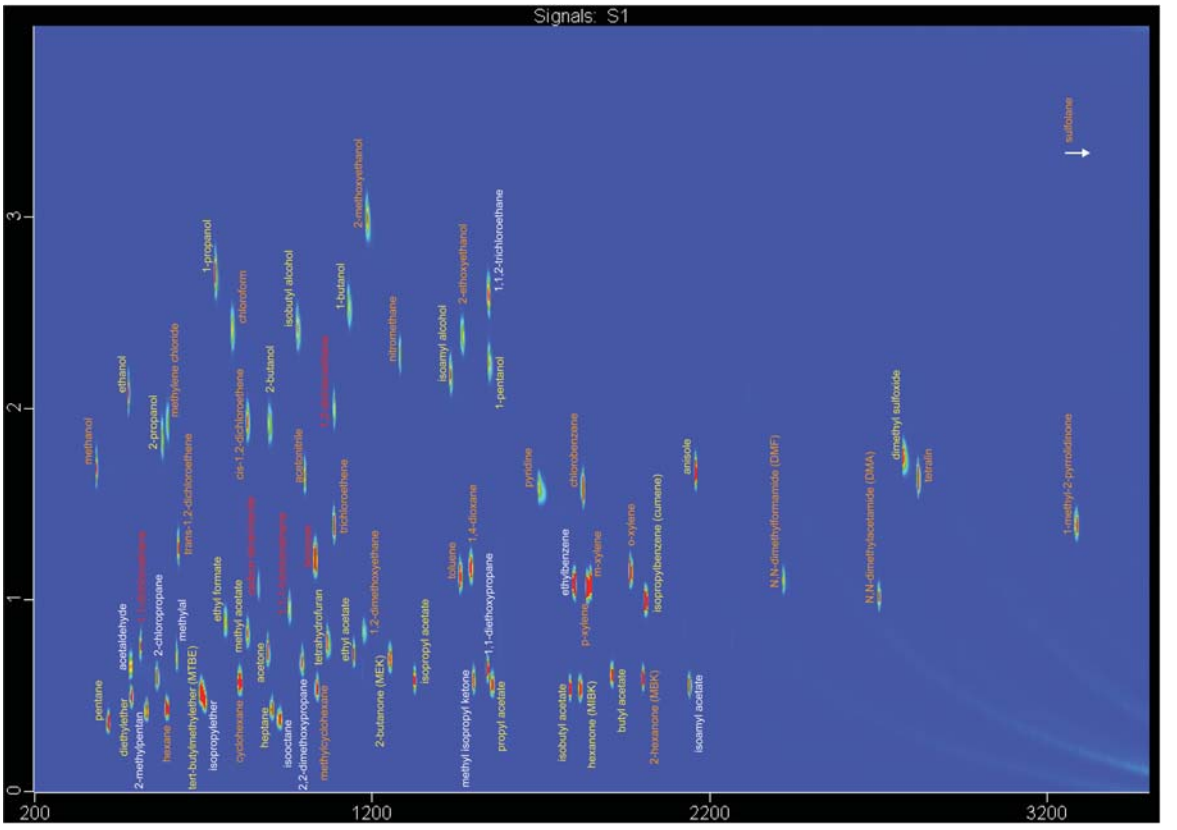
Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com

Organic Volatile Impurities
Rtx®-200 & Rtx®-WAX (GCxGC)



GC_PH00888

Columns:	Rtx®-200, 60m, 0.25mm ID, 1.0µm (cat.# 15056) Rtx®-Wax, 2m, 0.18mm ID, 0.3µm (custom)
Sample:	0.2µL mix of 69 neat organic volatile impurities
Instrument:	Agilent 6890 with LECO liquid nitrogen cryojet modulator
Inj.:	split/splitless, split ratio 600:1; gas saver: 20mL/min. after 1 min.; 4mm ID split inlet liner w/wool (cat.# 20781); injection with band formation (fast injection)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.5mL/min.
Oven temp.:	Rtx®-200: 35°C (9 min.) to 220°C @ 3°C/min. (hold 1 min.); Rtx®-Wax: 65°C (9 min.) to 250°C @ 3°C/min. (hold 1 min.)
Modulation:	modulator offset: 30°C; 2nd dimension separation: 4 sec.; hot pulse: 0.3 sec.; cool between stages: 1.7 sec.
Det:	FID @ 250°C; hydrogen: 40mL/min.; air: 450mL/min.; make-up gas: 45mL/min.; sampling rate: 200Hz

did you **know**?

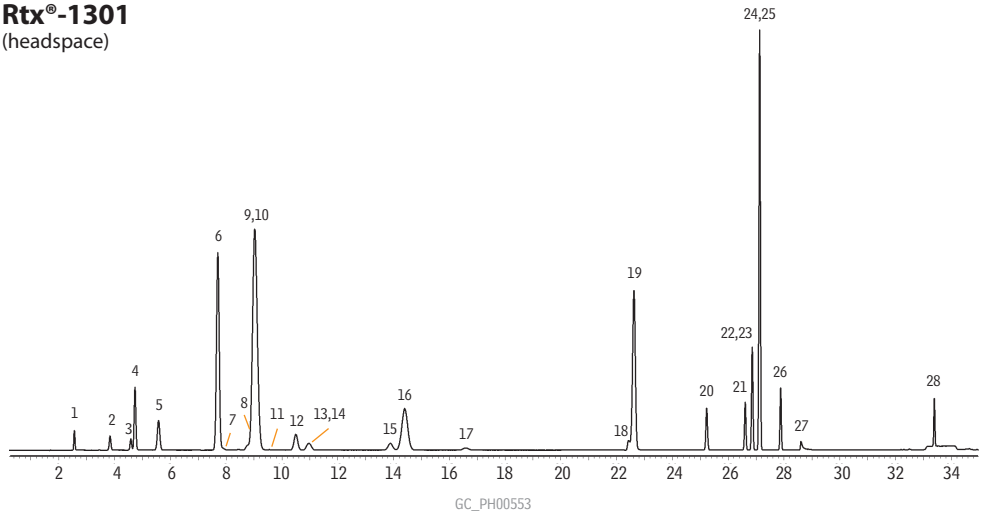
GCxGC Separations

Separation of the complete list of International Conference on Harmonization Class 1, Class 2, and Class 3 organic volatiles requires at least two, and often three, separate analyses on differing capillary GC columns. While many laboratories do not monitor for the complete list, separation of OVIs still is a challenge, often characterized by long runtimes and incomplete separations.

Using comprehensive GCxGC, it is possible to resolve all of these target compounds, in a single analysis, with less than a 1-hour run time. In this approach, results for which are shown above, two columns of differing selectivity are used to separate the compounds in a 2-dimensional plot. Various detectors also can be employed, including time-of-flight mass spectrometry, to yield reliable information for the entire target compound list in a single analysis.

For more about GCxGC, visit our website and review the article on pages 4-5 of **Restek Advantage 2005, vol. 1 (lit. cat.# 59077)**, or enter GCxGC in the search feature.

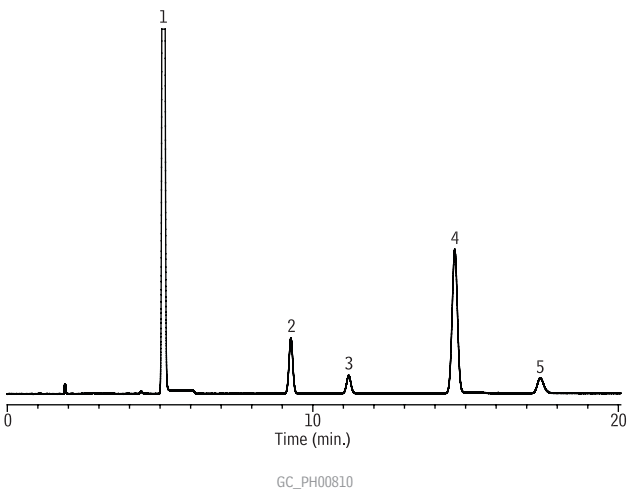
Residual Solvents
European Pharmacopoeia Class 1 and Class 2
Rtx®-1301
(headspace)



1. methanol
2. 1,1-dichloroethene
3. acetonitrile
4. methylene chloride (dichloromethane)
5. hexane (C6)
6. *cis*-1,2-dichloroethene
7. nitromethane
8. chloroform
9. cyclohexane
10. 1,1,1-trichloroethane
11. carbon tetrachloride
12. benzene
13. 1,2-dimethoxyethane
14. 1,2-dichloroethane
15. trichloroethylene (1,1,2-trichlorethene)
16. methylcyclohexane
17. 1,4-dioxane
18. pyridine
19. toluene
20. 2-hexanone
21. chlorobenzene
22. DMF
23. ethylbenzene
24. *m*-xylene
25. *p*-xylene
26. *o*-xylene
27. N,N-dimethylacetamide
28. 1,2,3,4-tetrahydronaphthalene

Column:	Rtx®-1301, 30m, 0.53mm ID x 3.0µm (cat.# 16085)
Sample:	headspace injection of 28 Class 1 and 2 residual solvents for pharmaceutical processing, prepared at the regulatory limit concentration, using samples shaken and heated at 80°C for 15 min., 1mL headspace injection
Oven temp.:	40°C (hold 20 min.) to 240°C @ 10°C/min. (hold 20 min.)
Inj./det. temp.:	200°C/250°C
FID sensitivity:	1.1 x 10^{11} AFS
Carrier gas:	hydrogen @ 35cm/sec.
Split ratio:	2:1

Organic Volatile Impurities
USP <467>
Rtx®-G43
(static headspace)



Column:	Rtx®-G43, 30m, 0.53mm ID, 3.0µm (cat.# 16085-126)
Sample:	USP <467> Calibration Mixture #5 (cat.# 36007) in DMSO stock standard. To each 22mL headspace vial 5ml water, ~ 1.0g of sodium sulfate and 100µL of stock standard were added. The preparation yielded the following concentrations,

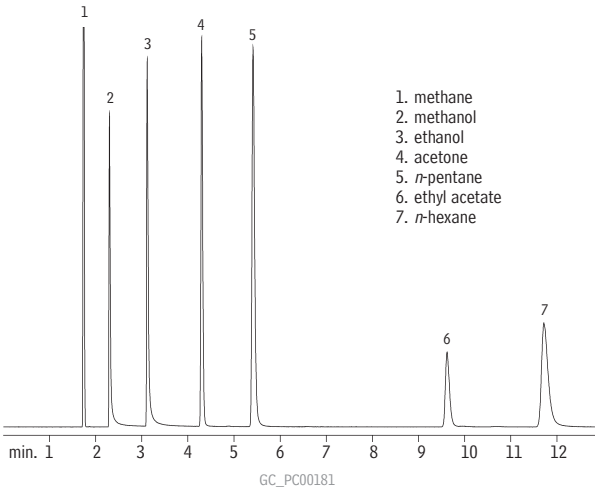
	Retention Time (min.)	Sample Concentration (µg/mL)
1. dichloromethane	5.110	12.0
2. chloroform	9.285	1.2
3. benzene	11.173	0.04
4. trichloroethylene	14.647	1.6
5. 1,4-dioxane	17.436	7.6

Inj.:	static headspace injection (see static headspace conditions)
Inj. temp.:	180°C
Carrier gas:	helium, split 2:1
Linear velocity:	5mL/min., constant flow
Oven temp.:	40°C for 20 min. to 240°C at 25°C/min. (hold for 10 min.)
Det.:	FID @ 250°C
	hydrogen flow: 40mL/min.
	air flow: 450mL/min.
	make-up flow: 45mL/min.

Static Headspace (Loop) Conditions:

Instrument:	Teledyne Tekmar HT3
Valve oven temp.:	150°C
Transfer line temp.:	150°C
Standby flow rate:	10mL/min.
Platen/sample temp.:	80°C
Platen temp equil. time:	2.00 min.
Sample equil. time:	15.00 min.
Mixer time:	2.00 min.
Mixing level:	5
Mixer stabilize time:	0.50 min.
Pressurize:	15psi
Pressurize time:	2.00 min.
Pressurize equil. time:	0.50 min.
Loop fill pressure:	5psi
Loop fill time:	2.00 min.
Loop fill equil. time:	0.50 min.
Inject time:	1.00 min.

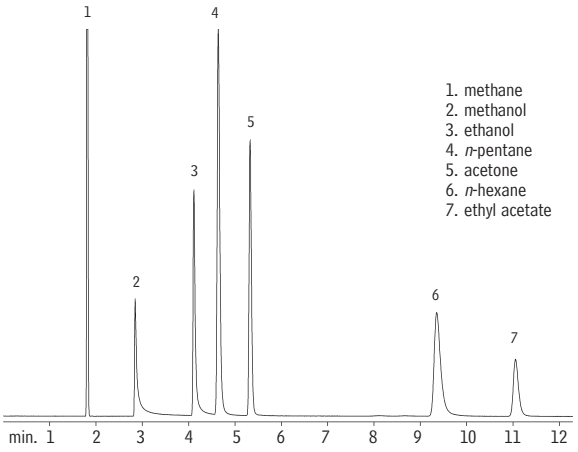
Solvents, Polar
Rt®-QPLOT



GC_PC00181

Column:	Rt®-QPLOT, 30m, 0.32mm ID (cat.# 19718)
Sample:	20µL split injection. 50ppm (w/v) each in helium, Cyclosplitter® inlet liner (cat.# 20755)
Oven temp.:	150°C
Inj./det. temp.:	200°C
Carrier gas:	hydrogen
Det.:	FID
Split ratio:	20/1

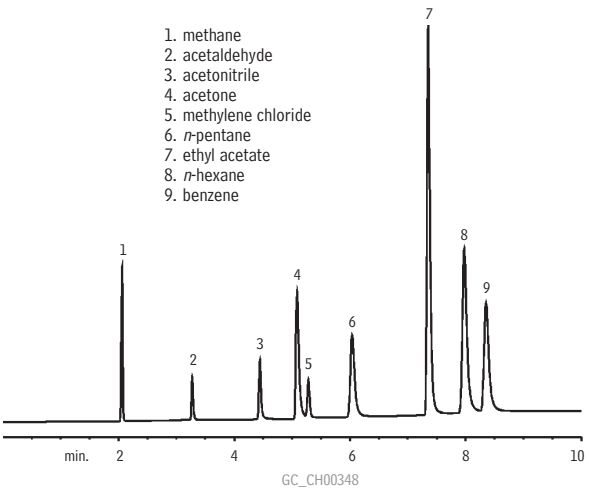
Solvents, Polar
Rt®-UPLOT



GC_PC00182

Column:	Rt®-UPLOT, 30m, 0.32mm ID (cat.# 19724)
Sample:	20µL split injection. 50ppm (w/v) each in helium, Cyclosplitter® inlet liner (cat.#20755)
Oven temp.:	150°C
Inj./det. temp.:	200°C
Carrier gas:	hydrogen
Detector:	FID
Split ratio:	20/1

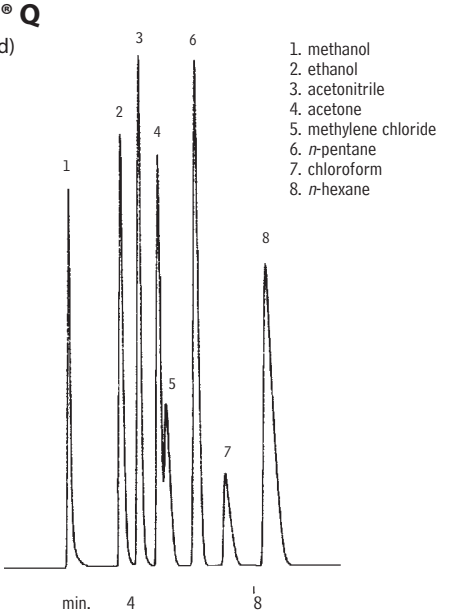
Solvents
Rt®-QPLOT



GC_CH00348

Column:	Rt®-QPLOT, 30m, 0.53mm ID (cat.# 19716)
Sample:	70µL split injection of solvent mixture
Oven temp.:	100°C to 220°C @ 15°C/min. (hold 2 min.)
Inj./det. temp.:	220°C
Carrier gas:	helium
Linear velocity:	23.6cm/sec. set @ 100°C
FID sensitivity:	1.28 x 10^{-10} AFS
Split ratio:	7.7:1
Split:	44.5cc/min.
Column flow:	6.6cc/min.

Solvents
HayeSep® Q
(micropacked)



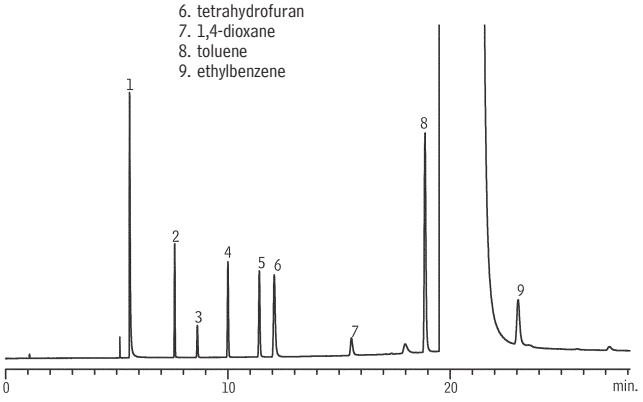
GC_CH00328

Column:	HayeSep® Q, 2m, 1mm ID (cat.# 19017)
Sample:	1µL direct injection of a neat solvent mixture
Oven temp.:	80°C to 180°C @ 16°C/min. (hold 5 min.)
Inj./det. temp.:	200°C
Carrier gas:	helium
Flow:	20mL/min. set @ 40°C
FID sensitivity:	512 x 10^{-11} AFS

Solvents
Rt®-QS-BOND

NEW!

1. methanol
2. acetonitrile
3. methylene chloride
4. *trans*-1,2-dichloroethylene
5. *cis*-1,2-dichloroethylene
6. tetrahydrofuran
7. 1,4-dioxane
8. toluene
9. ethylbenzene



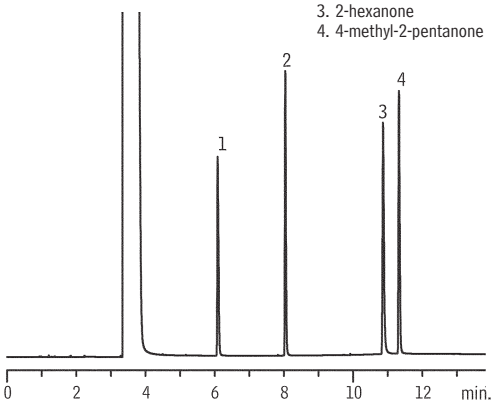
GC_PC01021

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	100-1,000µg/mL solvent mix in DMSO:water, 60:40 (v/v)
Inj.:	1µL split (split ratio 5:1), 4mm Siltek® single gooseneck liner (cat.# 20798-214.1)
Inj. temp.:	240°C
Carrier gas:	helium, constant flow
Flow rate:	5.7mL/min. @ 40°C
Oven temp.:	40°C (hold 0.5min.) to 120°C @ 15°C/min. to 200°C @ 5°C/min. (hold 10 min.)
Det.:	FID @ 240°C

Ketones
Rt®-QS-BOND

NEW!

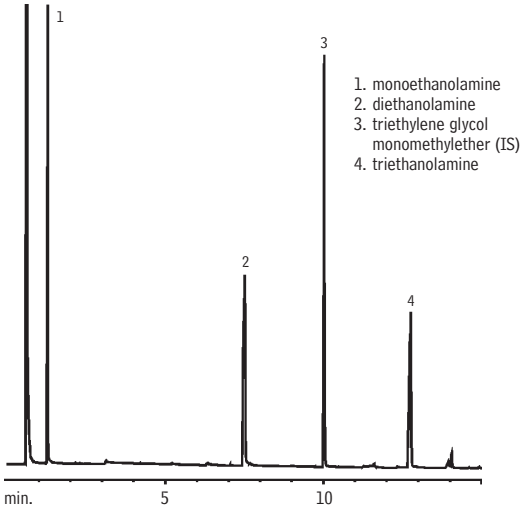
1. acetone
2. 2-butanone
3. 2-hexanone
4. 4-methyl-2-pentanone



GC_PC01015

Column:	Rt®-QS-BOND, 30m, 0.53mm ID (cat.# 19738)
Sample:	1,000µg/mL VOA Calibration Mix #1 (ketones) (cat.# 30006) in methanol:water, 90:10 (v/v)
Inj.:	1µL split (split ratio 50:1), 4mm Siltek® single gooseneck liner (cat.# 20798-214.1)
Inj. temp.:	240°C
Carrier gas:	helium, constant flow
Flow rate:	5.7mL/min. @ 40°C
Oven temp.:	60°C to 225°C @ 15°C/min. (hold 10 min.)
Det.:	FID @ 240°C

Ethanolamines
Rtx®-5 Amine

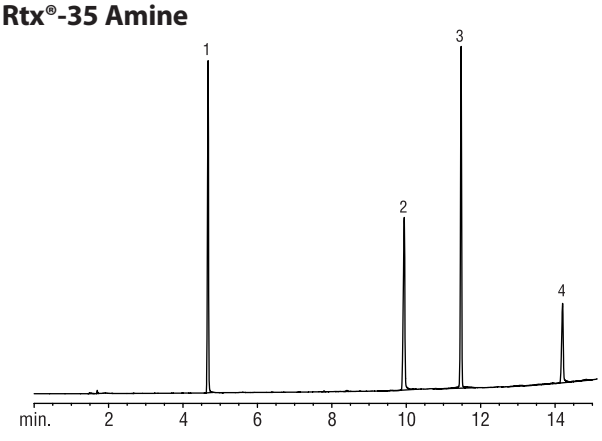


1. monoethanolamine
2. diethanolamine
3. triethylene glycol monomethylether (IS)
4. triethanolamine

GC_CH00296

Column:	Rtx®-5 Amine, 15m, 0.25mm ID, 0.50µm (cat.# 12335)
Sample:	1.0µL split injection of ethanolamine mix in methanol
On-column conc.:	34ng
Oven temp.:	50°C (hold 2 min.) to 180°C @ 10°C/min. (hold 2 min.)
Inj./det. temp.:	280°C/300°C
Carrier gas:	hydrogen
Linear velocity:	43cm/sec. set @ 50°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split ratio:	58:1

Ethanolamines
Rtx®-35 Amine

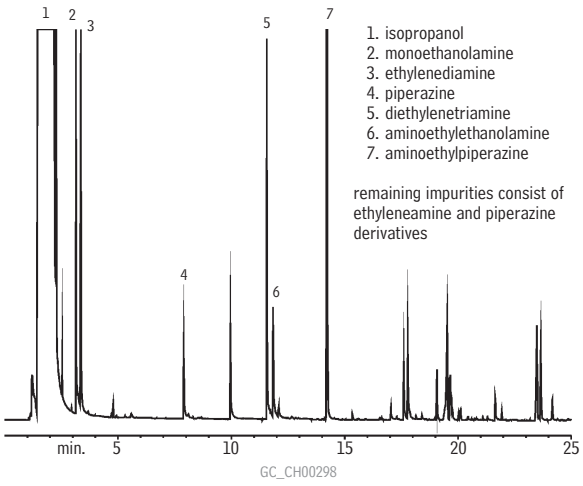


GC_CH00585

1. monoethanolamine
2. diethanolamine
3. triethyleneglycol monomethylether
4. triethanolamine

Column:	Rtx®-35 Amine, 30m, 0.32mm ID, 1.0µm (cat.# 11354)
Sample:	500µg/mL ethanolamine standard in water
Inj.:	1.0µL split (split ratio 10:1), cup splitter inlet liner (cat.# 20709)
Inj. temp.:	300°C
Carrier gas:	helium, constant pressure
Linear velocity:	40cm/sec. @ 50°C
Oven temp.:	50°C (hold 0.50 min.) to 280°C @15°C/min.
Det.:	FID @ 300°C

Ethyleneamines
Rtx®-5 Amine



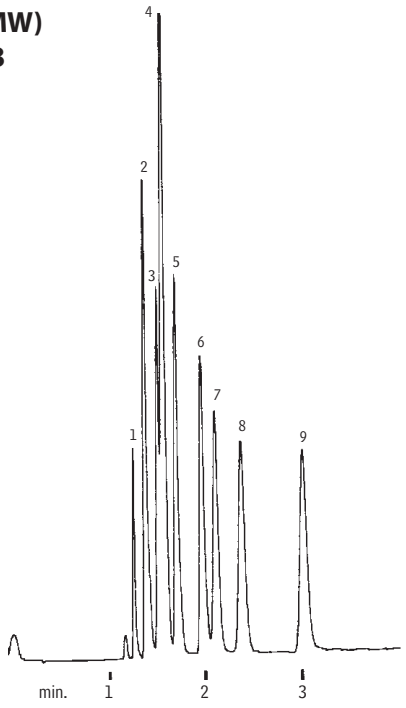
1. isopropanol
2. monoethanolamine
3. ethylenediamine
4. piperazine
5. diethylenetriamine
6. aminoethylethanolamine
7. aminoethylpiperazine

remaining impurities consist of ethyleneamine and piperazine derivatives

Column:	Rtx®-5 Amine, 30m, 0.25mm ID, 0.50µm (cat.# 12338)
Sample:	3.0µL split injection of ethyleneamine industrial sample
On-column conc.:	~5-80ng
Oven temp.:	40°C (hold 4 min.) to 315°C @ 10°C/min. (hold 5 min.)
Inj./det. temp.:	315°C
Carrier gas:	hydrogen
Linear velocity:	43cm/sec. set @ 40°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split ratio:	20:1

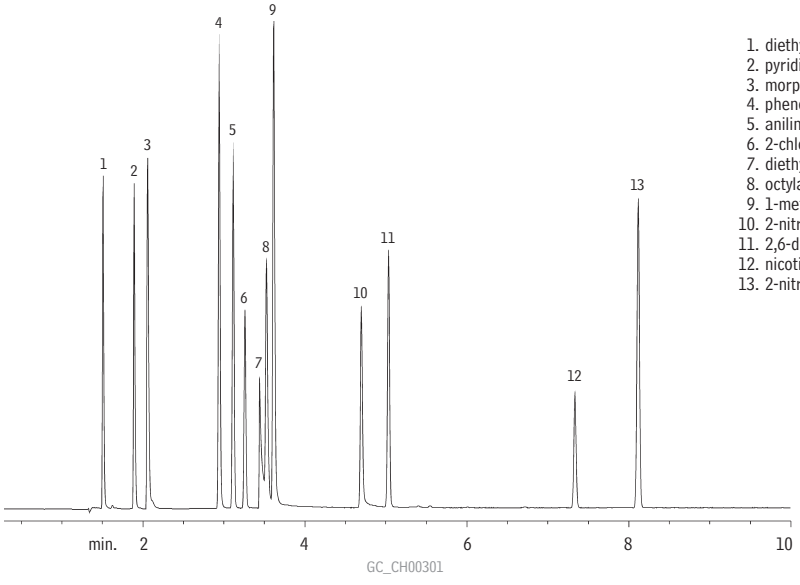
Amines (low MW)
Stabilwax®-DB

1. trimethylamine
2. dimethylamine
3. ethylamine
4. methylamine
5. isopropylamine
6. *n*-propylamine
7. *tert*-butylamine
8. diethylamine
9. *sec*-butylamine



Column:	Stabilwax®-DB, 30m, 0.53mm ID, 1.0µm (cat.# 10855)
Sample:	1.0µL direct injection of amines in water
Oven temp.:	45°C
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 5cc/min.)
FID sensitivity:	1 x 10^{-11} AFS
Recommended inlet liner:	Uniliner®

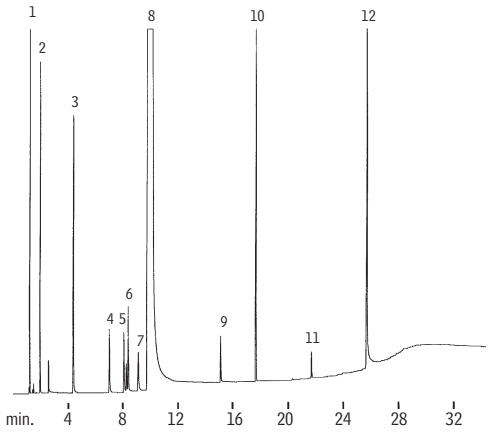
Amines & Phenols
Rtx®-5 Amine



1. diethylamine
2. pyridine
3. morpholine
4. phenol
5. aniline
6. 2-chlorophenol
7. diethylenetriamine
8. octylamine
9. 1-methyl-2-pyrrolidinone
10. 2-nitrophenol
11. 2,6-dimethylaniline
12. nicotine
13. 2-nitroaniline

Column:	Rtx®-5 Amine, 30m, 0.32mm ID, 1.0µm (cat.# 12354)
Sample:	1.0µL split injection of amines and phenols in water
On-column conc.:	22ng
Oven temp.:	120°C to 220°C @ 10°C/min.
Inj./det. temp.:	305°C
Carrier gas:	hydrogen
Linear velocity:	38cm/sec. set @ 120°C
FID sensitivity:	6.4 x 10^{-11} AFS
Split ratio:	25:1

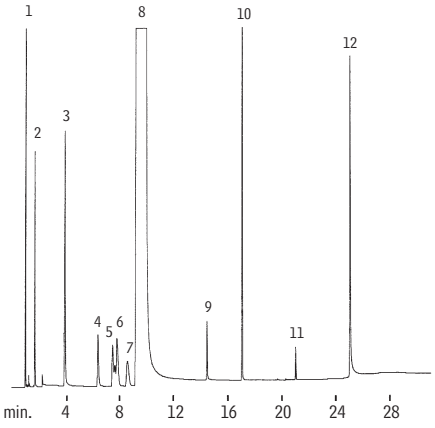
Hexamethylenediamine (HMD)
Stabilwax®-DB



GC_CH00302

1. cyclohexane
2. hexamethyleneimine
3. 1,4-diaminobutane
4. pentamethylenediamine
5. 1,2-diaminocyclohexane
6. 1,5-diamino-2-methylpentane
7. aminomethylcyclopentylamine
8. hexamethylenediamine
9. 6-aminocapronitrile
10. *n*-valeramide
11. adiponitrile
12. bis-hexamethylenetriamine

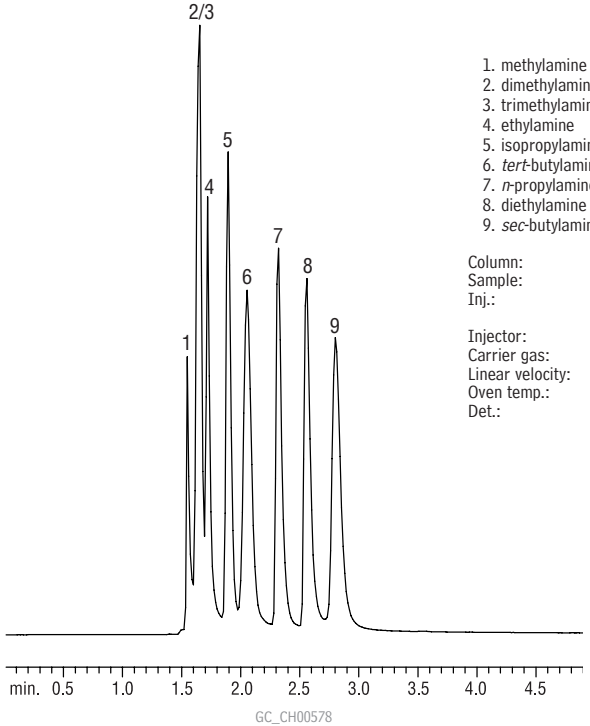
Column:	Stabilwax®-DB, 30m, 0.32mm ID, 0.25µm (cat.# 10824)
Sample:	0.4µL direct injection of a neat hexamethylenediamine (HMD) sample
On-column conc.:	10 to 1,000ng/component
Oven temp.:	95°C (hold 6 min.) to 235°C @ 7°C/min. (hold 4 min.)
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	2 x 10-11 AFS



GC_CH00303

Column:	Stabilwax®-DB, 30m, 0.53mm ID, 0.5µm (cat.# 10840)
Sample:	0.2µL direct injection of a neat hexamethylenediamine sample onto a Uniliner® inlet liner
Oven temp.:	95°C (hold 6 min.) to 235°C @ 7°C/min. (hold 2 min.)
Inj./det. temp.:	255°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 5cc/min.)
FID sensitivity:	64 x 10^{-11} AFS

Amines, Primary
Rtx®-35 Amine

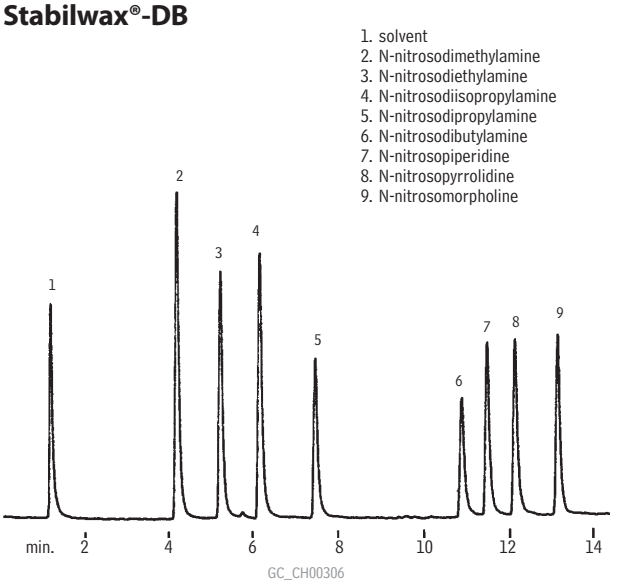


GC_CH00578

1. methylamine
2. dimethylamine
3. trimethylamine
4. ethylamine
5. isopropylamine
6. *tert*-butylamine
7. *n*-propylamine
8. diethylamine
9. *sec*-butylamine

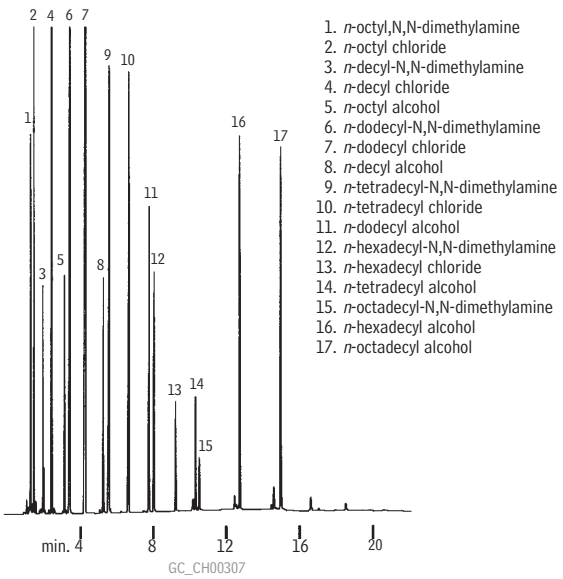
Column:	Rtx®-35 Amine, 30m, 0.53mm ID, 1.0µm (cat.# 11355)
Sample:	primary amines, 50ppm on-column conc. in water
Inj.:	1.0µL, split (10:1), 4mm base-deactivated single gooseneck inlet liner (cat.# 20798-210.1)
Injector:	250°C
Carrier gas:	helium, constant pressure
Linear velocity:	35.7cm/sec.
Oven temp.:	35°C (hold 5.0 min.)
Det.:	FID @ 300°C

Nitrosamines
Stabilwax®-DB



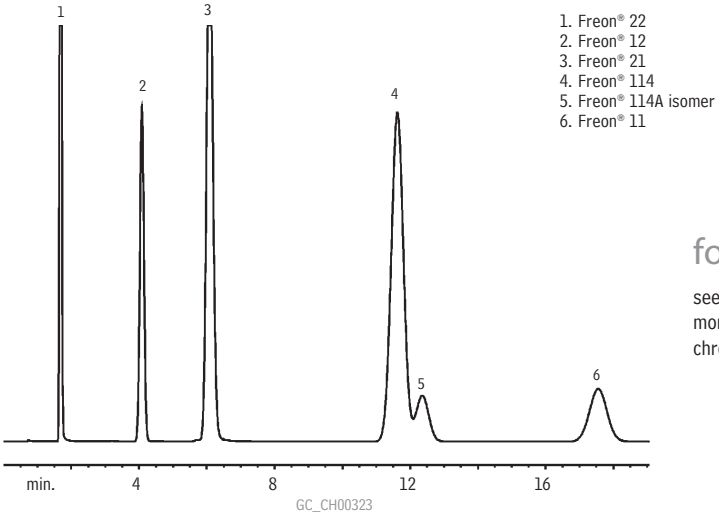
Column:	Stabilwax®-DB, 60m, 0.53mm ID, 1.0µm (cat.# 10858)
Sample:	direct injection of nitrosamines
Conc.:	1.0µg/mL
Oven temp.:	100°C (hold 1 min.) to 170°C @ 5°C/min.
Inj./det. temp.:	200°C
Carrier gas:	helium
Linear velocity:	100cm/sec. (flow rate: 15cc/min.)
Det.:	TSD

Amines/Alcohols/Chlorides
Stabilwax®



Column:	Stabilwax®, 30m, 0.53mm ID, 0.25µm (cat.# 10625)
Inj.:	0.5µL split injection
Oven temp.:	100°C to 250°C @ 8°C/min. (hold 5 min.)
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 5.2cc/min.)
FID sensitivity:	128 x 10^{11} AFS
Split ratio:	40:1

Chlorofluorocarbons
5% Krytox on 60/80 CarboBlack B
(packed)

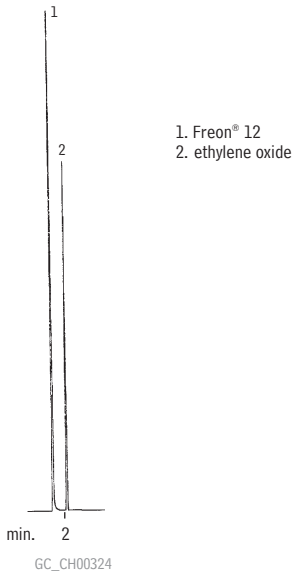


Column:	5% Krytox on 60/80 CarboBlack B, 3.05m, 1/8" OD, 2.1mm ID SilcoSmooth™ stainless steel tubing (cat.# 80127-800)
Inj.:	1µL injected, concentration 20% each component
Oven temp.:	50°C
Inj./det. temp.:	200°C/250°C
Carrier gas:	nitrogen @ 30mL/min.
Det.:	FID

for **more** info

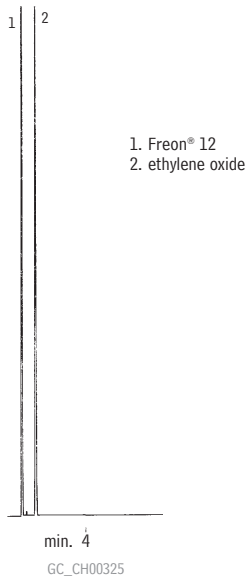
see **pages 652 & 703** for more chlorofluorocarbon chromatograms.

Freon® 12 & Ethylene Oxide
Rtx®-1



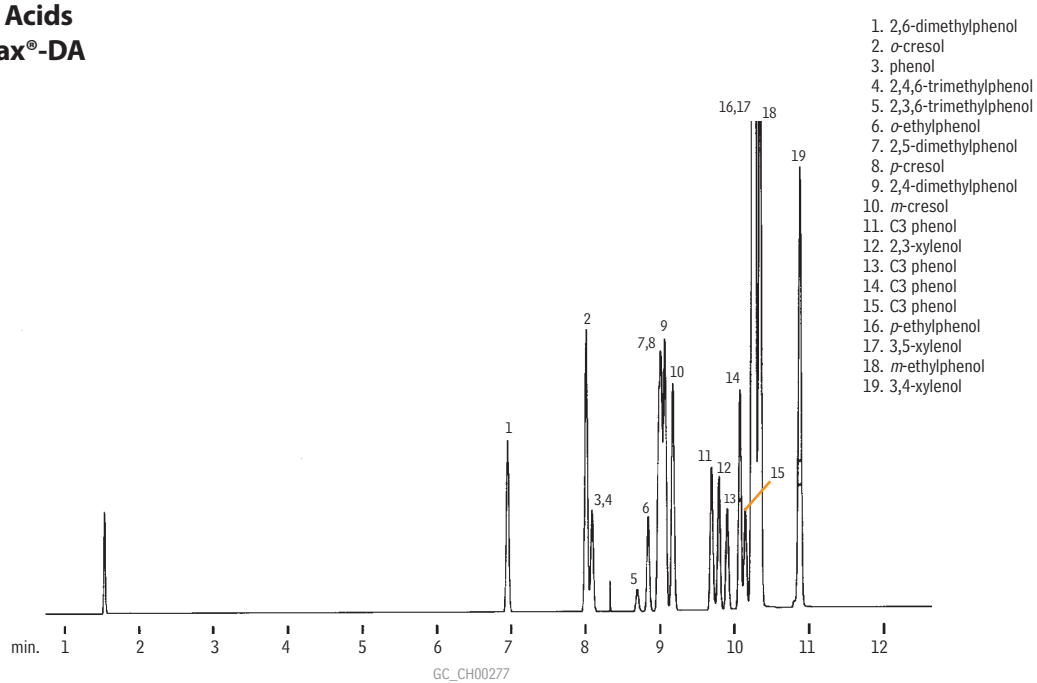
Column:	Rtx®-1, 30m, 0.53mm ID, 5.0µm (cat.# 10179)
Sample:	50µL split injection of Freon® 12 and ETO
Oven temp.:	25°C
Inj./det. temp.:	290°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec.
FID sensitivity:	4 x 10^{-11} AFS
Split vent:	40:1

Freon® 12 & Ethylene Oxide
Rtx®-200



Column:	Rtx®-200, 30m, 0.53mm ID, 3.0µm (cat.# 15085)
Sample:	50µL direct injection of Freon® 12 and ETO
Oven temp.:	25°C
Inj./det. temp.:	290°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 5.2cc/min.)

Cresylic Acids
Stabilwax®-DA



Column:	Stabilwax®-DA, 30m, 0.25mm ID, 0.50µm (cat.# 11038)
Sample:	Wet needle split injection of cresylic acids
Oven temp.:	180°C (hold 2 min.) to 260°C @ 2°C/min.
Inj./det. temp.:	250°C
Carrier gas:	hydrogen
Linear velocity:	40cm/sec. (flow rate: 3.2cc/min.)
FID sensitivity:	64 x 10^{-11} AFS
Split ratio:	40:1

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