

Chromatography Columns

NEW!
2014

MEGA®
improve your GC analysis

CUSTOM DEDICATED COLUMNS

GC-MS columns

dex xeb
chiral columns

mega 2D™
columns

FAST-GC
solutions

Mega-HT
High Temperature Columns

since 1980

GC products 2014

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Comprehensive
& detailed

MEGA®
CAPILLARY COLUMNS
LABORATORY

GC products 2012

our experience in Gas Chromatography at Your service

dex xeb
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GC-MS columns

mega 2D™
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FAST-GC
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Mega-HT
High Temperature Columns

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GC Columns

Fused Silica

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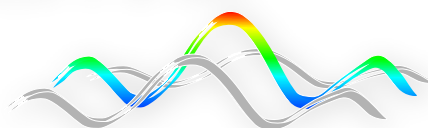
improve your GC analysis

CUSTOM
DEDICATED
COLUMNS

GC-MS
columns

dex xeb
chiral columns

mega^{2D}[™]
columns



FAST-GC
solutions

MegaHT
High Temperature Columns

general purpose

GC products
2014

since
1980

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MEGA since 1980 - Capillary Columns Laboratory - via F.lli, 27 - 20020 Legnano (MI) - Italy

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Since 1980 we offer:

- the most complete range of stationary phases for Conventional-GC, FAST-GC, Wide Bore GC, Chiral-GC, GC-MS
- special and innovative products for Multidimensional-GC (including GCxGC), High Temperature GC and more
- unsurpassed Quality, Efficiency and Inertness, we produce and test each column one-by-one to assure a perfect column-to-column reproducibility
- custom products by request with no additional cost
- support and services for your GC analysis

our experience in Gas Chromatography at Your service

GC Columns Dimensions Available

| | | | | | |
|--------------|------------------|----------------------|----------------------|----------------------|----------------------|
| FAST | I.D. | 0.05 mm | 0.075 mm | 0.10 mm | 0.15mm |
| | Length | from 2 to 5 m | from 2 to 8 m | from 2 to 15 m | from 2.5 to 30 m |
| | Film Thickness * | from 0.05 to 0.25 µm | from 0.05 to 0.50 µm | from 0.05 to 1.00 µm | from 0.05 to 1.40 µm |
| CONVENTIONAL | I.D. | 0.18 mm | 0.20 mm | 0.25 mm | 0.32mm |
| | Length | from 5 to 60 m | from 5 to 60 m | from 5 to 100 m | from 5 to 100 m |
| | Film Thickness * | from 0.05 to 1.50 µm | from 0.05 to 1.50 µm | from 0.05 to 3.00 µm | from 0.05 to 5.00 µm |
| WIDE BORE | I.D. | 0.45 mm | 0.53 mm | | |
| | Length | from 10 to 75 m | from 10 to 75 m | | |
| | Film Thickness * | up to 5.00 µm | up to 5.00 µm | | |

Completely customize your product, selecting all combinations of sizes and also asking for out-of-catalog configurations. Since 1980 we develop ad-hoc solutions for your specific analytical problem. We are able to even tune the selectivity of the stationary phase to respond to particular exigences.

All our stationary phases are available for FAST, Conventional, Wide-Bore and Multidimensional-GC (including GCxGC solutions). Discover moreover our MEGA-DEX chiral columns, our MEGA-HT High Temperature columns and other unique and special products.



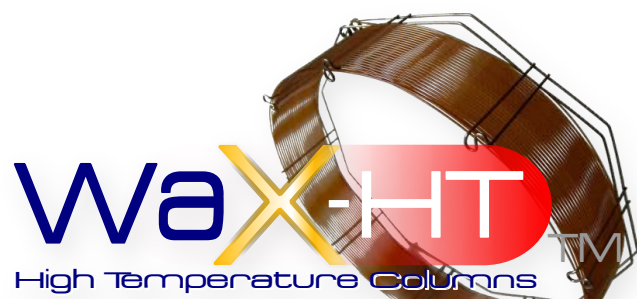
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New Products Highlight



MEGA-WAX HT column, an unique **PEG** stationary phase able to reach up to **300°C** even in isothermal mode. Especially developed for FAST-GC and GCxGC use. The performances of the MEGA-WAX HT have appeared on LCGC Europe Journal with GCxGC application notes. Click here to go to the webpage that includes the MEGA-WAX HT free literature .



MEGA-5 MS Xil column, a new GC-MS silphenylene-based phase that assures **ultra-low bleeding and unsurpassed inertness and efficiency** for your GC-MS analysis. Click here to open and download free technical literature of the new MEGA-5 MS Xil column.



MEGA-2D single column, a revolutionary **unique tubing column coated with two in series different stationary phases** for GCxGC and MDGC applications. No connections are needed. Contact us to have more information and discover all the advantages of the MEGA-2D technology also applied to conventional-GC.



FAST Chiral MEGA-DEX columns line; today you can speed up your chiral GC separations with **the most complete line of FAST-GC chiral columns**. Contact us to have more info and application notes.

| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|---|---------|---|--|---|
| MEGA-I 100% methyl polysiloxane | 350°C | DB-I, HP-I, AT-I, ZB-I, 007-I, Rtx-I, BP-I, SPB-I, CP Sil 5 CB | EPA: 504.1, 505, 551, 606, 612, 8141A/B, etc.** USP: G1, G2, G9, G38 | General purpose column. Solvent impurities, PCBs, simulated distillation, drugs, gases, natural gases, essential oils, semivolatiles, pesticides, phenols, etc. |
| MEGA-5 5% phenyl, 95% methyl polysiloxane | 350°C | DB-5, HP-5, AT-5, ZB-5, 007-5, Rtx-5, BP-5, SPB-5, CP Sil 8 CB | EPA: 506, 611, 604, 607, 608, 8015, 8041, 8082, 8091, etc.** USP: G27, G36, G41 | General purpose column. Solvent impurities, PCBs, hydrocarbons, essential oils, semivolatiles, pesticides, etc. |
| MEGA-SE52 5% phenyl, 95% methyl polysiloxane | 350°C | SE52 | USP: G27, G36, G41 | General purpose column. Solvent impurities, PCBs, hydrocarbons, essential oils, semivolatiles, triglycerides, pesticides, poly-waxes, etc. |
| MEGA-SE54 5% phenyl, 1% vinyl, 94% methyl polysiloxane | 350°C | SE54 | - | General purpose column. Solvent impurities, PCBs, hydrocarbons, essential oils, semivolatiles, allergens, pesticides, etc. |
| MEGA-I701 14% cyanopropylphenyl, 86% methyl polysiloxane | 280°C | DB-I701, HP-I701, AT-I701, ZB-I701, 007-I701, Rtx-I701, BP-I0, SPB-I701, CP Sil 19 CB | EPA: 513, 515.2, 552.2, 607, 619, 622, 8091, 8121, etc.** USP: G46 | General purpose column. Residual solvents, PCBs, alcohols, oxygenates, pesticides, etc. Ideal as confirmation column and GCxGC use. |
| MEGA-I7 50% phenyl, 50% methyl polysiloxane | 340°C | DB-I7, DB-608, HP-I7, AT-50, ZB-50, 007-I7, Rtx-I7, BPX-50, SPB-50, CP Sil 24 CB | EPA: 604, 608, 619, 8060, 8081 USP: G3, G17 | General purpose column. Phthalate esters, herbicides, pharmaceuticals, etc. Ideal as confirmation column and GCxGC use. |
| MEGA-WAX polyethylene glycol (PEG) | 250°C | DB-Wax, HP-Wax, InnoWax AT-Wax, ZB-Wax, 007-CW, Rtx-Wax, BP-20, CP Wax 52 CB | EPA: 602, 603, 619, 8015C USP 467 (OVIs), etc. ** USP: G14, G15, G16, etc. | General purpose column. FAMEs, flavor compounds, essential oils, BTEX aromatics, solvents, alcohols, etc. Tune your Wax column polarity! Ask us for more info. |
| MEGA-I MS low bleeding 100% methyl polysiloxane | 350°C | DB-I ms (UI), HP-I ms, ZB-I ms, Rtx-I ms, BPX-I, Equity-I, CP Sil 5 CB ms | EPA: 504.1, 505, 606, etc.** USP: G1, G2, G9, G38 | General purpose column for GC-MS use. See MEGA-I phase. |
| MEGA-5 MS low bleeding 5% phenyl, 95% methyl polysiloxane | 350°C | DB-5 ms (UI), HP-5 ms, AT-5 ms, ZB-5 ms, 007-5 ms, Rtx-5 ms, BPX-5, Equity-5 | EPA: 513, 528, 552, 610, 613 1625, 8100, 8141A/B, etc.** USP: G27, G36, G41 | General purpose column for GC-MS use. See MEGA-5 phase. |

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*: the temperature range may change according to the column dimensions and flow rate.
**: download on our website a more complete list of EPA and USP methods on the basis of EPA methods, USP requirements and column specifications.

| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|--|---------|---|---|--|
| MEGA-5 MS XiI low bleeding silphenylene based MS phase | 350°C | DB-5 ms (UI), Rtx-5 ms Sil, SLB-5 ms new column | EPA: 515, 521, 529, 552, 604, 610, 625, 1613, 1625, etc.** USP: G27, G36, G41 | General purpose column for GC-MS use. Dioxins and furans, herbicides, phthalate esters POCs, chlorinated acids, etc. |
| MEGA-35 MS low bleeding 35% phenyl, 65% methyl polysiloxane | 340°C | DB-35 ms, BPX-35, BPX-608, MR2, Rtx-35 Sil ms | EPA: 507, 508, 552, 614, 615, 622, etc.** USP: G28, G32, G42 | General purpose column for GC-MS use. See MEGA-35 phase. |
| MEGA-17 MS low bleeding 50% phenyl, 50% methyl polysiloxane | 340°C | DB-17 ms, Rtx-17 Sil ms | EPA: 505, 610, 619, 614, 8040, 8041, etc.** USP: G3, G17 | General purpose column for GC-MS use. See MEGA-17 phase. |
| MEGA-225 MS low bleeding 25% cyanopropyl, 25% phenyl, 50% methyl polysiloxane | 260°C | unique column | EPA: 8095 USP: G7, G19 | General purpose column for GC-MS use. See MEGA-225 phase. |
| MEGA-WAX MS low bleeding polyethylene glycol (PEG) | 250°C | Stabilwax, ZB-Wax Plus, InnoWax, VF-Wax ms | EPA: 602, 603, 619, 8015C, 8121, etc.** USP: G14, G15, G16 etc. | General purpose column for GC-MS use. See MEGA-WAX phase. |
| MEGA-10 100% cyanopropyl polysiloxane | 260°C | HP-88, AT-Silar, Silar 10 Rtx-2560, SP-2560 BPX-70, CP Sil 88 | EPA: 613, 1613, 8290B USP: G5, G8, G48 | High polarity column ideal for <i>cis/trans</i> FAMEs and dioxins isomers analysis. |
| MEGA-101 100% methyl polysiloxane | 350°C | OV-101 | USP: G1, G2, G9, G38 | General purpose apolar column. |
| MEGA-13 13% phenyl, 87% methyl polysiloxane | 340°C | CP Sil 13 CB | EPA: 601, 602, 624 | General purpose column, ideal as confirmation column. |
| MEGA-20 20% phenyl, 80% methyl polysiloxane | 340°C | AT-20, 007-7, Rtx-20, SPB-20 | USP: G28, G32 | General purpose column, ideal as confirmation column. |

All trademarks mentioned in this document
*: the temperature range may change
**: download on our website a more complete
basis of EPA methods, USP requirements

| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|--|-----------------------------|---|---|---|
| MEGA-200 trifluoropropyl methyl polysiloxane | 300°C | DB-200, DB-210, AT-210 007-210, Rtx-200, SP-2401, VF-200 ms | EPA: 551, 612, 625, 8095, etc.** USP: G6 | Unique selectivity column. Freon fluorocarbons, ketones, alcohols, organophosphorus pesticides, etc. |
| MEGA-225 25% cyanopropyl, 25% phenyl, 50% methyl polysiloxane | 260°C | DB-225, HP-225, AT-225, 007-225, Rtx-225, BP-225, CP Sil 43 CB | EPA: 8095 USP: G7, G19 | Mid-to-high polarity phase. Carbohydrates, sterols, flavor compounds, etc. |
| MEGA-35 35% phenyl, 65% methyl polysiloxane | 340°C | DB-35, HP-35, AT-35, ZB-35, 007-11, MR2 Rtx-35, SPB-35, SPB-608 | EPA: 507, 508, 513, 551.1, 615, 622, etc.** USP: G28, G32, G42 | General purpose column. Pesticides, PCBs, substituted polar compounds, phenols, etc. Ideal as confirmation column. |
| MEGA-50 50% cyanopropyl, 50% methyl polysiloxane | 260°C | DB-23, Silar 5, Rtx-2330, SP-2330 | USP: G8 | Mid-to-high polarity phase. Carbohydrates, sterols, FAMES, flavor compounds, etc. Confirmation column. |
| MEGA-624 6% cyanopropylphenyl, 94% methyl polysiloxane | 280°C | DB-624, HP-624, AT-624, ZB-624, 007-624, Rtx-624, Vocol, SPB-624, VF-624 ms | EPA: 501.3, 502.1, 502.2, 601, 624, 1624, 8020, 8021, etc.** USP: G43, 467 (OVIs) | General purpose column. Ideal for volatile organic pollutants, purgeable aromatics, purgeable hydrocarbons, VOCs, etc. |
| MEGA-ACID FFAP acid modified polyethylene glycol (PEG) | 250°C | DB-FFAP, AT-1000, 007-FFAP, Stabilwax-DA, BP-21, SPB-1000 Nukol, CP Wax 58 CB | EPA: 8032 USP: G14, G15, G16, G25, G35, G39 | General purpose column. Ideal for free acids, FAMES, BTEX aromatics, flavor compounds, alcohols, spirits, polar compounds, etc. |
| MEGA-ALC 1&2 proprietary phases | n.d. | DB-ALC 1&2, Rtx-BAC 1&2 | - | Application-specific columns for blood alcohols testing. |
| MEGA-BASIC proprietary unique phase for basic compounds | n.d. | unique column | - | Application-specific column for basic compounds analysis (i.e. amines). |
| MEGA-BIODIESEL phases for biodiesel analysis | 370°C (UNI EN ISO 14105) | - | UNI EN ISO 14105 (ASTM 6584), UNI EN ISO 14103 | Application-specific columns for free and total glycerine (phase stable up to 370°C) and for FAMES in biodiesel analysis. |

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*: the temperature range may change according to the column dimensions and flow rate.
**: download on our website a more complete list of methods based on the basis of EPA methods, USP requirements and other standards.

| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|---|---------|---|------------------------|---|
| MEGA-DAI 1&2 proprietary unique phases for Direct Aqueous Injections | n.d. | unique columns | - | Application-specific columns for the introduction of aqueous samples, thus minimizing preparation. |
| MEGA-JXR 100% methyl polysiloxane | 350°C | no equivalent on the market | USP: G1, G2, G9, G38 | General purpose apolar column. |
| MEGA-LAP proprietary unique phase for Lipid Analysis | 370°C | unique column | - | Application-specific column for lipids, sterols and triglycerides analysis. |
| MEGA-PAH unique phase for Polycyclic Aromatic Hydrocarbons | 340°C | unique column | EPA: 610, 8100 | Application-specific column for polycyclic aromatic hydrocarbons. |
| MEGA-PLUS copolymer polyethylene glycol + methyl polysiloxane | n.d. | Agilent DX columns series | EPA: 505 | Discover new selectivities! Choose also between MEGA-PLUS 25 (25% PEG), MEGA-PLUS 75 (75% PEG)...and others! Contact us! We can customize this phase as you need! |
| MEGA-POF 1&2 proprietary phases for pesticides, herbicides and insecticides | n.d. | new columns MRI (MEGA-POF 1) | EPA: 622 | Application-specific columns developed for pesticides, herbicides, insecticides analysis etc. |
| MEGA-I PONA PDMS optimized for hydrocarbons analysis | 350°C | DB-Petro, HP-Pona, Rtx-I Pona, Petrocol | - | Phase optimized for DHA (Detailed Hydrocarbons Analysis). |
| MEGA-PS255 1% vinyl, 99% methyl polysiloxane | 350°C | no equivalent on the market | - | Phase that is extremely suitable for high film thickness columns to analyze solvents, alcohols, volatiles, etc. |
| MEGA-PS264 5.8% phenyl, 0.2% vinyl, 94% methyl polysiloxane | 350°C | no equivalent on the market | - | Phase that is extremely suitable for high film thickness columns to analyze solvents, alcohols, volatiles, etc. |

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*: the temperature range may change
**: download on our website a more complete basis of EPA methods, USP requirements

| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|--|---------|--|---|---|
| MEGA-SE30 100% methyl polysiloxane | 350°C | SE30 | EPA: 504.1, 505, 606, 8141A USP: G1, G2, G9, G38 | General purpose apolar column. |
| MEGA-SOLVE 1&2 proprietary unique phases for complex solvents mix analysis | n.d. | unique columns TCEP (MEGA-SOLVE 2) | - | Application-specific columns developed for complex solvents mixtures analysis. MEGA-SOLVE 2 is ideal for aromatics and oxygenates in gasoline. |
| MEGA-TNT unique phase | n.d. | unique column | EPA: 8091, 8095 | Application-specific column for explosives analysis, nitroaromatics, nitramines, nitrate esters. |
| MEGA-VOC 1&2 proprietary phases for Volatile Organic Compounds | n.d. | new columns | - | Application-specific columns for volatile organic compounds (OVIs), solvents and purgeable compounds. |
| MEGA-DEX DAC beta | 230°C |  | chiral-enantiomeric separations | Diacetyl TBS beta cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |
| MEGA-DEX DAC gamma | 230°C |  | chiral-enantiomeric separations | Diacetyl TBS gamma cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |
| MEGA-DEX DET beta | 230°C |  | chiral-enantiomeric separations | Diethyl TBS beta cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |
| MEGA-DEX DET gamma | 230°C |  | chiral-enantiomeric separations | Diethyl TBS gamma cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |
| MEGA-DEX DMP beta | 230°C |  | chiral-enantiomeric separations | Dimethyl-pentyl TBS beta cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |

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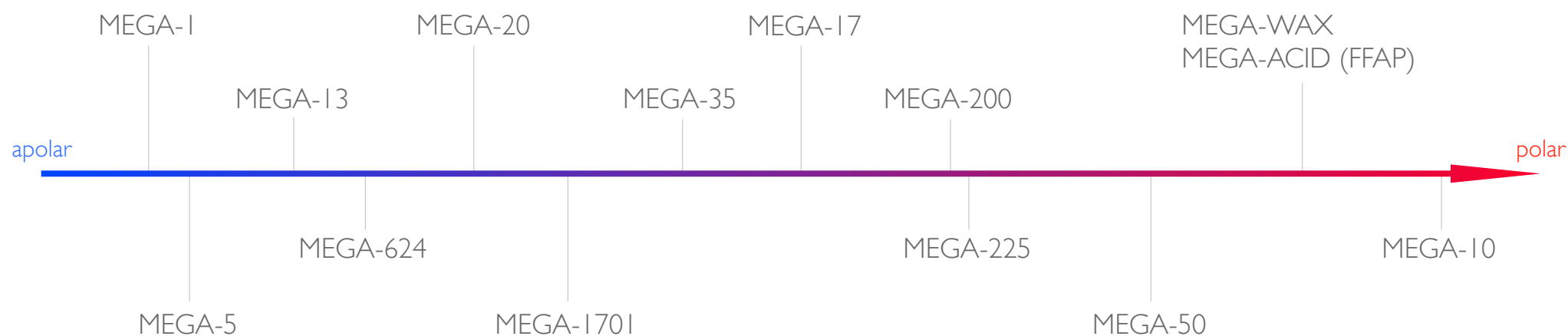
| Stationary Phase | T max * | Equivalent to | EPA - USP - Methods ** | Applications |
|--|---------|--|------------------------------------|---|
| MEGA-DEX DMT beta | 230°C |  | chiral-enantiomeric separations | Dimethyl TBS beta cyclodextrin based column. See and download on our website the applications and the table with hundreds of chiral compounds separated on our MEGA-DEX columns. |
| MEGA-I HT 100% methyl polysiloxane for high temperature | 380°C | high temperature column DB-I ht | - | High temperature general purpose column. See MEGA-I phase. |
| MEGA-I7 HT high temperature 50% phenyl, 50% methyl polysiloxane | 370°C | high temperature column DB-I7 ht | - | High temperature general purpose column. See MEGA-I7 phase. |
| MEGA-5 HT high temperature 5% phenyl, 95% methyl polysiloxane | 380°C | high temperature column DB-5 ht | - | High temperature general purpose column. See MEGA-5 phase. |
| MEGA-SE54 HT high temperature 5% phenyl, 1% vinyl, 94% methyl polysiloxane | 380°C | high temperature unique column | - | High temperature general purpose column. See MEGA-SE54 phase. |
| MEGA-WAX HT high temperature polyethyleneglycol (PEG) | 300°C | high temperature unique column | - | High temperature unique PEG phase. Extend the temperature limits of your FAST-GC and GCxGC analysis while using a polar Wax phase! |

FAST-GC
solutions

All our stationary phases are available for FAST-GC. Contact us to have more details. You can download on mega.mi.it our free guide to FAST-GC with a tons of application notes!

All trademarks mentioned in this document
*: the temperature range may change
**: download on our website a more complete
basis of EPA methods, USP requirements

Common Phases Polarity Quick View

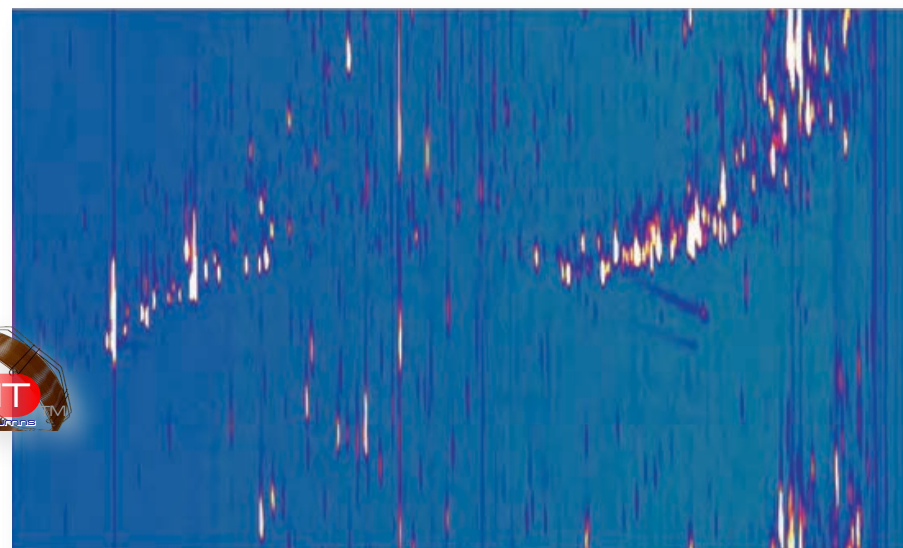


GCxGC Solutions

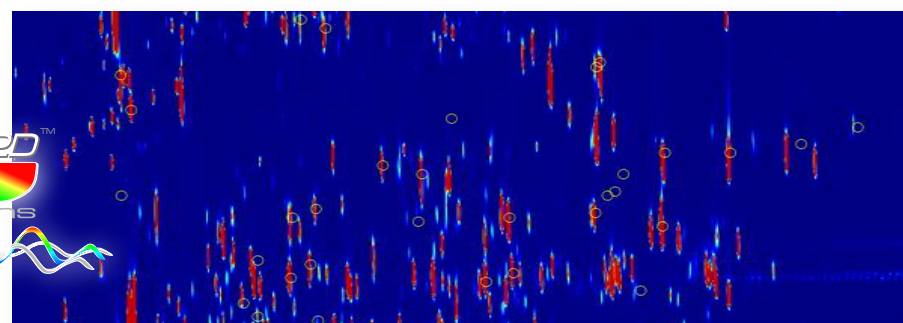
MEGA offers unique and innovative products for your GCxGC analysis.

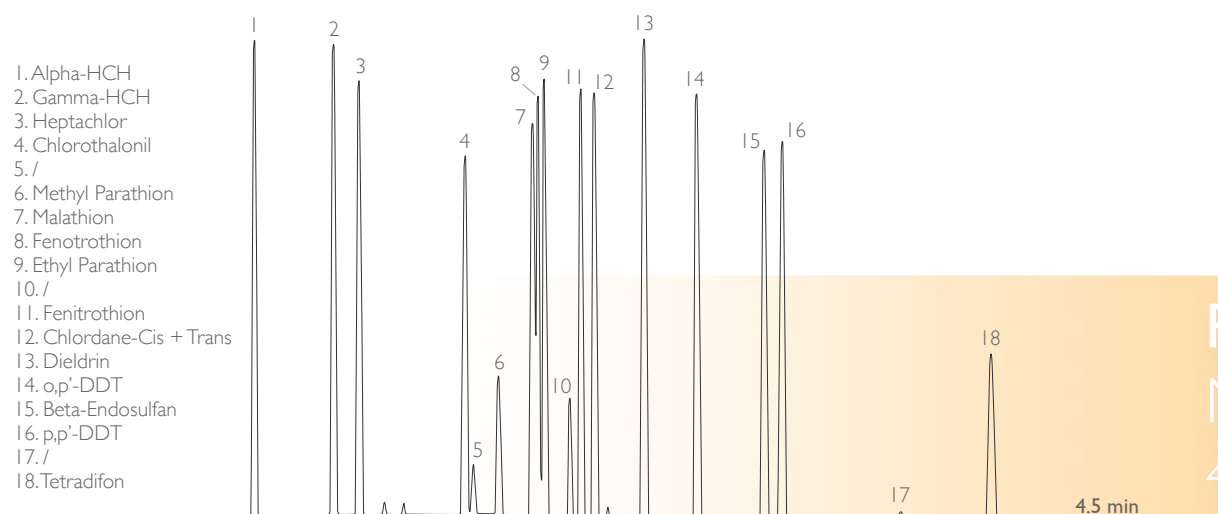
We can provide completely custom GCxGC solutions, including ready-to-use kits.

Selectivity of the stationary phase plays a fundamental role in GC and this is even more important in GCxGC. Ask us to tune the selectivity of the stationary phase thus to explore new and unique solutions and to optimize the orthogonality and the efficiency of your GCxGC system.



Kunzea essential oil GCxGC analysis using MEGA-WAX HT on 2nd dimension.
Courtesy of R. Shellie et al.



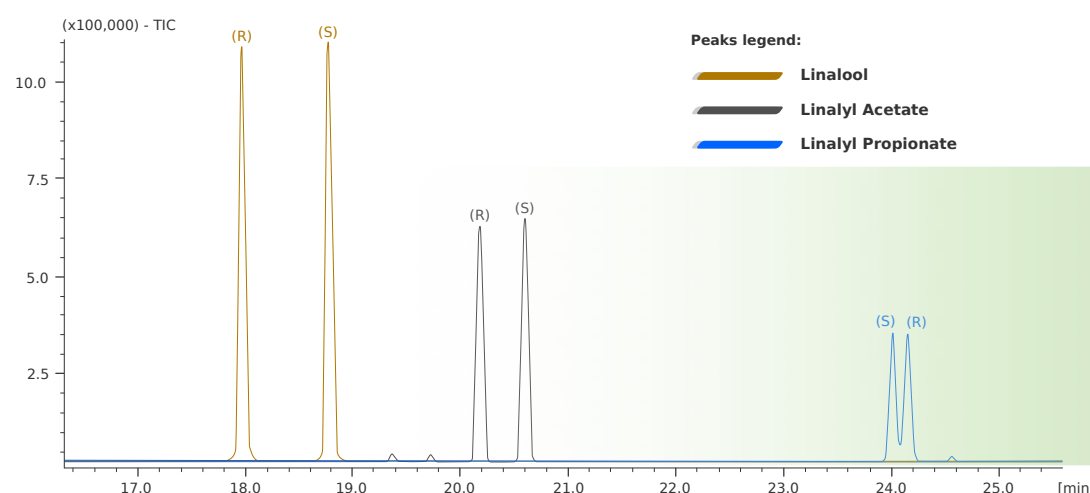
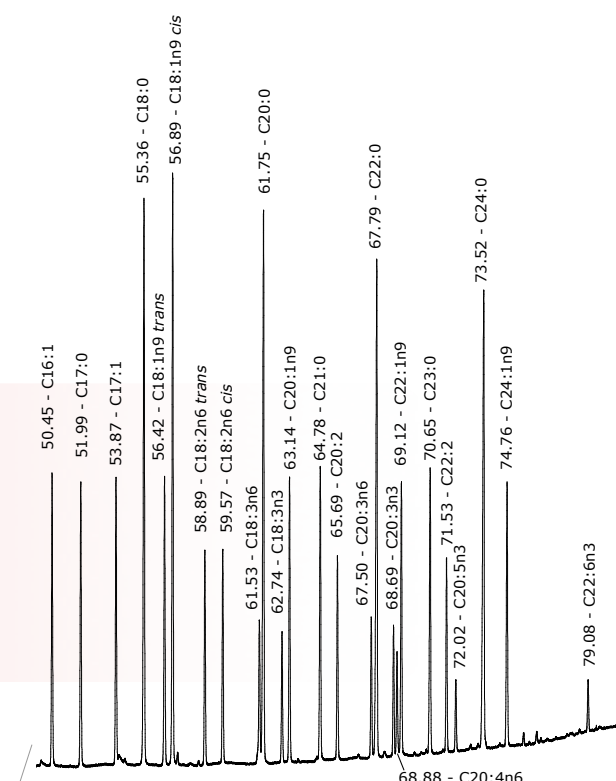


Pesticides mix on
MEGA-I70I FAST column
4.5 min analysis time only

Courtesy of University of Torino - Prof. C. Bicchi et al.

CUSTOM
DEDICATED
COLUMNS

cis/trans FAMES isomers
on MEGA-I0 column



dex xeb
chiral columns

Linalool - Linalyl Acetate
enantiomeric separation
on MEGA-DEX DET Beta
chiral column

Courtesy of University of Torino - Prof. C. Bicchi et al.

*: click here to visit

PRESS-FIT connectors

- easy to handle

- a simple pressure to
assure a perfect seal

- easy to install

MEGA Press-Fit connectors allow you to simply connect, with a tight seal, different columns or Retention Gaps together in many ways. Our Press-Fit connectors are custom-made to fit any tubing size and to ensure the minimal dead volume. Visit our website to download the free guide "Press-Fit Connectors Tips" and discover how easy is to use our Press-Fit connectors.

Press-Fit Union linear connectors, ideal to connect two columns or a Retention Gap to the analytical column.

Press-Fit "Y" three ways connectors, ideal to connect two analytical columns to a single injector port or split the exit of one column to a dual detector GC system. Many other configurations are possible using MEGA "Y" Press-Fit.

MEGA produces also personalized **Multiways Press-Fit connectors** for advanced analytical system configurations as MDGC and other custom settings.



RETENTION GAPs

- easy to handle

- exceptional inertness

- easy to install

Retention Gaps deactivated for any purpose: our Retention Gaps are suitable for any analytical needs (use with polar solvents, apolar solvents and for general use) and available in any internal diameter size (0.05, 0.075, 0.10, 0.15, 0.18, 0.20, 0.25, 0.32, 0.45, and 0.53mm I.D.). Any length is available, also in pre-cut pieces individually packaged and ready to use.

MEGA Retention Gaps have an unsurpassed chemical inertness. Use our Retention Gaps for focusing the sample components when introducing a large (liquid) sample directly into the column and/or to protect the analytical column from contamination. Retention Gaps are also useful as connecting pipes to various part of systems with different configurations.

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Selecting an LC Column

Column Dimensions

Particle Size and Column Length

When choosing a column, the first two parameters that should be considered are the particle diameter and column length. These two parameters are the major contributors to separation efficiency (N), also known as theoretical plates. The number of theoretical plates is directly proportional to the length of the column over the diameter of the particle.

Particle Diameter

Particle diameter (dp), is commonly expressed in micrometers (µm), and has an inverse relationship to the efficiency of the separation. As the particle diameter decreases, the efficiency of the separation increases proportionately. If all other parameters remain equal, a 3 µm particle diameter offers an approximate 60% increase in efficiency over a 5 µm particle, and a 1.9 µm particle diameter offers an additional 60% over a 3 µm particle. System backpressure also increases proportionally as particle size decreases. Selecting the proper particle diameter is a way of controlling separation efficiency, and even analysis speed, but is limited by the pressure capabilities of the system. Often, particle diameters are determined by instrumentation. Table I is a guideline for selecting the optimal particle size, based upon pressure capability for common mobile phases.

Equation 1 The resolution equation defines variables affecting separations.

$$R = \frac{1}{4} \sqrt{N} \times \left(\frac{k'}{k'+1} \right) \times \left(\frac{\alpha-1}{\alpha} \right)$$

Efficiency Retention capacity Selectivity

Table I Empirically determined maximum pressures exhibited for acetonitrile and methanol gradients for various particle sizes and flow rates

Bold blue numbers represent optimal linear velocity for the given particle size and ID. For longer column lengths, the approximate pressure corresponds to the increase in column length. A 2-fold increase in column length yields a 2-fold increase in back pressure.

| Flow rate (mL/min.) | Pressure (psi) Acetonitrile @ 25°C | | | Flow rate (mL/min.) | Pressure (psi) Methanol @ 25°C | | |
|------------------------|---------------------------------------|-------------|-------------|------------------------|-----------------------------------|-------------|-------------|
| | 1.9µm | 2.2µm | 3µm | | 1.9µm | 2.2µm | 3µm |
| 0.2 | 2436 | 1755 | 1045 | 0.2 | 3198 | 2304 | 1371 |
| 0.3 | 3655 | 2633 | 1567 | 0.3 | 4797 | 3455 | 2057 |
| 0.4 | 4873 | 3510 | 2090 | 0.4 | 6395 | 4607 | 2743 |
| 0.5 | 6091 | 4388 | 2612 | 0.5 | 7994 | 5759 | 3429 |
| 0.55 | 6700 | 4826 | 2873 | 0.55 | 8794 | 6335 | 3771 |
| 0.6 | 7309 | 5265 | 3135 | 0.6 | 9593 | 6911 | 4114 |
| 0.7 | 8527 | 6143 | 3657 | 0.7 | 11192 | 8062 | 4800 |
| 0.8 | 9745 | 7020 | 4180 | 0.8 | 12791 | 9214 | 5486 |
| 0.9 | 10964 | 7898 | 4702 | 0.9 | 14390 | 10366 | 6171 |
| 1 | 12182 | 8775 | 5224 | 1 | 15989 | 11518 | 6857 |

Data are for 2.1 x 50 mm columns using a gradient of 5% B to 95% B (A: water, B: organic solvent). See Table II for optimal flow rates for alternate column internal diameters.

When choosing a particle diameter, it is not recommended to operate significantly below the optimal linear velocity, as losses in efficiency can be observed due to axial dispersion. As a quick estimate of particle diameter usability, check the optimal linear velocity for the organic solvent used and ensure maximum pressures observed are within the pressure specifications of your instrument. Please note that these are maximum pressures observed during gradient analyses. Isocratic mobile phases of lesser viscosity will operate with less back pressure.

Column Length

Column length (L) directly relates to efficiency. Increasing column length increases efficiency. It is important to note that column length is not an ideal way to increase resolution. Doubling the column length yields only a 1.4x gain in resolution (efficiency is a square root term in the resolution equation), while doubling both analysis time and system backpressure. Shorter column lengths are suitable for fast gradients and higher sample throughput, while longer column lengths are more suitable for higher peak capacity and shallow gradients.

Column Internal Diameter

Column internal diameter (ID) is the inner diameter of the column hardware holding the packing material, and is commonly expressed in millimeters (mm). Column ID is ultimately related to efficiency and flow rate through the van Deemter equation. This chromatographic concept relates column efficiency (often called band broadening) to linear velocity. Linear velocity is the distance mobile phase travels per unit time, while flow rate is the volume of mobile phase per unit time. A specific linear velocity has a flow rate that is dependent upon the internal diameter of the column. As column ID is lowered, a lower flow rate is needed to maintain the same linear velocity. Flow rate is the volume of mobile phase needed to create the desired liner velocity. It is important to note that as particle size decreases, optimal linear velocity increases. Columns with smaller particle sizes, namely 1.9 and 2.2 µm, are capable of running much higher flow rates and therefore creating higher sample throughput. Table II (next page) can be used to find the optimal flow rate, as it relates to particle size and internal diameter, and is a good starting point for method development.

Table II Optimal flow rates for various particle diameters and column internal diameters.

| Column ID (mm) | Optimal flow rate (mL/min.) | | | |
|-------------------|--------------------------------|----------------|--------------|--------------|
| | 1.9 μ m dp | 2.2 μ m dp | 3 μ m dp | 5 μ m dp |
| 4.6 | | | 1.50 | 1.00 |
| 3.2 | | | 0.73 | 0.50 |
| 3.0 | 1.12 | 1.00 | 0.65 | 0.40 |
| 2.1 | 0.55 | 0.47 | 0.31 | 0.20 |
| 1.0 | | | 0.07 | 0.05 |

Table III Common classifications for LC columns by internal diameter.

| Classification | Internal Diameter |
|----------------|-------------------|
| Capillary | <1.0 mm ID |
| Micro bore | 1.0 mm ID |
| Narrow bore | 2.1-3.0 mm ID |
| Standard bore | 3.2-4.6 mm ID |
| Semi-prep | 10 to 21.2 mm ID |
| Prep | 30 to 50 mm ID |

System volume, or extra column volume, also affects efficiency. As extra column volume increases, lower efficiency is experienced as band broadening increases. Typically, column IDs less than 3.0 mm, considered narrow bore columns, require systems with minimized extra column volume. Table III defines the classification of columns according to internal diameter or bore. Another contributor to overall system volume and column ID choice is the system delay volume. Delay volume is the volume contained between the pumps and the column, often including the mixing chamber and injection valve. Delay volume is especially significant during gradient analysis. Narrow bore columns often require lower flow rates, and these lower flow rates will not sweep the delay volume in high volume systems quickly. This extends analysis time and creates an increased gradient lag time. For fast gradient analysis and LC/MS, narrow bore columns and systems with low extra column volume are recommended.

Physical Characteristics

Silica Type

The physical characteristics of the support material can be selected to control retention and peak shape. The base silica, commonly porous spherical particles, used in the manufacturing of the column can first be selected by type, namely Type A, Type B, or Base Deactivated. Type B silica is typically higher in purity and provides limited silanol activity. When analyzing basic compounds, especially without the use of mobile phase modifiers, Type B silica is recommended for more symmetric peak shape. Type A and Base Deactivated silica are recommended for acidic, neutral, and slightly basic compounds.

Another criterion for choosing a column line is the porosity of the silica. The pore size, or pore diameter, which is commonly expressed in Å, is the average diameter of the silica pores. This relates inversely to available surface area. Smaller pore volumes create a larger surface area in a given particle and, therefore, can be used to control the amount of stationary phase bonded to the particle.

The carbon load, or % carbon in the packing material, is the measure of the amount, or load, of stationary phase. Carbon load directly affects retention. Higher carbon loads typically result in higher retention characteristics. Figure 1 illustrates the relative retention capacities of commercially available columns for hydrophobic compounds. Allure® columns were designed for maximum retention of small molecules by utilizing high carbon load, surface area, and ligand density. In contrast, Viva columns, considered wide pore, have a large pore diameter and are used for the analysis of larger molecules as commonly seen in biological separations. Table IV summarizes the physical characteristics and recommended uses for Restek column lines.

Silica columns commonly have a temperature limit of 80 °C. Increased temperature can be used to decrease mobile phase viscosity and, therefore, lower the back pressure of a

Table IV Physical characteristics and recommended uses for Restek columns, based on silica lines.

| Column Line | Pore Size (Å) | Surface Area (m ² /g) | Carbon Load Range* (%) | Usage |
|-------------|---------------|----------------------------------|------------------------|--|
| Allure | 60 | 450 | 12-27 | Very high retention (highest retention available) High purity 5 μ m particle size only |
| Ultra II | 100 | 300 | 11-19 | High retention High purity Full range particle size - 1.9, 2.2, 3 and 5 μm for UHPLC and HPLC |
| Ultra | 100 | 300 | 2-20 | High retention High purity 3 and 5 μ m particle size only |
| Pinnacle II | 110 | 180 | 2-13 | Moderate retention Acidic Type A (not for RP analyses of bases) 3 and 5 μ m particle size only |
| Pinnacle DB | 140 | 150 | 4-11 | Moderate retention Base deactivated silica 1.9, 3 and 5 μ m particle sizes |
| Viva | 300 | 100 | 3.5-9 | Low retention Wide-pore silica for biological separations |

*Ranges are based on phases available for each silica line. See column product listings for more specific information.



system. It is important to note that while altering the temperature of a separation can lower back pressure, it also lowers retention and can change selectivity. pH can also be used to control the selectivity and retention of ionizable compounds. Acid-base equilibrium can be employed to directly affect the retention characteristics of acidic and basic compounds, mainly in reversed phase chromatography (RPC). The pH limit of most silica columns is between 2 and 8.

Stationary Phases

Stationary phase, or the specific chemical ligand bonded to the silica support, plays a primary role in resolving compounds. Through selectivity, the major contributor to resolution, a stationary phase can control the retention characteristics of the solutes. Identifying the appropriate stationary phase can greatly ease method development and create less need for mobile phase additives. The decision tree in Figure 2 (next page) can help analysts select appropriate stationary phases, based upon analyte solubility and polarity. Liquid chromatography employs specific modes of separation which are denoted by the polarity distinction between the stationary and mobile phases; the most common are reversed phase, normal phase and HILIC.

Reversed phase chromatography (RPC) consists of a nonpolar stationary phase and a polar mobile phase. RPC is the most commonly used mode and works well for the analysis of water-soluble hydrophobic compounds. The most common types of columns used in RPC are alkyls (most often a C18, also known as octadecyl or ODS). End-capping is often employed in reversed phase columns. End-capping refers to the dense bonding or modification of the silica surface to further limit silanol activity. This acts to provide better peak symmetry, especially for basic compounds. Alternate ligands and bonding chemistries can be applied to RPC columns to incorporate phenyl, cyano, amino, and other polar groups into the stationary phase, providing alternate selectivity to a C18.

Normal phase chromatography (NPC), named because it was the first type of liquid chromatography, not for being more common, employs a polar stationary phase and a nonpolar mobile phase. NPC is suited for the analysis of fat soluble compounds and can also provide more selectivity for positional isomers than is commonly observed in RPC. Bare silica columns are most commonly used for NPC. Other phases for NPC include cyano and amino.

Hydrophilic Interaction Chromatography (HILIC) employs a polar stationary phase and a less polar mobile phase. HILIC differentiates itself from RPC and NPC as it uses traditional NPC stationary phases and RPC mobile phases. HILIC is recommended for the analysis of very polar compounds, often having negative log P values, and for analysis by LC/MS. Bare silica, cyano and amino columns are also commonly used in HILIC mode. Some stationary phases, like IBD, PFP propyl and cyano, incorporate both nonpolar and polar functionality and can be used in multiple or mixed-mode separation mechanisms.

Restek stationary phases and recommended uses are presented in Figure 3 (page 149). For additional help selecting a column, contact Restek at support@restek.com or call your local Restek representative.

Figure 1 Relative retention capabilities of commercially available columns for hydrophobic compounds.

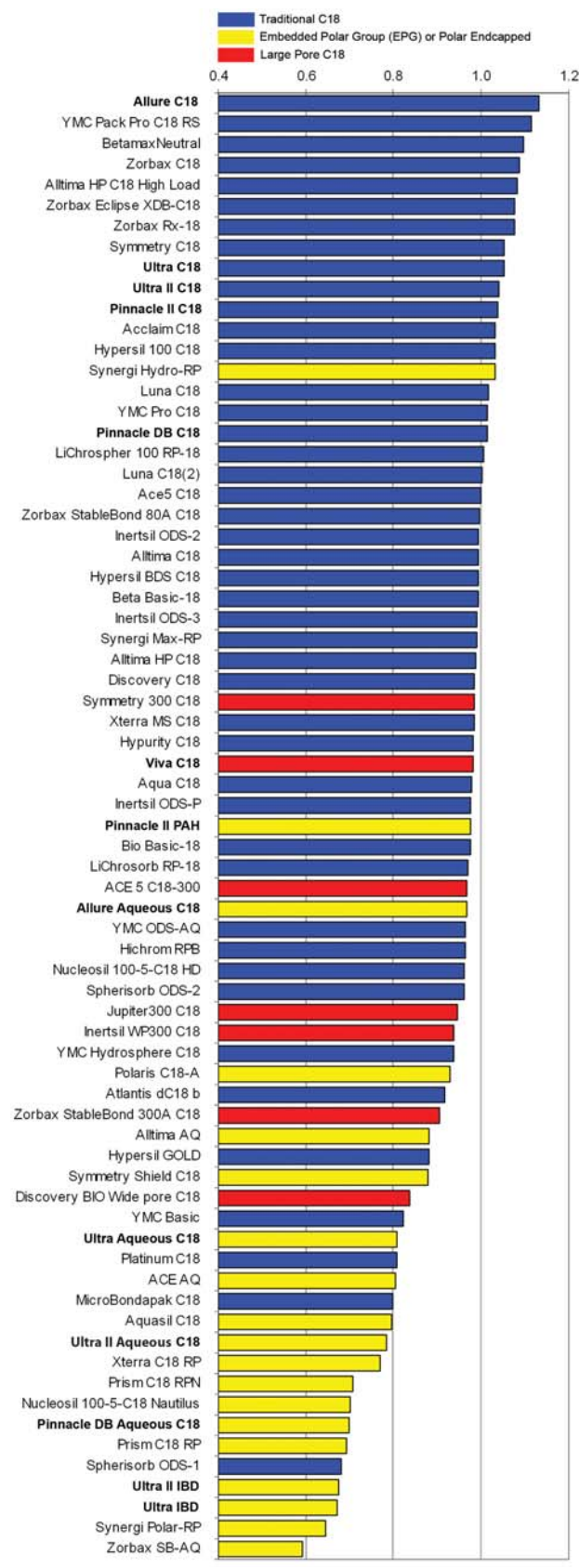
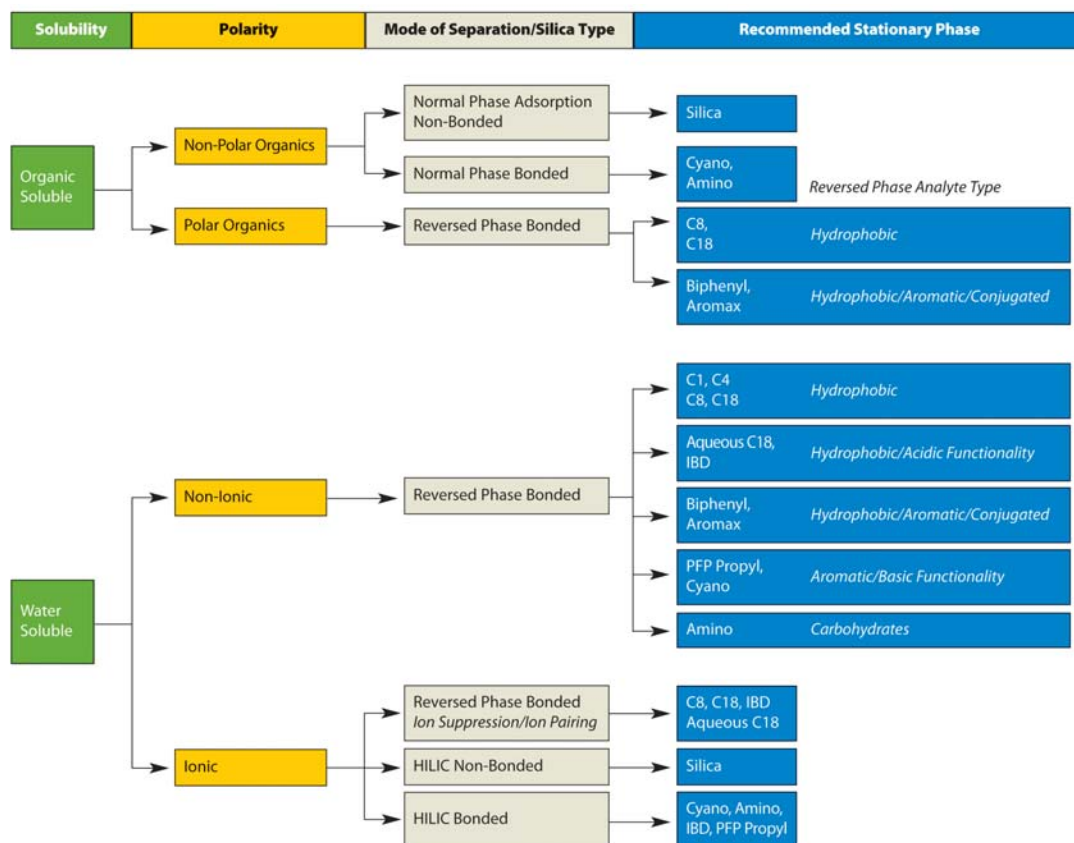


Figure 2 Decision tree for LC mode of separation and column selection.



Solvent Miscibility and Solubility

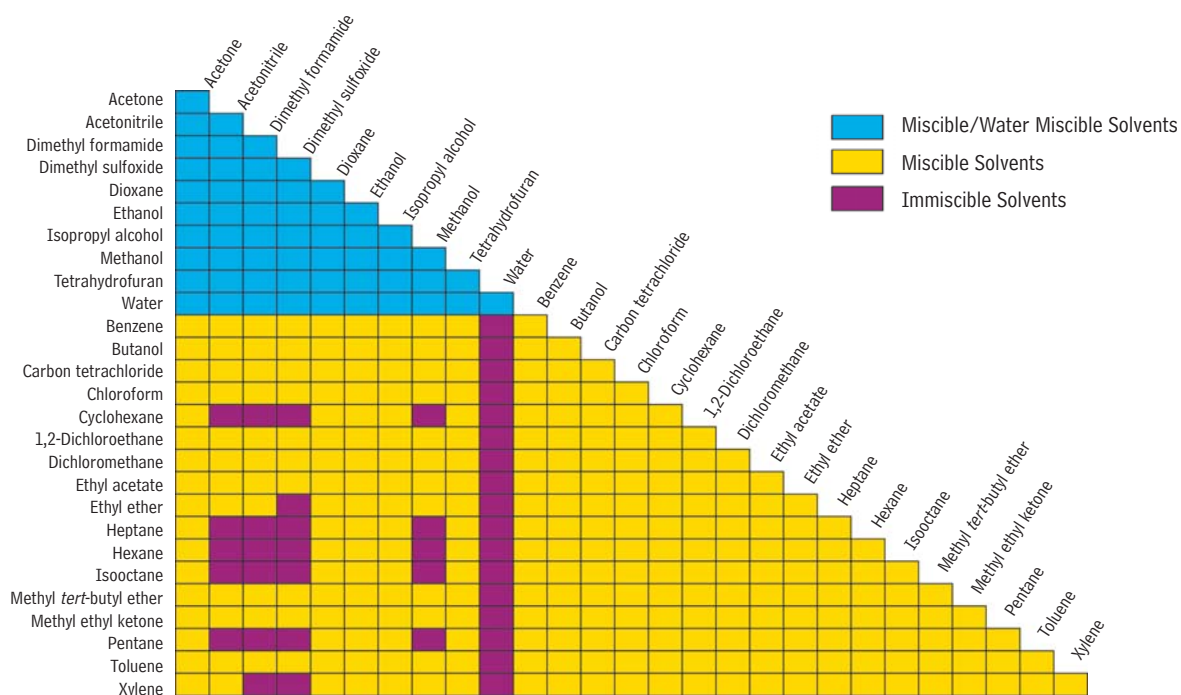
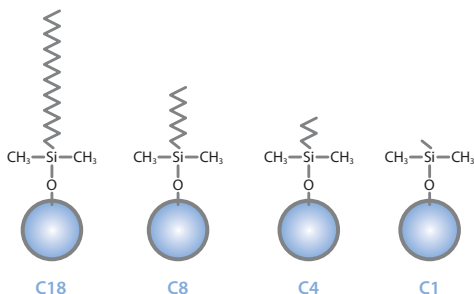


Figure 3 Restek stationary phases and recommended uses.

Alkyl Phases

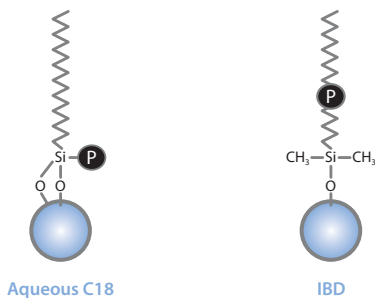
- General purpose reversed phase columns rely on dispersive interaction to separate molecules.
- Elution order is hydrophilic to hydrophobic; increased chain length increases retention.



Non Polar Retention

Modified Alkyl Phases

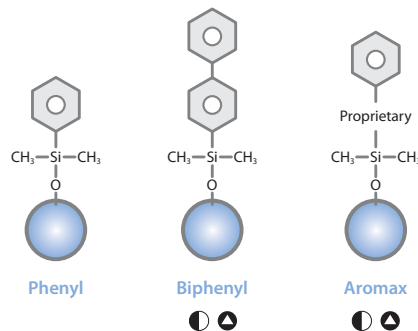
- Alkyl phases with modified bonding chemistry to increase polarity.
- Columns are compatible with 100% aqueous mobile phases.
- Rely on dispersive interaction with additional hydrogen bonding.
- Aqueous columns show balanced retention and are a great starting point for method development.
- Polar embedded IBD columns provide good peak symmetry for bases and offer orthogonal selectivity to a C18.
- IBD phases are capable of mixed mode mechanisms and can operate in both reversed phase and HILIC modes.



Acidic Retention

Phenyl Phases

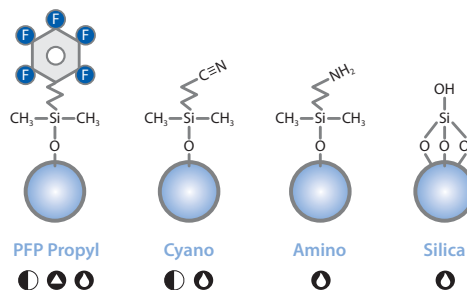
- Phenyl columns rely on dispersive and pi-pi (π - π) interactions.
- Enhanced retention and selectivity are seen with aromatic, conjugated molecules, and compounds containing electron withdrawing ring substituents.
- Biphenyl and Aromax columns show more interaction and greater aromatic retention and selectivity, relative to conventional phenyl and phenyl-hexyl phases.



Aromatic Retention

Polar Phases

- Polar phases rely on aromatic and dipole interactions.
- Cyano and PFP Propyl phases show increased retention for aromatic compounds and charged bases.
- PFP Propyl phases are commonly used for increased retention of ionic and basic compounds.
- Amino columns are commonly used for the analysis of saccharides.
- Silica columns are used for normal phase and HILIC separations.



Legend



orthogonal selectivity to a C18



good choice for LC/MS



HILIC compatible

HPLC Pump Pressure Conversion Table

| Pressure | psi | atm | kg/cm ² | 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/cm ² = | 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

| Restek HPLC Column | End Cap? | Pore Size (Å) | Carbon load (%) | Applications |
|-------------------------|----------|---------------|-----------------|--|
| Ultra II C18 | Y | 100 | 19 | Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids. |
| Ultra II 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 II C8 | Y | 100 | 12 | Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention. |
| Ultra II Biphenyl | Y | 100 | 15 | Excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation. |
| Ultra II Aromax | Y | 100 | 17 | Alternative to Biphenyl when more retention is required. |
| Ultra II 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 II PFP Propyl | Y | 100 | 11 | Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, and halogenated compounds. |
| Ultra II Silica | N | 100 | 0 | Ideal for normal phase applications. |
| Ultra II Carbamate | N | 100 | 15 | Rapid analysis of carbamates. |
| Ultra II Quat | Y | 100 | 12 | Proprietary phase for the analysis of paraquat and diquat and other quaternary amines. |
| 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 II C18 | Y | 110 | 13 | Superior general purpose C18 for non-basic analytes. |
| Pinnacle II PAH | Y | 110 | — | Maximum resolution of polycyclic aromatic hydrocarbons. |
| Pinnacle II C8 | Y | 110 | 7 | Superior general purpose C8 for non-basic 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 carbohydrate 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. |

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 # |
|---|--|----------|--------|
| 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 | 157 |
| 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 | 159 |
| 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 | 158 |
| A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. | Unique | L11 | 160 |
| A unique reversed phase material that exhibits superior retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. | Unique | L11 | 161 |
| 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 | L68 | 162 |
| A pentafluorophenyl with a propyl spacer. | Fluophase PFR, Discovery HS F5 | L43 | 163 |
| High purity, high surface area. | — | L3 | 164 |
| Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase. | Unique | — | 165 |
| High purity silica. | Unique | — | 165 |
| Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding. | Hypersil BDS C18, Zorbax Eclipse XDB-C18, Spherisorb ODS | L1 | 166 |
| 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 | 171 |
| 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 | 167 |
| Highly base-deactivated spherical silica manufactured by Restek. Unique pentafluorophenyl phase with a propyl spacer. | Discovery HS F5 | L43 | 169 |
| 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 | L11 | 170 |
| Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding. | Hypersil BDS Cyano, Spherisorb Cyano, Zorbax Eclipse XDB-CN | L10 | 168 |
| Highly base-deactivated spherical silica manufactured by Restek. Phenyl bonding. | Hypersil BDS Phenyl, Spherisorb Phenyl Zorbax Eclipse XDB-Phenyl | L11 | 168 |
| Highly base-deactivated spherical silica manufactured by Restek. | — | L3 | 172 |
| 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 | L68 | 171 |
| Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons. | Unique | — | 172 |
| Intermediate carbon load and surface area, suitable for a wide range of neutral to acidic compounds. Silica manufactured by Restek. | Hypersil ODS | L1 | 173 |
| Proprietary stationary phase; resolves 16 PAHs in US EPA Method 610. Silica manufactured by Restek. | Unique | — | 174 |
| Provides shorter retention times for hydrophobic compounds than C18. Silica manufactured by Restek. | Hypersil C8 | L7 | 174 |
| More rugged than bare silica for normal phase analyses. Silica manufactured by Restek. | Hypersil CPS | L10 | 175 |
| Offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Silica manufactured by Restek. | Hypersil Phenyl | L11 | 175 |
| Silica manufactured by Restek. | Hypersil APS 2 Amino, Spherisorb Amino | L8 | 176 |
| Silica manufactured by Restek. Unique biphenyl phase. | Unique | L11 | 176 |
| Superior value phase for normal phase separation of polar analytes. Lower retention than Ultra C18. Silica manufactured by Restek. | Hypersil Silica | L3 | 177 |
| 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 | 178 |
| Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases. | Unique | L1 | 179 |
| Highly retentive, highly selective phase, developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. | Unique | — | 181 |
| Highly retentive phase for analytes containing amino functionality. | BetaMax Base, Maxsil CN | L10 | 178 |
| 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 | 179 |
| Single 30cm column performs equally to two C18 columns in series. (AOAC Method 986.13) | Unique | — | 180 |

Continued on next page...



| Restek HPLC Column | End Cap? | Pore Size (Å) | Carbon load (%) | Applications |
|---------------------------|----------|---------------|-----------------|---|
| Allure Biphenyl | Y | 60 | 23 | Multiple ring structure; excellent for aromatic and unsaturated compounds. Increased retention over traditional phenyl phases. |
| Allure Silica | — | 60 | — | Highly 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. |
| 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 Wide Pore C18 | Y | 300 | 9 | Proteins and other higher molecular weight compounds. |
| Viva Wide Pore C8 | Y | 300 | 5 | Proteins and other higher molecular weight compounds. Less retentive than C18 phase. |
| Viva Wide Pore C4 | Y | 300 | 3.5 | Proteins and other higher molecular weight compounds. Less retentive than C18 and C8 phases. |
| Viva Wide Pore Biphenyl | Y | 300 | 6.7 | Exhibits excellent peak shape for a wide range of compounds; ideal for large molecule and biomolecule assays. |
| Viva Wide Pore PFP Propyl | Y | 300 | 5 | Exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds. |
| Viva Wide Pore 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.



tech tip

Managing High Backpressure

High backpressure is one of the most common problems encountered in HPLC analyses. Normal column backpressure 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, pages 196-198. Particles build up on the inexpensive, replaceable frit in the filter, instead of on the permanent frit at the column inlet.

| Chromatographic Properties | Similar Phases | USP Code | Page # |
|---|--|----------|--------|
| High purity, highly retentive phase for aromatic and unsaturated compounds. | Unique | L11 | 180 |
| High purity, highly retentive phase for normal phase separation of polar analytes. Very high surface area. | Maxsil Si | L3 | 181 |
| 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 | 182 |
| 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 | 183 |
| 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 | L68 | 184 |
| 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 | 183 |
| 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 | 184 |
| Exceptionally stable C1 packing resists hydrolysis, even under acidic mobile phase conditions. Least retentive reversed phase hydrocarbon packing. | Spherisorb C1 | L13 | 185 |
| 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 | 185 |
| High-purity, highly retentive, base-deactivated phase with alternate selectivity to hydrocarbon phases, especially for aromatic analytes. | Platinum Phenyl, Supelcosil Phenyl, Betasil Phenyl | L11 | 186 |
| 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 | 186 |
| A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogens or other basic analytes. | Fluophase PFR, Fluosep-RP Phenyl, Curosil PFP | L43 | 187 |
| High purity, high surface area. | — | L3 | 188 |
| Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase. | Unique | — | 188 |
| High purity silica. | Unique | — | 189 |
| Silica manufactured by Restek. | BioBasic 18, Symmetry 300 C18, Jupiter 300 C18, Zorbax 300 OSB C18, Synchropak C18, 208 TP C18 | L1 | 190 |
| Silica manufactured by Restek. | BioBasic 8, Zorbax 300 OSB C8, Synchropak C8, 208 TP C8 | L7 | 191 |
| Silica manufactured by Restek. | BioBasic 4, Symmetry 300 C4, Jupiter 300 C4, Synchropak C4, 208 TP C4 | L26 | 191 |
| Silica manufactured by Restek. | Unique | L11 | 192 |
| Silica manufactured by Restek. | Unique | L43 | 192 |
| Silica manufactured by Restek. | — | L3 | 193 |

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. <i>Ultra II C18 (p. 157), Ultra II Aqueous C18 (p. 159), Pinnacle DB C18 (p. 166), Pinnacle DB Aqueous C18 (p. 171), Pinnacle II C18 (p. 173), Allure C18 (p. 178), Allure Aqueous C18 (p. 179), Ultra C18 (p. 182), Ultra Aqueous C18 (p. 183), Viva C18 (p. 190)</i> |
| L3 | Porous silica particles, 5 to 10µm in diameter. <i>Ultra II Silica (p. 164), Pinnacle DB Silica (p. 172), Pinnacle II Silica (p. 177), Allure Silica (p. 181), Ultra Silica (p. 188), Viva Silica (p. 193)</i> |
| L7 | Octylsilane chemically bonded to totally porous silica particles, 1.7 to 10µm in diameter. <i>Ultra II C8 (p. 158), Pinnacle DB C8 (p. 167), Pinnacle II C8 (p. 174), Ultra C8 (p. 183), Viva C8 (p. 191)</i> |
| L8 | An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10µm in diameter. <i>Pinnacle II Amino (p. 176), Ultra Amino (p. 186)</i> |
| L10 | Nitrile groups chemically bonded to porous silica particles, 3 to 10µm in diameter. <i>Pinnacle DB Cyano (p. 168), Pinnacle II Cyano (p. 175), Allure Basix (p. 178), Ultra Cyano (p. 185)</i> |
| L11 | Phenyl groups chemically bonded to porous silica particles, 1.7 to 10µm in diameter. <i>Ultra II Aromax (p. 161), Ultra II Biphenyl (p. 160), Pinnacle DB Phenyl (p. 168), Pinnacle DB Biphenyl (p. 170), Pinnacle II Phenyl (p. 175), Pinnacle II Biphenyl (p. 176), Allure Biphenyl (p. 180), Ultra Phenyl (p. 186), Viva Biphenyl (p. 192)</i> |
| L13 | Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter. <i>Ultra C1 (p. 185)</i> |
| L26 | Butyl silane chemically bonded to totally porous silica particles, 3 to 10µm in diameter. <i>Ultra C4 (p.184), Viva C4 (p.191)</i> |
| L43 | Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10µm in diameter. <i>Ultra II PFP Propyl (p. 163), Pinnacle DB PFP Propyl (p. 169), Allure PFP Propyl (p. 179), Ultra PFP (p. 187), Viva PFP Propyl (p. 192)</i> |
| L68 | Spherical, porous silica, 100µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not end capped. <i>Ultra II IBD (p. 162), Pinnacle DB IBD (p. 171), Ultra IBD (p. 184)</i> |

RESTEK USLC™

Ultra Selective Liquid Chromatography™

USLC™ is the directed application of selectivity—the most influential factor affecting resolution—to optimize separations and improve method performance. Restek has extensively studied reversed phase selectivity to provide practicing chromatographers with the most effective and widest range of USLC™ stationary phase chemistries available.

Selectivity Drives Separations

By understanding and controlling selectivity through USLC™, chromatographers have the best opportunity for fast, effective analyte resolution.

One of the most significant challenges in method development is finding the proper stationary and mobile phase chemistry for a particular separation. As sample complexity increases, achieving adequate resolution between matrix components and target analytes becomes more difficult. Despite recent advancements in column format, such as sub-2 micron packings and pellicular particles, resolution can still be difficult to obtain because, while these formats can increase chromatographic efficiency and analysis speed, they do not significantly influence resolution. Selectivity, as shown in Equation 1, is the single most powerful factor affecting resolution, and it is largely dependent upon stationary phase composition.

Real Diversity in Phase Chemistry

Restek columns offer the widest range of selectivities available on a single column line. More choices mean optimized separations and more robust methods.


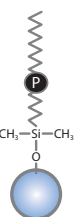
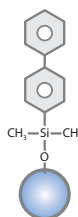
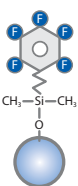
While numerous bonded phases are available for reversed phase chromatography, many are similar and offer only moderate changes in retention (e.g. C8 and C18), rather than significant differences in selectivity. Method development is less laborious and time-consuming when using a full range of column selectivities, including orthogonal phase chemistries like polar embedded, phenyl, and fluorophenyl columns. Restek has led the development of unique USLC™ phases across these phase classes in order to provide chromatographers with a more effective range of column selectivities and innovative column chemistries for method development. The phases shown in Figure 1 provide the widest range of reversed phase selectivity available on any column line, and can be used to guide the least understood and most practically significant part of method development—proper column selection.

Equation 1 Selectivity drives resolution—USLC™ considers column selectivity during method development, resulting in fast, effective separations.

$$R = 1/4 \sqrt{N} \times (k'/k' + 1) \times (\alpha - 1/\alpha)$$

Efficiency Retention capacity Selectivity

Figure 1 Restek offers the widest range of unique column chemistries to aid in fast, easy method development.

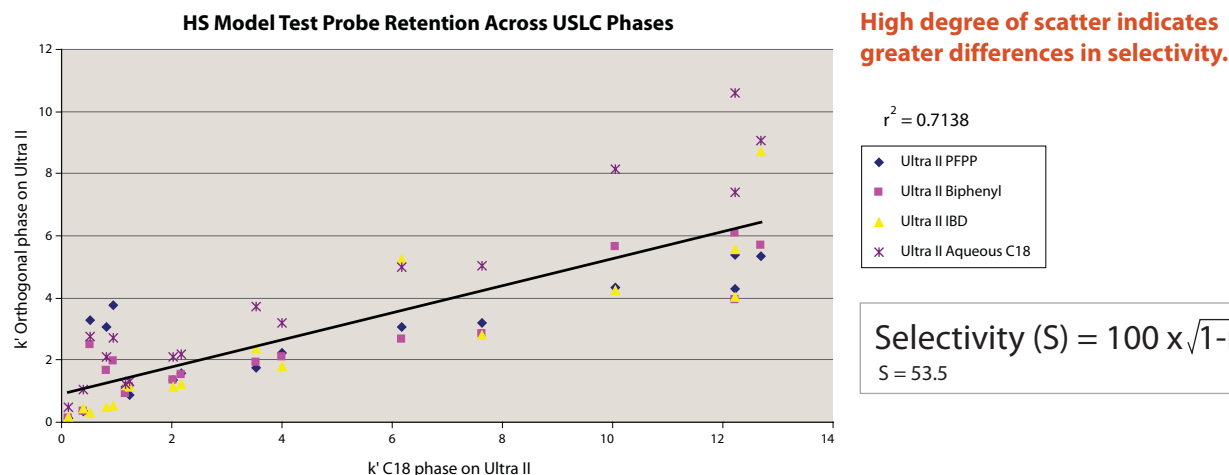
| Restek phase (column class) | Aqueous C18 (alkyl) | IBD (polar embedded) | Biphenyl (phenyl) | PFP Propyl (fluorophenyl) |
|---------------------------------|---|--|--|---|
| |  |  |  |  |
| Ligand type | Proprietary polar modified and functionally bonded C18 | Proprietary polar functional embedded alkyl | Unique Biphenyl | Proprietary end-capped pentafluorophenyl propyl |
| Characteristics and uses | <ul style="list-style-type: none"> C18 phase for balanced retention of multiple solute types. Compatible with up to 100% aqueous mobile phases. | <ul style="list-style-type: none"> Enhanced retention of polar acids. Moderate retention of both acidic and basic solutes. | <ul style="list-style-type: none"> Increased retention of aromatic, unsaturated, conjugated solutes, or solutes containing an electron withdrawing ring substituent. Enhanced retention and selectivity when used with methanolic mobile phases. | <ul style="list-style-type: none"> Increased retention of protonated bases and solutes containing aromatic moieties. |

Evaluating and Extending Selectivity

Restek leads the industry in USLC™ phase diversity because optimal differences in selectivity are built in during the research and development of our bonded phases.

The diversity in selectivity provided by USLC™ columns can be demonstrated empirically using the hydrophobic-subtraction (HS) model [1]. This model is a novel procedure for characterizing selectivity that uses test probes to define the solute and stationary phase interactions in reversed phase separations. Restek is leading the commercial application of this model by implementing it in the research and development of USLC™ bonded phases. To evaluate phase selectivity using the hydrophobic-subtraction model, the retention characteristics of the solute probes are compared across different phases on the same silica base. In this approach, the range of selectivity is indicated by the degree of scatter along the regression line; high correlations indicate similarity and low correlations represent changes in selectivity across phases (Figure 2). The difference in selectivity across columns can then be quantified based on the correlation by calculating the selectivity (S) statistic for the comparison [2].

Figure 2 Restek has extended the selectivity range for reversed phase separations as illustrated by the hydrophobic-subtraction model and corresponding selectivity (S) value.



USLC™ Columns: Selectivity Choices Optimize Separations

Restek USLC™ columns offer the widest range of selectivities available and are an integral part of successful method development (Figure 3). Ideal for column switching systems, these columns provide the orthogonal separations needed to create optimal resolution and robust methods. Combining USLC™ phases with a suitable column format gives practicing chromatographers the most powerful tool available for successful method development.

Figure 3: Restek offers the widest range of selective phases available on any column line.

| | Column Line | | | | | | |
|-----------------------------------|--|---|---|--|--------------------------------------|--|---------------------------------|
| Common Reversed Phase Column Type | Restek Ultra II 1.9, 2.2, 3, 5 and 10µm | Waters Acquity CSH 1.7, 3.5 and 5 µm | Waters Acquity HSS 1.8, 3.5 and 5 µm | Waters Acquity BEH 1.7, 2.5, 3.5, 5 and 10 µm | Phenomenex Kinetex 1.7 and 2.6 µm | Agilent Zorbax RRHD 1.8, 3.5 and 5 µm | Agilent Poroshell 120 2.7 µm |
| Alkyl (C18 and C8) | ● | ● | ● | ● | ● | ● | ● |
| Phenyl | ● | ● | | ● | | | |
| Polar Embedded Alkyl | ● | | | | | | |
| Fluorophenyl | ● | ● | | | ● | | |

References (Not available from Restek.)

[1] L.R. Snyder, J.W. Dolan, P.W. Carr, J. Chromatogr. A 1060 (2004) 77.

[2] U.D. Neue, J.E. O'Gara, A. Mendez, J. Chromatogr. A 1127 (2006) 161.

We're here to help!

To discuss the right selectivity for your separation or to find a comparable column, **contact us at support@restek.com or 800-356-1688.**

Combine Speed and Selectivity with Ultra II® UHPLC and HPLC Columns



Ultra II®
LC Columns

NEW!

Excellent choice

for method development
using column switching
systems and systematic
Quality by Design
approaches

Available Particle Sizes:

- 1.9µm for UHPLC
- 2.2µm for UFLC and RRLC
- 3µm, 5µm, & 10µm for HPLC

Get UHPLC Speed at HPLC Prices!

Restek lets you speed up
analyses without paying
a premium.

Compare today and save!

- **Ultra Selectivity** - Widest variety of stationary phases and selectivity of any HPLC and UHPLC column line.
- **Ultra Utility** - Full range of particle sizes for use on any HPLC or UHPLC system.
- **Ultra Reproducibility** – 100% Restek manufactured silica for column-to column reproducibility.
- **Ultra Scalability** – Both HPLC and UHPLC columns manufactured from identical silica support to allow reliable scaling of methods across systems.

Widest Selectivity Available of Any HPLC & UHPLC Column Line!

| Available Phases | Phase Description |
|----------------------|---|
| Ultra II C18 | Inert and rugged reversed phase octadecyl. |
| Ultra II C8 | Inert and rugged general purpose. |
| Ultra II Aqueous C18 | Uniquely modified alkyl for balanced retention and improved mobile phase compatibility, relative to a conventional C18. |
| Ultra II IBD | Unique polar embedded alkyl for symmetry of bases and increased retention of acids. Orthogonal selectivity to a C18. |
| Ultra II Biphenyl | Unique Biphenyl phase for enhanced retention and selectivity compared to phenyl and phenyl hexyl phases. Orthogonal selectivity to a C18. |
| Ultra II Aromax | Proprietary phenyl phase for maximum aromatic selectivity and retention. Orthogonal selectivity to a C18. |
| Ultra II PFP Propyl | Pentafluorophenyl phase for increased retention of basic compounds. Orthogonal selectivity to a C18. |
| Ultra II Silica | General purpose silica column for normal phase and HILIC separations. |
| Ultra II Carbamate | Specifically designed for carbamate analysis. |
| Ultra II Quat | Ideal for the analysis of paraquat and diquat or other quaternary amines. |

Innovative phase developed by Restek!

Ultra II® C18 Columns (USP L1)

Chromatographic Properties:

A retentive, highly pure material that exhibits excellent peak shape for a wide range of compounds. This is a robust and very reproducible general-purpose reversed phase column.

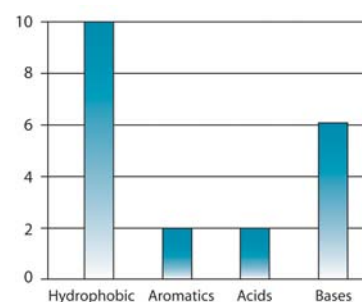


Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm,
spherical
pore size: 100Å
carbon load: 19%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 1.9µm Columns | | | | | | | | |
| 30mm | | | 9604232 | | 960423E | | | |
| 50mm | | | 9604252 | | 960425E | | | |
| 100mm | | | 9604212 | | 960421E | | | |
| 2.2µm Columns | | | | | | | | |
| 30mm | | | 9604832 | | 960483E | | | |
| 50mm | | | 9604852 | | 960485E | | | |
| 100mm | | | 9604812 | | 960481E | | | |
| 3µm Columns | | | | | | | | |
| 30mm | 9604331 | \$404 | 9604332 | | 960433E | | 9604335 | |
| 50mm | 9604351 | \$404 | 9604352 | | 960435E | | 9604355 | |
| 100mm | 9604311 | \$435 | 9604312 | | 960431E | | 9604315 | |
| 150mm | 9604361 | \$466 | 9604362 | | 960436E | | 9604365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9604531 | \$378 | 9604532 | | 960453E | | 9604535 | |
| 50mm | 9604551 | \$378 | 9604552 | | 960455E | | 9604555 | |
| 100mm | 9604511 | \$404 | 9604512 | | 960451E | | 9604515 | |
| 150mm | 9604561 | \$435 | 9604562 | | 960456E | | 9604565 | |
| 200mm | 9604521 | \$466 | 9604522 | | 960452E | | 9604525 | |
| 250mm | 9604571 | \$492 | 9604572 | | 960457E | | 9604575 | |

Ultra II® C18 Retention Profile



Ultra II® C18 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 |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II C18 Guard Cartridge | 960450212 | 960450210 | 960450222 | 960450220 | |



| |
|-------------------|
|Page # |
| vitamins733 |

Ultra II® C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9604557 | | 9604558 | | 9604559 | | 9604550 | |
| 100mm | 9604517 | | 9604518 | | 9604519 | | 9604510 | |
| 150mm | 9604567 | | 9604568 | | 9604569 | | 9604560 | |
| 250mm | 9604577 | | 9604578 | | 9604579 | | 9604570 | |

Available in 10µm particle size upon request.

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



also
available

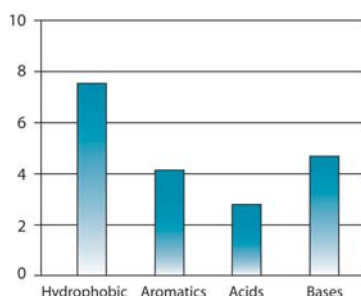
**Bulk Packing
Materials**
See page 194.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® C8 Retention Profile



Ultra II® C8 Columns (USP L7)

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 II® C18 column.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 3µm Columns | | | | | | | | |
| 30mm | 9603331 | | 9603332 | | 960333E | | 9603335 | |
| 50mm | 9603351 | | 9603352 | | 960335E | | 9603355 | |
| 100mm | 9603311 | | 9603312 | | 960331E | | 9603315 | |
| 150mm | 9603361 | | 9603362 | | 960336E | | 9603365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9603531 | | 9603532 | | 960353E | | 9603535 | |
| 50mm | 9603551 | | 9603552 | | 960355E | | 9603555 | |
| 100mm | 9603511 | | 9603512 | | 960351E | | 9603515 | |
| 150mm | 9603561 | | 9603562 | | 960356E | | 9603565 | |
| 200mm | 9603521 | | 9603522 | | 960352E | | 9603525 | |
| 250mm | 9603571 | | 9603572 | | 960357E | | 9603575 | |

Ultra II® C8 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 |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II C8 Guard Cartridge | 960350212 | 960350210 | 960350222 | 960350220 | |

Ultra II® C8 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9603557 | | 9603558 | | 9603559 | | 9603550 | |
| 100mm | 9603517 | | 9603518 | | 9603519 | | 9603510 | |
| 150mm | 9603567 | | 9603568 | | 9603569 | | 9603560 | |
| 250mm | 9603577 | | 9603578 | | 9603579 | | 9603570 | |

Available in 10µm particle size upon request.

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Ultra II® Aqueous C18 Columns (USP L1)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 3µm Columns | | | | | | | | |
| 30mm | 9608331 | \$424 | 9608332 | \$398 | 960833E | | 9608335 | |
| 50mm | 9608351 | \$424 | 9608352 | \$398 | 960835E | | 9608355 | |
| 100mm | 9608311 | \$455 | 9608312 | \$430 | 960831E | | 9608315 | |
| 150mm | 9608361 | \$518 | 9608362 | \$502 | 960836E | | 9608365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9608531 | \$393 | 9608532 | \$373 | 960853E | | 9608535 | |
| 50mm | 9608551 | \$393 | 9608552 | \$373 | 960855E | | 9608555 | |
| 100mm | 9608511 | \$414 | 9608512 | \$398 | 960851E | | 9608515 | |
| 150mm | 9608561 | \$455 | 9608562 | \$430 | 960856E | | 9608565 | |
| 200mm | 9608521 | \$486 | 9608522 | \$461 | 960852E | | 9608525 | |
| 250mm | 9608571 | \$512 | 9608572 | \$492 | 960857E | | 9608575 | |

Ultra II® Aqueous C18 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 |
|--------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Ultra II Aqueous C18 Guard Cartridge | 960850212 | 960850210 | 960850222 | 960850220 | \$145 |

Ultra II® Aqueous C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9608557 | | 9608558 | | 9608559 | | 9608550 | |
| 100mm | 9608517 | | 9608518 | | 9608519 | | 9608510 | |
| 150mm | 9608567 | | 9608568 | | 9608569 | | 9608560 | |
| 250mm | 9608577 | | 9608578 | | 9608579 | | 9608570 | |

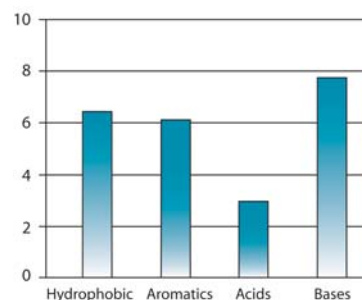
Available in 10µm particle size upon request.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® Aqueous C18 Retention Profile



| | Page # |
|---------------------|--------|
| dietary supplements | 729 |
| herbicides | 713 |
| melatonin | 729 |
| organic acids | 729 |
| vitamins | 734 |

Supersize without surprise!

ordering note

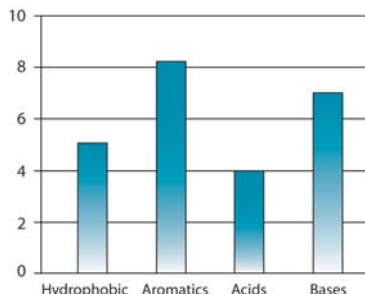
We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).



Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® Biphenyl Retention Profile



| | Page # |
|--------------------------------|--------|
| alcohol metabolites | .749 |
| amphetamines | .750 |
| antibiotics | .725 |
| diuretics | .749 |
| drug residues | .725 |
| drugs of abuse | .748 |
| NSAIDs | .723 |
| pain management drugs in urine | .747 |
| sulfa drugs | .725 |
| THC & metabolites | .748 |

Ultra II® Biphenyl Columns (USP L11)

Chromatographic Properties:

A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This is a great alternative to a C18 column when alternative selectivity is desired. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat. # | price | cat. # | price | cat. # | price | cat. # | price |
| 1.9µm Columns | | | | | | | | |
| 30mm | | | 9609232 | | 960923E | | | |
| 50mm | | | 9609252 | | 960925E | | | |
| 100mm | | | 9609212 | | 960921E | | | |
| 3µm Columns | | | | | | | | |
| 30mm | 9609331 | | 9609332 | | 960933E | | 9609335 | |
| 50mm | 9609351 | | 9609352 | | 960935E | | 9609355 | |
| 100mm | 9609311 | | 9609312 | | 960931E | | 9609315 | |
| 150mm | 9609361 | | 9609362 | | 960936E | | 9609365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9609531 | | 9609532 | | 960953E | | 9609535 | |
| 50mm | 9609551 | | 9609552 | | 960955E | | 9609555 | |
| 100mm | 9609511 | | 9609512 | | 960951E | | 9609515 | |
| 150mm | 9609561 | | 9609562 | | 960956E | | 9609565 | |
| 200mm | 9609521 | | 9609522 | | 960952E | | 9609525 | |
| 250mm | 9609571 | | 9609572 | | 960957E | | 9609575 | |

Ultra II® Biphenyl 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 |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II Biphenyl Guard Cartridge | 960950212 | 960950210 | 960950222 | 960950220 | \$145 |

Ultra II® Biphenyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat. # | price | cat. # | price | cat. # | price | cat. # | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9609557 | | 9609558 | | 9609559 | | 9609550 | |
| 100mm | 9609517 | | 9609518 | | 9609519 | | 9609510 | |
| 150mm | 9609567 | | 9609568 | | 9609569 | | 9609560 | |
| 250mm | 9609577 | | 9609578 | | 9609579 | | 9609570 | |

Available in 10µm particle size upon request.

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



Ultra II® Aromax Columns (USP L11)

Chromatographic Properties:

Ultra II® Aromax is a unique reversed phase material that exhibits superior retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This column is a great alternative to our Biphenyl phase when increased retention is required. A very suitable choice for analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 1.9µm Columns | | | | | | | | |
| 30mm | | | 9607232 | | 960723E | | | |
| 50mm | | | 9607252 | | 960725E | | | |
| 100mm | | | 9607212 | | 960721E | | | |
| 3µm Columns | | | | | | | | |
| 30mm | 9607331 | | 9607332 | | 960733E | | 9607335 | |
| 50mm | 9607351 | | 9607352 | | 960735E | | 9607355 | |
| 100mm | 9607311 | | 9607312 | | 960731E | | 9607315 | |
| 150mm | 9607361 | | 9607362 | | 960736E | | 9607365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9607531 | | 9607532 | | 960753E | | 9607535 | |
| 50mm | 9607551 | | 9607552 | | 960755E | | 9607555 | |
| 100mm | 9607511 | | 9607512 | | 960751E | | 9607515 | |
| 150mm | 9607561 | | 9607562 | | 960756E | | 9607565 | |
| 200mm | 9607521 | | 9607522 | | 960752E | | 9607525 | |
| 250mm | 9607571 | | 9607572 | | 960757E | | 9607575 | |

Ultra II® Aromax 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 |
|---------------------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price | |
| Ultra II Aromax Guard Cartridge | 960750212 | | 960750210 | | 960750222 | | 960750220 | | \$145 |

Ultra II® Aromax HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9607557 | | 9607558 | | 9607559 | | 9607550 | |
| 100mm | 9607517 | | 9607518 | | 9607519 | | 9607510 | |
| 150mm | 9607567 | | 9607568 | | 9607569 | | 9607560 | |
| 250mm | 9607577 | | 9607578 | | 9607579 | | 9607570 | |

Available in 10µm particle size upon request.

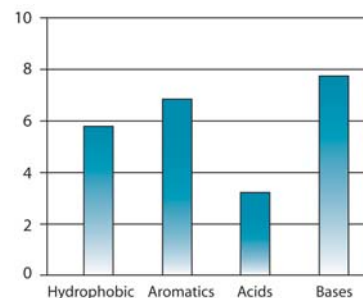


NEW!

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® Aromax Retention Profile



| | Page # |
|--------------------------------|--------|
| explosives | 711 |
| famotidine and USP impurities | 736 |
| potential genotoxic impurities | 737 |
| vitamins | 735 |

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



ChromaBLOGraphy

Topical and timely insights from top chromatographers.

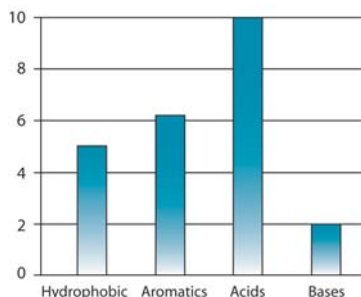
Visit us at blog.restek.com



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® IBD Retention Profile



Ultra II® IBD Columns

Chromatographic Properties:

An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and high level of base deactivation, while reducing or eliminating the need for mobile phase additives. Great for mixed polar and nonpolar compounds.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 3µm Columns | | | | | | | | |
| 30mm | 9605331 | | 9605332 | | 960533E | | 9605335 | |
| 50mm | 9605351 | | 9605352 | | 960535E | | 9605355 | |
| 100mm | 9605311 | | 9605312 | | 960531E | | 9605315 | |
| 150mm | 9605361 | | 9605362 | | 960536E | | 9605365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9605531 | | 9605532 | | 960553E | | 9605535 | |
| 50mm | 9605551 | | 9605552 | | 960555E | | 9605555 | |
| 100mm | 9605511 | | 9605512 | | 960551E | | 9605515 | |
| 150mm | 9605561 | | 9605562 | | 960556E | | 9605565 | |
| 200mm | 9605521 | | 9605522 | | 960552E | | 9605525 | |
| 250mm | 9605571 | | 9605572 | | 960557E | | 9605575 | |

Ultra II® IBD 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 |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II IBD Guard Cartridge | 960550212 | 960550210 | 960550222 | 960550220 | \$145 |

Ultra II® IBD HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9605557 | | 9605558 | | 9605559 | | 9605550 | |
| 100mm | 9605517 | | 9605518 | | 9605519 | | 9605510 | |
| 150mm | 9605567 | | 9605568 | | 9605569 | | 9605560 | |
| 250mm | 9605577 | | 9605578 | | 9605579 | | 9605570 | |

Available in 10µm particle size upon request.



Supersize without surprise!

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).

Ultra II® PFP Propyl Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, and halogenated compounds.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 1.9µm Columns | | | | | | | | |
| 30mm | | | 9606232 | | 960623E | | | |
| 50mm | | | 9606252 | | 960625E | | | |
| 100mm | | | 9606212 | | 960621E | | | |
| 3µm Columns | | | | | | | | |
| 30mm | 9606331 | | 9606332 | | 960633E | | 9606335 | |
| 50mm | 9606351 | | 9606352 | | 960635E | | 9606355 | |
| 100mm | 9606311 | | 9606312 | | 960631E | | 9606315 | |
| 150mm | 9606361 | | 9606362 | | 960636E | | 9606365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9606531 | | 9606532 | | 960653E | | 9606535 | |
| 50mm | 9606551 | | 9606552 | | 960655E | | 9606555 | |
| 100mm | 9606511 | | 9606512 | | 960651E | | 9606515 | |
| 150mm | 9606561 | | 9606562 | | 960656E | | 9606565 | |
| 200mm | 9606521 | | 9606522 | | 960652E | | 9606525 | |
| 250mm | 9606571 | | 9606572 | | 960657E | | 9606575 | |

Ultra II® PFP Propyl 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 |
|-------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II PFP Propyl Guard Cartridge | 960650212 | 960650210 | 960650222 | 960650220 | \$145 |

Ultra II® PFP Propyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9606557 | | 9606558 | | 9606559 | | 9606550 | |
| 100mm | 9606517 | | 9606518 | | 9606519 | | 9606510 | |
| 150mm | 9606567 | | 9606568 | | 9606569 | | 9606560 | |
| 250mm | 9606577 | | 9606578 | | 9606579 | | 9606570 | |

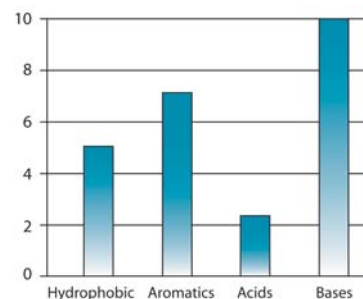
Available in 10µm particle size upon request.



Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 11%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® PFP Propyl Retention Profile



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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.





Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm,
spherical
pore size: 100Å
carbon load: 0%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® Silica Columns (USP L3)

Chromatographic Properties:

High surface area. Type B silica packing.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 1.9µm Columns | | | | | | | | |
| 30mm | | | 9600232 | | 960023E | | | |
| 50mm | | | 9600252 | | 960025E | | | |
| 100mm | | | 9600212 | | | | | |
| 2.2µm Columns | | | | | | | | |
| 30mm | | | 9600832 | | 960083E | | | |
| 50mm | | | 9600852 | | 960085E | | | |
| 100mm | | | 9600812 | | 960081E | | | |
| 3µm Columns | | | | | | | | |
| 30mm | 9600331 | | 9600332 | | 960033E | | 9600335 | |
| 50mm | 9600351 | | 9600352 | | 960035E | | 9600355 | |
| 100mm | 9600311 | | 9600312 | | 960031E | | 9600315 | |
| 150mm | 9600361 | | 9600362 | | 960036E | | 9600365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9600531 | | 9600532 | | 960053E | | 9600535 | |
| 50mm | 9600551 | | 9600552 | | 960055E | | 9600555 | |
| 100mm | 9600511 | | 9600512 | | 960051E | | 9600515 | |
| 150mm | 9600561 | | 9600562 | | 960056E | | 9600565 | |
| 200mm | 9600521 | | 9600522 | | 960052E | | 9600525 | |
| 250mm | 9600571 | | 9600572 | | 960057E | | 9600575 | |

Ultra II® Silica 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II Silica Guard Cartridge | 960050212 | 960050210 | 960050222 | 960050220 | \$145 |

Ultra II® Silica HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9600557 | | 9600558 | | 9600559 | | 9600550 | |
| 100mm | 9600517 | | 9600518 | | 9600519 | | 9600510 | |
| 150mm | 9600567 | | 9600568 | | 9600569 | | 9600560 | |
| 250mm | 9600577 | | 9600578 | | 9600579 | | 9600570 | |

Available in 10µm particle size upon request.



also
available

**Bulk Packing
Materials**
See page 194.

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Ultra II® Carbamate Columns

Chromatographic Properties:

Specifically designed for carbamates analysis. The unique packing separates 10 target carbamates in just 7 minutes, and is compatible with fluorescence or LC/MS detection. This improved run time will boost productivity and sample throughput, while reducing solvent usage and disposal expenses.

| Length | 1.0mm ID | | 2.1mm ID | | 3.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 3µm Columns | | | | | | | | |
| 30mm | 9611331 | | 9611332 | | 961133E | | 9611335 | |
| 50mm | 9611351 | | 9611352 | | 961135E | | 9611355 | |
| 100mm | 9611311 | | 9611312 | | 961131E | | 9611315 | |
| 150mm | 9611361 | | 9611362 | | 961136E | | 9611365 | |
| 5µm Columns | | | | | | | | |
| 30mm | 9611531 | | 9611532 | | 961153E | | 9611535 | |
| 50mm | 9611551 | | 9611552 | | 961155E | | 9611555 | |
| 100mm | 9611511 | | 9611512 | | 961151E | | 9611515 | |
| 150mm | 9611561 | | 9611562 | | 961156E | | 9611565 | |
| 200mm | 9611521 | | 9611522 | | 961152E | | 9611525 | |
| 250mm | 9611571 | | 9611572 | | 961157E | | 9611575 | |

Ultra II® Carbamate 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 |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra II Carbamate Guard Cartridge | 961150212 | 961150210 | 961150222 | 961150220 | \$145 |

Ultra II® Carbamate HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9611557 | | 9611558 | | 9611559 | | 9611550 | |
| 100mm | 9611517 | | 9611518 | | 9611519 | | 9611510 | |
| 150mm | 9611567 | | 9611568 | | 9611569 | | 9611560 | |
| 250mm | 9611577 | | 9611578 | | 9611579 | | 9611570 | |

Available in 10µm particle size upon request.

Ultra II® Quat Columns

Chromatographic Properties:

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 | 9612565 | |



NEW!

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-------------------------|--------|
| food contaminants | 719 |
| pesticides (carbamates) | 719 |

Chromatogram
Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



NEW!

Physical Characteristics:

particle size: 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 11%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|----------------------|--------|
| vanilla bean extract | 727 |
| xanthines | 743 |

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)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB C18 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB C18 Guard Cartridge | 941450212 | 941450210 | 941450222 | 941450220 | \$148 |

Pinnacle® DB C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9414557 | | 9414558 | | 9414559 | | 9414550 | |
| 100mm | 9414517 | | 9414518 | | 9414519 | | 9414510 | |
| 150mm | 9414567 | | 9414568 | | 9414569 | | 9414560 | |
| 250mm | 9414577 | | 9414578 | | 9414579 | | 9414570 | |

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Pinnacle® DB C8 Columns (USP L7)

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 reducing analysis time, if resolution is adequate. Replaces Hypersil® BDS C8 and Pinnacle® C8 Amine.



Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

| 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 | | 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 |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB C8 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 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB C8 Guard Cartridge | 941350212 | 941350210 | 941350222 | 941350220 | \$148 |

Pinnacle® DB C8 HPLC Prep Columns

| Length | 10mm ID cat.# price | 21.2mm ID cat.# price | 30mm ID cat.# price | 50mm ID cat.# price |
|--------------------|------------------------|--------------------------|------------------------|------------------------|
| 5µm Columns | | | | |
| 50mm | 9413557 | 9413558 | 9413559 | 9413550 |
| 100mm | 9413517 | 9413518 | 9413519 | 9413510 |
| 150mm | 9413567 | 9413568 | 9413569 | 9413560 |
| 250mm | 9413577 | 9413578 | 9413579 | 9413570 |

ChromaBLOGraphy

Topical and timely insights from top chromatographers.

Visit us at blog.restek.com



Anthony Hahn, Customer Service

Restek Customer Service

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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



Physical Characteristics:

particle size: 1.9µm or 5µm, spherical
pore size: 140Å
carbon load: 4%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

also
available

Bulk Packing Materials

See page 194.

Pinnacle® DB Cyano Columns (USP L10)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|---------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 Cyano 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 |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Pinnacle DB Cyano Guard Cartridge | 941650212 | 941650210 | 941650222 | 941650220 | |

Pinnacle® DB Cyano HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9416557 | | 9416558 | | 9416559 | | 9416550 | |
| 100mm | 9416517 | | 9416518 | | 9416519 | | 9416510 | |
| 150mm | 9416567 | | 9416568 | | 9416569 | | 9416560 | |
| 250mm | 9416577 | | 9416578 | | 9416579 | | 9416570 | |

Pinnacle® DB Phenyl Columns (USP L11)

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 | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

Pinnacle® DB Phenyl 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 |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Pinnacle DB Phenyl Guard Cartridge | 941550212 | 941550210 | 941550222 | 941550220 | |



Physical Characteristics:

particle range: 5µm, spherical
pore size: 140Å
carbon load: 5.3%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB PFP Propyl Columns (USP L43)

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.



Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB PFP Propyl 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 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB PFP Propyl Guard Cartridge | 941950212 | 941950210 | 941950222 | 941950220 | |

Pinnacle® DB PFP Propyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9419557 | | 9419558 | | 9419559 | | 9419550 | |
| 100mm | 9419517 | | 9419518 | | 9419519 | | 9419510 | |
| 150mm | 9419567 | | 9419568 | | 9419569 | | 9419560 | |
| 250mm | 9419577 | | 9419578 | | 9419579 | | 9419570 | |

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms





Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 8%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|---------------|--------|
| drug residues | 725 |
| steroids | 742 |

Pinnacle® DB Biphenyl Columns (USP L11)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB Biphenyl 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 |
|--------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB Biphenyl Guard Cartridge | 940950212 | 940950210 | 940950222 | 940950220 | \$148 |

Pinnacle® DB Biphenyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9409557 | | 9409558 | | 9409559 | | 9409550 | |
| 100mm | 9409517 | | 9409518 | | 9409519 | | 9409510 | |
| 150mm | 9409567 | | 9409568 | | 9409569 | | 9409560 | |
| 250mm | 9409577 | | 9409578 | | 9409579 | | 9409570 | |

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Pinnacle® DB Aqueous C18 Columns (USP L1)

Chromatographic Properties:

Highly selective phase for polar analytes. Compatible with highly aqueous (up to 100%) mobile phases. Silica manufactured by Restek.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB Aqueous C18 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 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB Aqueous C18 Guard Cartridge | 941850212 | 941850210 | 941850222 | 941850220 | |

Pinnacle® DB Aqueous C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9418557 | | 9418558 | | 9418559 | | 9418550 | |
| 100mm | 9418517 | | 9418518 | | 9418519 | | 9418510 | |
| 150mm | 9418567 | | 9418568 | | 9418569 | | 9418560 | |
| 250mm | 9418577 | | 9418578 | | 9418579 | | 9418570 | |

Pinnacle® DB IBD UHPLC Columns

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.

| Length | 2.1mm ID | |
|----------------------|----------|---------|
| | cat.# | price |
| 1.9µm Columns | | |
| 30mm | | 9425232 |
| 50mm | | 9425252 |
| 100mm | | 9425212 |

Pinnacle® DB IBD HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9425557 | | 9425558 | | 9425559 | | 9425550 | |
| 100mm | 9425517 | | 9425518 | | 9425519 | | 9425510 | |
| 150mm | 9425567 | | 9425568 | | 9425569 | | 9425560 | |
| 250mm | 9425577 | | 9425578 | | 9425579 | | 9425570 | |



Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
pH range: 2.5 to 8
temperature limit: 80°C



food contaminants720, 722
pesticides720, 722





Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB Silica Columns (USP L3)

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Useful for normal phase separations. Replaces Hypersil® BDS and Pinnacle® Amine.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|----------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

also available

HPLC Syringes

See pages 285-289.



Pinnacle® DB Silica 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 |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle DB Silica Guard Cartridge | 941050212 | 941050210 | 941050222 | 941050220 | |

Pinnacle® DB Silica HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9410557 | | 9410558 | | 9410559 | | 9410550 | |
| 100mm | 9410517 | | 9410518 | | 9410519 | | 9410510 | |
| 150mm | 9410567 | | 9410568 | | 9410569 | | 9410560 | |
| 250mm | 9410577 | | 9410578 | | 9410579 | | 9410570 | |

Pinnacle® DB PAH UHPLC Columns

- Complete resolution of EPA 610 PAHs in less than 4 minutes.
- Greatly reduces run times, increasing sample throughput.

Chromatographic Properties:

Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons.

| Length | 2.1mm ID | |
|----------------------|----------|---------|
| | cat.# | price |
| 1.9µm Columns | | |
| 30mm | | 9470232 |
| 50mm | | 9470252 |
| 100mm | | 9470212 |



Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



.....Page #
polycyclic aromatic hydrocarbons718

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)

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.

| | 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 | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II C18 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II C18 Guard Cartridge | 921450212 | 921450210 | 921450222 | 921450220 | |

Pinnacle® II C18 HPLC Prep Columns

| | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| Length | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9214557 | | 9214558 | | 9214559 | | 9214550 | |
| 100mm | 9214517 | | 9214518 | | 9214519 | | 9214510 | |
| 150mm | 9214567 | | 9214568 | | 9214569 | | 9214560 | |
| 250mm | 9214577 | | 9214578 | | 9214579 | | 9214570 | |



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 13%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-----------------------|----------|
| allicin | 730 |
| capsaicinoids | 728 |
| morphine sulfate | 738 |
| phenolic antioxidants | 727, 730 |

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms





Physical Characteristics:

particle size: 4µm, spherical
pore size: 110Å
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



polycyclic aromatic hydrocarbons717

Pinnacle® II PAH Columns

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 a reliable, cost-effective choice.

| Length | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | 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 PAH 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II PAH Guard Cartridge | 921950212 | 921950210 | 921950222 | 921950220 | |

Pinnacle® II C8 Columns (USP L7)

Chromatographic Properties:

Reliable performance and symmetric peaks for neutral to acidic compounds. Provides shorter retention times for hydrophobic compounds, compared to C18 phases. Replaces Hypersil® C8 and Pinnacle® C8.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II C8 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 |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II C8 Guard Cartridge | 921350212 | 921350210 | 921350222 | 921350220 | |

Pinnacle® II C8 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9213557 | | 9213558 | | 9213559 | | 9213550 | |
| 100mm | 9213517 | | 9213518 | | 9213519 | | 9213510 | |
| 150mm | 9213567 | | 9213568 | | 9213569 | | 9213560 | |
| 250mm | 9213577 | | 9213578 | | 9213579 | | 9213570 | |



Pinnacle® II Cyano Columns (USP L10)

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.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 4%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



.....Page #
piperine728

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II Cyano 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 |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II Cyano Guard Cartridge | 921650212 | 921650210 | 921650222 | 921650220 | \$148 |

Pinnacle® II Cyano HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9216557 | | 9216558 | | 9216559 | | 9216550 | |
| 100mm | 9216517 | | 9216518 | | 9216519 | | 9216510 | |
| 150mm | 9216567 | | 9216568 | | 9216569 | | 9216560 | |
| 250mm | 9216577 | | 9216578 | | 9216579 | | 9216570 | |



also
available

**Bulk Packing
Materials**
See page 194.

Pinnacle® II Phenyl Columns (USP L11)

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.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 6%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II Phenyl 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 |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II Phenyl Guard Cartridge | 921550212 | 921550210 | 921550222 | 921550220 | |



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 2%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-----------------------|--------|
| lactulose concentrate | .743 |
| sugars | .727 |

Pinnacle® II Amino Columns (USP L8)

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 | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II Amino 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 |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Pinnacle II Amino Guard Cartridge | 921750212 | 921750210 | 921750222 | 921750220 | |



Physical Characteristics:

particle size: 5µm, spherical
pore size: 110Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® II Biphenyl Columns (USP L11)

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.

| Length | 4.6mm ID | |
|-------------------|----------|---------|
| | cat.# | price |
| 5µm Column | | |
| 150mm | | 9209565 |
| 250mm | | 9209575 |

Pinnacle® II Biphenyl Guard Cartridges

| Guard Cartridges | 3-pk. (10 x 4.0mm) | 2-pk. (20 x 4.0mm) | price |
|--------------------------------------|-----------------------|-----------------------|-------|
| Pinnacle II Biphenyl Guard Cartridge | 920950210 | 920950220 | |

ChromaBLOGraphy

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Pinnacle® II Silica Columns (USP L3)

Chromatographic Properties:

Good general purpose packing for normal phase separations. Moderate surface area. Replaces Hypersil® and Pinnacle® Silica.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|------------------------|--------|
| hydrocodone bitartrate | 738 |
| tocopherols | 730 |

Pinnacle® II Silica 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 |
|------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Pinnacle II Silica Guard Cartridge | 921050212 | 921050210 | 921050222 | 921050220 | |

Pinnacle® II Silica HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9210557 | | 9210558 | | 9210559 | | 9210550 | |
| 100mm | 9210517 | | 9210518 | | 9210519 | | 9210510 | |
| 150mm | 9210567 | | 9210568 | | 9210569 | | 9210560 | |
| 250mm | 9210577 | | 9210578 | | 9210579 | | 9210570 | |

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



also available

HPLC Syringes

See pages 346-349.





Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 27%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|------------|--------|
| herbicides | 712 |
| pesticides | 716 |

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 evaporative light scattering (ELSD) and MS detectors, in which more organic solvent in the mobile phase gives better sensitivity.

Allure® C18 Columns (USP L1)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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® C18 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 C18 Guard Cartridge | 916450212 | 916450210 | 916450222 | 916450220 | \$148 |

Allure® C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9164557 | | 9164558 | | 9164559 | | 9164550 | |
| 100mm | 9164517 | | 9164518 | | 9164519 | | 9164510 | |
| 150mm | 9164567 | | 9164568 | | 9164569 | | 9164560 | |
| 250mm | 9164577 | | 9164578 | | 9164579 | | 9164570 | |

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|------------|--------|
| herbicides | 714 |

Allure® Basix Columns (USP L10)

Chromatographic Properties:

Highly retentive propyl cyano phase. Excellent choice for basic compounds and for analytes containing amine group functionality.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

Allure® Basix 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 Basix Guard Cartridge | 916150212 | 916150210 | 916150222 | 916150220 | |

Allure® Basix HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9161557 | | 9161558 | | 9161559 | | 9161550 | |
| 100mm | 9161517 | | 9161518 | | 9161519 | | 9161510 | |
| 150mm | 9161567 | | 9161568 | | 9161569 | | 9161560 | |
| 250mm | 9161577 | | 9161578 | | 9161579 | | 9161570 | |



also
available

**Bulk Packing
Materials**
See page 194.

Allure® PFP Propyl Columns (USP L43)**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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|-----------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Allure® PFP Propyl 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 PFP Propyl Guard Cartridge | 916950212 | 916950210 | 916950222 | 916950220 | |

Allure® PFP Propyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|-----------------------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5μm Columns | | | | | | | | |
| 50mm | 9169557 | | 9169558 | | 9169559 | | 9169550 | |
| 100mm | 9169517 | | 9169518 | | 9169519 | | 9169510 | |
| 150mm | 9169567 | | 9169568 | | 9169569 | | 9169560 | |
| 250mm | 9169577 | | 9169578 | | 9169579 | | 9169570 | |

Allure® Aqueous C18 Columns (USP L1)**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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|-----------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Allure® Aqueous C18 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 Aqueous C18 Guard Cartridge | 916850212 | 916850210 | 916850222 | 916850220 | |

Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|--------------------------------|--------|
| antibiotics | 723 |
| benzodiazepines | 751 |
| catecholamines | 745 |
| cocaine, ecgonine methyl ester | 750 |
| nucleic acid bases | 744 |
| opiates | 748 |

Physical Characteristics:

particle size: 5 μ m spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 23%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-----------------|--------|
| antibiotics | 740 |
| corticosteroids | 741 |
| steroids | 742 |

Allure® Biphenyl Columns (USP L11)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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® Biphenyl 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 |
|---------------------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price | |
| Allure Biphenyl Guard Cartridge | 916650212 | | 916650210 | | 916650222 | | 916650220 | | \$148 |

Allure® Biphenyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9166557 | | 9166558 | | 9166559 | | 9166560 | |
| 100mm | 9166517 | | 9166518 | | 9166519 | | 9166520 | |
| 150mm | 9166567 | | 9166568 | | 9166569 | | 9166570 | |
| 250mm | 9166577 | | 9166578 | | 9166579 | | 9166580 | |

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-------------------|--------|
| fruit juice acids | 531 |

Allure® Organic Acids Columns

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.

| Length | 3.2mm ID | | 4.6mm ID | |
|-------------------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price |
| 5µm Column | | | | |
| 150mm | 9165563 | \$586 | 9165565 | |
| 250mm | | | 9165575 | |
| 300mm | | | 9165585 | |

Note: Other dimensions available on request.

Allure® Organic Acids 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 |
|--------------------------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price | |
| Allure Organic Acids Guard Cartridge | 916550212 | | 916550210 | | 916550222 | | 916550220 | | |

Allure® Silica Columns (USP L3)**Chromatographic Properties:**

Highly retentive phase for normal phase separations. Very high surface area, Type B silica packing.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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® Silica 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 Silica Guard Cartridge | 916050212 | 916050210 | 916050222 | 916050220 | |

Allure® Silica HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9160557 | | 9160558 | | 9160559 | | 9160550 | |
| 100mm | 9160517 | | 9160518 | | 9160519 | | 9160510 | |
| 150mm | 9160567 | | 9160568 | | 9160569 | | 9160560 | |
| 250mm | 9160577 | | 9160578 | | 9160579 | | 9160570 | |

Allure® AK Columns**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 | | 4.6mm ID | |
|---|-------------|-------|-------------|-------|
| | cat.# | price | cat.# | price |
| 5µm Columns with Trident Integral Inlet Fittings | | | | |
| 200mm | 9159523-700 | \$601 | 9159525-700 | |

Allure® AK Guard Cartridge

| Guard Cartridges | 3-pk. (10 x 4.0mm) | price |
|---------------------------|-----------------------|-------|
| Allure AK Guard Cartridge | 915950210 | |

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Physical Characteristics:

particle size: 5µm
pore size: 60Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



.....Page #
carbonyls710

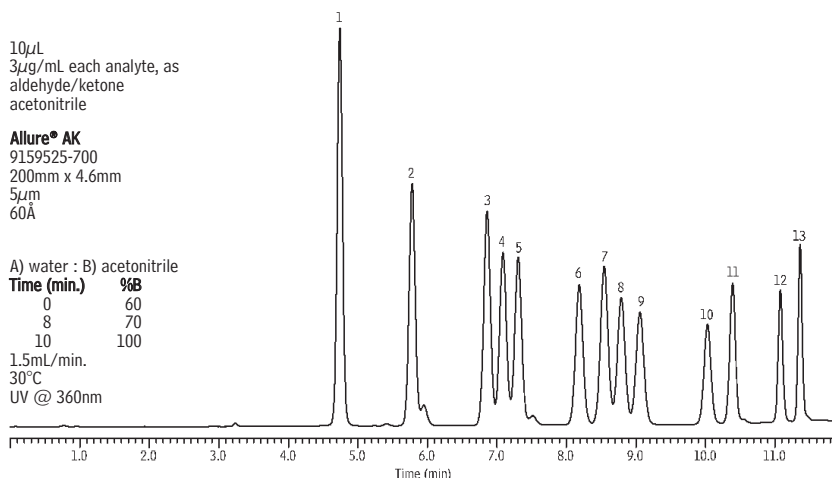
Carbonyls by CARB Method 1004 on an Allure® AK column.

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 | Ret. Time (min.) |
|------------------------|------------------|
| DNPH derivatives of: | |
| 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. methyl ethyl ketone | 9.06 |
| 10. benzaldehyde | 10.03 |
| 11. valeraldehyde | 10.39 |
| 12. m-tolualdehyde | 11.08 |
| 13. hexaldehyde | 11.36 |



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 20%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|---------------------------------------|--------|
| acetaminophen, narcotic analgesics | 738 |
| aldehydes, ketones | 710 |
| beclomethasone | 739 |
| corticosteroids | 741 |
| drug residues | 724 |
| herbicides | 712 |
| hydrocodone bitartrate, acetaminophen | 743 |
| nitrofurantol metabolites | 724 |
| vitamins (fat soluble) | 732 |

also available

Capillary HPLC Columns

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.

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.

Ultra C18 Columns (USP L1)

Chromatographic Properties:

A retentive, high-purity packing that exhibits excellent peak shape for a wide range of compounds. Excellent general-purpose reversed phase column.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C18 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 |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra C18 Guard Cartridge | 917450212 | 917450210 | 917450222 | 917450220 | \$148 |

Ultra C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9174557 | | 9174558 | | 9174559 | | 9174550 | |
| 100mm | 9174517 | | 9174518 | | 9174519 | | 9174510 | |
| 150mm | 9174567 | | 9174568 | | 9174569 | | 9174560 | |
| 250mm | 9174577 | | 9174578 | | 9174579 | | 9174570 | |

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Ultra C8 Columns (USP L7)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C8 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 |
|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra C8 Guard Cartridge | 910350212 | 910350210 | 910350222 | 910350220 | |

Ultra C8 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9103557 | | 9103558 | | 9103559 | | 9103550 | |
| 100mm | 9103517 | | 9103518 | | 9103519 | | 9103510 | |
| 150mm | 9103567 | | 9103568 | | 9103569 | | 9103560 | |
| 250mm | 9103577 | | 9103578 | | 9103579 | | 9103570 | |

Ultra Aqueous C18 Columns (USP L1)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Aqueous C18 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 |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Aqueous C18 Guard Cartridge | 917850212 | 917850210 | 917850222 | 917850220 | \$148 |

Ultra Aqueous C18 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9178557 | | 9178558 | | 9178559 | | 9178550 | |
| 100mm | 9178517 | | 9178518 | | 9178519 | | 9178510 | |
| 150mm | 9178567 | | 9178568 | | 9178569 | | 9178560 | |
| 250mm | 9178577 | | 9178578 | | 9178579 | | 9178570 | |

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|---------------------------|--------|
| explosives | 711 |
| oxycodone | 738 |
| vanillin & ethyl vanillin | 728 |
| vitamins | 733 |

also available

Capillary HPLC Columns

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.

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|-------------------------|----------|
| amino acids (aromatics) | 745 |
| analgesics | 737 |
| carboxylic acids | 726 |
| food contaminants | 721, 722 |
| herbicides | 714 |
| pesticides | 721 |
| phenethyl glucosinolate | 730 |
| sudan dyes | 722 |
| vitamins | 731 |

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|---|-----------|
| antiarrhythmics | .739 |
| antibiotics | .740, 741 |
| diflubenzuron (pesticide) | .716 |
| glyburide | .741 |
| nucleosides, nucleotides, & nucleic acid bases | .744 |
| vitamins | .732 |

Ultra IBD Columns

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra IBD 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 |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra IBD Guard Cartridge | 917550212 | 917550210 | 917550222 | 917550220 | \$148 |

Ultra IBD HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9175557 | | 9175558 | | 9175559 | | 9175550 | |
| 100mm | 9175517 | | 9175518 | | 9175519 | | 9175510 | |
| 150mm | 9175567 | | 9175568 | | 9175569 | | 9175560 | |
| 250mm | 9175577 | | 9175578 | | 9175579 | | 9175570 | |

Ultra C4 Columns (USP L26)

Chromatographic Properties:

Exceptionally stable C4 packing, with high bonding coverage and base deactivation. Less retention than C18 or C8 phases.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C4 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 |
|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra C4 Guard Cartridge | 910250212 | 910250210 | 910250222 | 910250220 | |

ChromaBLOGraphy

Topical and timely insights from top chromatographers.

Visit us at blog.restek.com

Ultra C1 Columns (USP L13)

Chromatographic Properties:

Exceptionally stable C1 phase. Least retentive reversed phase hydrocarbon packing.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C1 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 |
|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra C1 Guard Cartridge | 910150212 | 910150210 | 910150222 | 910150220 | |

Ultra Cyano Columns (USP L10)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Cyano 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 |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Cyano Guard Cartridge | 910650212 | 910650210 | 910650222 | 910650220 | \$148 |

Ultra Cyano HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9106557 | | 9106558 | | 9106559 | | 9106550 | |
| 100mm | 9106517 | | 9106518 | | 9106519 | | 9106510 | |
| 150mm | 9106567 | | 9106568 | | 9106569 | | 9106560 | |
| 250mm | 9106577 | | 9106578 | | 9106579 | | 9106570 | |

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 5%
pH range: 2.5 to 8
temperature limit: 80°C

also available

HPLC Syringes

See pages 346-349.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 8%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



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antiarrhythmics739



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).



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 10%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



.....Page #
guaifenesin, codeine743

Ultra Phenyl Columns (USP L11)

Chromatographic Properties:

High-purity, highly retentive, base-deactivated phase with alternative selectivity to straight chain hydrocarbon phases, especially for aromatic analytes.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Phenyl 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 |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Phenyl Guard Cartridge | 910550212 | 910550210 | 910550222 | 910550220 | |

Ultra Phenyl HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9105557 | | 9105558 | | 9105559 | | 9105550 | |
| 100mm | 9105517 | | 9105518 | | 9105519 | | 9105510 | |
| 150mm | 9105567 | | 9105568 | | 9105569 | | 9105560 | |
| 250mm | 9105577 | | 9105578 | | 9105579 | | 9105570 | |

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 2%
encap: no
pH range: 2.5 to 8
temperature limit: 80°C



also
available

Bulk Packing Materials

See page 194.

Ultra Amino Columns (USP L8)

Chromatographic Properties:

Recommended for normal phase analyses of mono- and disaccharides, or similar compounds.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Amino 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 |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Amino Guard Cartridge | 910750212 | 910750210 | 910750222 | 910750220 | |

Ultra PFP Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase. Unique selectivity for compounds containing organohalogens or other basic functional groups.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|-----------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | 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 | |

3.0mm ID available on request for 3 μ m particle applications above 4,000 psi (275 Bar).

Ultra PFP 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 |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra PFP Guard Cartridge | 917650212 | 917650210 | 917650222 | 917650220 | |

Ultra PFP HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|-----------------------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5μm Columns | | | | | | | | |
| 50mm | 9176557 | | 9176558 | | 9176559 | | 9176550 | |
| 100mm | 9176517 | | 9176518 | | 9176519 | | 9176510 | |
| 150mm | 9176567 | | 9176568 | | 9176569 | | 9176560 | |
| 250mm | 9176577 | | 9176578 | | 9176579 | | 9176570 | |

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
pore size: 100Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C



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|----------------------|--------|
| purines, pyrimidines | 745 |



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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Chromatogram
Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



HPLC COLUMNS

Ultra Columns

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C



also available

We also have syringe filters!
See **page 399**.

restek **exclusive!**

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
pH range: 2.5 to 8
temperature limit: 80°C



food contaminants (carbamates)Page #
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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.

Ultra Silica Columns (USP L3)

Chromatographic Properties:

High surface area, Type B silica packing.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Silica 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 |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Silica Guard Cartridge | 910050212 | 910050210 | 910050222 | 910050220 | |

Ultra Silica HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9100557 | | 9100558 | | 9100559 | | 9100550 | |
| 100mm | 9100517 | | 9100518 | | 9100519 | | 9100510 | |
| 150mm | 9100567 | | 9100568 | | 9100569 | | 9100560 | |
| 250mm | 9100577 | | 9100578 | | 9100579 | | 9100570 | |

Ultra Carbamate Columns

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.0mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 3µm Columns | | | | | | | | | | |
| 50mm | 9177351 | | 9177352 | | 9177353 | | 9177354 | \$491 | 9177355 | |
| 100mm | 9177311 | | 9177312 | | 9177313 | | | | 9177315 | |
| 5µm Columns | | | | | | | | | | |
| 250mm | | | | | | | | | 9177575 | \$485 |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

*For post-column derivatization/fluorescence detection applications using 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.

Ultra Carbamate 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Carbamate Guard Cartridge | 917750212 | 917750210 | 917750222 | 917750220 | |

Ultra Quat Columns

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 |

Ultra Quat 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 |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Ultra Quat Guard Cartridge | 918150212 | 918150210 | 918150222 | 918150220 | |

Ultra Quat Reagent Solution

Use with Ultra Quat HPLC column.
Dilute to 1 liter water, per instructions.

In water, 20mL/bottle
cat. # 32441 (ea.) \$54

Paraquat & Diquat Calibration Mix

diquat dibromide paraquat dichloride
1,000µg/mL each in water, 1mL/ampul
cat. # 32437 (ea.) \$28

restek exclusive!

Physical Characteristics:

particle size: 5µm, spherical
pore size: 100Å
pH range: 2.5 to 8
temperature limit: 80°C



paraquat, diquat715

free literature

Simple, Sensitive HPLC/UV Analysis for Paraquat and Diquat

Download your free copy from
www.restek.com

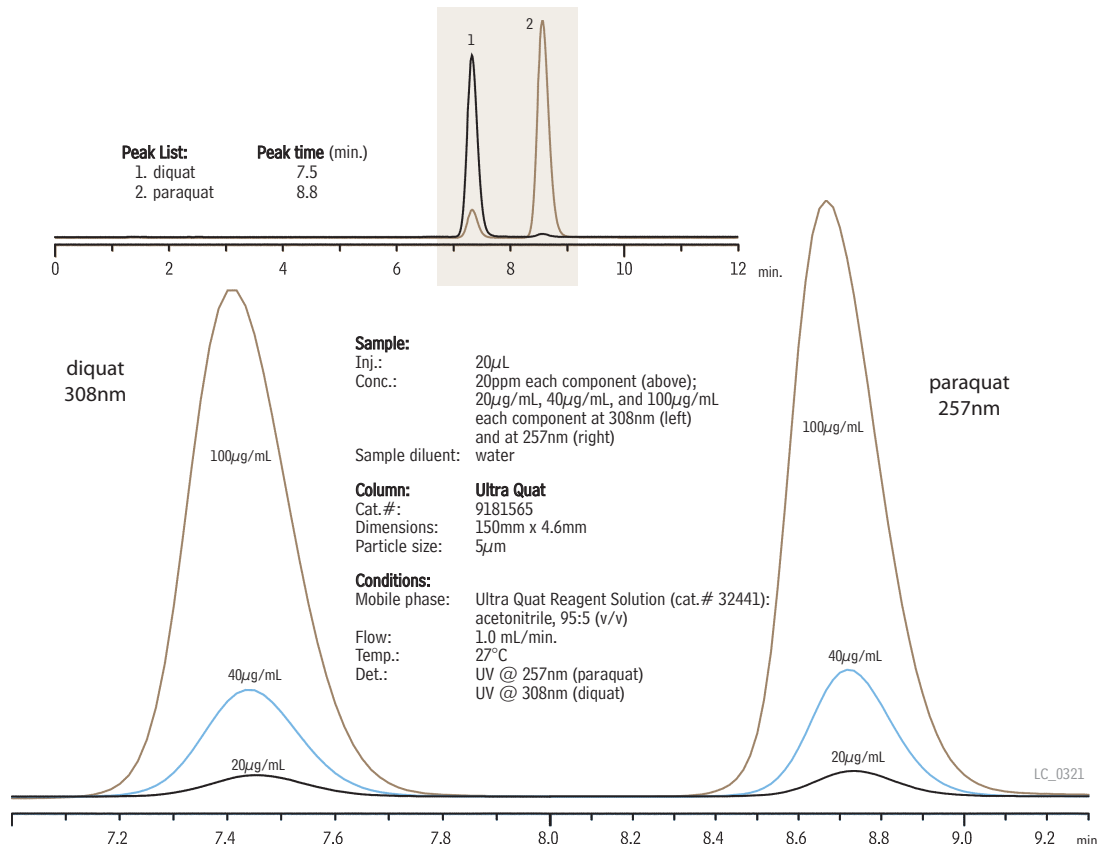
lit. cat.# 580006

restek innovation!

An Ultra Quat column and Ultra Quat Reagent Solution eliminate the need for ion pairing reagents in paraquat/diquat analysis.



Consistent resolution, retention times, and peak symmetry for paraquat and diquat on an Ultra Quat column.



restek **innovation!**

Viva silica has a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation of large molecules and biomolecules.



Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C



| | Page # |
|----------------|--------|
| oxytocin | 746 |
| peptides | 745 |
| proteins | 746 |

Viva Wide Pore 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 around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

Viva C18 Columns (USP L1)

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 | |

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Viva C18 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 |
|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Viva C18 Guard Cartridge | 951450212 | 951450210 | 951450222 | 951450220 | |

Viva C18 HPLC Prep Columns

| | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|--------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| Length | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5µm Columns | | | | | | | | |
| 50mm | 9514557 | | 9514558 | | 9514559 | | 9514550 | |
| 100mm | 9514517 | | 9514518 | | 9514519 | | 9514510 | |
| 150mm | 9514567 | | 9514568 | | 9514569 | | 9514560 | |
| 250mm | 9514577 | | 9514578 | | 9514579 | | 9514570 | |

also available

Capillary HPLC Columns
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.

Viva C8 Columns (USP L7)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|-----------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Viva C8 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 |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Viva C8 Guard Cartridge | 951350212 | 951350210 | 951350222 | 951350220 | |

Viva C8 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|-----------------------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5μm Columns | | | | | | | | |
| 50mm | 9513557 | | 9513558 | | 9513559 | | 9513550 | |
| 100mm | 9513517 | | 9513518 | | 9513519 | | 9513510 | |
| 150mm | 9513567 | | 9513568 | | 9513569 | | 9513560 | |
| 250mm | 9513577 | | 9513578 | | 9513579 | | 9513570 | |

Viva C4 Columns (USP L26)

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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|-----------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Viva C4 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 |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| Viva C4 Guard Cartridge | 951250212 | 951250210 | 951250222 | 951250220 | |

Viva C4 HPLC Prep Columns

| Length | 10mm ID | | 21.2mm ID | | 30mm ID | | 50mm ID | |
|-----------------------------------|---------|-------|-----------|-------|---------|-------|---------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price |
| 5μm Columns | | | | | | | | |
| 50mm | 9512557 | | 9512558 | | 9512559 | | 9512550 | |
| 100mm | 9512517 | | 9512518 | | 9512519 | | 9512510 | |
| 150mm | 9512567 | | 9512568 | | 9512569 | | 9512560 | |
| 250mm | 9512577 | | 9512578 | | 9512579 | | 9512570 | |



Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

also available

3 μ m particles are available for all Viva phases—please inquire.

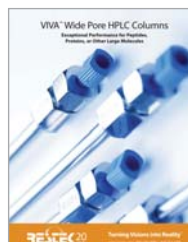


Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 300Å
carbon load: 3.5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

ordering note

Other column dimensions and phases are available. Please call for a quote.



free literature

Viva Wide Pore HPLC Columns

Download your free copy from
www.restek.com

lit. cat# 59939

restek **exclusive!****Physical Characteristics:**

particle size: 5µm
pore size: 300Å
carbon load: 6.7%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

also available

3µm particles are available for all Viva phases—
please inquire.

**Physical Characteristics:**

particle size: 5µm, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Viva Biphenyl Columns (USP L11)**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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Viva Biphenyl 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 |
|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Viva Biphenyl Guard Cartridge | 951650212 | 951650210 | 951650222 | 951650220 | |

Viva PFP Propyl Columns (USP L43)**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.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Viva PFP Propyl 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 |
|---------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|
| | cat.# | cat.# | cat.# | cat.# | |
| Viva PFP Propyl Guard Cartridge | 951950212 | 951950210 | 951950222 | 951950220 | |

also available**Looking for HPLC syringes?**

See pages 346-349.



Viva Silica Columns (USP L3)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds in normal phase separations.

| Length | 1.0mm ID | | 2.1mm ID | | 3.2mm ID | | 4.6mm ID | |
|--------------------|----------|-------|----------|-------|----------|-------|----------|-------|
| | 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 | |

Viva Silica 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 |
|-----------------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-------|
| | cat.# | price | cat.# | price | cat.# | price | cat.# | price | |
| Viva Silica Guard Cartridge | 951050212 | | 951050210 | | 951050222 | | 951050220 | | |



Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
pH range: 2.5 to 8
temperature limit: 80°C

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 \$15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.



Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms





Bulk Packing Materials

Use our bulk packing materials to pack your own columns!

- Prepare your own columns in conventional or custom dimensions.
- Consistent, high-quality materials.

Restek is among the small group of column manufacturers capable of producing their own high purity silica. We offer our Ultra II®, 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.



| Description | min. qty. | cat.# | 5-99 grams | 100-499 grams | 500-999 grams | ≥1000 grams |
|---|-----------|-------|------------|---------------|---------------|-------------|
| 3µm Ultra II Bulk Packing Materials | | | | | | |
| Ultra II C18 Bulk Packing | 5g | 96043 | | | | |
| Ultra II C8 Bulk Packing | 5g | 96033 | | | | |
| Ultra II Silica Bulk Packing | 5g | 96003 | | | | |
| 5µm Ultra II Bulk Packing Materials | | | | | | |
| Ultra II C18 Bulk Packing | 5g | 96045 | | | | |
| Ultra II C8 Bulk Packing | 5g | 96035 | | | | |
| Ultra II Silica Bulk Packing | 5g | 96005 | | | | |
| 5µm Pinnacle DB Bulk Packing Materials | | | | | | |
| Pinnacle DB C18 Bulk Packing | 5g | 94145 | | | | |
| Pinnacle DB C8 Bulk Packing | 5g | 94135 | | | | |
| Pinnacle DB Cyano Bulk Packing | 5g | 94165 | | | | |
| Pinnacle DB Silica Bulk Packing | 5g | 94105 | | | | |
| 3µm Pinnacle II Bulk Packing Materials | | | | | | |
| Pinnacle II C8 Bulk Packing | 5g | 92133 | | | | |
| Pinnacle II C18 Bulk Packing | 5g | 92143 | | | | |
| Pinnacle II Cyano Bulk Packing | 5g | 92163 | | | | |
| Pinnacle II Phenyl Bulk Packing | 5g | 92153 | | | | |
| Pinnacle II Silica Bulk Packing | 5g | 92103 | | | | |
| 5µm Pinnacle II Bulk Packing Materials | | | | | | |
| Pinnacle II Amino Bulk Packing | 5g | 92175 | | | | |
| Pinnacle II C8 Bulk Packing | 5g | 92135 | | | | |
| Pinnacle II C18 Bulk Packing | 5g | 92145 | | | | |
| Pinnacle II Cyano Bulk Packing | 5g | 92165 | | | | |
| Pinnacle II Phenyl Bulk Packing | 5g | 92155 | | | | |
| Pinnacle II Silica Bulk Packing | 5g | 92105 | | | | |

also available

Restek Pack in a Box Kit:
HPLC Column Packing System
See page 351.



| 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 | | | | |
| Ultra C4 Bulk Packing | 10g/btl. | 91025 | | | | |
| Ultra C8 Bulk Packing | 10g/btl. | 91035 | | | | |
| Ultra C18 Bulk Packing | 10g/btl. | 91745 | | | | |
| Ultra Amino Bulk Packing | 10g/btl. | 91075 | | | | |
| Ultra Cyano Bulk Packing | 10g/btl. | 91065 | | | | |
| Ultra Phenyl Bulk Packing | 10g/btl. | 91055 | | | | |
| Ultra Silica Bulk Packing | 10g/btl. | 91005 | | | | |

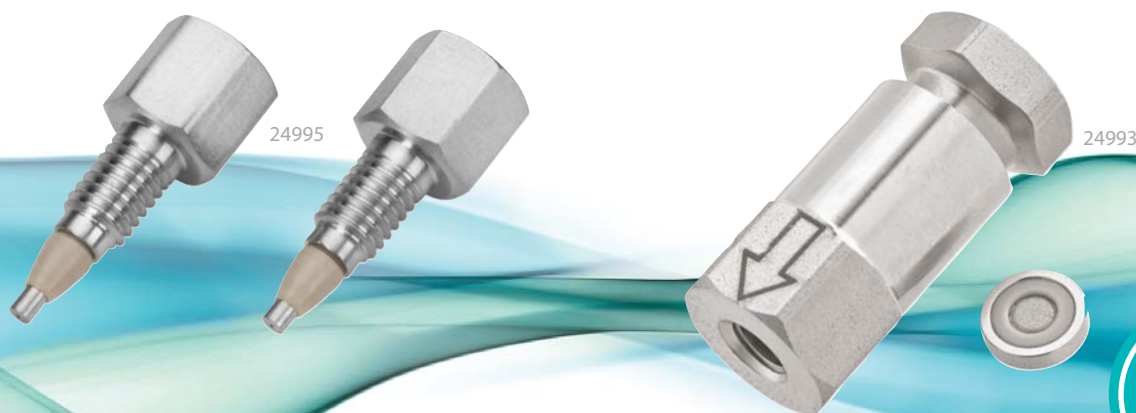
also available

Other stationary phases and particle sizes are available; please inquire.

NEW!

Protect your column with UltraShield and UltraLine UHPLC Filters

A cost-effective way to extend the lifetime of any UHPLC column, without sacrificing UHPLC performance.



UltraShield UHPLC PreColumn Filter

- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Universal fit—connects easily to any brand column.
- Leak-tight to 15,000 psi (1034 bar).
- 0.5 μ m titanium filter in stainless steel body with PEEK ferrule.

Specifications:

Inlet/Outlet: Female/Male 10-32
Port Geometry: Parker ($1/16$ CPI)
Material: Stainless Steel, PEEK ferrule
Filter: 0.5 μ m Titanium
Pressure Rating: 15,000 psig (1054 bar)
Wrench Flat: $5/16$ "

| Description | qty. | cat.# | price |
|------------------------------------|--------|-------|-------|
| UltraShield UHPLC PreColumn Filter | ea. | 24995 | \$50 |
| UltraShield UHPLC PreColumn Filter | 5-pk. | 24996 | \$190 |
| UltraShield UHPLC PreColumn Filter | 10-pk. | 24997 | \$360 |

UltraLine UHPLC In-Line Filter

- In-line design installs easily with standard fittings.
- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Leak-tight to 15,000 psi (1034 bar).
- Replaceable 0.5 μ m stainless steel filter in stainless steel body.

Specifications:

Inlet/Outlet: Female/Female 10-32
Port Geometry: Parker ($1/16$ CPI)
Material: Stainless Steel housing
Filter: 0.5 μ m Stainless Steel, 0.125" W x 0.062" T, 5 μ L volume
Pressure Rating: 15,000 psig (1054 bar)
Wrench Flat: $3/8$ "

| Description | qty. | cat.# | price |
|--------------------------------|-------|-------|-------|
| UltraLine UHPLC In-Line Filter | | | |
| (In-Line Assembly with Filter) | ea. | 24993 | \$125 |
| UltraLine Replacement Filters | 5-pk. | 24994 | \$60 |



Shannon Rishell, 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

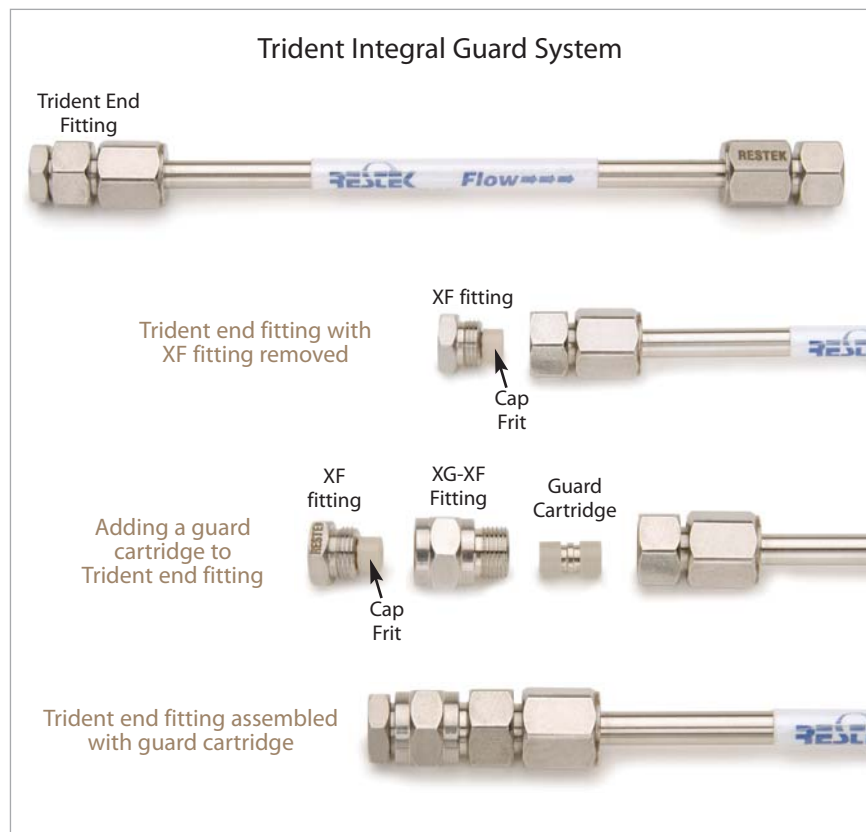
Restek's Exclusive Trident Integral System

- 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) and Trident guard cartridges. See page 198.

| 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 | 5-pk. | 25990 | |



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 Direct 10mm guard cartridge holder with filter

Components



Assembled



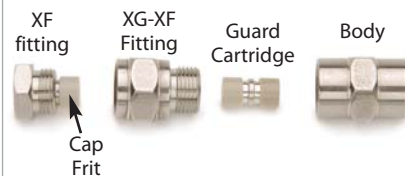
Installed onto column



Cap frits

Trident In-Line 10mm guard cartridge holder with filter

Components



Assembled



Installed onto column





10 & 20 mm Guard Cartridges

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 Guard Cartridge | — | 915950210 | — | — | |
| Allure Basix Guard Cartridge | 916150212 | 916150210 | 916150222 | 916150220 | |
| Allure C18 Guard Cartridge | 916450212 | 916450210 | 916450222 | 916450220 | |
| Allure PFP Propyl Guard Cartridge | 916950212 | 916950210 | 916950222 | 916950220 | |
| Allure Silica Guard Cartridge | 916050212 | 916050210 | 916050222 | 916050220 | |
| Allure Organic Acids Guard Cartridge | 916550212 | 916550210 | 916550222 | 916550220 | |
| Allure Aqueous C18 Guard Cartridge | 916850212 | 916850210 | 916850222 | 916850220 | |
| Allure Biphenyl Guard Cartridge | 916650212 | 916650210 | 916650222 | 916650220 | |
| Pinnacle II Amino Guard Cartridge | 921750212 | 921750210 | 921750222 | 921750220 | |
| Pinnacle II C8 Guard Cartridge | 921350212 | 921350210 | 921350222 | 921350220 | |
| Pinnacle II C18 Guard Cartridge | 921450212 | 921450210 | 921450222 | 921450220 | |
| Pinnacle II Cyano Guard Cartridge | 921650212 | 921650210 | 921650222 | 921650220 | |
| Pinnacle II PAH Guard Cartridge | 921950212 | 921950210 | 921950222 | 921950220 | |
| Pinnacle II Phenyl Guard Cartridge | 921550212 | 921550210 | 921550222 | 921550220 | |
| Pinnacle II Biphenyl Guard Cartridge | — | 920950210 | — | 920950220 | |
| Pinnacle II Silica Guard Cartridge | 921050212 | 921050210 | 921050222 | 921050220 | |
| Pinnacle DB C8 Guard Cartridge | 941350212 | 941350210 | 941350222 | 941350220 | |
| Pinnacle DB C18 Guard Cartridge | 941450212 | 941450210 | 941450222 | 941450220 | |
| Pinnacle DB Aqueous C18 Guard Cartridge | 941850212 | 941850210 | 941850222 | 941850220 | |
| Pinnacle DB Biphenyl Guard Cartridge | 940950212 | 940950210 | 940950222 | 940950220 | |
| Pinnacle DB PFP Propyl Guard Cartridge | 941950212 | 941950210 | 941950222 | 941950220 | |
| Pinnacle DB Cyano Guard Cartridge | 941650212 | 941650210 | 941650222 | 941650220 | |
| Pinnacle DB Phenyl Guard Cartridge | 941550212 | 941550210 | 941550222 | 941550220 | |
| Pinnacle DB Silica Guard Cartridge | 941050212 | 941050210 | 941050222 | 941050220 | |
| Ultra II Aromax Guard Cartridge | 960750212 | 960750210 | 960750222 | 960750220 | |
| Ultra II Biphenyl Guard Cartridge | 960950212 | 960950210 | 960950222 | 960950220 | |
| Ultra II C8 Guard Cartridge | 960350212 | 960350210 | 960350222 | 960350220 | |
| Ultra II C18 Guard Cartridge | 960450212 | 960450210 | 960450222 | 960450220 | |
| Ultra II Aqueous C18 Guard Cartridge | 960850212 | 960850210 | 960850222 | 960850220 | |
| Ultra II Carbamate Guard Cartridge | 961150212 | 961150210 | 961150222 | 961150220 | |
| Ultra II IBD Guard Cartridge | 960550212 | 960550210 | 960550222 | 960550220 | |
| Ultra II PFP Propyl Guard Cartridge | 960650212 | 960650210 | 960650222 | 960650220 | |
| Ultra II Silica Guard Cartridge | 960050212 | 960050210 | 960050222 | 960050220 | |
| Ultra Amino Guard Cartridge | 910750212 | 910750210 | 910750222 | 910750220 | |
| Ultra Aqueous C18 Guard Cartridge | 917850212 | 917850210 | 917850222 | 917850220 | |
| Ultra C1 Guard Cartridge | 910150212 | 910150210 | 910150222 | 910150220 | |
| Ultra C4 Guard Cartridge | 910250212 | 910250210 | 910250222 | 910250220 | |
| Ultra C8 Guard Cartridge | 910350212 | 910350210 | 910350222 | 910350220 | |
| Ultra C18 Guard Cartridge | 917450212 | 917450210 | 917450222 | 917450220 | |
| Ultra Carbamate Guard Cartridge | 917750212 | 917750210 | 917750222 | 917750220 | |
| Ultra Cyano Guard Cartridge | 910650212 | 910650210 | 910650222 | 910650220 | |
| Ultra IBD Guard Cartridge | 917550212 | 917550210 | 917550222 | 917550220 | |
| Ultra PFP Guard Cartridge | 917650212 | 917650210 | 917650222 | 917650220 | |
| Ultra Phenyl Guard Cartridge | 910550212 | 910550210 | 910550222 | 910550220 | |
| Ultra Silica Guard Cartridge | 910050212 | 910050210 | 910050222 | 910050220 | |
| Ultra Quat Guard Cartridge | 918150212 | 918150210 | 918150222 | 918150220 | |
| Viva C18 Guard Cartridge | 951450212 | 951450210 | 951450222 | 951450220 | |
| Viva C8 Guard Cartridge | 951350212 | 951350210 | 951350222 | 951350220 | |
| Viva C4 Guard Cartridge | 951250212 | 951250210 | 951250222 | 951250220 | |
| Viva PFP Propyl Guard Cartridge | 951950212 | 951950210 | 951950222 | 951950220 | |
| Viva Biphenyl Guard Cartridge | 951650212 | 951650210 | 951650222 | 951650220 | |
| Viva Silica Guard Cartridge | 951050212 | 951050210 | 951050222 | 951050220 | |

HPLC Normal Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

| | | | |
|--------------|-----------|-------------------------|------|
| benzene | 1.00mg/mL | benzyl alcohol | 3.00 |
| benzaldehyde | 0.04 | 4-methoxybenzyl alcohol | 2.00 |

In hexane, 1mL/ampul

cat. # 35004 (ea.) \$33

No data pack available.

HPLC Reversed Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

| | | | |
|---------|-----------|-------------|------|
| benzene | 3.00mg/mL | naphthalene | 0.50 |
| uracil | 0.02 | biphenyl | 0.06 |

In methanol:water (75:25), 1mL/ampul

cat. # 35005 (ea.) \$33

No data pack available.

HPLC Performance Test Mix (5 components)

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 | | quinizarin | 94 |
| hydrochloride | 2,800µg/mL | toluene | 1,400 |
| ethylbenzene | 1,700 | uracil | 28 |

In methanol, 1mL/ampul

cat. # 31699 (ea.)

Carbohydrate HPLC Performance Check Mix (5 components)

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.) \$33

No data pack available.

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, 25, 125, 250, 500µg/mL in water in a five ampul kit.

cat. # 31805 (kit)

No data pack available.

Quantity discounts not available.



Ultra Quat Reagent Solution

Use with Ultra Quat HPLC column. Dilute to 1 liter, per instructions.

In water, 20mL/bottle

cat. # 32441 (ea.)



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GC COLUMNS

FUSED SILICA COLUMNS

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Selecting a GC Column

Strategic column choices can improve lab productivity by assuring that speed and resolution are optimized. While the number of choices available can be daunting, consideration of the resolution equation variables—selectivity, retention (capacity), and efficiency—simplifies the decision. Selectivity determines which stationary phase is most appropriate, and it can be approximated using retention indices or existing applications. Once the phase has been chosen, physical dimensions (internal diameter, film thickness, length) can be selected based on retention and efficiency. Understanding how selectivity, retention, and efficiency influence separations allows analysts to make effective, informed choices and quickly select the best column for specific separations.

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

↑Efficiency ↑Retention ↑Selectivity

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

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 between the analyte and 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 the attractive forces are strong. If they are dissimilar, then analyte to stationary phase attraction is weak, and less retention is observed. Therefore, when selecting a stationary phase, knowledge of the structure of the analytes of interest and the stationary phase is crucial. The reference table on page 27 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". Since benzene solvates more readily with the stationary phase, it has 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.

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- Optimize dual-column run conditions, columns in parallel or in series.

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Pro ezGC includes a master set of retention index libraries at no extra charge! These libraries contain more than 3,000 compounds analyzed on the most commonly used stationary phases, in ten application areas, including pesticides, PCBs, dioxins/furans, flavor and fragrance compounds, drugs of abuse, FAMES, semivolatile and volatile pollutants, petroleum hydrocarbons, and solvents and chemicals. The libraries permit computer simulation without entering actual laboratory data.

| Description | qty. | cat.# | price |
|---|------|-------|-------|
| Pro ezGC Method Development Software CD-ROM | ea. | 21487 | \$201 |

Table I lists the Kovats retention indices for the more common stationary phases. 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 column selectivity for 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-SMS | 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 |

Retention, k

The capacity of the column relates to how much material can be injected onto a column without adversely affecting peak shape. If the amount of a compound (mass) exceeds the capacity of a column (WCOT), the peak will front, which sometimes can look like a “shark fin”. The goal is to select a column with sufficient capacity such that peak shape will not suffer. Peak symmetry is typically used to calculate the degree of sample overload. 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 the detector and how much flow it can optimally work under. For example, some MS detectors can only handle column flow rates of up to 1.5 mL/min.; therefore, a 0.53 mm ID column, which requires higher flows for proper chromatography, is not an option for this detector. The third consideration is sample capacity of the column. If the concentration of the sample exceeds the column capacity, loss of resolution, poor reproducibility, and peak distortion will result. Table II shows several typical column characteristics for various column IDs.

Table II Typical characteristics for columns with the same phase ratio, such as 0.10 mm ID x 0.10 μ m and 0.18 mm ID x 0.18 μ m, etc.

| | Column ID | | | | | |
|--|-------------|------------|------------|------------|------------|-------------|
| Characteristic | 0.10mm | 0.15mm | 0.18mm | 0.25mm | 0.32mm | 0.53mm |
| Helium Flow (@ 20cm/sec.) | 0.16mL/min. | 0.3mL/min. | 0.3mL/min. | 0.7mL/min. | 1.2mL/min. | 2.6mL/min. |
| Hydrogen Flow (@ 40cm/sec.) | 0.32mL/min. | 0.6mL/min. | 0.6mL/min. | 1.4mL/min. | 2.4mL/min. | 5.2mL/min. |
| Sample Capacity (max load per component) | <10ng | <40ng | <50ng | 50–100ng | 400–500ng | 1000–2000ng |
| Theoretical Plates/Meter | 8000 | 4000 | 3500 | 3200 | 2500 | 1800 |



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, such as purity analysis.

Film thickness directly affects phase ratio (β), which is an important consideration when changing internal diameter. When internal diameter increases, film thickness (df) must increase in order to provide similar resolution and retention. Table III shows values for common dimensions of columns. Similar values indicate similar elution for different IDs.

Table III Phase ratio (β) values for common column dimensions.*

| Column ID | Film Thickness (df) / β Value | | | | | | |
|-----------|-------------------------------------|--------------|--------------|-------------|-------------|-------------|-------------|
| | 0.10 μ m | 0.25 μ m | 0.50 μ m | 1.0 μ m | 1.5 μ m | 3.0 μ m | 5.0 μ m |
| 0.18mm | 450 | 180 | 90 | 45 | 30 | 15 | 9 |
| 0.25mm | 625 | 250 | 125 | 63 | 42 | 21 | 13 |
| 0.32mm | 800 | 320 | 160 | 80 | 53 | 27 | 16 |
| 0.53mm | 1325 | 530 | 265 | 128 | 88 | 43 | 27 |

* $\beta = r/2df$ (r = internal radius of tubing; df = phase film thickness)

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.

Conclusion

A basic understanding of the resolution equation allows analysts to make more effective column choices. Phase choice is influenced primarily by selectivity, which can be approximated by considering phase and analyte structures, as well as by referencing retention indices or existing applications. Column retention (capacity) and efficiency also affect separations and should influence decisions on column internal diameter, film thickness, and length. By considering these factors, analysts can simplify the column selection process and increase lab productivity by optimizing separations.



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Selection of Capillary Column Summary

Selecting a capillary column for an analysis can be done by following these basic steps:

1) Choose the proper phase for the compounds being chromatographed

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

2) Select column ID, film thickness, and length

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

3) Set optimum parameters for your analysis

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

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.

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



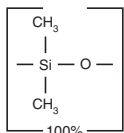
need **more** help?

- Call 800-356-1688 or 814-353-1300, ext. 4, or your Restek representative.
- Visit www.restek.com
- Email (U.S.): support@restek.com
Email (outside U.S.): intltechsupp@restek.com

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

**Rxi®-1ms, Rxi®-1HT,
Rtx®-1**

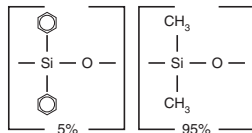
100% dimethyl polysiloxane



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

**Rxi®-5ms, Rxi®-5HT,
Rtx®-5, Rtx®-5MS**

5% diphenyl/95% dimethyl polysiloxane

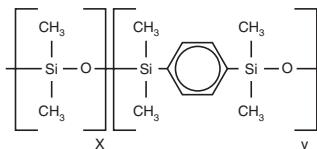


Polarity: slightly polar
Uses: flavors, environmental, aromatic hydrocarbons
[G27]

Rxi®-5Sil MS

5% phenyl

95% dimethyl arylene polysiloxane

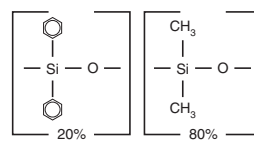


Polarity: slightly polar
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

Rtx®-20

20% diphenyl

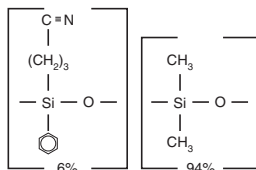
80% dimethyl polysiloxane



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

Rtx®-1301, Rtx®-624, Rtx®-G43

6% cyanopropylphenyl
94% dimethyl polysiloxane

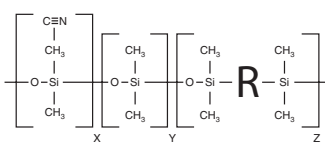


Polarity: slightly polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products
[G43]

Rxi®-624Sil MS

6% cyanopropylphenyl

94% dimethyl arylene polysiloxane

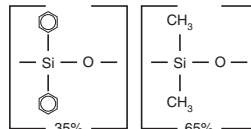


Polarity: intermediately polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products

Rtx®-35

35% diphenyl

65% dimethyl polysiloxane

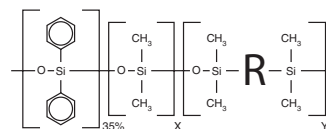


Polarity: intermediately polar
Uses: pesticides, Aroclor PCBs, amines, nitrogen-containing herbicides
[G42]

Rxi®-35Sil MS

35% phenyl

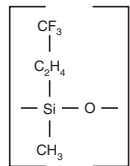
65% dimethyl arylene polysiloxane



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

Rtx®-200

trifluoropropylmethyl polysiloxane

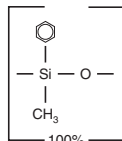


Polarity: selective for lone pair electrons
Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols
[G6]

Rtx®-50

50% phenyl

50% methyl polysiloxane

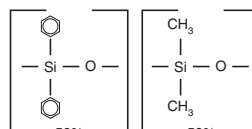


Polarity: intermediately polar
Uses: FAMES, carbohydrates
[G3]

Rxi®-17

50% diphenyl

50% dimethyl polysiloxane

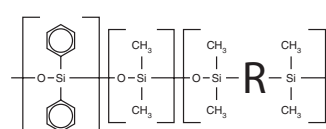


Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols
[G3]

Rxi®-17Sil MS

50% phenyl

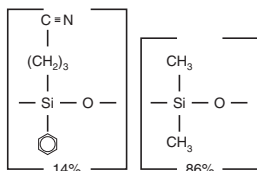
50% dimethyl arylene polysiloxane



Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols

Rtx®-1701

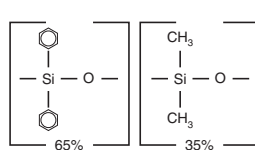
14% cyanopropylphenyl
86% dimethyl polysiloxane



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

Rtx®-65, Rtx®-65TG

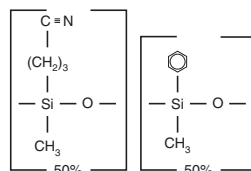
65% diphenyl
35% dimethyl polysiloxane



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

Rtx®-225

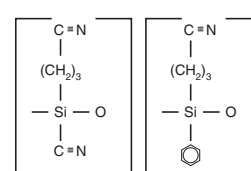
50% cyanopropylmethyl
50% phenylmethyl polysiloxane



Polarity: polar
Uses: FAMES, carbohydrates
[G7]

Rt®-2330

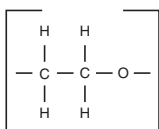
90% biscyanopropyl
10% cyanopropylphenyl polysiloxane



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]

note

Structures, polarities, and properties also apply to metal MXT® stationary phases.

Columns by Phase

| Restek | Phase Composition | USP Nomenclature* | Agilent | Varian-Chrompack | SGE | Phenomenex | Macherey-Nagel | Supelco | Alltech | Quadrex |
|--|--|----------------------------|--|--|--------------------|----------------------|-------------------------------------|---------------------------------|--------------------|----------|
| Rtx-1 (p. 49) | 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-1HT (p. 47) | 100% dimethyl polysiloxane | | DB-1HT | VF-1HT | | ZB-1HT | | | EC-1, AT-1HT | |
| Rxi-1ms (p. 41) | 100% dimethyl polysiloxane (low bleed) | | HP-1/ HP-1ms DB-1/ DB-1ms Ultra-1 | VF-1ms / CP-Sil 5 CB Low Bleed/MS | BP-1 | ZB-1, ZB-1ms | Optima-1ms, Optima-1ms Accent | SPB-1, Equity-1 | AT-1 | 007-1 |
| Rtx-5 (p. 50) | 5% diphenyl 95% dimethyl polysiloxane | G27, G36 | HP-5/ DB-5 | CP Sil 8 CB | BP-5 | ZB-5 | Optima-5 | SPB-5 | EC-5, AT-5 | 007-5 |
| Rxi-5HT (p. 47) | 5% diphenyl 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 | CP-Sil 8 CB | BP-5 | ZB-5, ZB-5ms | Optima-5, Optima-5ms | SPB-5, Equity-5 | AT-5ms | 007-5 |
| Rxi-5Sil MS (p. 42, 87, 95, 97) | 5% phenyl/95% dimethyl arylene polysiloxane | | DB-5ms, DB-5ms UI | VF-5ms / CP-Sil 8 CB Low Bleed/MS | BPX-5 | ZB-5ms | Optima-5ms Accent | SLB-5ms | | 007-5MS |
| Rxi-XLB (p. 44, 94) | Arylene/methyl modified polysiloxane | | DB-XLB | VF-XMS | | MR1 | Optima-XLB | | | |
| Rtx-20 (p. 51) | 20% diphenyl 80% dimethyl polysiloxane | G28, G32 | | | | | | SPB-20 | EC-20, AT-20 | 007-20 |
| Rtx-35 (p. 51) | 35% diphenyl 65% dimethyl polysiloxane | G42 | HP-35, DB-35 | | BPX-35, BPX-608 | ZB-35 | | SPB-35, SPB-608 | AT-35 | 007-35 |
| Rxi-35Sil MS (p. 44) | 35% phenyl/65% dimethyl arylene polysiloxane | | DB-35ms | VF-35ms | BP-35 | MR2 | Optima-35ms | | | |
| Rtx-50 (p. 52) | 50% phenyl 50% methyl polysiloxane | G3 | HP-50 | | AT-50 | | Optima-17 | SPB-50 | AT-50 | 007-17 |
| Rxi-17 (p. 44) | 50% diphenyl 50% dimethyl polysiloxane | | HP-50+ , HP-17, DB-17, DB-608 | CP-Sil 24 CB | | ZB-50 | Optima-17 | | | |
| Rxi-17Sil MS (p. 45, 73, 98) | 50% phenyl/50% dimethyl arylene polysiloxane | | HP-17, DB-17, DB-17ms | CP-Sil 24 CB, VF-17ms | BPX-50 | ZB-50 | Optima-17ms | | | |
| Rtx-65 (p. 52) | 65% diphenyl 35% dimethyl polysiloxane | G17 | | | | | | | | 007-65HT |
| Rxi-624Sil MS (p. 46, 83, 103) | 6% cyanopropyl phenyl/94% dimethyl arylene polysiloxane | G43 | HP-624, DB-624 | VF-624ms | BP-624 | ZB-624 | Optima-624 | | | |
| Rtx-1301 (p. 55) Rtx-624 (p. 55) | 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, AT-1301 | 007-1301 |
| Rtx-1701 (p. 56) | 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. 54) | trifluoropropyl methyl polysiloxane | G6 | DB-210, DB-200 | VF-200ms | | | Optima-210 | | AT-210 | 007-210 |
| Rtx-200ms (p. 54) | trifluoropropyl methyl polysiloxane (low bleed) | | | VF-200ms | | | | | | |
| Rtx-225 (p. 56) | 50% cyanopropyl 50% phenylmethyl polysiloxane | G7, G19 | HP-225, DB-225 | CP Sil 43 CB | BP-225 | | Optima-225 | SPB-225 | AT-225 | 007-225 |
| Rtx-440 (p. 53) | modified polysiloxane (unique phase) | | unique column | | | | | | | |
| Rt-2330 (p. 57) | 90% biscyanopropyl 10% cyanopropyl phenyl polysiloxane | G48 | | | BPX-70 | | | SP-2330, SP-2331, SP-2380 | AT-Silar | |
| Rt-2560 (p. 57, 69) | bicyanopropyl polysiloxane | | HP-88 | CP Sil 88 | | | | SP-2560 | | |
| Rtx-Wax (p. 58) | 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. 59, 84) | polyethylene glycol | G14, G15, G16, G20, G39 | Innowax | CP Wax 52 CB, VF-WAX MS | | ZB-WAX Plus | | Supelcowax-10 | | |
| Restek PLOT Columns | Phase Composition | USP Nomenclature | Agilent | Varian | SGE | Phenomenex | Macherey-Nagel | Supelco | Alltech | Quadrex |
| Rt-Alumina BOND/Na ₂ SO ₄ (p. 108) MXF-Alumina BOND/Na ₂ SO ₄ | Na ₂ SO ₄ deactivation | | GS-Alumina, HP PLOT S | CP-AL ₂ O ₃ / Na ₂ SO ₄ | | | | AluminaSulfate- PLOT | AT-Alumina | |
| Rt-Alumina BOND/KCl (p. 108, 76) | KCl deactivation | | GS-Alumina/KCl, HP-PLOT Al ₂ O ₃ /KCl | CP-Al ₂ O ₃ /KCl | | | | AluminaChloride -PLOT | | |
| Rt-Alumina BOND/CFC (p. 108, 74) | | | unique column | | | | | | | |
| Rt-Msieve 5A (p. 109) MXT-Msieve 5A | | | GS-Msieve, HP PLOT Molsieve | CP-Molsieve 5A | | | | Molsieve 5A | AT-Molsieve | PLT-5A |
| Rt-Q-BOND (p. 110) MXT-Q-BOND | 100% divinylbenzene | | | CP-PoraPLOT Q, CP-PoraBond Q | | | | Supel-Q-PLOT | AT-Q | |
| Rt-QS-BOND (p. 110) | porous divinyl benzene homopolymer | | GS-Q | | | | | | | |
| Rt-S-BOND (p. 110) MXT-S-BOND | divinylbenzene 4-vinylpyridine | | | CP-PoraPLOT S | | | | | | |
| Rt-U-BOND (p. 110) | divinylbenzene ethylene glycol/dimethylacrylate | | HP-PLOT U | CP-PoraPLOT U, CP-PoraBond U | | | | | | |

*See page 139 for our USP Liquid F

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Columns by Application/Industry

| Restek | Applications | Agilent | Supelco | Macherey-Nagel | SGE | Varian-Chrompack | Phenomenex |
|---|---|-----------------------|--------------------------------|-----------------------------|----------|-----------------------|---------------|
| Specially deactivated phases | | | | | | | |
| Rtx-Volatile Amine (p. 63) | Volatile amines | | | | | CP-VolAmine | |
| Rtx-5Amine (p. 64) | Amines | | | | | CP-Sil 8 CB | |
| Rtx-35Amine (p. 65) | Amines | unique column | | | | | |
| Stabilwax-DB (p. 66) | Amines | CAM | Carbowax Amine | | | CP WAX 51 | |
| Stabilwax-DA (p. 67) | Free fatty acids | HP-FFAP, DB-FFAP | Nukol | Permabond FFAP, Optima FFAP | BP-21 | VF-DA, CP WAX 58 CB | ZB-FFAP |
| Chiral Columns | | | | | | | |
| Rt-βDEXm, Rt-βDEXsm, Rt-βDEXse, Rt-βDEXsp, Rt-βDEXsa, Rt-βDEXcst, Rt-γDEXsa (p. 68) | Chiral compounds | | | | | | |
| Foods, Flavors, & Fragrances | | | | | | | |
| Rt-2560 (p. 69) | cis/ trans FAMEs | HP-88 | SPB-2560 | | | | |
| FAMEWAX (p. 70) | Marine oils | | Omegawax | | | | |
| Rt-CW20M F&F (p. 71) | Flavors & fragrance | HP-20m, CarboWax 20 | | | BP-20M | | |
| Rtx-1 F&F (p. 71) | Flavors & fragrance | | | | | | |
| Rtx-65 TG (p. 72) | Triglycerides | unique column | | | | | |
| Petroleum & Petrochemical | | | | | | | |
| Rt-Alumina BOND/CFC (p. 74) | Chlorinated fluorocarbons (CFCs) | | | | | | |
| Rtx-DHA (p. 75) | Detailed hydrocarbon analysis | HP-PONA, DB-Petro | Petrocol DH | | BP1-PONA | CP Sil PONA CB | |
| Rtx-2887 (p. 77) | Hydrocarbons - ASTM 2887 | DB-2887 | Petrocol 2887, Petrocol EX2887 | | | | |
| MXT-2887 (p. 77) | Hydrocarbons - ASTM 2887 | | | | | | |
| D3606 (p. 128) | Ethanol - ASTM 3606 | unique column | | | | | |
| Rt-TCEP (p. 80) | | | TCEP | | | CP-TCEP | |
| MXT-1HT SimDist (p. 77) | Simulated distillation | DBHT-SimDist | | | | CP-SIMDIST | ZB-1T SimDist |
| MXT-1 SimDist (p. 79) | Simulated distillation | DBHT-SMD | | | | CP-SIMDIST | Ultimet |
| MXT-500 SimDist (p. 79) | Simulated distillation | unique column | | | | | |
| Rtx-Biodiesel TG (p. 81) | Triglycerides in biodiesel | unique column | | | | | |
| MXT-Biodiesel TG (p. 81) | | | | | | | |
| Clinical/Forensic - Blood Alcohol Testing | | | | | | | |
| Rtx-BAC1 (p. 82) | Blood alcohol testing | DB-ALC1 | | | | | ZB-BAC1 |
| Rtx-BAC2 (p. 82) | Blood alcohol testing | DB-ALC2 | | | | | ZB-BAC2 |
| Pharmaceutical | | | | | | | |
| Rtx-G27 w/IntegraGuard (p. 86) | Organic volatile impurities (OVI) - USP 467 | | | | | | |
| Rtx-G43 w/IntegraGuard (p. 86) | Organic volatile impurities (OVI) - USP 467 | | OVI-G43 | | | | |
| Rxi-624Sil MS (p. 83) | Organic volatile impurities (OVI) - USP 467 | HP-624, DB-624 | | | BP-624 | VF-624 | ZB-624 |
| Rtx-5 (G27) (p. 85) | 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 (G16) (p. 84) | Organic volatile impurities (OVI) - USP 467 | Innowax | Supelcowax-10 | | BP-624 | CP Wax 52 CB | ZB-WaxPlus |
| Environmental | | | | | | | |
| Rxi-5Sil MS (p. 87, 95, 97) | Semivolatiles - EPA Methods 8270, 625, 525 | DB-5ms | SLB-5 | Optima-5ms | | VF-5ms | ZB-5ms |
| Rtx-VMS (p. 100) | Volatiles - EPA Methods 8260, 624, 524 | unique column | | | | | |
| Rxi-624Sil MS (p. 103) | Volatiles - EPA Method 624 | DB-624 | | | | VF-624ms | ZB-624 |
| Rtx-502.2 (p. 102) | Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602 | DB-502.2 | VOCOL | | | | |
| Rtx-Volatiles (p. 102) | Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602 | | VOCOL | | | | |
| Rtx-VRX (p. 101) | Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602 | DB-VRX | | | | | |
| Rtx-CLPesticides (p. 88) | Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508 | unique column | | | | | |
| Rtx-CLPesticides2 (p. 88) | Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508 | unique column | | | | | |
| Stx-CLPesticides (p. 90) | Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508 | unique column | | | | | |
| Stx-CLPesticides2 (p. 90) | Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508 | unique column | | | | | |
| Rtx-1614 (p. 92) | Brominated flame retardants | unique column | | | | | |
| Rtx-PCB (p. 93) | Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners | unique column | | | | | |
| Rxi-XLB (p. 94) | Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners | DB-XLB | | | | VF-XMS | MR1 |
| Rtx-OPPesticides (p. 91) | Organophosphorus pesticides - EPA Method 8141 | unique column | | | | | |
| Rtx-OPPesticides2 (p. 91) | Organophosphorus pesticides - EPA Method 8141 | unique column | | | | | |
| Rtx-Dioxin2 (p. 96) | Dioxin & Furans - EPA Methods | unique column | | | | | |
| Rxi-17Sil MS (p. 98) | Polycyclic aromatic hydrocarbons | HP-17, DB-17, DB-17ms | | Optima-17ms | BPX-50 | CP-Sil 24 CB, VF-17ms | ZB-50 |
| Rtx-Mineral Oil (p. 99) | DIN ENISO 9377-2 | | | | | Select Mineral Oil | |



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.

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 a few centimeters 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 2 cm 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 25-30 m column and 10 minutes for a 50-60 m 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 detector connections for leaks, using a Restek Electronic Leak Detector (cat.# 22839).
14. Verify the carrier gas flow is at the rate you intend to use for your analysis. (Use the Restek ProFlow 6000 flowmeter, cat.# 22656, to ensure accurate flow measurement.) 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. The type of detector and column type will determine which compound to inject. 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 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 µm) 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 carrier gas flowing 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

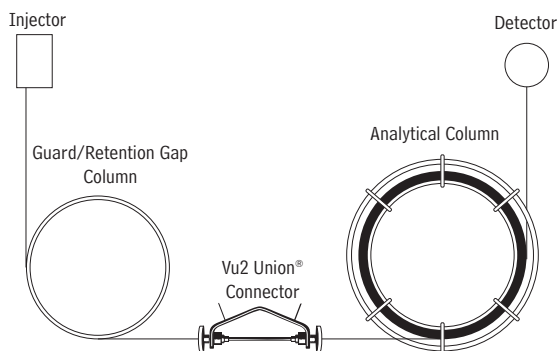
Guard columns and retention gaps are widely used in gas chromatography. The concept of the guard column is to trap nonvolatile material at the head of the column, not allowing the material to reach the analytical column. The concept of the retention gap is to help focus the compounds transferred from 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.

did you know?

We test our guard columns/ transfer lines with a comprehensive test mix to ensure high inertness.



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



please note

For superior inertness, try our Siltek® guard columns!
See page 33 for details.

Having trouble making a leak-free connection? Try our “built in” Integra-Guard® columns!
See page 35 for details.

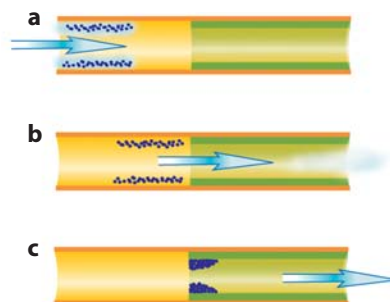
Analyte Focusing

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 split-less 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 forming 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). As the oven temperature is increased, the solvent and target compounds are vaporized and move unretained through the retention gap (Figure 2b). When the target compounds come in contact with the stationary phase, they are refocused in a narrow band (Figure 2c), improving the chromatography.

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 that may leak and to ensure longer column lifetime, use our unique Integra-Guard® Column. See **page 35**.

Connectors for Fused Silica Columns



Vu2 Union® Connector
(See page 289.)



Press-Tight® Connectors
(See pages 287-288.)



MXT® Union Connector Kit
for Fused Silica
(See page 292.)

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 non-volatile material, usually in the first 10-20 cm, 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.

Using guard columns is advantageous, because they prevent contamination that can cause active sites as well as change the conditions of the focusing zone of the analytical column. Another advantage is that the resolution of closely eluting compounds will not be affected when the column is trimmed during maintenance, because the guard column does not contribute to the resolving power of the analytical column. Using guard columns is a simple, cost-effective way to extend analytical column lifetime.

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. However, polar-deactivated guard columns are not resistant to harsh "water vaporization", which 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 solvent beading 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 287 to 292 for information about these connectors.

Fused Silica Guard/Retention Gap Columns

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)

- Tested with a comprehensive 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 a comprehensive 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 a comprehensive 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 |

*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 35**.

also **available****Metal MXT® Guard/Retention Gap Columns**

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 114**.

it's a **fact**

Use guard columns to:

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

did you **know?**

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

best **choice**

Siltek® treated tubing (cat.# 22505, **page 320**) is recommended for purge and trap transfer lines.



also available

Base-deactivated inlet liners

See page 213.

did you know?

We test our guard columns/transfer lines with a comprehensive test mix to ensure high inertness.

also available

Metal MXT® Guard Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 114**.

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, Rtx®-Volatile Amine, and Stabilwax®-DB capillary columns.
- Batch test chromatogram included.
- Maximum temperature: 315 °C.

Chemists using guard columns in the 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, as well as base-deactivated inlet liners, 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 |

Hydroguard® Water-Resistant Guard/Retention Gap Columns/Transfer Lines (fused silica)

- Extend analytical column lifetime by preventing degradation from harsh “steam-cleaning” water injections.
- Tested with a comprehensive test mix, to ensure high inertness.
- 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:

- Headspace analyzers.
- Air analysis equipment and concentrator units.

| 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 |

*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

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.

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.

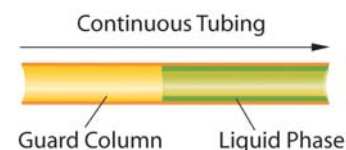
| Description | qty. | cat.# | price |
|---|------|-----------|-------|
| Rtx-1 | | | |
| 30m, 0.25mm ID, 0.25µm Rtx-1 w/5m Integra-Guard Column | ea. | 10123-124 | |
| 30m, 0.53mm ID, 1.00µm Rtx-1 w/5m Integra-Guard Column | ea. | 10155-126 | |
| 30m, 0.53mm ID, 5.00µm Rtx-1 w/5m Integra-Guard Column | 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 | 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 | |
| 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 | |
| 15m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13635-124 | |
| 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 | |
| 30m, 0.32mm ID, 1.00µm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13654-125 | |
| 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 | 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 | |

restek innovation!

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

similar products

DuraGuard, EZ-Guard, Guardian

Integra-Guard® built-in guard column

String indicates where the analytical column begins.



Tag indicates guard column end.

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.

Lower Detection Limits with Ground-Breaking Column Technology

Rxi® technology unifies outstanding inertness, low bleed, and high reproducibility into a single high performance column line. Take variation out of the equation and get the most consistent results for trace level analysis with Rxi® columns.

Visit us at www.restek.com/rxi



Make the Switch to Rxi® columns!

Experience what Rxi®
did for many others

- Lower detection limits
- Better peak shape
- Accurate results

phases available



- Rxi®-1 ms (p. 41)
- Rxi®-1HT (p. 47)
- Rxi®-5ms (p. 41)
- Rxi®-5Sil MS (p. 42)
- Rxi®-5HT (p. 47)
- Rxi®-XLB (p. 44)
- Rxi®-624Sil MS (p. 46)
- Rxi®-35Sil MS (p. 44)
- Rxi®-17 (p. 44)
- Rxi®-17Sil MS (p. 45)
- Rxi® guard/retention gap columns (p. 40)

Rxi 3-IN-1 TECHNOLOGY

Highest Inertness • Lowest Bleed • Exceptional Reproducibility

Lower Detection Limits with Ground-Breaking Column Technology

Rxi® columns deliver more accurate, reliable trace-level results than any other fused silica column on the market. To ensure the highest level of performance, all Rxi® capillary columns are manufactured and individually tested to meet stringent requirements for exceptional inertness, low bleed, and unsurpassed column-to-column reproducibility.

Highest Inertness

Inertness is one of the most difficult attributes to achieve in an analytical column, but it is one of the most critical as it improves peak shape, response, and retention time stability. Rxi® technology produces the most inert columns available, providing:

- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

Increased Signal and Reproducible Retention Times

When capillaries are not sufficiently deactivated, peaks become asymmetric, resulting in reduced signal and unpredictable retention times. As column activity increases, peak tailing becomes more pronounced, reducing peak height and causing retention time to drift (Figure 1). In practice, this means that sensitivity is lost and trace-level analytes cannot be reliably determined. In addition, even compounds at higher concentrations may be misidentified, due to retention time shifting.

A more significant problem for sample analysis is that retention time can vary with analyte concentration if the column is not highly inert. Since the amount of target analyte in samples is unknown, retention times on a poorly deactivated column can easily vary enough to move compounds outside of the retention time window (Figure 2). This can result in inaccurate identifications and the need for manual integration and additional review or analysis before results can be reported. Using inert Rxi® columns ensures that compounds elute with good signal-to-noise ratios at expected retention times, regardless of analyte concentration.

Figure 1 As column activity increases, signal decreases and retention time shifts.

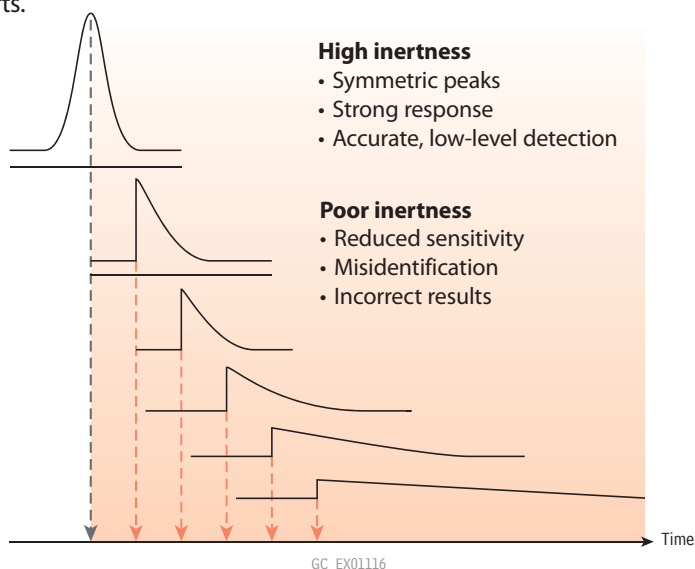
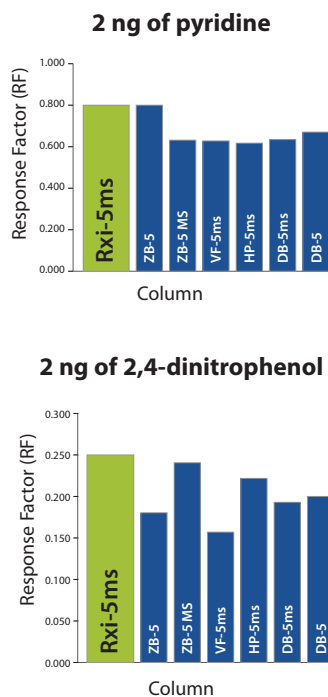
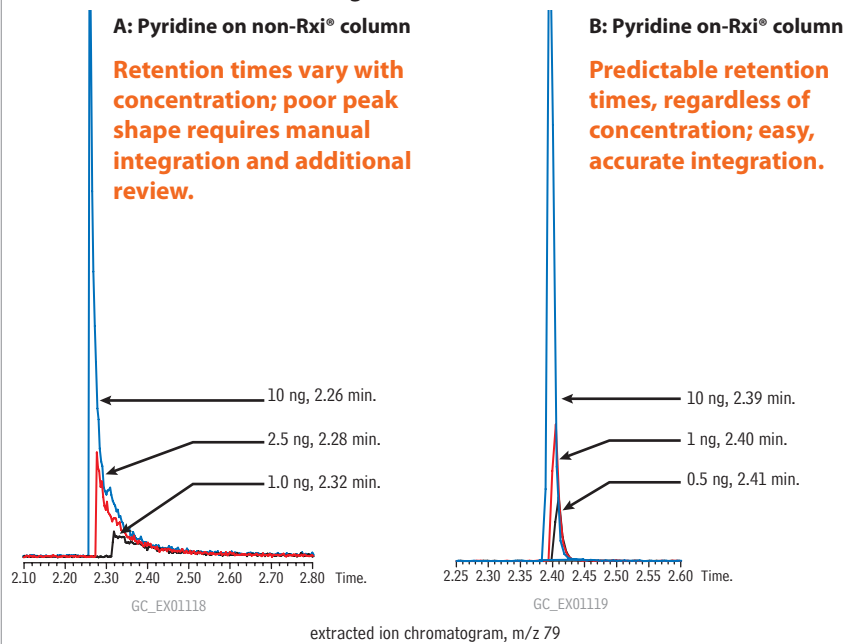


Figure 3 An Rxi®-5ms column gives the highest response for both basic and acidic compounds.



Comparison of 30m x 0.25mm ID, 0.25µm columns.

Figure 2 Analyte levels in samples are unknown; only inert columns, which prevent concentration from affecting retention time, can assure accurate results.



Improved Response for Difficult Compounds

Another reason column inertness is important for trace-level analysis is that many acidic, basic, and polar compounds will tail significantly and become difficult to analyze if the column contains active sites. The remarkable neutrality of Rxi® columns solves this problem and allows a wide range of compounds to be analyzed with high sensitivity, often on a single column. All Rxi® columns are exceptionally inert as demonstrated in Figure 3 by high response factors for both pyridine (basic) and 2,4-dinitrophenol (acidic). Rxi® columns reliably produce highly symmetric peaks and improved responses for difficult compounds, indicating greater inertness than columns produced by other manufacturers (Figure 4).

Innovation & Service

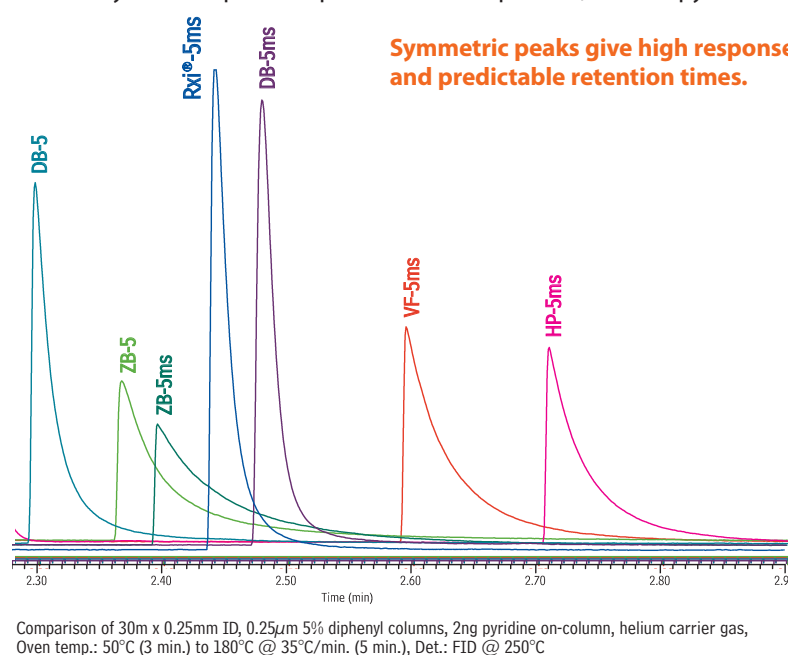
“When my research group needed a GC column for a chiral separation, Restek was the only company that offered to provide us with test columns to evaluate. The willingness of Restek to work with us to find a solution to our separation problem is exceptional.”

Joe Dinnocenzo,
Professor of Chemistry
Director, Center for
Photoinduced Charge Transfer
University of Rochester

How can we help you today?

Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.

Figure 4 Rxi® columns are the most inert columns on the market providing the most symmetric peak shape for basic compounds, such as pyridine.

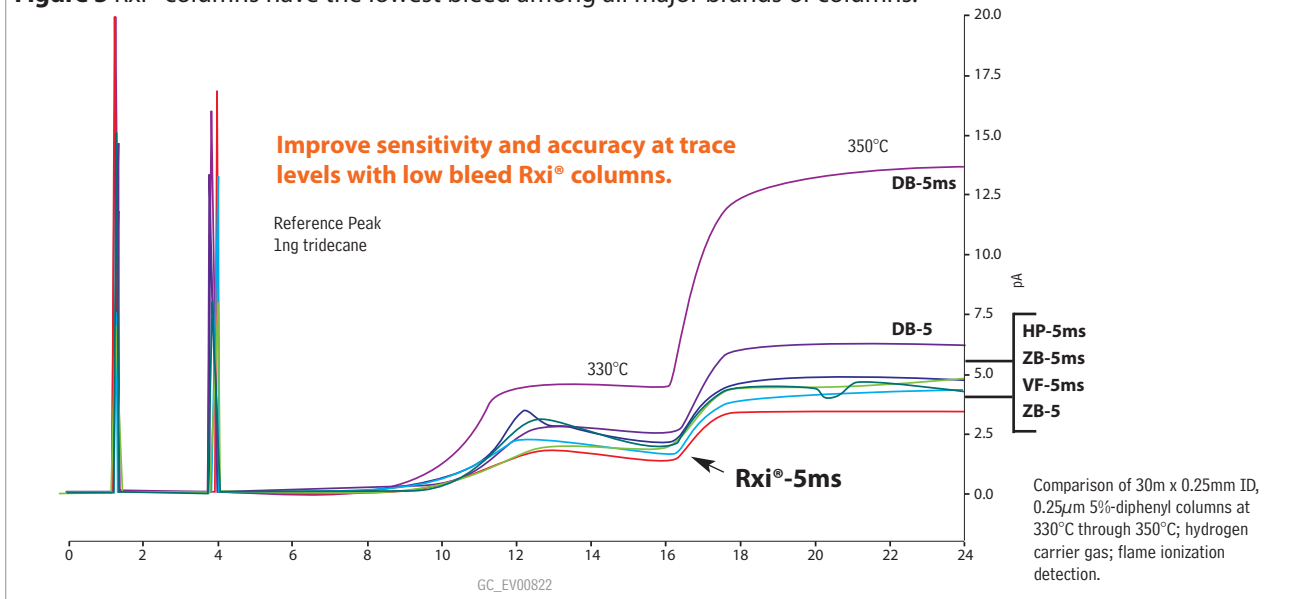


Lowest Bleed

Rxi® columns are more stable at high temperatures than any other manufacturer's column (Figure 5), resulting in higher system sensitivity. This low-bleed characteristic is the result of superior stabilization achieved by optimizing polymer cross-linking and surface deactivation technologies. Benefits of using ultra-low bleed Rxi® columns include:

- Increased sensitivity, for lower detection limits and better matches to mass spectral libraries.
- Faster system stabilization.
- Reduced detector contamination and less downtime for maintenance.

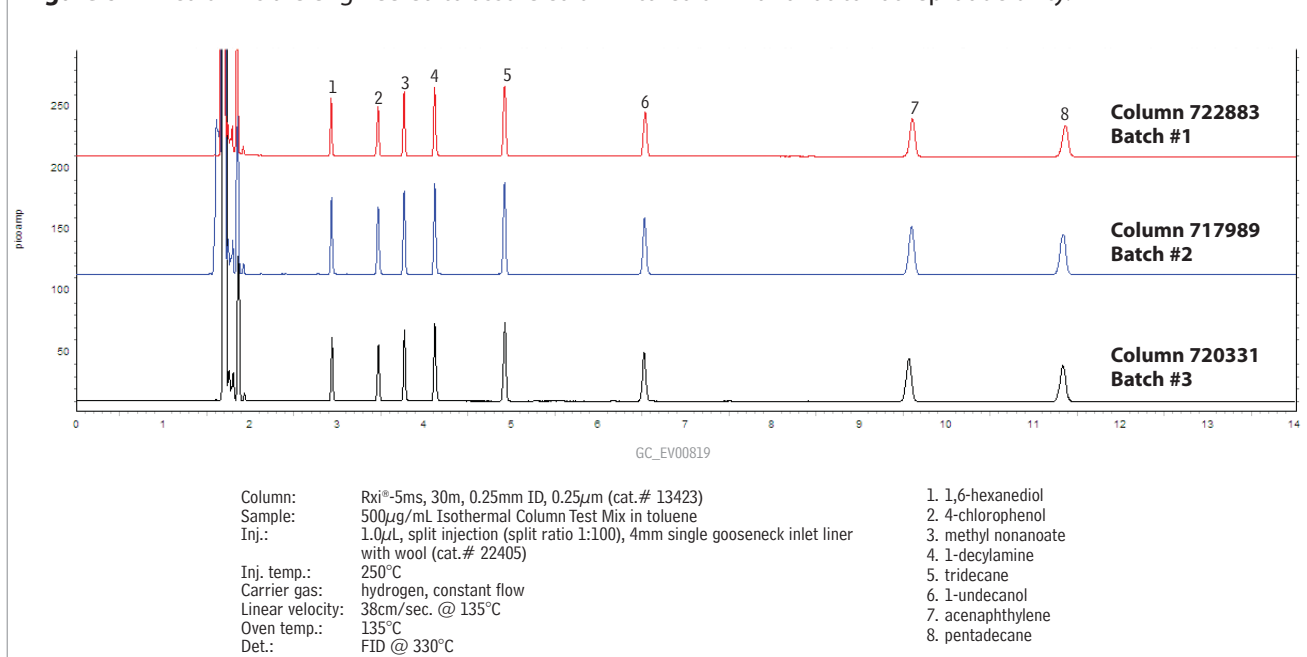
Figure 5 Rxi® columns have the lowest bleed among all major brands of columns.



Exceptional Reproducibility

Chromatographers today need to know that every column they receive is going to perform the same way as the column it replaces. Unmatched manufacturing precision and stringent quality control mean Rxi® columns exceed industry standards, resulting in the best column-to-column reproducibility available as measured by efficiency, retention, bleed, and inertness (Figure 6).

Figure 6 Rxi® columns are engineered to assure column-to-column and lot-to-lot reproducibility.



Column Cross-Reference Table

Rxi® columns produce the same selectivity as competitor columns, but are much more inert, exhibit lower bleed, and offer exceptional reproducibility. For more accurate, reliable trace-level results, choose Rxi® columns.

| POLARITY | non-polar | Restek | Phase Composition | Agilent | Varian/ Chrompack | SGE | Phenomenex | Machery-Nagel | Supelco |
|----------|-----------|---------------|---|--|--|--------|----------------|---|-------------------|
| | | Rxi-1ms | 100% dimethyl polysiloxane | HP-1ms UI, DB-1ms UI, HP-1, HP-1ms, DB-1 DB-1ms, Ultra-1 | VF-1ms CP-Sil 5 CP Sil 5 CB Low Bleed/MS | BP-1 | ZB-1 ZB-1ms | Optima-1 Optima-1ms Optima-1ms Accent | SPB-1 Equity-1 |
| | | Rxi-1HT | 100% dimethyl polysiloxane | DB-1HT | VF-1HT | | ZB-1HT | | |
| | + polar | Rxi-5ms | 5% diphenyl/ 95% dimethyl polysiloxane | HP-5ms UI, HP-5, HP-5ms, DB-5, Ultra-2 | CP-Sil 8 CP Sil 8 CB | BP-5 | ZB-5 ZB-5ms | Optima-5 Optima-5ms | SPB-5 Equity-5 |
| | | Rxi-5Sil MS | 5% phenyl, 95% dimethyl arylene polysiloxane | DB-5ms UI, DB-5ms | VF-5ms CP-Sil 8 CB Low Bleed/MS | BPX-5 | ZB-5ms | Optima-5ms Accent | SLB-5ms |
| | | Rxi-5HT | 5% diphenyl/95% dimethyl polysiloxane | DB-5HT | VF-5HT | | ZB-5HT | | |
| | | Rxi-XLB | arylene/methyl modified polysiloxane | DB-XLB | VF-Xms | | MR1 | Optima-XLB | |
| | | Rxi-624Sil MS | 6% cyanopropylphenyl, 94% dimethyl arylene polysiloxane | DB-624, HP-624 | VF-624ms | BP-624 | ZB-624 | Optima-624 | |
| | | Rxi-35Sil MS | 35% phenyl, 65% dimethyl arylene polysiloxane | DB-35ms | VF-35ms | BP-35 | MR2 | Optima-35ms | |
| | | Rxi-17 | 50% diphenyl/50% dimethyl polysiloxane | HP-17, DB-17, DB-608, HP-50 + | CP-Sil 24 CB | | ZB-50 | Optima-17 | |
| | | Rxi-17Sil MS | 50% phenyl, 50% dimethyl arylene polysiloxane | DB-17ms, HP-17, DB-17 | VF-17ms CP-Sil 24 CB | BPX-50 | ZB-50 | Optima-17ms | |

Visit **www.restek.com/rxi** for detailed comparisons and to learn how exceptional Rxi® inertness, bleed, and reproducibility can improve your data.

Use **Rxi® Guard/Retention Gap Columns** to protect your analytical column and help focus analytes.

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 |

Rxi®-1ms Columns (fused silica)

(nonpolar phase, Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for drugs of abuse, essential oils, hydrocarbons, pesticides, PCB congeners (e.g. Aroclor mixes), sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Tested and guaranteed for 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.

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

| ID | df | temp. limits | 10-Meter | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
|--------|--------|------------------|----------|----------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 13301 | | | | |
| 0.18mm | 0.18µm | -60 to 330/350°C | | | 13302 | | |
| | 0.36µm | -60 to 330/350°C | | | 13311 | | |
| 0.20mm | 0.33µm | -60 to 330/350°C | | 13397 | | 13398 | 13399 |

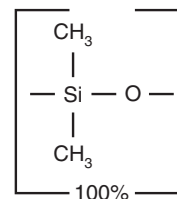
Rxi®-5ms Columns (fused silica)

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

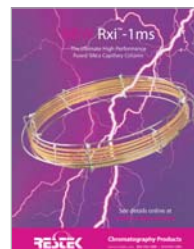
- General purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g. Aroclor mixes), solvent impurities.
- Most inert column on the market.
- Tested and guaranteed for ultra-low bleed—improved signal-to-noise ratio, for better sensitivity and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

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

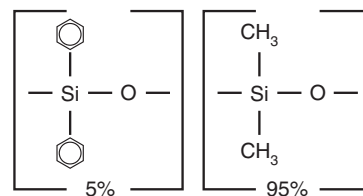
| ID | df | temp. limits | 10-Meter | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
|--------|--------|------------------|----------|----------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 13401 | | | | |
| 0.18mm | 0.18µm | -60 to 330/350°C | | | 13402 | | |
| | 0.30µm | -60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

Rxi®-1ms Structure**similar phases**

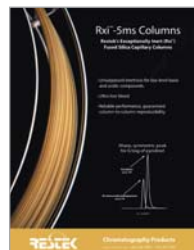
DB-1, DB-1ms, HP-1, HP-1ms, Ultra-1, SPB-1, Equity-1, VF-1ms, CP-Sil 5 CB Low Bleed/MS

free literature**Rxi®-1ms: The Ultimate High Performance Fused Silica Capillary Column**Download your free copy from www.restek.com

lit. cat.# 580075B

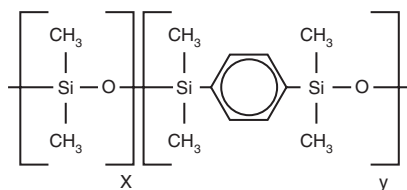
Rxi®-5ms Structure**similar phases**

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

lit. cat.# 580046A

Rxi®-5Sil MS Structure



similar phases

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

Rxi®-5Sil MS Columns (fused silica)

(low polarity Crossbond® silarylene phase; selectivity close to 5% phenyl/
 95% dimethyl arylene 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.

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

| ID | df | temp. limits | 10-Meter | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 43601 | | |
| 0.18mm | 0.10µm | -60 to 320/350°C | | | |
| | 0.18µm | -60 to 330/350°C | | 43602 | 43605 |
| | 0.36µm | -60 to 330/350°C | | 43604 | |

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 | |
| 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 | |
| 15m, 0.25mm ID, 0.50µm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13635-124 | |
| 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 | |
| 30m, 0.32mm ID, 1.00µm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13654-125 | |

free literature

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

lit. cat.# GNFL1061

**Developing New
 Methods for
 Pesticides in Dietary
 Supplements**

lit. cat.# PHAN1242

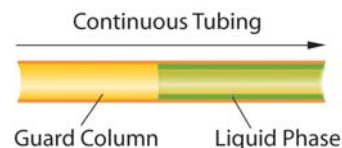
Download your free
 copies from
www.restek.com

**Phases currently available as
 Integra-Guard® columns**

Rtx®-1
 Rtx®-5
 Rtx®-5MS
 Rxi®-5Sil MS
 Rtx®-624
 Rtx®-1301
 Rtx®-1701
 Stabilwax®

See page 35 for
 more information.

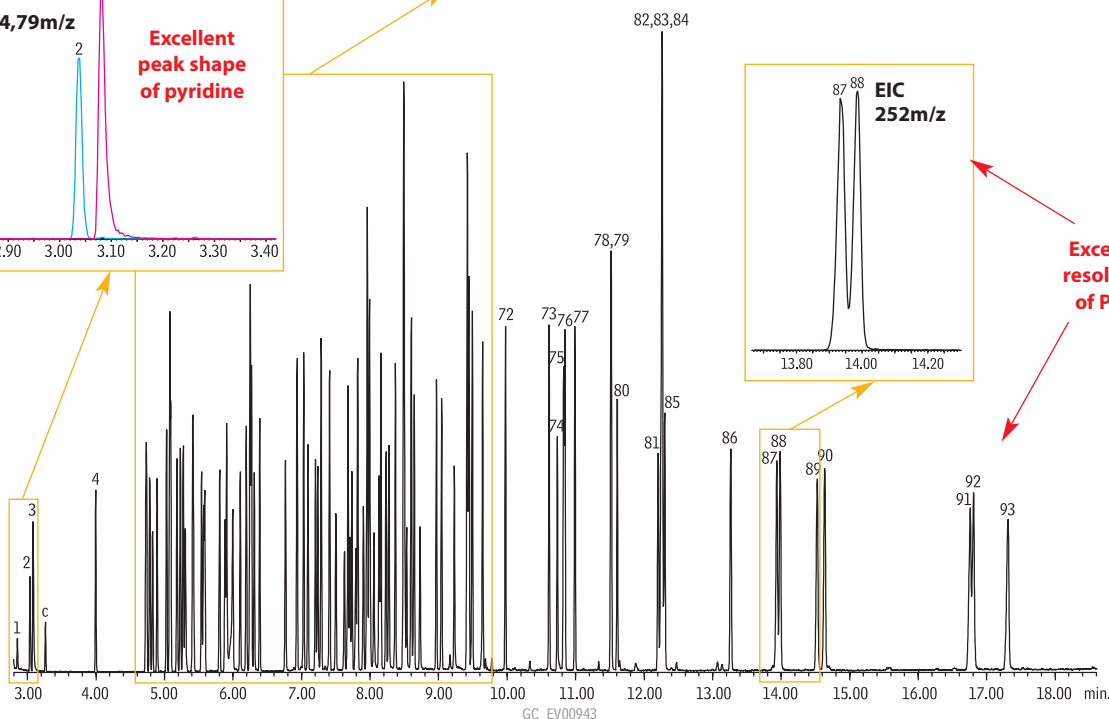
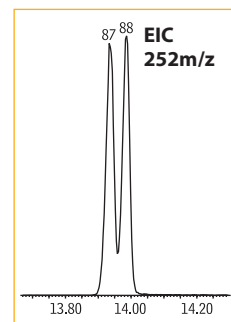
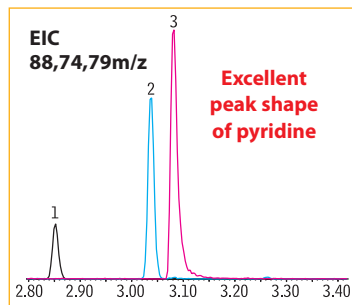
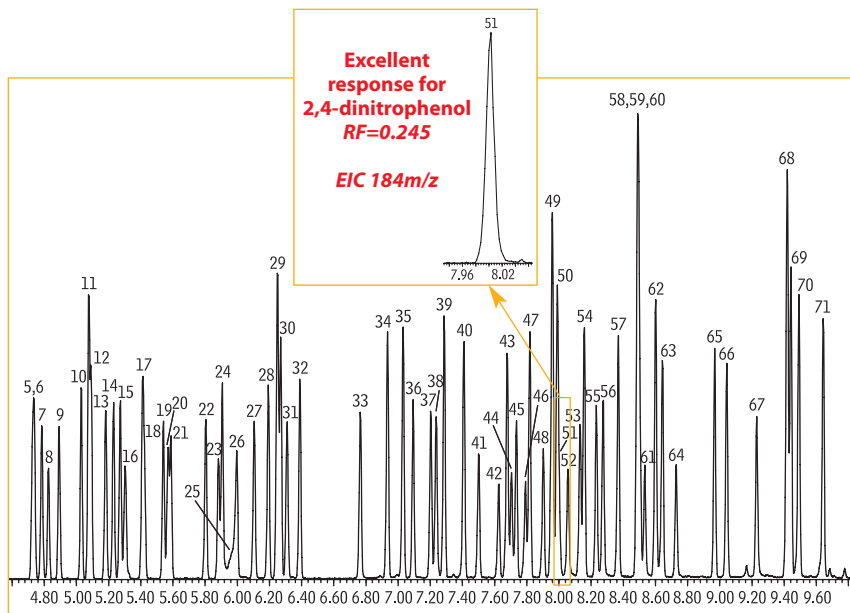
Integra-Guard® built-in guard column



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.

Semivolatile organics for US EPA Method 8270 on an Rxi®-5Si1 MS column.

Column: Rxi®-5Si1 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 | 17. 4-methylphenol/3-methylphenol | 34. 2-methylnaphthalene | 51. 2,4-dinitrophenol | 66. hexachlorobenzene | 83. bis(2-ethylhexyl) phthalate |
| 2. <i>n</i> -nitrosodimethylamine | 18. <i>n</i> -nitroso-di- <i>n</i> -propylamine | 35. 1-methylnaphthalene | 52. 4-nitrophenol | 67. pentachlorophenol | 84. chrysene-d12 (IS) |
| 3. pyridine | 19. hexachloroethane | 36. hexachlorocyclopentadiene | 53. 2,4-dinitrotoluene | 68. phenanthrene-d10 (IS) | 85. chrysene |
| c. toluene | 20. nitrobenzene-d5 (SS) | 37. 2,4,6-trichlorophenol | 54. dibenzofuran | 69. phenanthrene | 86. di- <i>n</i> -octyl phthalate |
| 4. 2-fluorophenol (SS) | 21. nitrobenzene | 38. 2,4,5-trichlorophenol | 55. 2,3,5,6-tetrachlorophenol | 70. anthracene | 87. benzo(b)fluoranthene |
| 5. phenol-d6 (SS) | 22. isophorone | 39. 2-fluorobiphenyl (SS) | 56. 2,3,4,6-tetrachlorophenol | 71. carbazole | 88. benzo(k)fluoranthene |
| 6. phenol | 23. 2-nitrophenol | 40. 2-chloronaphthalene | 57. diethyl phthalate | 72. di- <i>n</i> -butyl phthalate | 89. benzo(a)pyrene |
| 7. aniline | 24. 2,4-dimethylphenol | 41. 2-nitroaniline | 58. 4-chlorophenyl phenyl ether | 73. fluoranthene | 90. perylene-d12 (IS) |
| 8. bis(2-chloroethyl) ether | 25. benzoic acid | 42. 1,4-dinitrobenzene | 59. fluorene | 74. benzidine | 91. indeno(1,2,3-cd)pyrene |
| 9. 2-chlorophenol | 26. bis(2-chloroethoxy)methane | 43. dimethyl phthalate | 60. 4-nitroaniline | 75. pyrene-d10 (SS) | 92. dibenzo(a,h)anthracene |
| 10. 1,3-dichlorobenzene | 27. 2,4-dichlorophenol | 44. 1,3-dinitrobenzene | 61. 4,6-dinitro-2-methylphenol | 76. pyrene | 93. benzo(ghi)perylene |
| 11. 1,4-dichlorobenzene-d4 (IS) | 28. 1,2,4-trichlorobenzene | 45. 2,6-dinitrotoluene | 62. <i>n</i> -nitrosodiphenylamine (diphenylamine) | 77. <i>p</i> -terphenyl-d14 (SS) | |
| 12. 1,4-dichlorobenzene | 29. naphthalene-d8 (IS) | 46. 1,2-dinitrobenzene | 63. 1,2-diphenylhydrazine (as azobenzene) | 78. 3,3'-dimethylbenzidine | |
| 13. benzyl alcohol | 30. naphthalene | 47. acenaphthylene | 64. 2,4,6-tribromophenol (SS) | 79. butyl benzyl phthalate | |
| 14. 1,2-dichlorobenzene | 31. 4-chloroaniline | 48. 3-nitroaniline | 65. 4-bromophenyl phenyl ether | 80. bis(2-ethylhexyl) adipate | |
| 15. 2-methylphenol | 32. hexachlorobutadiene | 49. acenaphthene-d10 (IS) | | 81. 3,3'-dichlorobenzidine | |
| 16. bis(2-chloroisopropyl) ether | 33. 4-chloro-3-methylphenol | 50. acenaphthene | | 82. benzo(a)anthracene | |

c = contaminant

similar phases

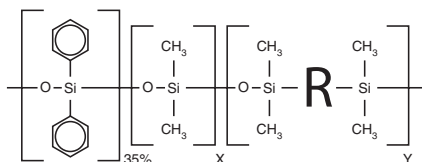
DB-XLB, VF-Xms

i 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.

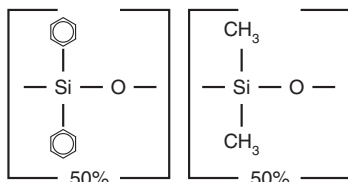
Rxi®-35Si MS Structure



similar phases

DB-35ms, MR2, VF-35ms

Rxi®-17 Structure



similar phases

DB-17, DB-608, CP-Sil 24 CB, HP-50+

Rxi®-XLB Columns (fused silica)

(low polarity proprietary phase)

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

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

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

Rxi®-35Si MS Columns (fused silica)

(midpolarity phase; equivalent to 35% phenyl/65% dimethyl arylene polysiloxane)

- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Very low bleed phase for GC/MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|-----------------|----------|----------|
| 0.25mm | 0.25µm | 50 to 340/360°C | 13820 | 13823 |
| | 0.50µm | 50 to 340/360°C | 13835 | 13838 |
| | 1µm | 50 to 320/340°C | 13850 | 13853 |
| 0.32mm | 0.25µm | 50 to 340/360°C | 13821 | 13824 |
| | 0.50µm | 50 to 340/360°C | 13836 | 13839 |
| | 1µm | 50 to 320/340°C | 13851 | 13854 |
| 0.53mm | 0.50µm | 50 to 320/340°C | 13837 | 13840 |
| | 1µm | 50 to 320/340°C | 13852 | 13855 |



More dimensions are now available!

Rxi®-17 Columns (fused silica)

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

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

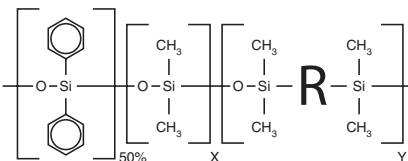
| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|-----------------|----------|----------|
| 0.25mm | 0.25µm | 40 to 280/320°C | 13520 | 13523 |
| | 0.50µm | 40 to 280/320°C | 13535 | 13538 |
| | 1.00µm | 40 to 280/320°C | 13550 | 13553 |
| 0.32mm | 0.25µm | 40 to 280/320°C | 13521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

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

Rxi®-17Si1 MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 50% phenyl/50% dimethyl arylene polysiloxane)

- 340/360 °C upper temperature limits.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP phase G3.
- Low-bleed for use with sensitive detectors, such as MS.
- Excellent separation of EU-PAHs, including fluoranthenes.

NEW!**Rxi®-17Si1 MS Structure**

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|-----------------|----------|----------|----------|
| 0.25mm | 0.25µm | 40 to 340/360°C | 14120 | 14123 | 14126 |
| 0.32mm | 0.25µm | 40 to 340/360°C | 14121 | 14124 | |

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|-----------------|----------|----------|
| 0.10mm | 0.10µm | 40 to 340/360°C | 14101 | |
| 0.18mm | 0.18µm | 40 to 340/360°C | | 14102 |
| | 0.36µm | 40 to 340/360°C | | 14111 |

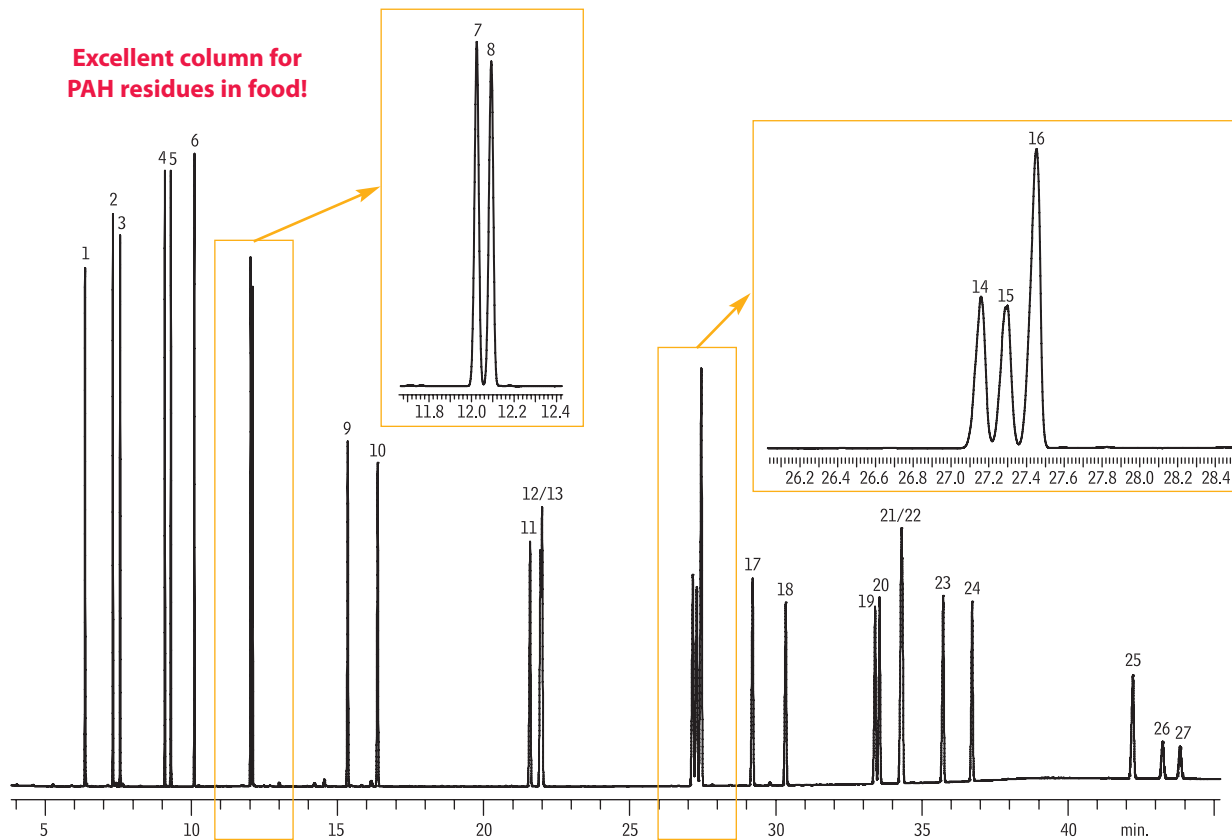
*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

similar phases

DB-17ms, VF-17ms, BPX-50

Polycyclic Aromatic Hydrocarbons on Rxi®-17Si1 MS

**Excellent column for
PAH residues in food!**



GC_EV1160

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene

15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenzo[a,h]acridine
20. Dibenzo[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenzo[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo[a,i]pyrene
27. Dibenzo[a,h]pyrene

**Column
Sample**

Diluent:
Conc.:
Injection
Inj. Vol.:
Liner:
Inj. Temp.:
Purge Flow:
Oven
Oven Temp:
Carrier Gas
Flow Rate:
Detector
Instrument
Acknowledgement

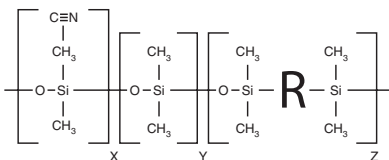
Rxi®-17Si1 MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
SV Calibration Mix #5 / 610 PAH Mix (cat.# 31011)
EPA Method 8310 PAH Mixture (cat.# 31841)
dichloromethane
10 ppm

0.5 µL splitless (hold 1.75 min.)
Auto SYS XL PSS Split/Splitless w/Wool (cat.# 21718)
320 °C
75 mL/min.

65 °C (hold 0.5 min.) to 220 °C at 15 °C/min. to 330 °C at 4 °C/min. (hold 15 min.)
He, constant flow
2.0 mL/min.
FID @ 320 °C
PE Clarus 600 GC
Instrument provided by PerkinElmer



Rxi®-624Si MS Structure



Rxi®-624Si MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/94% dimethyl arylene polysiloxane)

- Low bleed, high thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds, including acidic and basic compounds.
- Selective—highly selective for residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

| ID | df | temp. limits | 20-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.18mm | 1.00µm | -20 to 300/320°C | 13865 | | |
| 0.25mm | 1.40µm | -20 to 300/320°C | | 13868 | |
| 0.32mm | 1.80µm | -20 to 300/320°C | | 13870 | 13872 |
| 0.53mm | 3.00µm | -20 to 280/300°C | | 13871 | |

similar phases

DB-624, HP-624, VF-624, BP-624, ZB-624,
 AT-624, 007-1301, G43R



free literature

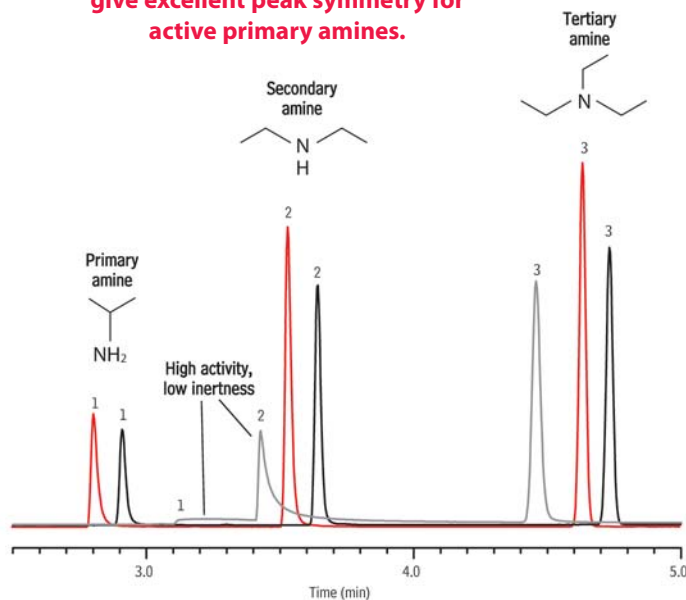
Rxi®-624Si MS: The "Go To" GC Column for Fast, Effective Volatile Impurities Method Development

Download your free copy from www.restek.com

lit. cat.# PHFL1245

Inertness comparison (basic compounds): primary, secondary, and tertiary amines on an Rxi®-624Si MS column.

Highly inert Rxi®-624Si MS columns give excellent peak symmetry for active primary amines.



GC_PH1162

| Peaks | Conc. (µg/mL) |
|-------------------|---------------|
| 1. Isopropylamine | 100 |
| 2. Diethylamine | 100 |
| 3. Triethylamine | 100 |

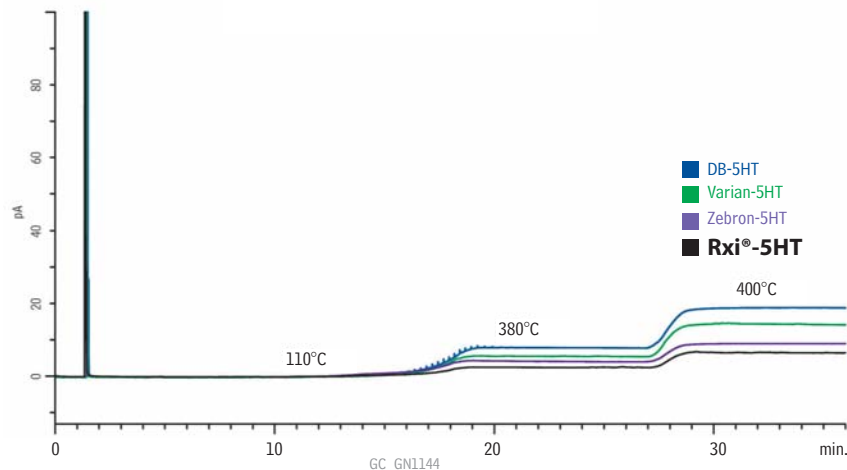
| | |
|--------------------|---|
| Column | Rxi®-624SiMS, 30 m, 0.32 mm ID, 1.8 µm (cat.# 13870) |
| Sample | |
| Diluent: | DMSO |
| Conc.: | 100 µg/mL |
| Injection | |
| Inj. Vol.: | 1 µL split (split ratio 20:1) |
| Liner: | 5mm Single Gooseneck with Wool (cat.# 22973-200.1) |
| Inj. Temp.: | 250 °C |
| Oven | |
| Oven Temp: | 50 °C (hold 1 min.) to 200 °C at 20 °C/min. (hold 5 min.) |
| Carrier Gas | He, constant flow |
| Linear Velocity: | 37 cm/sec. |
| Detector | FID @ 250 °C |
| Instrument | Agilent/HP6890 GC |

NEW!

Looking for an Inert and Low Bleed High Temp Column?

High temperature columns have thin films so they need to be thoroughly deactivated. Restek's Rxi® process offers better inertness and lower bleed than any other manufacturer.

Bleed Profiles of 5HT Columns



Replace DB-5ht, ZB-5HT, and VF-5ht and benefit from better data and lower bleed!

Rxi®-5HT Columns (fused silica)

(low polarity phase; 5% diphenyl/95% dimethyl polysiloxane)

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

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------------|--------------|----------|----------|
| 0.25mm | 0.10 μ m | -60 to 400°C | 13905 | 13908 |
| | 0.25 μ m | -60 to 400°C | | 13923 |
| 0.32mm | 0.10 μ m | -60 to 400°C | 13906 | 13909 |
| | 0.25 μ m | -60 to 400°C | | 13924 |
| 0.53mm | 0.15 μ m | -60 to 400°C | | 13910 |

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

Rxi®-1HT Columns (fused silica)

(100% dimethyl polysiloxane)

- Columns processed for high temperature applications.
- Temperature range: -60 to 400 °C*.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------------|--------------|----------|----------|
| 0.25mm | 0.10 μ m | -60 to 400°C | 13950 | 13951 |
| | 0.25 μ m | -60 to 400°C | | 13952 |
| 0.32mm | 0.10 μ m | -60 to 400°C | 13953 | 13954 |
| | 0.25 μ m | -60 to 400°C | | 13955 |
| 0.53mm | 0.15 μ m | -60 to 400°C | | 13956 |

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

RESTEK

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Importers & Manufacturers
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11/12

www.restek.com

47

General Purpose Columns



Chemically bonded capillary columns

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

Extensive 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:



Rtx®-1, Rtx®-5, Rtx®-5MS, Rtx®-20, Rtx®-35, Rtx®-50, Rtx®-65, Rtx®-440, Rtx®-200, Rtx®-200MS, Rtx®-1301, Rtx®-624, Rtx®-1701, Rtx®-225, Rtx®-2330, Rtx®-Wax, Stabilwax®

visit www.restek.com for complete product listings

Rtx®-1 Columns (fused silica)

(nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for solvent impurities, PCB congeners (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.

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

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

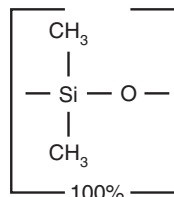
*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

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 | |

Rtx®-1 Structure**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**Metal MXT® Columns**

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 115** for our MXT®-1 columns.

it's a fact

For exceptional inertness, ultra-low bleed, and unsurpassed performance, choose Rxi®-1ms columns! See **pages 36-41**.

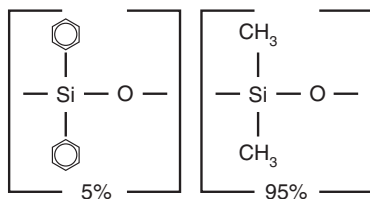
crossbond® technology

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



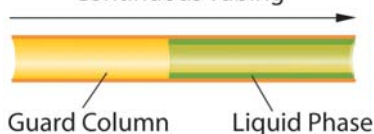
similar phases

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

Continuous Tubing



Get the protection without the connection!

For Rtx®-5 and Rtx®-5MS columns with
built-in Integra-Guard® guard columns,
see **page 35**.

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel
tubing; inertness comparable to fused silica
tubing. See **page 116** for our MXT®-5 columns.

Rtx®-5 Amine Columns

See **page 64**.

Rtx®-5/Rtx®-5MS (fused silica)

- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (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)

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

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

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

| 30-meter | 6-pack cat.# | 6-pack price | price if bought separately | savings of |
|-------------------|--------------|--------------|----------------------------|------------|
| 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 | | | |

*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)

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

Column specifically tested for low bleed performance.

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

**Six columns
for the price
of five!**

Other phases and
configurations
available on request.

it's a fact

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

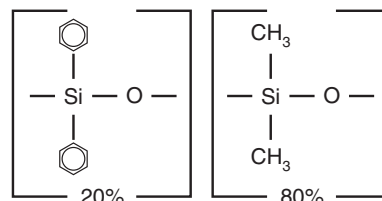
Rtx®-20 Columns (fused silica)

(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 monomodal distribution and extremely low bleed.

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

Rtx®-20 Structuresimilar **phase**

SPB-20, AT-20, 007-7

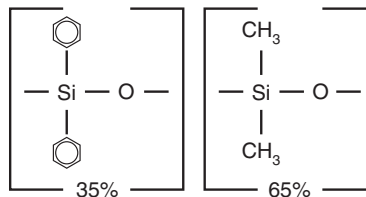
Rtx®-35 Columns (fused silica)

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

- General purpose columns for organochlorine pesticides, PCB congeners (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.

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

Rtx®-35 Structuresimilar **phases**

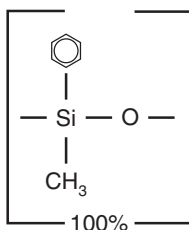
DB-35, HP-35, SPB-35, SPB-608

also **available****Metal MXT® Columns**

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 116** for our MXT®-20 columns and **page 117** for our MXT®-35 columns.

Rtx®-35 Amine ColumnsSee **page 65**.

Rtx®-50 Structure



similar phases

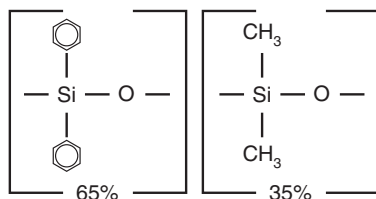
HP-50, SPB-50, SP-2250

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 117** for our MXT®-50 columns.

Rtx®-65 Structure



similar phases

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

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 117** for our MXT®-65 columns.

Rtx®-50 Columns (fused silica)

(midpolarity phase; Crossbond® 50% phenyl/50% methyl 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.

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

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

Rtx®-65 Columns (fused silica)

(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.

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

also available

Rtx®-65TG Columns

Tested specifically for triglycerides.
See **page 72**.

crossbond® technology

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

Rtx®-440 Columns (fused silica)

(midpolarity proprietary Crossbond® phase)

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

restek **innovation!**

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

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

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

Column: Rtx®-440 30m, 0.32mm 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
 Diallylate (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

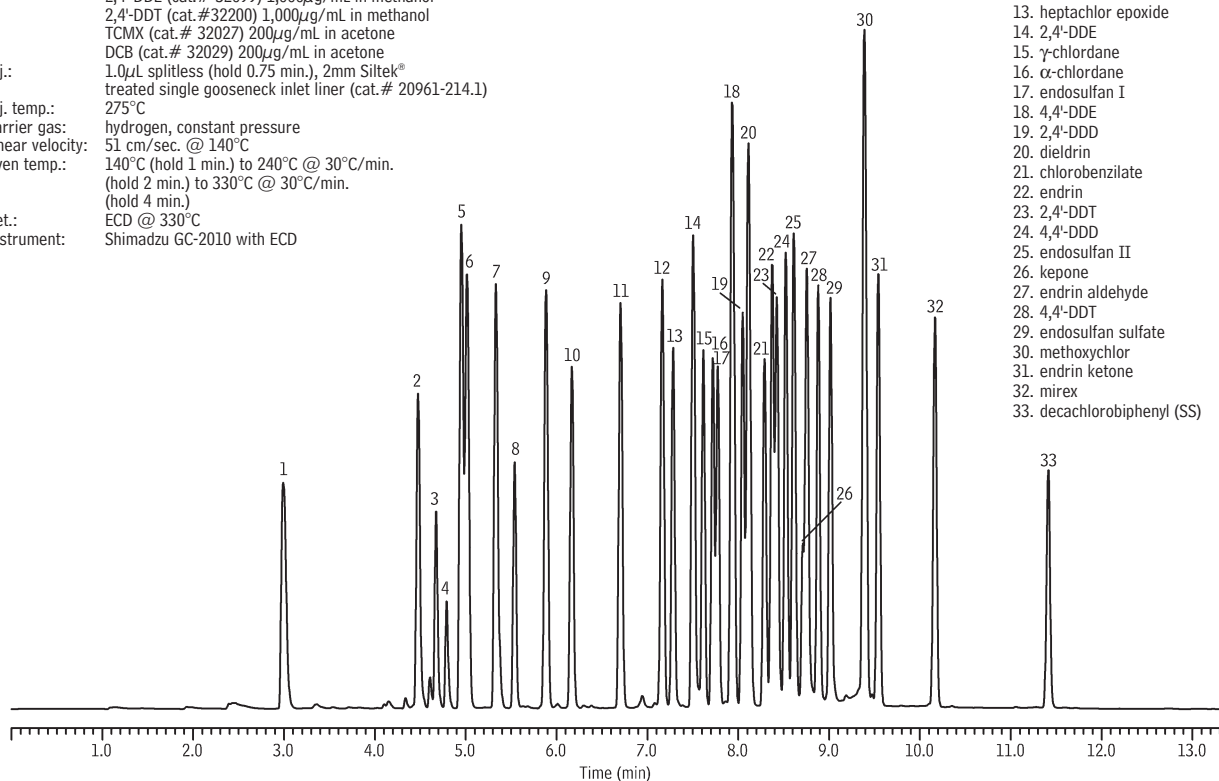
Linear velocity: 51 cm/sec. @ 140°C

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

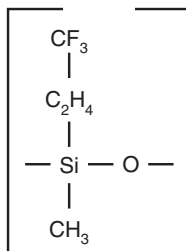
Instrument: Shimadzu GC-2010 with ECD

1. hexachlorocyclopentadiene
2. 2,4,5,6-tetrachloro-m-xylene (SS)
3. *cis*-diallylate
4. *trans*-diallylate
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)



GC_EV00796

Rtx®-200 Structure



similar phases

DB-200, DB-210, VF-200ms

Rtx®-200/Rtx®-200MS (fused silica)

- 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)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

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

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

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 118** for our MXT®-200 columns.

Rtx®-200MS—Low-bleed GC/MS Columns (fused silica)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

Column specifically tested for low bleed performance.

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

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

(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 cyanosiloxane bonded stationary phase available, with no other column manufacturer providing lower bleed, longer life-time, 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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter | 75-Meter | 105-Meter |
|--------|--------|---------------|----------|----------|----------|----------|-------------|
| 0.25mm | 0.25µm | -20 to 280°C | 16020 | 16023 | \$450 | 16026 | |
| | 0.50µm | -20 to 270°C | 16035 | 16038 | \$450 | 16041 | |
| | 1.00µm | -20 to 260°C | 16050 | 16053 | \$450 | 16056 | |
| | 1.40µm | -20 to 240°C | | | | 16016 | |
| 0.32mm | 0.25µm | -20 to 280°C | 16021 | 16024 | \$480 | 16027 | |
| | 0.50µm | -20 to 270°C | 16036 | 16039 | \$480 | 16042 | |
| | 1.00µm | -20 to 260°C | 16051 | 16054 | \$480 | 16057 | |
| | 1.50µm | -20 to 250°C | 16066 | 16069 | \$480 | 16072 | |
| | 1.80µm | -20 to 240°C | | 16092 | \$480 | 16093 | |
| 0.53mm | 0.25µm | -20 to 280°C | 16022 | 16025 | \$540 | 16028 | |
| | 0.50µm | -20 to 270°C | 16037 | 16040 | \$540 | 16043 | |
| | 1.00µm | -20 to 260°C | 16052 | 16055 | \$540 | 16058 | |
| | 1.50µm | -20 to 250°C | 16067 | 16070 | \$540 | 16073 | |
| | 3.00µm | -20 to 240°C | 16082 | 16085 | \$540 | 16088 | 16076 16091 |

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

please note

Rtx®-1301 columns and Rtx®-624 columns are exactly the same columns.

Rtx®-624 Columns (fused silica)

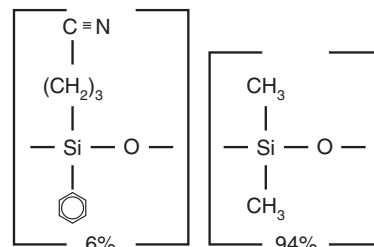
(low to midpolarity phase; Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane)

- 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.

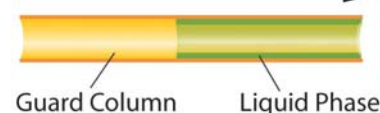
The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first 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.

| ID | df | temp. limits | 30-Meter | 60-Meter | 75-Meter | 105-Meter |
|--------|--------|--------------|----------|----------|----------|-----------|
| 0.25mm | 1.40µm | -20 to 240°C | 10968 | 10969 | | |
| 0.32mm | 1.80µm | -20 to 240°C | 10970 | 10972 | | |
| 0.45mm | 2.55µm | -20 to 240°C | | | 10982 | |
| 0.53mm | 3.00µm | -20 to 240°C | 10971 | 10973 | 10974 | 10975 |

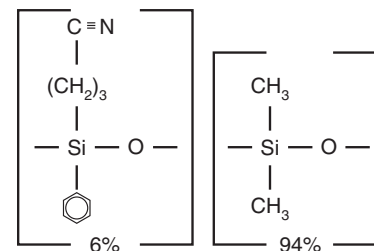
| ID | df | temp. limits | 20-Meter | 40-Meter |
|--------|--------|--------------|----------|----------|
| 0.18mm | 1.00µm | -20 to 240°C | 40924 | 40925 |

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

Integra-Guard® built-in guard column
Continuous Tubing**Get the protection without the connection!**

For Rtx®-1301 and Rtx®-624 columns with built-in Integra-Guard® guard columns, see **page 35**.

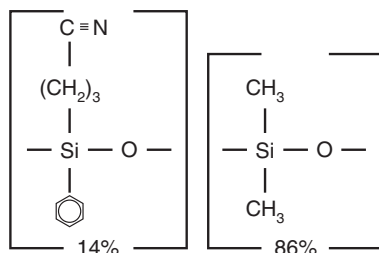
Rtx®-624 Structure**similar phases**

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

also available**Metal MXT® Columns**

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 117** for our MXT®-1301 columns and **page 121** for our MXT®-624 columns.

Rtx®-1701 Structure

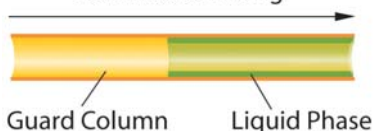


similar phases

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

Integra-Guard® built-in guard column

Continuous Tubing



Get the protection without the connection!

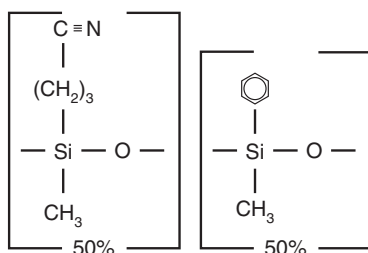
For Rtx®-1701 columns with built-in
Integra-Guard® guard columns,
see **page 35**.

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel
tubing; inertness comparable to fused silica
tubing. See **page 118** for our MXT®-1701
columns.

Rtx®-225 Structure



similar phases

DB-225, HP-225, SPB-225, CP-Sil 43 CB

Rtx®-1701 Columns (fused silica)

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

- General purpose columns for alcohols, oxygenates, PCB congeners (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.

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

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

Rtx®-225 Columns (fused silica)

(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.

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

Rt®-2330 Columns (fused silica)

(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 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.

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

| ID | df | temp. limits | 10-Meter | 20-Meter | 40-Meter |
|--------|--------|----------------|----------|----------|----------|
| 0.18mm | 0.10µm | 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.

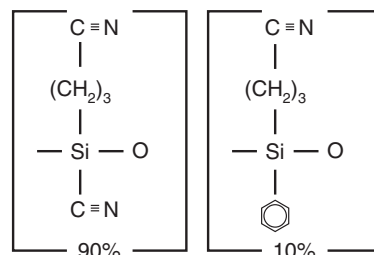
Rt®-2560 Column (fused silica)

(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.

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

Rt®-2330 Structure**similar phases**

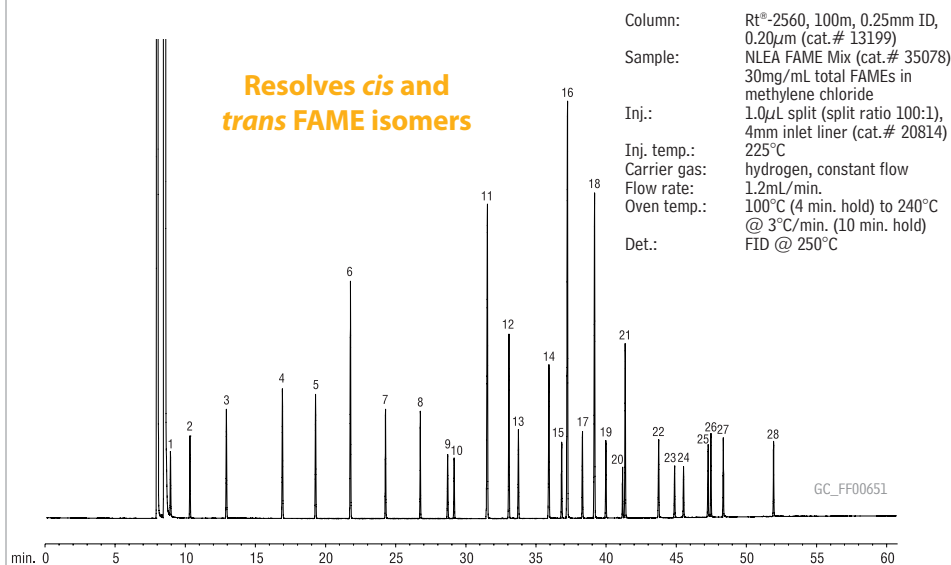
DB-23, HP-23, SP-2330, SP-2380

Doing Dioxin Analysis?

Rtx®-Dioxin2 columns provide better resolution and higher maximum temperatures than conventional columns. See **page 96**.

similar phases

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

NLEA FAMES resolved on an Rt®-2560 column.

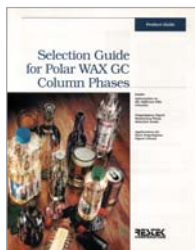
Column: Rt®-2560, 100m, 0.25mm ID, 0.20µm (cat.# 13199)
 Sample: NLEA FAME Mix (cat.# 35078), 30mg/mL total FAMES in methylene chloride
 Inj.: 1.0µL split (split ratio 100:1), 4mm inlet liner (cat.# 20814)
 Inj. temp.: 225°C
 Carrier gas: hydrogen, constant flow
 Flow rate: 1.2mL/min.
 Oven temp.: 100°C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

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similar phases

DB-WAX, HP-Wax

Rtx®-Wax Columns (fused silica)

(polar phase; Crossbond® Carbowax® polyethylene glycol)

- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Temperature range: 20 °C to 250 °C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

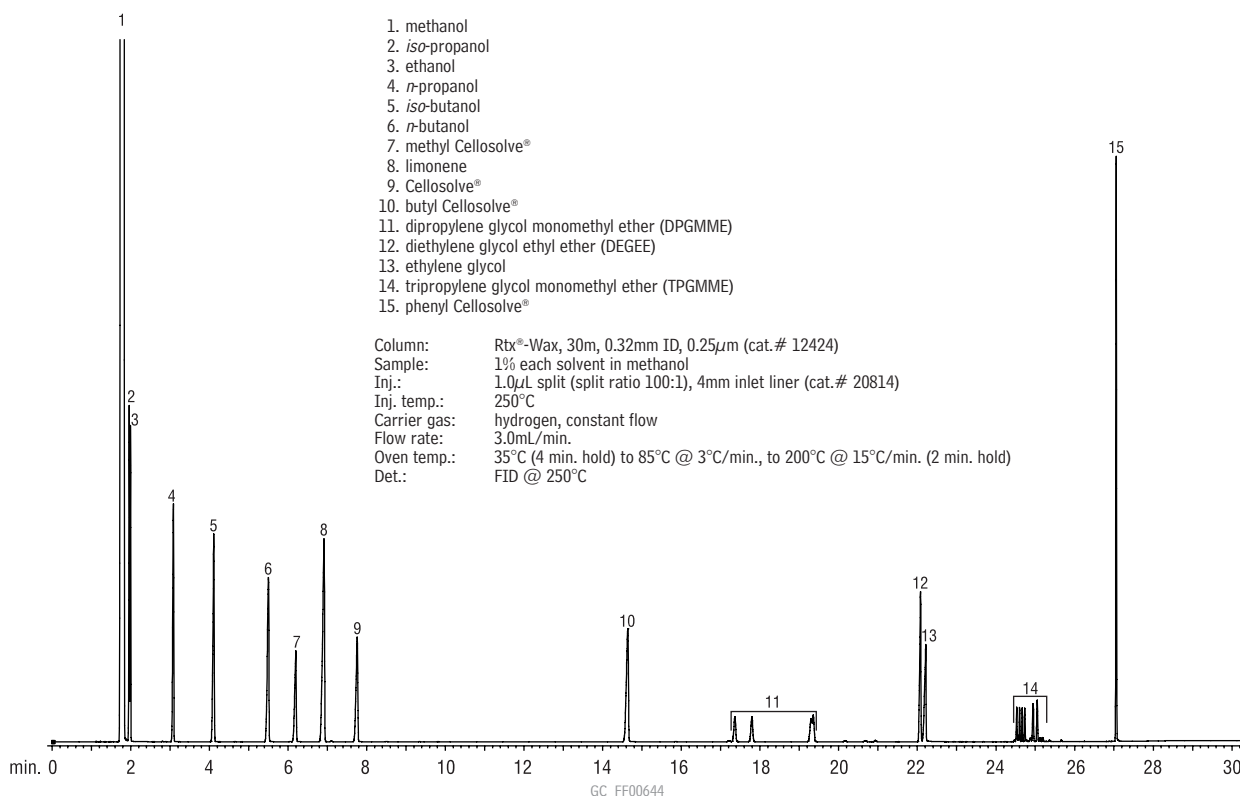
Rtx®-Wax columns are the most inert and efficient PEG columns currently available. The extended operating temperature range allows analysis of compounds having a wide volatility range, and ensures low bleed at temperatures as high as 250 °C. Selectivity is comparable to other Carbowax® columns, for compounds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

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

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|-----------------|----------|----------|
| 0.10mm | 0.10µm | 20 to 250°C | 41601 | 41602 |
| | 0.20µm | 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.

Cleaning solvents on an Rtx®-Wax column.



Stabilwax® Columns (fused silica)

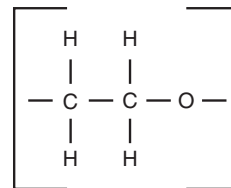
(polar phase; Crossbond® Carbowax® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest bleed PEG column on the market; long column lifetimes are assured
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing. Stabilwax® columns are used for a wide range of compounds and matrices including: FAMES, flavor compounds, essential oils, solvents, aromatics including xylene isomers, acrolein/acrylonitrile (EPA 603), and oxygenated compounds. Also used for purity testing of chemicals and analyzing impurities in water matrices and alcoholic beverages.

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

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

Stabilwax® Structure**manufacturing procedure**

Better column-to-column reproducibility

similar phases

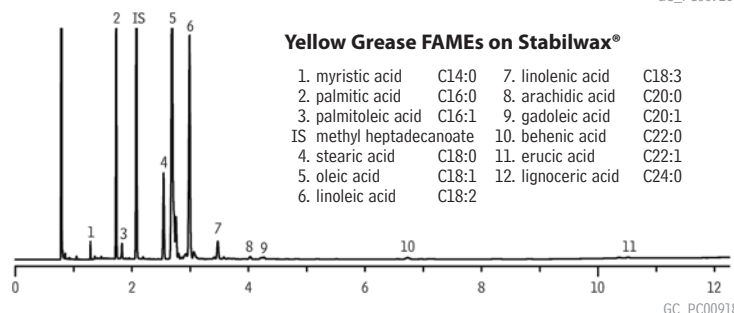
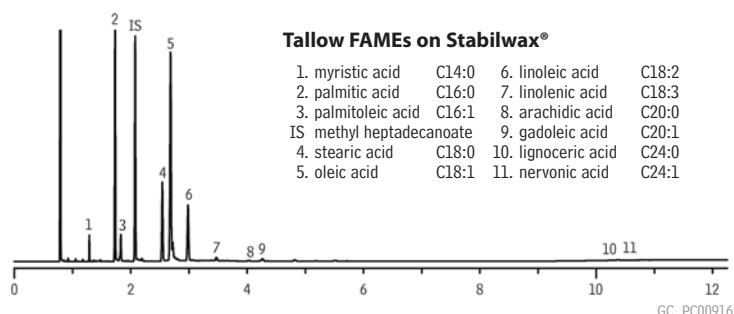
DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10, CP-Wax 52 CB

Six columns for the price of five!

Call 800-356-1688, ext. 4, or your Restek representative for details!

also available**Metal MXT® Columns**

Rugged, flexible, Silcosteel® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 118** for our MXT®-WAX columns.

FAMES in biodiesel oils on a Stabilwax® column.

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

See page 646 for Soy FAMES and Rapeseed FAMES analysis.



Fast GC Using 0.10 mm and 0.15 mm ID Capillary Columns

- Significantly reduces analysis time without sacrificing resolution.
- Higher column efficiencies speed up separations.
- Ideal for GC/MS.
- Excellent for comprehensive GC (GCxGC) as second dimension column.

Narrow bore (less than or equal to 0.15 mm 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. Therefore, resolution can be achieved with a shorter column, which decreases analysis time. In addition, narrow bore columns are more compatible with GC/MS since typical flow rates are 1.0 mL/min. or less, eliminating the need to split the column flow at the MS interface. Conventional methods are easily converted to narrow bore columns, but some research may be necessary due to lower column capacities and higher back pressures.

Rxi®-1ms Columns for Fast GC (fused silica)

(nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 13301 | |
| 0.15mm | 0.15µm | -60 to 330/350°C | 43800 | 43801 |
| | 2.0µm | -60 to 330/350°C | | 43802 |

Rxi®-5ms Columns for Fast GC (fused silica)

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

| ID | df | temp. limits | 10-Meter |
|--------|--------|------------------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 13401 |

Rxi®-5Sil MS Columns for Fast GC (fused silica)

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

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|-------------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 43601 | |
| 0.15mm | 0.15µm | -60 to 330/350°C | 43815 | \$295 43816 |
| | 2.0µm | -60 to 330/350°C | | 43817 |

Rxi®-17 Columns for Fast GC (fused silica)

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

| ID | df | temp. limits | 10-Meter |
|--------|--------|-----------------|----------|
| 0.10mm | 0.10µm | 40 to 280/320°C | 13501 |

Rxi®-17Sil MS Columns for Fast GC (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 50% phenyl methyl polysiloxane)

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|-----------------|----------|----------|
| 0.15mm | 0.15µm | 40 to 340/360°C | 43820 | 43821 |

Rtx®-200 Columns for Fast GC (fused silica)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|----------|
| 0.15mm | 0.15µm | -20 to 320/340°C | 43835 | 43836 |

Stabilwax® Columns for Fast GC (fused silica)

(polar phase; Crossbond® Carbowax® polyethylene glycol)

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|-----------------|----------|----------|
| 0.10mm | 0.10µm | 40 to 250/260°C | 42601 | |
| 0.15mm | 0.15µm | 40 to 250/260°C | 43830 | 43831 |

Rtx®-LC50 Columns for Fast GC (fused silica)

(polar, dimethyl [50% liquid crystal] polysiloxane)

| ID | df | temp. limits | 10-Meter |
|--------|--------|----------------|----------|
| 0.10mm | 0.10µm | 100°C to 270°C | 19736 |

Rtx®-CLPesticides for Fast GC (fused silica)

(proprietary Crossbond® phase)

| ID | df | temp. limits | 10-Meter |
|--------|--------|------------------|----------|
| 0.10mm | 0.10µm | -60 to 310/330°C | 43101 |

Rtx®-CLPesticides2 for Fast GC (fused silica)

(proprietary Crossbond® phase)

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|----------|
| 0.10mm | 0.10µm | -60 to 310/330°C | 43301 | 43302 |



Operating considerations for 0.10 mm ID columns

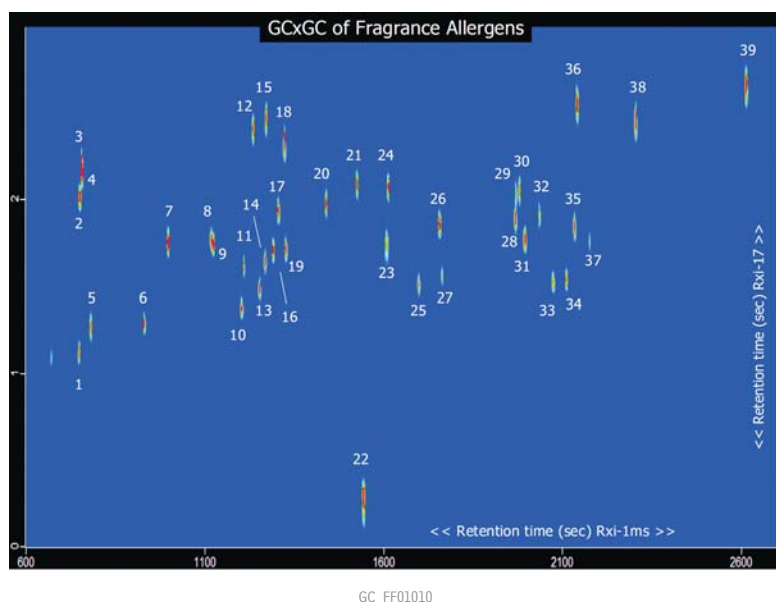
The small degree of extra care involved in using 0.10 mm ID columns will be more than repaid by faster analyses and higher column efficiencies. 0.10 mm ID columns require higher operating pressures (>40 psig), which can result in more ferrule leaks, septum leaks, and sample flashback through leaking syringe plungers. Connections must be monitored and leak-checked more often. Operating a 0.10 mm 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.

GCxGC Second Dimension Selectivity Kit

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

- Rxi®-17, 50% diphenyl dimethylpolysiloxane
- Rtx®-CLPesticides, trifluoropropyl containing polymer
- Stabilwax®, polar polyethylene glycol
- Rt®-LC350, liquid crystalline phase selective for aromatic compounds

| Description | qty. | cat.# | price |
|--|------|-------|-------|
| GCxGC Second Dimension Selectivity Kit | 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)

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

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

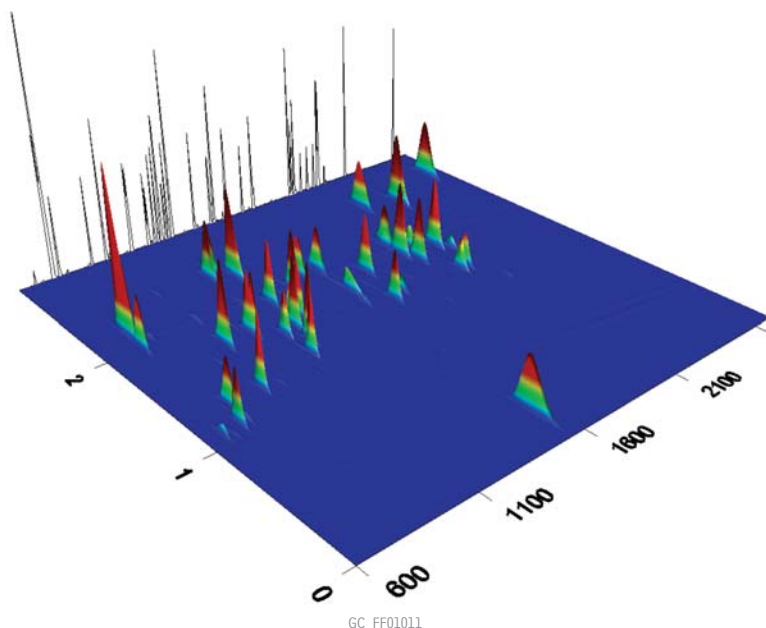
Carrier gas: helium, corrected constant flow via pressure ramps

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



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
- Petroleum & Petrochemical
- Clinical, Forensic & Toxicology
- Pharmaceutical
- Environmental

Unique stationary phases and applications

- Designed to help solve chromatographic challenges.
- Optimized stationary phases for best separations, accurate quantification, and best choice for shorter analysis times.



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11/12

Basic Compounds Analysis

Rtx®-Volatile Amine Columns (fused silica)

- Unique selectivity for baseline resolution of all volatile amines.
- Excellent inertness assures accuracy and sensitivity for volatile amines, including free ammonia.
- Highly robust phase withstands repeated water injections, resulting in longer column lifetime.
- High temperature stability (290 °C) ensures elution of amines up to C16 and allows contaminants to be removed by “baking out” the column.

The Rtx®-Volatile Amine column was designed specifically for analyzing volatile amines in difficult matrices, such as water. The unique base deactivation creates an exceptionally inert surface for these sensitive compounds, resulting in highly symmetric peaks which allow low detection limits. The stable bonded phase yields a column that is not only retentive and highly selective for these compounds, but is also very robust and able to withstand repeated water injections. Comparisons made by customers performing routine volatile amine applications have shown the Rtx®-Volatile Amine column outperforms other amine-specific columns, especially for peak shape and lifetime. Each Rtx®-Volatile Amine column is held to stringent quality specifications and tested with a specially designed test mix that includes basic compounds to ensure exceptional inertness, reliability, and reproducibility. These qualities assure consistent performance and make the Rtx®-Volatile Amine column the best choice for volatile amines analysis.

| ID | temp. limits | 15-Meter | 30-Meter | 60-Meter |
|--------|--------------|----------|----------|----------|
| 0.32mm | -60 to 290°C | 18076 | 18077 | 18078 |



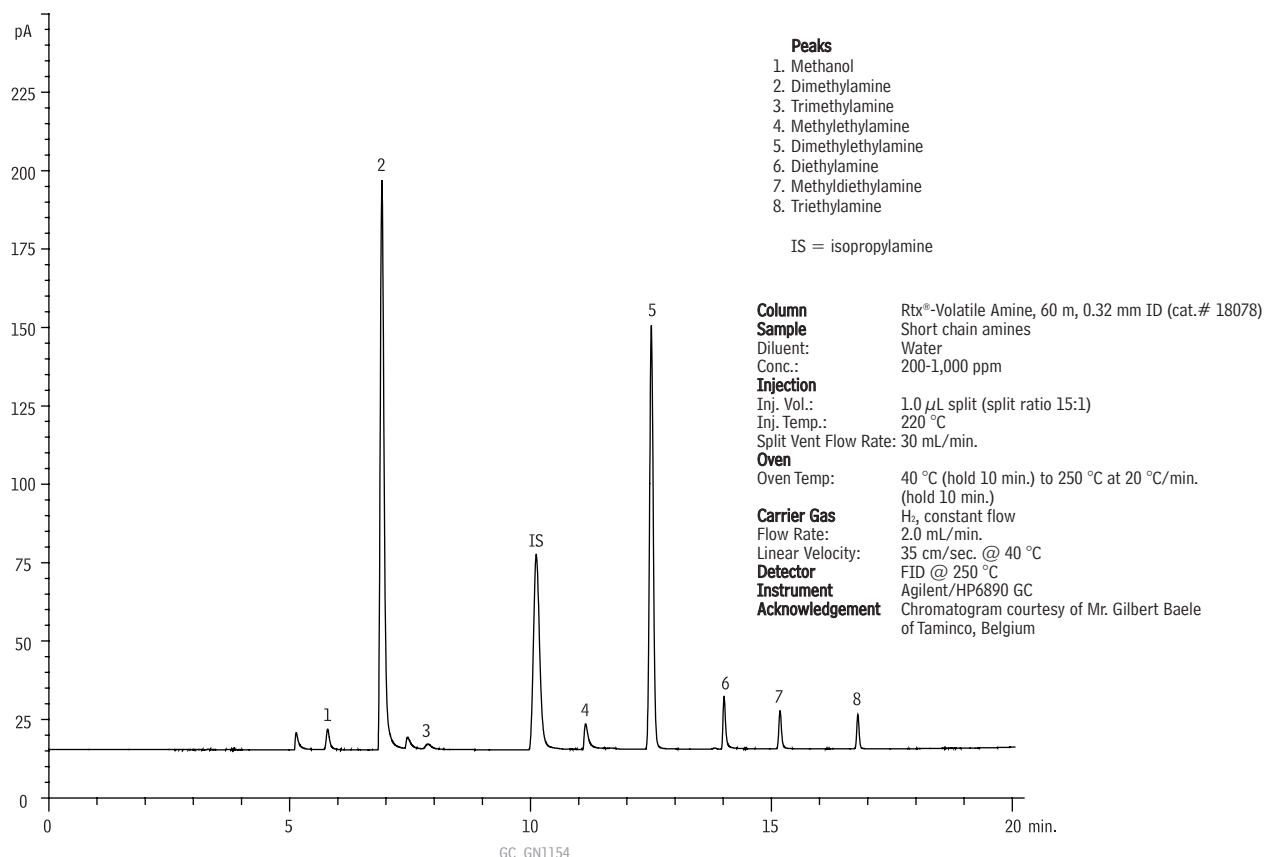
similar phases

Direct replacement for CP-Volamine, thick-film CP-Sil 8 for amines, and other amine-deactivated columns coated with low polarity polysiloxane phases.

please note

We recommend using base-deactivated fused silica guard columns (**page 34**) and base-deactivated liners (**page 213**) with Rtx®-Volatile Amine columns.

Short chain amines in water on an Rtx®-Volatile Amine column.





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innovation!

similar phase

PTA-5, CP-Sil CB

also available

See **page 65** for Rtx®-35 Amine columns.

please note

We recommend using base-deactivated fused silica guard columns (**page 34**) and base-deactivated liners (**page 213**) with Rtx®-5 Amine columns.

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

www.restek.com/chromatograms



Basic Compounds Analysis

Rtx®-5 Amine Columns (fused silica)

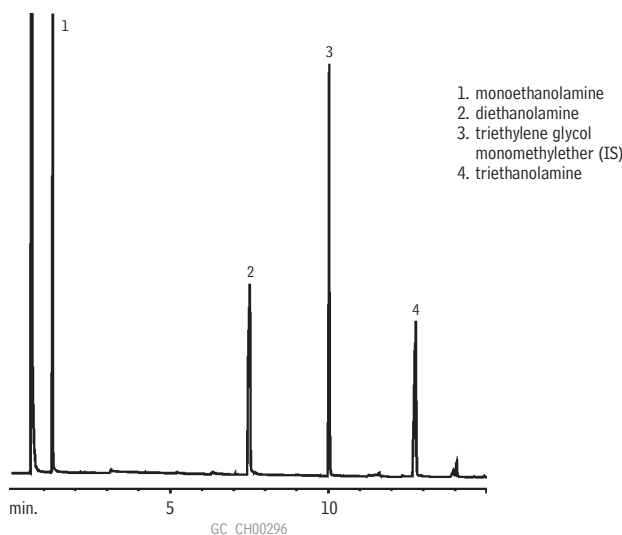
(low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- 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.

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

Ethanolamines on an Rtx®-5 Amine column.



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

Basic Compounds Analysis

Rtx®-35 Amine Columns (fused silica)

(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.

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

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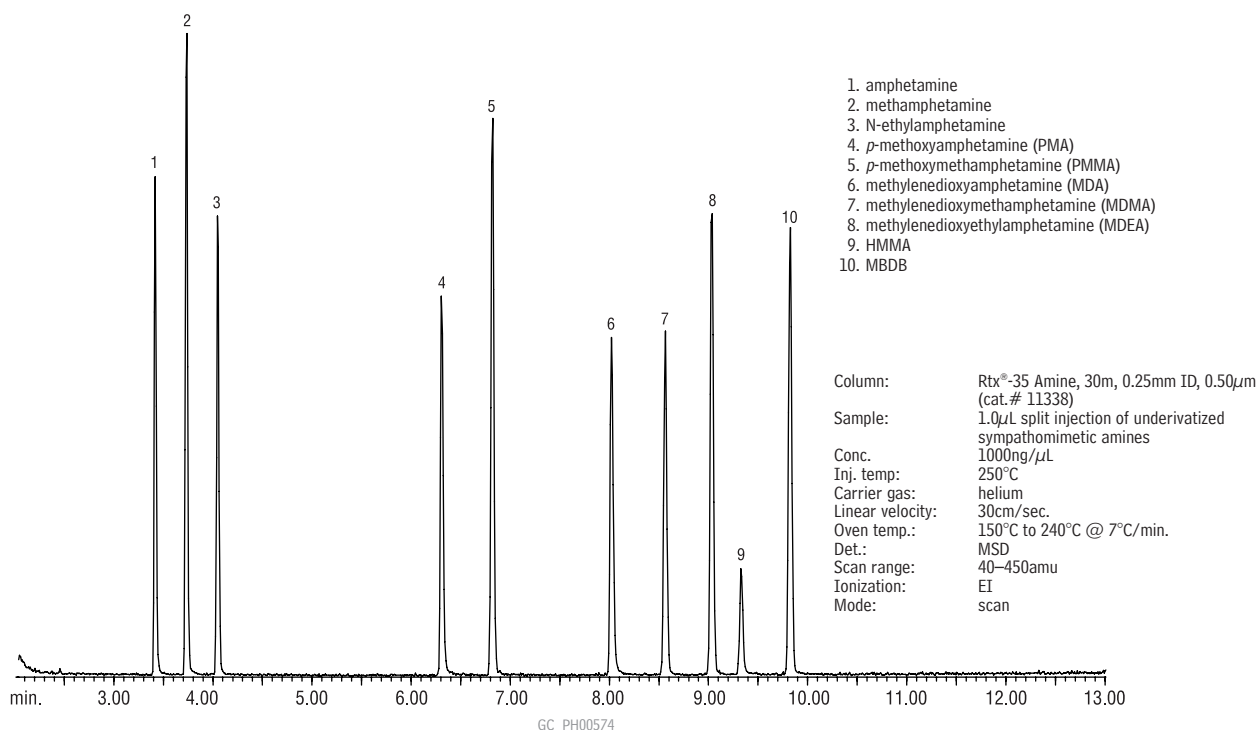
please note

We recommend using base-deactivated fused silica guard columns (**page 34**) and base-deactivated liners (**page 213**) with Rtx®-35 Amine columns.

Table of Contents for
GC Chromatograms
see **page 542**



Sympathomimetic amines (basic drugs) (underivatized) on an Rtx®-35 Amine column.





free literature

GC Analysis of Non-Purgeable Solvents in Pharmaceutical Discharges

Download your free copy from
www.restek.com
lit. cat.# 580027

similar phases

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

Basic Compounds Analysis

Stabilwax®-DB Columns (fused silica)

(polar phase; Crossbond® base-deactivated Carbowax® polyethylene glycol—for amines and basic compounds)

- 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.

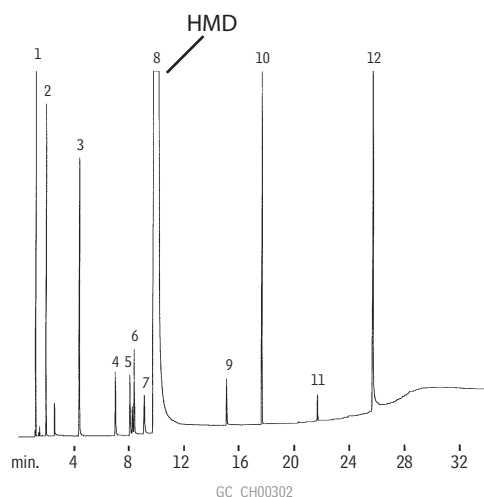
| ID | df | temp. limits | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|-----------------|----------|----------|----------|
| 0.25mm | 0.25µm | 40 to 210/220°C | 10820 | 10823 | |
| | 0.50µm | 40 to 210/220°C | | 10838 | |
| 0.32mm | 0.25µm | 40 to 210/220°C | 10821 | 10824 | |
| | 0.50µm | 40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

ChromaBLOGraphy

Topical and timely insights from top chromatographers.

Visit us at blog.restek.com

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



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 Columns (fused silica)

(polar phase; Crossbond® acid-deactivated Carbowax® polyethylene glycol—for acidic compounds)

- 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.

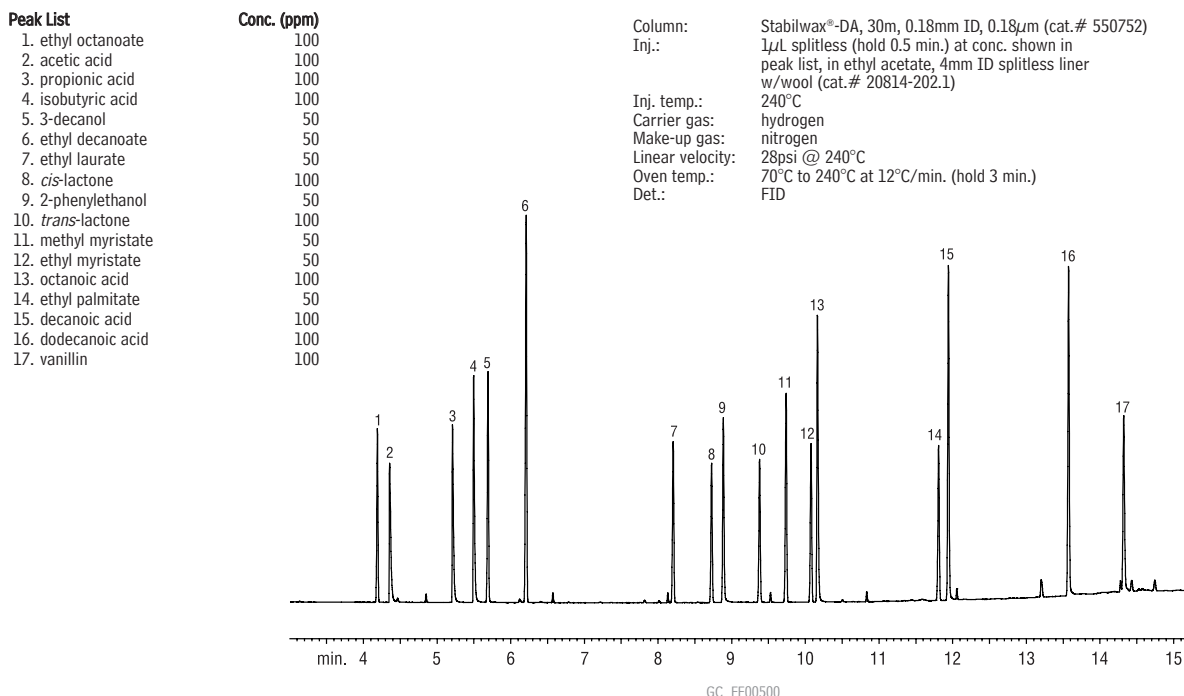
similar phases

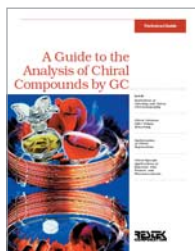
DB-FFAP, HP-FFAP, NUKOL, OV-351,
CP-Wax 58 CB, FFAP

crossbond® technology

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

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

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



free literature

A Guide to the Analysis of Chiral Compounds by GC

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lit. cat.# 59889

please note

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



Chiral selectivity improves significantly by realizing lower elution temperatures.

This can be achieved by:

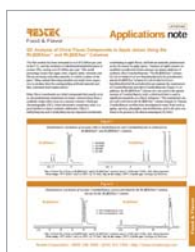
- Faster linear velocities (80 cm/sec.) with hydrogen carrier gas.
- Slower temperature ramp rates (1–2 °C/min.).
- Appropriate minimum operating temperature (40 or 60 °C).
- On-column concentrations of 50 ng or less.



free literature

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

lit. cat.# 59553



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

lit. cat.# 59546

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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.

Rt®-βDEXm Columns (fused silica)

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

Uses: General purpose chiral phase with many published applications.

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

Rt®-βDEXsm Columns (fused silica)

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

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

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

Rt®-βDEXse Columns (fused silica)

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

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.

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

Rt®-βDEXsp Columns (fused silica)

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

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

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

Rt®-βDEXsa Columns (fused silica)

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

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

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

Rt®-βDEXcst Columns (fused silica)

(Proprietary cyclodextrin material doped into 14% cyanopropylphenyl/86% dimethyl polysiloxane)
Uses: Proprietary stationary phase, developed specifically for the fragrance industry. Also used for pharmaceutical applications.

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

Rt®-γDEXsa Columns (fused silica)

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

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

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

cis/trans FAMES

Rt®-2560 Column (fused silica)

(highly polar phase; biscyanopropyl polysiloxane—not bonded)

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

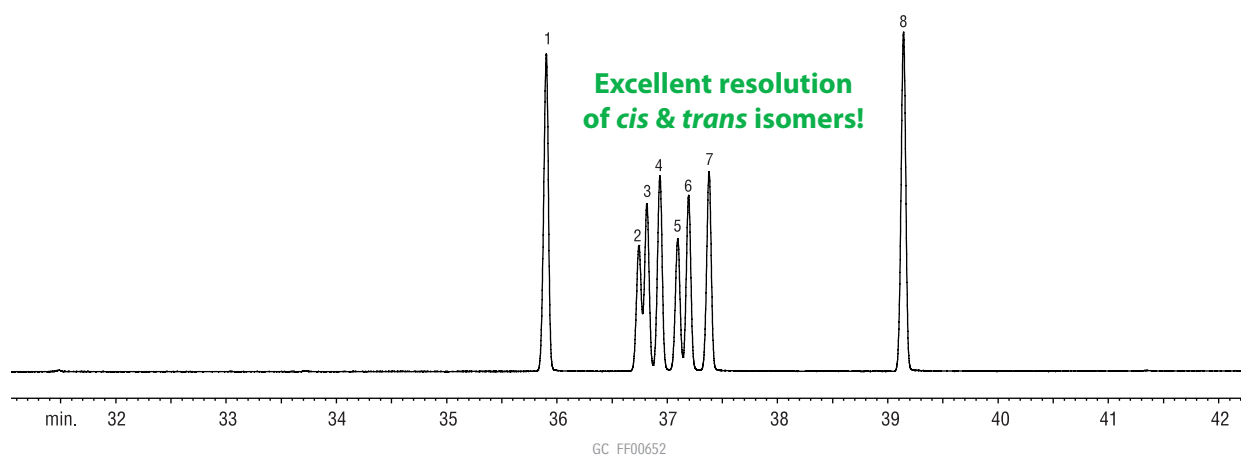
Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

similar phases

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

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

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



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 (<i>trans</i> -6) | 8.0 |
| 3. C18:1 methyl elaidate (<i>trans</i> -9) | 10.0 |
| 4. C18:1 methyl transvacenate (<i>trans</i> -11) | 12.0 |
| 5. C18:1 methyl petroselinate (<i>cis</i> -6) | 8.0 |
| 6. C18:1 methyl oleate (<i>cis</i> -9) | 10.0 |
| 7. C18:1 methyl vacenate (<i>cis</i> -11) | 12.0 |
| 8. C18:2 methyl linoleate (<i>cis</i> -9,12) | 20.0 |



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Polyunsaturated FAME Analysis

FAMEWAX Columns (fused silica)

(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.

similar **phase**

Omegawax

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

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

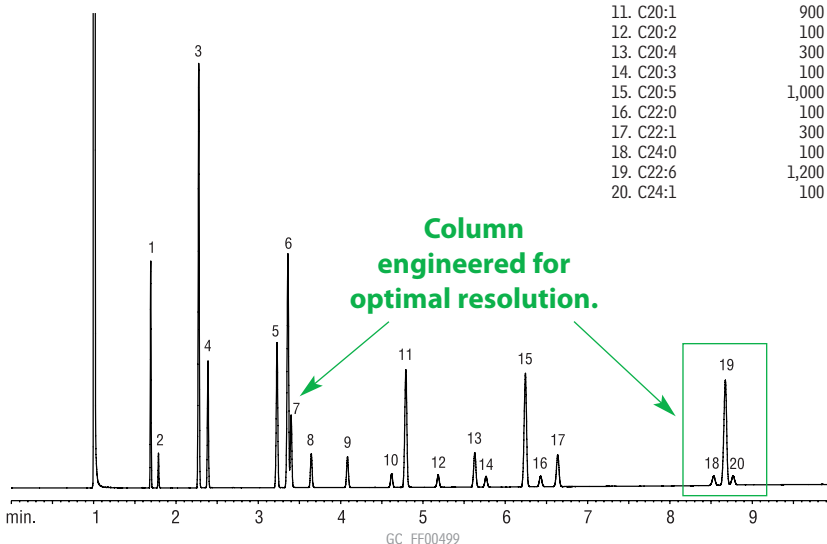
www.restek.com/chromatograms



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 isoctane
(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 | 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 |



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Flavor & Fragrance Compounds Analysis

Rt®-CW20M F&F Columns (fused silica)

(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.

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

Perfect
confirmation
column for F&F analysis!

similar **phases**

HP-20M, Carbowax® 20M

Rtx®-1 F&F Columns (fused silica)

(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.

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

similar **phase**

HP-1



Al Carusone, Technical Service

Technical Service

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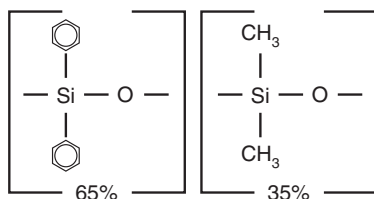
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Rtx®-65TG Structure



save money!

Get six columns for the price of five.
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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 0.53 mm retention gaps and
appropriate connectors.

- Vu2 Union® (see page 289)
- MXT®-Union Connector Kits for Fused Silica
(see page 292)

Triglycerides in Foods Analysis

Rtx®-65TG Columns (fused silica)

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

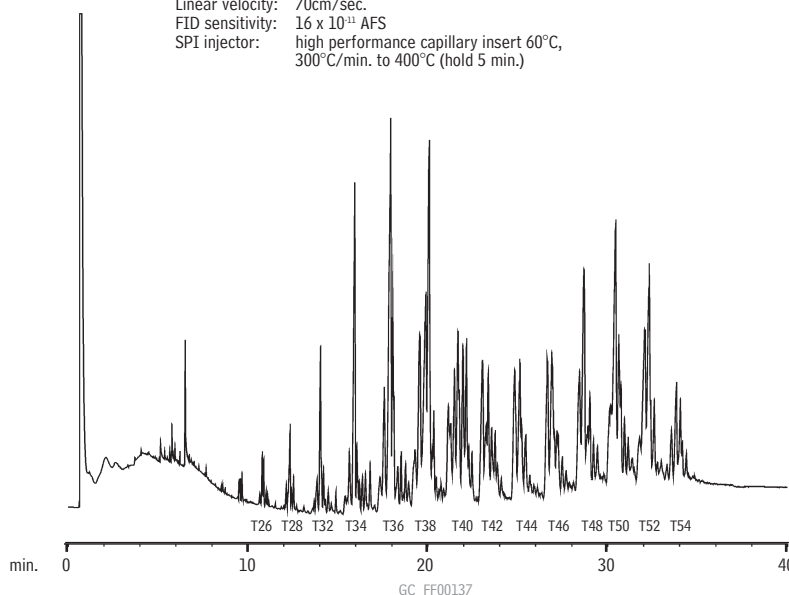
- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.

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 the analyses of polar compounds.

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



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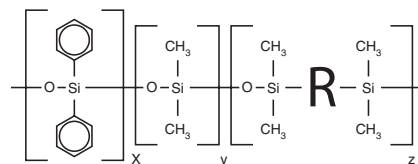
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PAHs in Foods Analysis

Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 50% phenyl/50% dimethyl arylene polysiloxane)

- 340/360 °C upper temperature limits.
- Excellent inertness for active compounds.
- Equivalent to USP phase G3.
- Low-bleed for use with sensitive detectors, such as GC/MS.
- Excellent separation of EU-PAHs, including fluoranthenes.

**Rxi®-17Sil MS Structure**

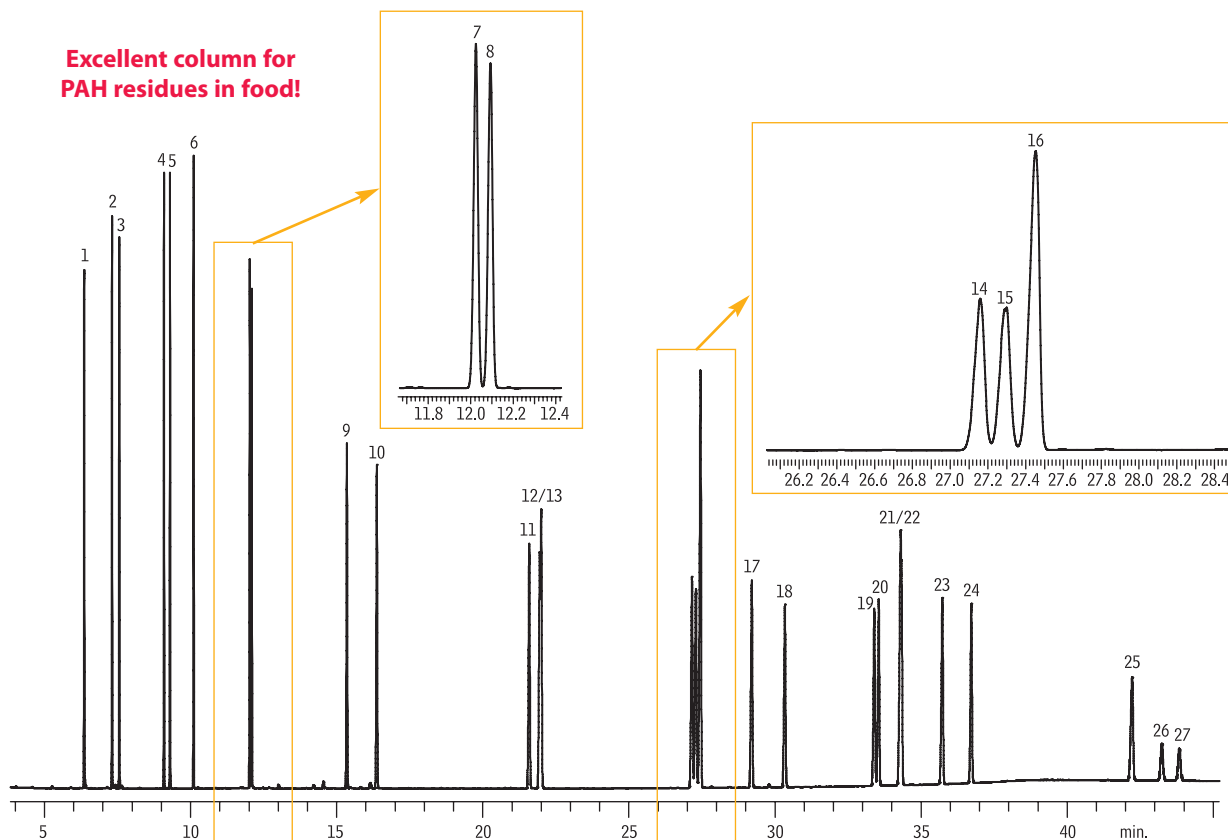
similar phases

DB-17ms, VF-17ms, BPX-50

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|-----------------|----------|----------|----------|
| 0.25mm | 0.25µm | 40 to 340/360°C | 14120 | 14123 | 14126 |
| 0.32mm | 0.25µm | 40 to 340/360°C | 14121 | 14124 | |

| ID | df | temp. limits | 20-Meter |
|--------|--------|-----------------|----------|
| 0.18mm | 0.18µm | 40 to 340/360°C | 14102 |
| | 0.36µm | 40 to 340/360°C | 14111 |

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

Polycyclic Aromatic Hydrocarbons on an Rxi®-17Sil MS column.Excellent column for
PAH residues in food!

GC_EV1160

- Naphthalene
- 2-Methylnaphthalene
- 1-Methylnaphthalene
- Acenaphthylene
- Acenaphthene
- Fluorene
- Phenanthrene
- Anthracene
- Fluoranthene
- Pyrene
- Benz[a]anthracene
- Chrysene
- Triphenylene
- Benzo[b]fluoranthene

- Benzo[k]fluoranthene
- Benzo[j]fluoranthene
- Benzo[a]pyrene
- 3-Methylcholanthrene
- Dibenz[a,h]acridine
- Dibenz[a,j]acridine
- Indeno[1,2,3-cd]pyrene
- Dibenz[a,h]anthracene
- Benzo[ghi]perylene
- 7H-Dibenzo[c,g]carbazole
- Dibenzo[a,e]pyrene
- Dibenzo[a,i]pyrene
- Dibenzo[a,h]pyrene

**Column
Sample**

Diluent:
Conc.:
Injection
Inj. Vol.:
Liner:
Inj. Temp.:
Purge Flow:

Oven

Oven Temp:
Carrier Gas
Flow Rate:
Detector
Instrument
Acknowledgement

Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
SV Calibration Mix #5 / 610 PAH Mix (cat.# 31011)
EPA Method 8310 PAH Mixture (cat.# 31841)
dichloromethane
10 ppm

0.5 µL splitless (hold 1.75 min.)
Auto SYS XL PSS Split/Splitless w/Wool (cat.# 21718)
320 °C
75 mL/min.

65 °C (hold 0.5 min.) to 220 °C at 15 °C/min. to 330 °C at 4 °C/min. (hold 15 min.)
He, constant flow
2.0 mL/min.
FID @ 320 °C
PE Clarus 600 GC
Instrument provided by PerkinElmer

Chlorinated Fluorocarbons (CFC) Analysis



Rt®-Alumina BOND/CFC Columns (fused silica PLOT)

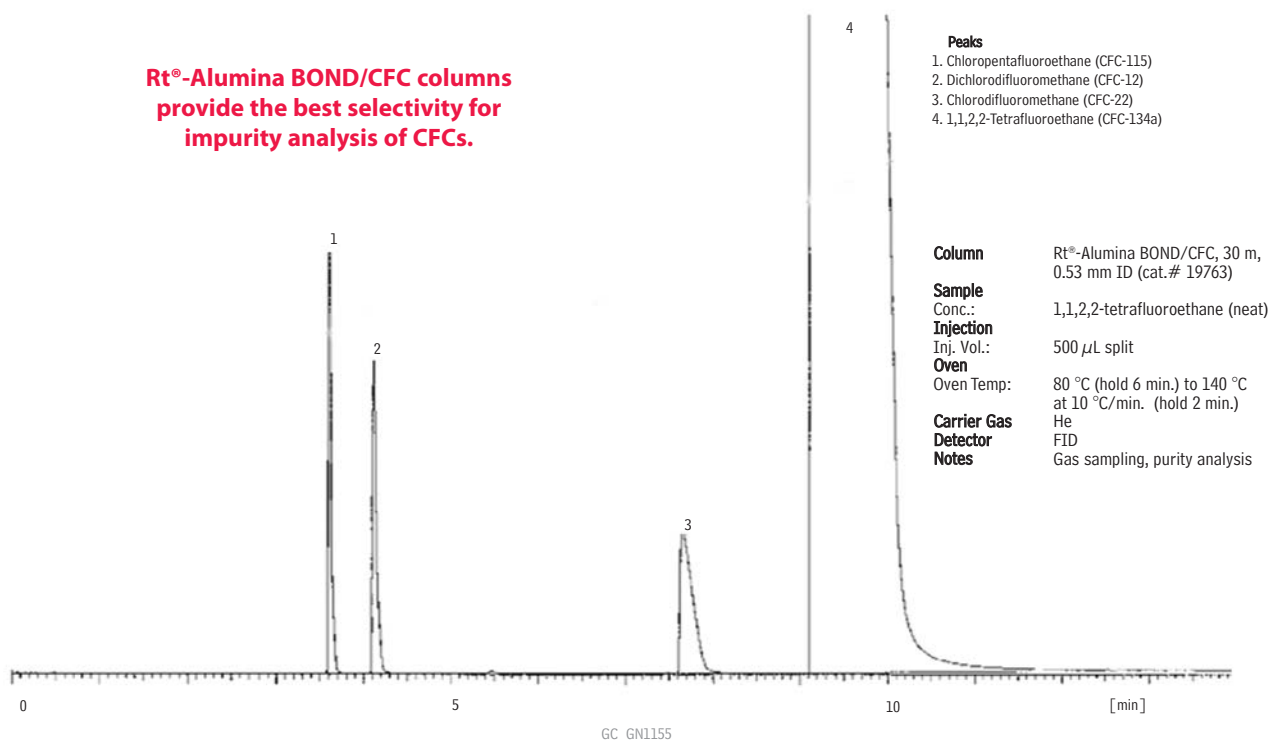
- Improved inertness for halogenated compounds.
- Highly selective alumina-based column, separates most CFCs.
- High retention and capacity for CFCs.

The alumina adsorbent is ideal for retaining halogenated compounds, especially CFC (chlorinated fluorocarbons, freons). It offers high selectivity, allowing a wide range of CFC isomers to be resolved at above ambient temperatures. The Rt®-Alumina BOND/CFC column is thoroughly deactivated to reduce the reactivity of alumina. Even though there is still some residual reactivity for some mono- or di-substituted halogenated hydrocarbons, the majority of these compounds can be accurately quantified from main stream processes or in impurity analyses.

| ID | df | temp. limits | 30-Meter |
|--------|------|--------------|----------|
| 0.53mm | 10µm | to 200°C | 19763 |

Impurity analysis of 1,1,2,2-tetrafluoroethane (CFC-134a) on an Rt®-Alumina BOND/CFC column.

**Rt®-Alumina BOND/CFC columns
provide the best selectivity for
impurity analysis of CFCs.**



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Detailed Hydrocarbon Analysis (DHA)

Rtx®-DHA Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane—optimized for hydrocarbon analysis)

- Columns meet or exceed all ASTM D6730-01 and CAN/CGSB 3.0 No. 14.3-99 method guidelines; test report for method D6730 supplied with each column.
- Excellent responses and peak symmetry for polar oxygenates.

Gasolines are complex mixtures of hundreds of compounds. Information about concentrations of the individual components is important for evaluating raw materials and for controlling refinery processes. ASTM D6730-01 outlines a high-resolution GC method for detailed hydrocarbon analysis (DHA) of gasolines. Rtx®-DHA columns are ideal for DHA methods and easily meet or exceed both ASTM D6730-01 and Canadian General Standards Board CAN/CGSB 3.0 No. 14.3-99 requirements. Every Rtx®-DHA column is tested for retention, efficiency, stationary phase selectivity, and bleed—guaranteeing reproducible column-to-column performance.

| ID | df | temp. limits | 50-Meter | 100-Meter | 150-Meter |
|--------|--------|------------------|----------|-----------|-----------|
| 0.20mm | 0.50µm | -60 to 300/340°C | 10147 | | |
| 0.25mm | 0.50µm | -60 to 300/340°C | | 10148 | |
| | 1.00µm | -60 to 300/340°C | | | 10149 |

Rtx®-5 DHA Tuning Column (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane—optimized for hydrocarbon analysis)

| ID | df | temp. limits | 5-Meter |
|--------|--------|--------------|---------|
| 0.25mm | 1.00µm | -60 to 340°C | 10165 |

NOTE: Rtx®-1PONA columns have been renamed as Rtx®-DHA columns. There are no changes in the manufacturing process or column performance.



Method Recommended

| ASTM Method | Column | cat. # | Dimensions |
|-------------|---------------------------------------|---------------|------------------------------------|
| D6729 | Rtx-DHA-100 | 10148 | 100m x 0.25mm, 0.50µm |
| D6730 | Rtx-DHA-100 & Rtx-5 DHA Tuning Column | 10148 & 10165 | 100m x 0.25mm, 0.50µm w/ precolumn |
| D6733 | Rtx-DHA-50 | 10147 | 50m x 0.20mm, 0.50µm |
| D5501 | Rtx-DHA-150 | 10149 | 150m x 0.25mm, 1.0µm |

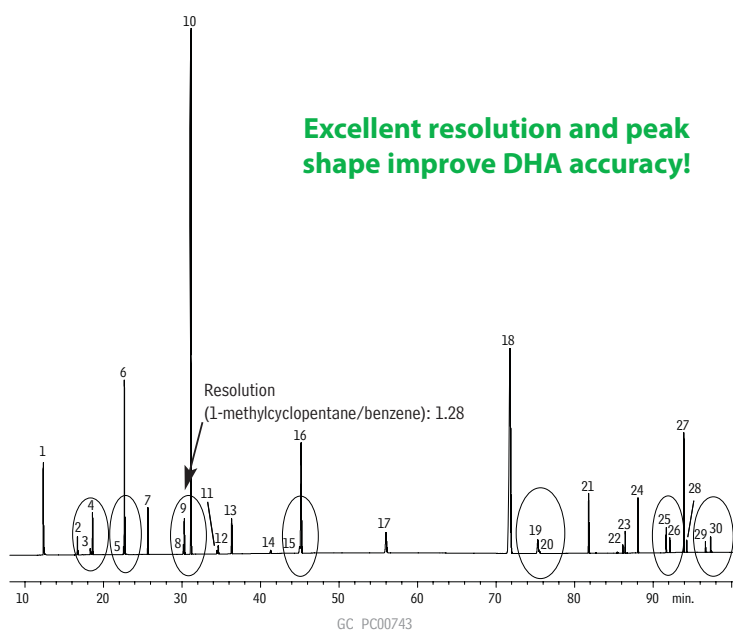
similar phases

Petrocol DH, DB-Petro, HP-PONA, CP-Sil PONA C8

did you know?

Using hydrogen instead of helium can cut analysis time in half! Visit www.restek.com/petro for complete analytical details.

Critical pairs of gasoline components resolved per ASTM specifications on an Rtx®-DHA column.



- ethanol
- C5
- tert-butanol
- 2-methylbutene-2
- 2,3-dimethylbutane
- methyl tert-butyl ether (MTBE)
- C6
- 1-methylcyclopentene
- benzene
- cyclohexane
- 3-ethylpentane
- 1-tert-2-dimethylcyclopentane
- C7
- 2,2,3-trimethylpentane
- 2,3,3-trimethylpentane
- toluene
- C8
- ethylbenzene
- p-xylene
- 2,3-dimethylheptane
- C9
- 5-methylnonane
- 1,2-methylethylbenzene
- C10
- C11 (undecane)
- 1,2,3,5-tetramethylbenzene
- naphthalene
- C12 (dodecane)
- 1-methylnaphthalene
- C13 (tridecane)

Column: Rtx®-DHA, 100m, 0.25mm ID, 0.5µm (cat. # 10148) plus Rtx®-5DHA 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

Circles indicate critical pairs that must be resolved.

ChromaBLOGraphy

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Rt®-Alumina BOND columns show unique retention characteristics for hydrocarbons.

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 108** for our MXT®-Alumina BOND/Na₂SO₄ columns.

similar phases

GC-Alumina KCl, CP-Al₂O₃/KCl

Light Hydrocarbon Analysis

Rt®-Alumina BOND Columns

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.
5. High capacity and loadability give exceptionally symmetric peaks; ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations.

Rt®-Alumina BOND/Na₂SO₄ Columns (fused silica PLOT)

(Na₂SO₄ deactivation)

| ID | df | temp. limits | 30-Meter | 50-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 4μm | to 200°C | 19775 | |
| 0.32mm | 5μm | to 200°C | 19757 | 19758 |
| 0.53mm | 10μm | to 200°C | 19755 | 19756 |

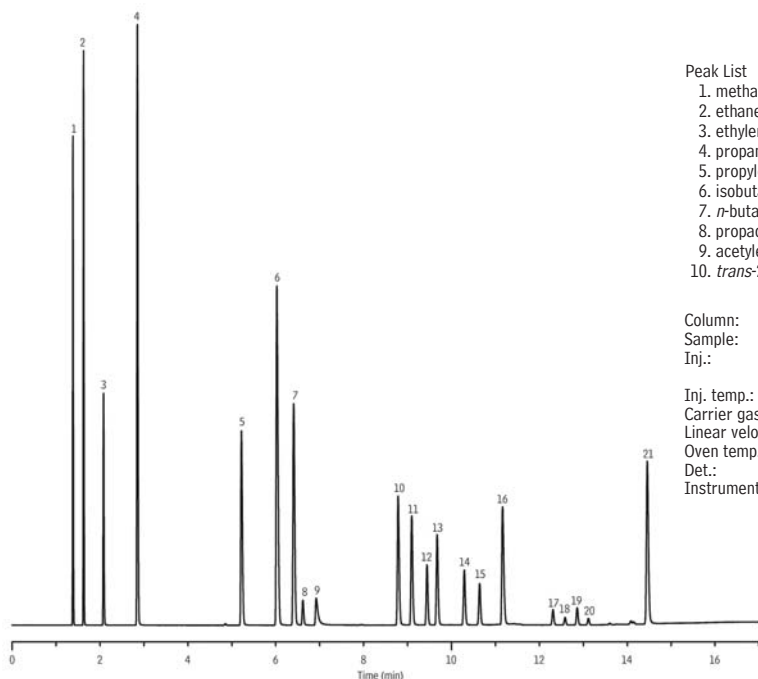
Rt®-Alumina BOND/KCl Columns (fused silica PLOT)

(KCl deactivation)

- Acetylene elutes before C4 hydrocarbons (impurities in butane/isobutane).
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.

| ID | df | temp. limits | 30-Meter | 50-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 4μm | to 200°C | 19776 | |
| 0.32mm | 5μm | to 200°C | 19761 | 19762 |
| 0.53mm | 10μm | to 200°C | 19759 | 19760 |

Refinery gas hydrocarbons on an Rt®-Alumina BOND/Na₂SO₄ column.



| Peak List | |
|--------------------|-----------------------|
| 1. methane | 11. 1-butene |
| 2. ethane | 12. isobutylene |
| 3. ethylene | 13. cis-2-butene |
| 4. propane | 14. isopentane |
| 5. propylene | 15. n-pentane |
| 6. isobutane | 16. 1,3-butadiene |
| 7. n-butane | 17. trans-2-pentene |
| 8. propadiene | 18. 2-methyl-2-butene |
| 9. acetylene | 19. 1-pentene |
| 10. trans-2-butene | 20. cis-2-pentene |
| | 21. n-hexane |

Column: Rt®-Alumina BOND/Na₂SO₄, 30m, 0.53mm ID, 10.0μm (cat.# 19755)
Sample: refinery gas hydrocarbons through C6
Inj.: 10μL split, 40mL/min. split vent flow rate
2mm split Precision® liner w/wool (cat.# 20823)
Inj. temp.: 200°C
Carrier gas: helium, constant pressure (5.0psi, 34.5kPa)
Linear velocity: 37.3cm/sec. @ 60°C
Oven temp.: 60°C (hold 2 min.) to 200°C @ 10°C/min. (hold 1 min.)
Det.: FID @ 200°C
Instrument: Agilent 5890

Simulated Distillation (C5-C44) Analysis

Rtx®-2887 Column (fused silica)

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

- 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.

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

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

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

- Application-specific columns for simulated distillation.
- Stable to 400 °C.

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

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

(nonpolar phases)

- Stable up to 400 °C—lowest bleed for longest column lifetime.
- Reliably meets all ASTM D2887 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

| ID | df | temp. limits | 10-Meter |
|--------|--------|------------------|----------|
| 0.53mm | 2.65µm | -60 to 360/400°C | 70132 |

also **available**Rtx®-1 SimDist 2887—a packed column for process instrumentation. See **page 126**.**similar phases**

DB-2887, Petrocol EX2887

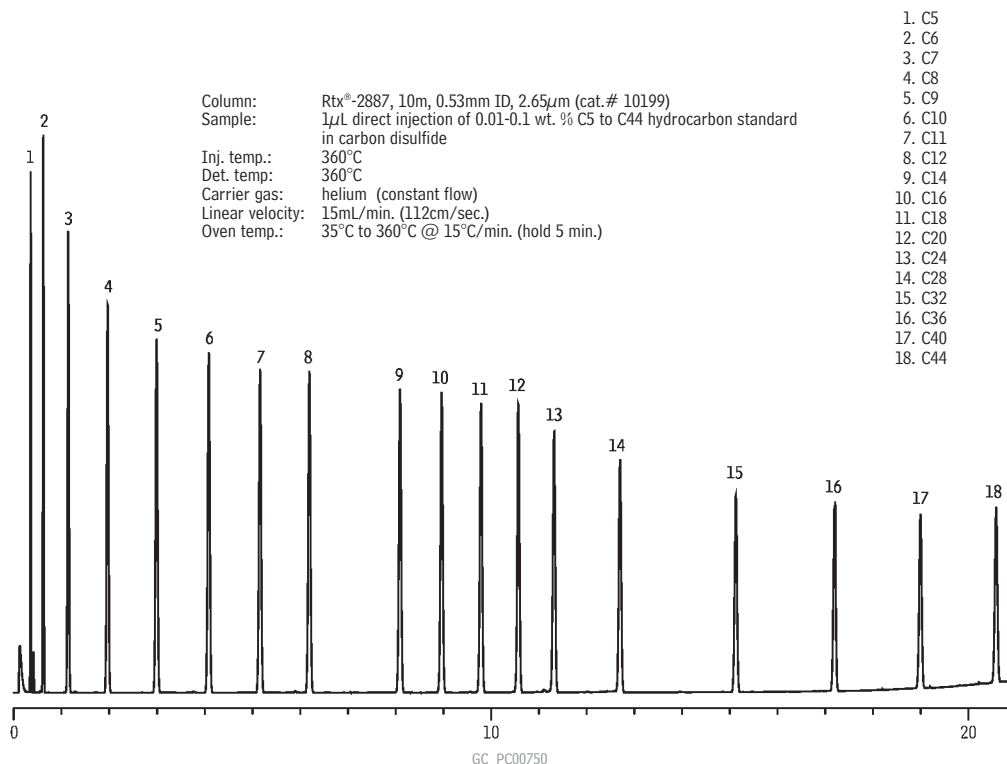
similar phases

DB-2887, Petrocol EX2887, CP-HT-Simdist CB

similar phases

DB-1HT, CP-HT-Simdist CB

See page 78 for more dimensions.

**Simulated distillation on an Rtx®-2887 column.**



similar phases

DB-1HT, CP-HT-Simdist CB



Method Recommended Columns

| ASTM Method | Hydrocarbon Range | cat. # | Configuration |
|-------------------|--------------------|--------|----------------------------|
| D2887 | C5 - C44 | 70131 | 5m x 0.53mm, 0.88 μ m |
| | | 70132 | 10m x 0.53mm, 2.65 μ m |
| D7213 (D2887-ext) | C5 - C60 | 70131 | 5m x 0.53mm, 0.88 μ m |
| | | 70115 | 5m x 0.53mm, 0.20 μ m |
| | | 70112 | 5m x 0.53mm, 0.10 μ m |
| | | 70132 | 10m x 0.53mm, 2.65 μ m |
| D3710 | gasoline up to C14 | 70132 | 10m x 0.53mm, 2.65 μ m |
| D5307 | crude up to C42 | 70115 | 5m x 0.53mm, 0.20 μ m |
| D6352 | C10 - C90 | 70112 | 5m x 0.53mm, 0.10 μ m |
| | | 70115 | 5m x 0.53mm, 0.20 μ m |
| D7500 | C7 - C110 | 70112 | 5m x 0.53mm, 0.10 μ m |
| | | 70115 | 5m x 0.53mm, 0.20 μ m |
| D7169 | C5 - C100 | 70112 | 5m x 0.53mm, 0.10 μ m |
| | | 70115 | 5m x 0.53mm, 0.20 μ m |

Simulated Distillation (C44-C100) Analysis

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

(nonpolar phases)

- Stable up to 450 °C—lowest bleed for longest column lifetime.
- Reliably meet all ASTM D6352, D7169, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation. Metal columns are a better alternative than fused silica, and the MXT®-1HT SimDist columns are the lowest bleed, highest efficiency columns available, outperforming other metal columns for critical method parameters.

| ID | df | temp. limits | 5-Meter | 10-Meter |
|--------|--------------|------------------|---------|----------|
| 0.53mm | 0.10 μ m | -60 to 430/450°C | 70112 | |
| | 0.20 μ m | -60 to 430/450°C | 70115 | |
| | 0.21 μ m | -60 to 430/450°C | | 70118 |
| | 0.88 μ m | -60 to 400/430°C | 70131 | 70134 |
| | 1.00 μ m | -60 to 380/400°C | | 70130 |
| | 1.20 μ m | -60 to 380/400°C | | 70119 |
| | 2.65 μ m | -60 to 360/400°C | | 70132 |
| | 5.00 μ m | -60 to 360/400°C | | 70133 |

Low bleed, high efficiency MXT®-1HT SimDist columns outperform competitors (ASTM D6352 conditions).

Lower bleed means:

- Longer column lifetime.
- More stable calibrations.
- Accurate boiling point determinations.

RESTEK ADVANTAGE:

Longer column lifetime and more accurate data!

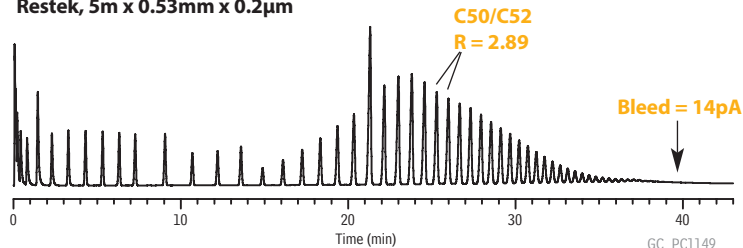
Higher efficiency means:

- Greater resolution; analyze more samples before method criteria are reached.
- Assured method performance.

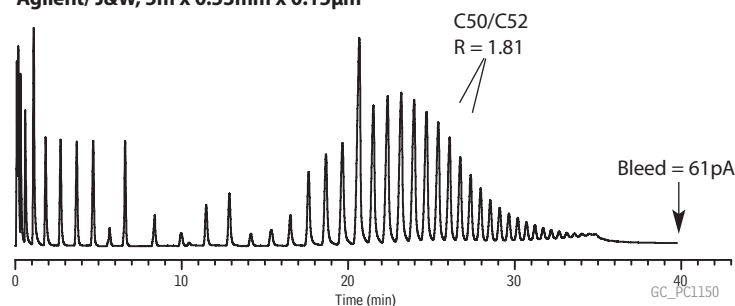
RESTEK ADVANTAGE:

Run more samples within method specifications!

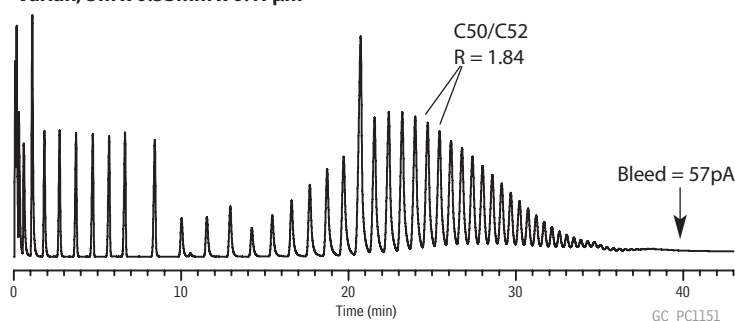
Restek, 5m x 0.53mm x 0.2 μ m



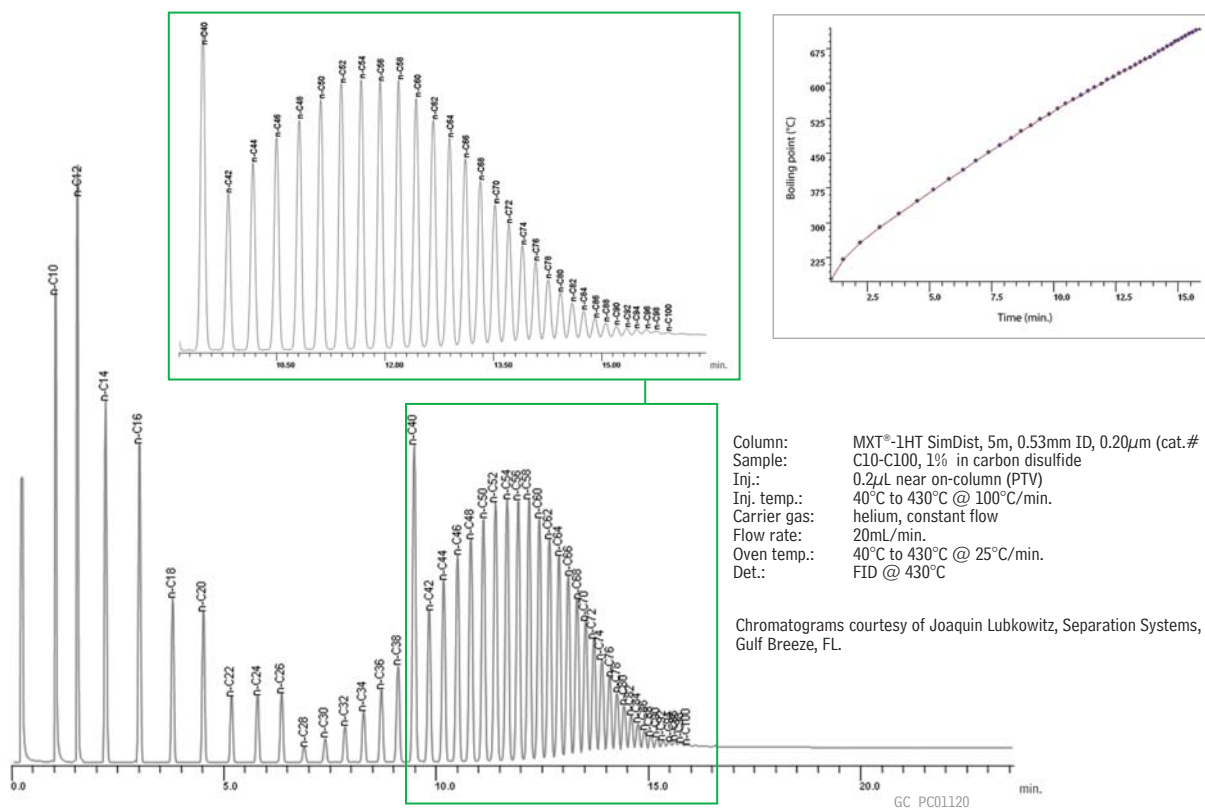
Agilent/ J&W, 5m x 0.53mm x 0.15 μ m



Varian, 5m x 0.53mm x 0.17 μ m



Robust MXT®-1HT SimDist columns meet all ASTM D6352 requirements, even under accelerated conditions.



MXT®-1 SimDist/MXT®-500 SimDist

- 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®-1 SimDist phases offer true methyl silicone polarity; MXT®-500 SimDist phase is a carborane siloxane polymer.
- Stable to 430 °C.

MXT®-1 SimDist Column (Siltek® treated stainless steel) (nonpolar phase)

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

MXT®-500 SimDist Column (Siltek® treated stainless steel) (nonpolar phase)

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

Polywax® Calibration Materials

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

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Aromatics & Oxygenates in Gasoline Analysis

Rt®-TCEP Columns (fused silica)

(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.

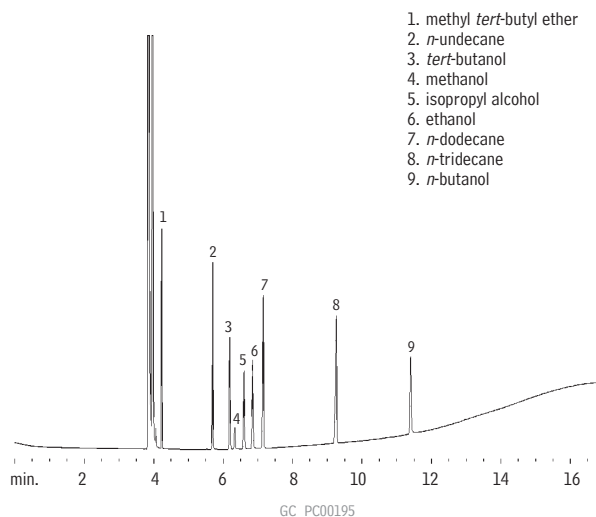
The Rt®-TCEP column incorporates a nonbonded stationary phase coated on a surface specialized for enhanced polymer stability and extended column lifetime. Solvent rinsing should be avoided. Conditioning is necessary only if the column is to be used at temperatures near the maximum operating temperature.

similar phases

SPB-TCEP, CP-TCEP

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

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

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

- 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 0.53 mm ID column eliminates column coupling completely.

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

*Total column length = 16 meters.

**Connected with low-dead-volume MXT connector.

Rtx®-Biodiesel TG Columns (fused silica)

- 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 glycerides analysis, according to ASTM D6584 and EN 14105 methods.

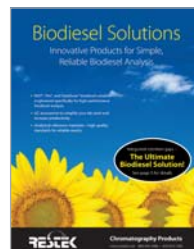
| Description | temp. limits | cat. # | price |
|--|--------------|--------|-------|
| 10m, 0.32mm ID, 0.10µm | to 330/380°C | 10292 | |
| 10m, 0.32mm ID, 0.10µm with 2m x 0.53mm ID Retention Gap | to 330/380°C | 10291 | |
| 15m, 0.32mm ID, 0.10µm | to 330/380°C | 10294 | |
| 15m, 0.32mm ID, 0.10µm with 2m x 0.53mm ID Retention Gap | to 330/380°C | 10293 | |

free
literature

**Biodiesel Solutions:
Innovative Products
for Simple, Reliable
Biodiesel Analysis**

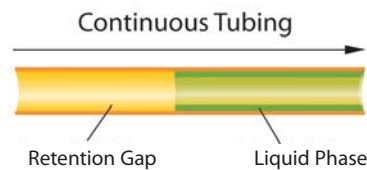
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copy from
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lit. cat. # 580207



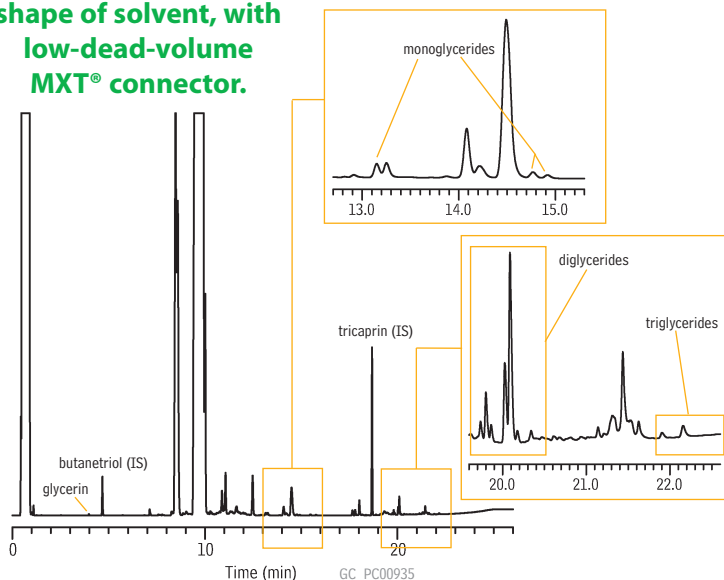
Integra-Gap® technology

- Built-in retention gap.
- Eliminates connector and leaks.
- Extends analytical column lifetime.



Derivatized B100 and internal standards on an MXT®-Biodiesel TG column with 2 m x 0.53 mm ID coupled 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

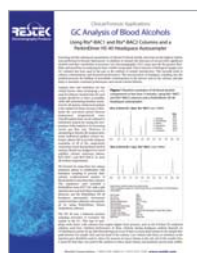


restek **innovation!**

Baseline resolution in less than 3 minutes.

similar phases

DB-ALC1, DB-ALC2



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Blood Alcohol Analysis

Rtx®-BAC1/Rtx®-BAC2

- 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.

Rtx®-BAC1 Columns (fused silica) (proprietary Crossbond® phase)

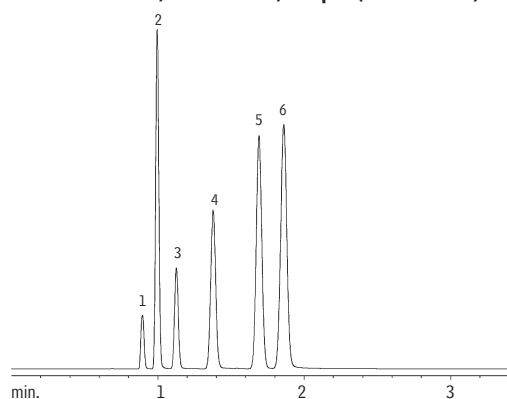
| ID | df | temp. limits | 30-Meter |
|--------|--------------|------------------|----------|
| 0.32mm | 1.80 μ m | -20 to 240/260°C | 18003 |
| 0.53mm | 3.00 μ m | -20 to 240/260°C | 18001 |

Rtx®-BAC2 Columns (fused silica) (proprietary Crossbond® phase)

| ID | df | temp. limits | 30-Meter |
|--------|--------------|------------------|----------|
| 0.32mm | 1.20 μ m | -20 to 240/260°C | 18002 |
| 0.53mm | 2.00 μ m | -20 to 240/260°C | 18000 |

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

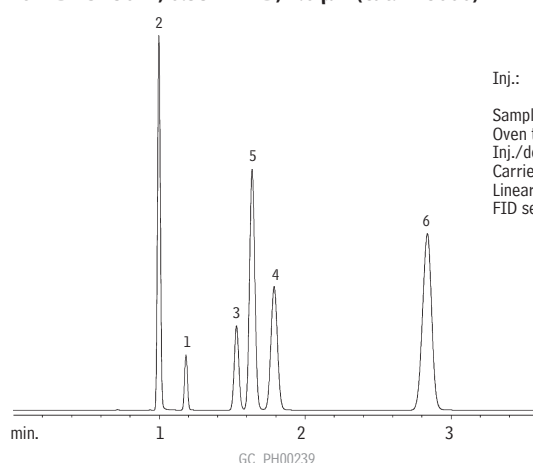
Rtx®-BAC1 30 m, 0.53 mm ID, 3.0 μ m (cat.# 18001)



**Blood alcohol
analysis in less than
3 minutes!**

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

Rtx®-BAC2 30 m, 0.53 mm ID, 2.0 μ m (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 10⁻¹¹ AFS

Organic Volatile Impurities (OVI) Analysis

Rxi®-624Si MS Columns
for USP<467> Residual Solvents analysis

NEW!

Improve system suitability
pass rates with the best
resolution of acetonitrile and
dichloromethane on any G43.

- Symmetric peak shape for bases provides accurate integration and unmatched sensitivity.
- High thermal stability ensures a consistent baseline, making it the only MS friendly column in its class.
- Reproducible Rxi® technology provides the column-to-column reproducibility needed in validated methods.

Rxi®-624Si MS Columns (fused silica)

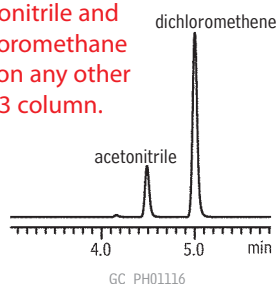
(midpolarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/94% dimethyl arylene polysiloxane)

- Low bleed, high thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds, including acidic and basic compounds.
- Selective—highly selective for residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

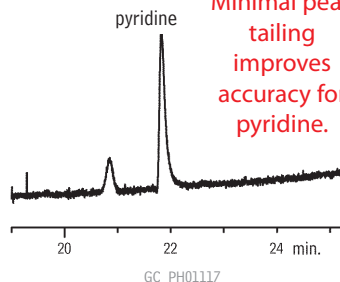
| ID | df | temp. limits | 20-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.18mm | 1.00µm | -20 to 300/320°C | 13865 | | |
| 0.25mm | 1.40µm | -20 to 300/320°C | | 13868 | |
| 0.32mm | 1.80µm | -20 to 300/320°C | | 13870 | 13872 |
| 0.53mm | 3.00µm | -20 to 280/300°C | | 13871 | |

Class 2 Mix A

Better resolution of
acetonitrile and
dichloromethane
than on any other
G43 column.

**Class 2 Mix B**

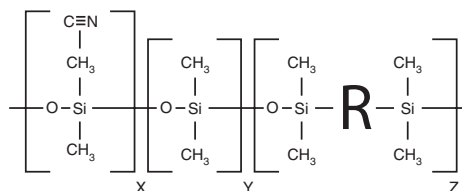
Minimal peak
tailing
improves
accuracy for
pyridine.



Column: Rxi®-624Si MS, 30m, 0.32mm ID, 1.8µm (cat.# 13870)
 Inj.: 1.0mL manual headspace injection, split (3:1), 1mm split liner (cat.# 20972)
 Inj. temp.: 140°C
 Carrier gas: helium, constant flow
 Flow rate: 2.2mL/min.
 Oven temp.: 40°C (hold 20 min.) to 240°C @ 10°C/min. (hold 20 min.)
 Det: FID @ 250°C
 Hydrogen: 40mL/min.
 Air: 450mL/min.
 Makeup: 45mL/min.
 Instrument: Agilent 6890

**Make the Switch
to Rxi® columns!**

Replaces: DB-624, HP-624,
VF-624, BP-624, ZB-624,
AT-624, 007-1301, G43R

Rxi®-624Si MS Structure

Visit www.restek.com/ovi
for a complete product listing.

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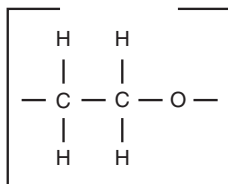
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11/12

G16 phase

Stabilwax® Structure



similar phases

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

Organic Volatile Impurities (OVI) Analysis

Stabilwax® Columns (fused silica)

(polar phase; Crossbond® Carbowax® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest bleed PEG column on the market; long column lifetimes are assured
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing.

| ID | df | temp. limits | 30-Meter |
|--------|--------|-----------------|----------|
| 0.32mm | 0.25µm | 40 to 250/260°C | 10624 |
| 0.53mm | 0.25µm | 40 to 250/260°C | 10625 |

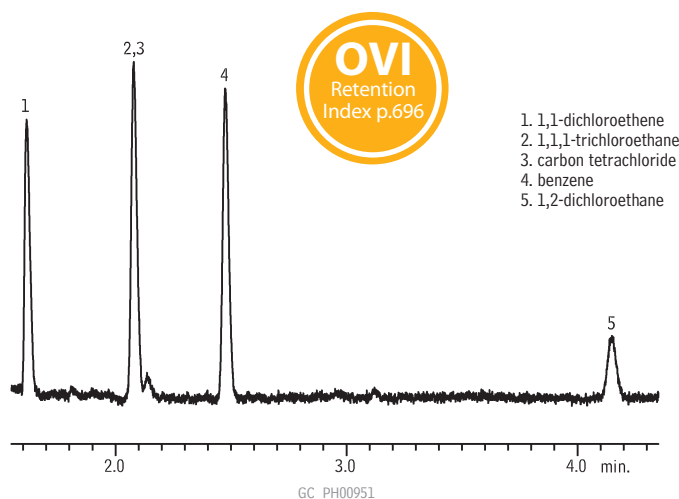
For our complete listing of Stabilwax® columns, see **page 59**.

ordering note

Get the protection without the connection!

For Stabilwax® columns with built-in Integra-Guard® guard columns, see **page 35**.

Class 1 residual solvents on a Stabilwax® (G16) column.



1. 1,1-dichloroethene
2. 1,1,1-trichloroethane
3. carbon tetrachloride
4. benzene
5. 1,2-dichloroethane

free literature

Residual Solvent Analysis

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lit. cat.# PHFL1018A



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.

Organic Volatile Impurities (OVI) Analysis

Rtx®-5 Columns (fused silica)

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

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

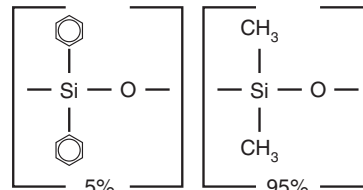
The 5% diphenyl/95% dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low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

| ID | df | temp. limits | 30-Meter |
|--------|--------|------------------|----------|
| 0.53mm | 5.00µm | -60 to 270/290°C | 10279 |

For our complete listing of Rtx®-5 columns, see **page 50**.

G27 phase

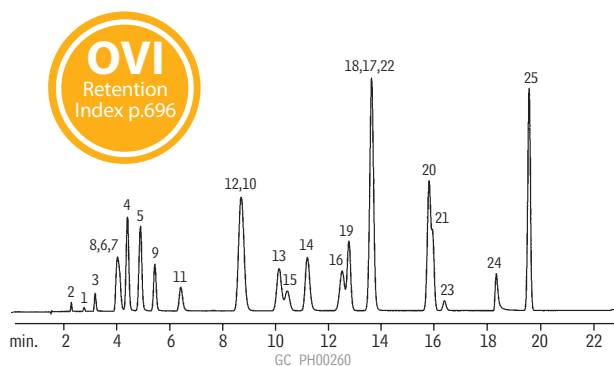
Rtx®-5 Structure



similar phases

DB-5, HP-5, HP-5MS, Ultra-2, SPB-5, Equity-5, MDN-5

Organic volatile impurities on an Rtx®-5 (Rtx®-G27) column.



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

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

Chromatogram Search Tool

Search by compound name, synonym, CAS # or keyword

www.restek.com/chromatograms



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USP

Pharmaceutical
Standards

See pages 527-528.

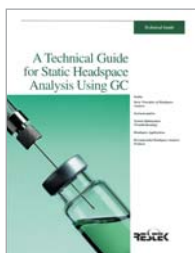


free literature

A Technical Guide for Static Headspace Analysis Using GC

Download your free
copy from
www.restek.com

lit. cat.# 59895A



Organic Volatile Impurities (OVI) Analysis

Rtx®-G27 Column (fused silica with 5-meter Integra-Guard® guard column)

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

- Application-specific columns for residual solvents in pharmaceutical products. Meet all requirements of USP <467>.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G27 stable to 290 °C.

Some USP <467> methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

| ID | df | temp. limits | 30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column |
|--------|--------|------------------|---|
| 0.53mm | 5.00µm | -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)

- Application-specific columns for residual solvents in pharmaceutical products. Meet all requirements of USP <467>.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G43 stable to 240 °C.

Some USP <467> methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

| ID | df | temp. limits | 30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column |
|--------|--------|--------------|---|
| 0.53mm | 3.00µm | -20 to 240°C | 16085-126 |



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

Semivolatiles Analysis

Rxi®-5Sil MS Columns (fused silica)

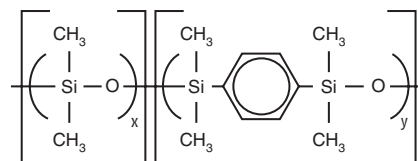
(low polarity Crossbond® silarylene phase; selectivity close to 5% phenyl/95% dimethyl arylene polysiloxane)

- 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.

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

| ID | df | temp. limits | 10-Meter | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 330/350°C | 43601 | | |
| 0.18mm | 0.10µm | -60 to 320/350°C | | | |
| | 0.18µm | -60 to 330/350°C | | 43602 | 43605 |
| | 0.36µm | -60 to 330/350°C | | 43604 | |

Rxi®-5Sil MS Structuresimilar **phases**

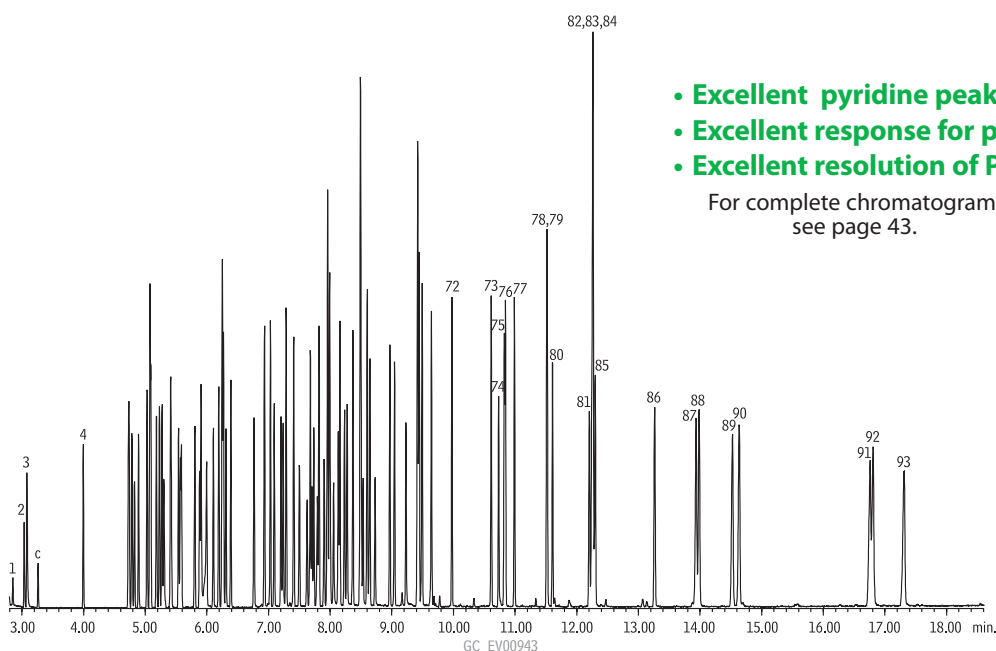
DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS

ordering **note**

Get the protection without the connection!

For Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns, see **page 35**.

The Rxi®-5Sil MS column is recommended for US EPA Method 8270.

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

- Excellent pyridine peak shape.
- Excellent response for phenols.
- Excellent resolution of PAHs.

For complete chromatogram, see page 43.

restek **innovation!**

- Very low bleed provides highest sensitivity.
- Faster analysis time with full separation of chlorinated pesticides.



**CarboPrep®
SPE Cartridges**
See page 393.

How much time do column changes cost you?
Switch to Rtx®-CLPesticides columns and analyze pesticides, herbicides, PCBs and more on a single column set.



Analyze Chlorinated Pesticides, PCBs and Chlorinated Herbicides

Download your free copy from
www.restek.com
lit. cat.# EVFL1013

Purchase one of these recommended combinations of guard and analytical columns and save money.

ordering **note**

Add "-530" or "-535" to the catalog number for the column kit, to save on the cost of the reference mix.

Chlorinated Pesticides 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.

Rtx®-CLPesticides Columns (fused silica)

| ID | df | temp. limits | 10-Meter | 15-Meter | 20-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 310/330°C | 43101 | | | | |
| 0.18mm | 0.18µm | -60 to 310/330°C | 42101 | | 42102 | | |
| 0.25mm | 0.25µm | -60 to 320/340°C | | 11120 | | 11123 | 11126 |
| 0.32mm | 0.32µm | -60 to 320/340°C | | | | 11141 | |
| | 0.50µm | -60 to 320/340°C | | 11136 | | 11139 | |
| 0.53mm | 0.50µm | -60 to 300/320°C | | 11137 | | 11140 | |

Rtx®-CLPesticides2 Columns (fused silica)

| ID | df | temp. limits | 10-Meter | 15-Meter | 20-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|----------|----------|
| 0.10mm | 0.10µm | -60 to 310/330°C | 43301 | | 43302 | | |
| 0.18mm | 0.14µm | -60 to 310/330°C | 42301 | | 42302 | | |
| 0.25mm | 0.20µm | -60 to 320/340°C | | 11320 | | 11323 | 11326 |
| 0.32mm | 0.25µm | -60 to 320/340°C | | 11321 | | 11324 | |
| | 0.50µm | -60 to 320/340°C | | | | 11325 | |
| 0.53mm | 0.42µm | -60 to 300/320°C | | 11337 | | 11340 | |

Rtx®-CLPesticides Column Kits

(Note: Columns are not preconnected in these kits.)

Rtx-CLPesticides Kit (0.25mm ID) cat.# 11199 (kit), \$1050 **SAVE \$100**

| 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, Deactivated | 20403-261 | |
| 5m, 0.25mm ID Siltek Guard Column | 10026 | |

Rtx-CLPesticides Kit (0.32mm ID) cat.# 11196 (kit), \$1080 **SAVE \$135**

| 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, Deactivated | 20403-261 | |
| 5m, 0.32mm ID Siltek Guard Column | 10027 | |

Rtx-CLPesticides Kit (0.53mm ID) cat.# 11197 (kit), \$1155 **SAVE \$180**

| 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, Deactivated | 20403-261 | |
| 5m, 0.53mm ID IP Deactivated Guard Column | 10045 | \$67 |

Add a reference mix to your kit order and save!

| Description | list price | price with/kit | suffix # |
|--|------------|----------------|----------|
| Organochlorine Pesticide Mix AB #1 (cat.# 32291) | \$50 | \$35 | |
| Organochlorine Pesticide Mix AB #2 (cat.# 32292) | \$40 | \$25 | |

also **available**

For a wide variety of column connectors, see **pages 287-293**.

Chlorinated Pesticides Analysis

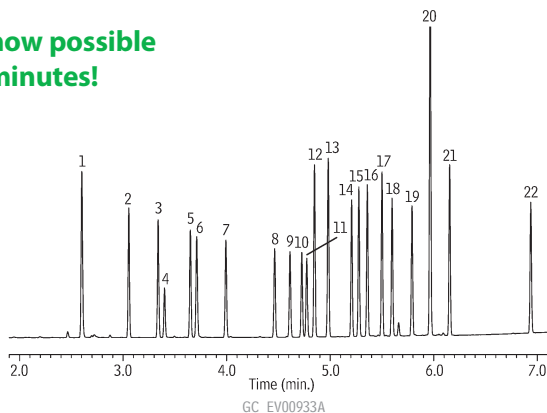
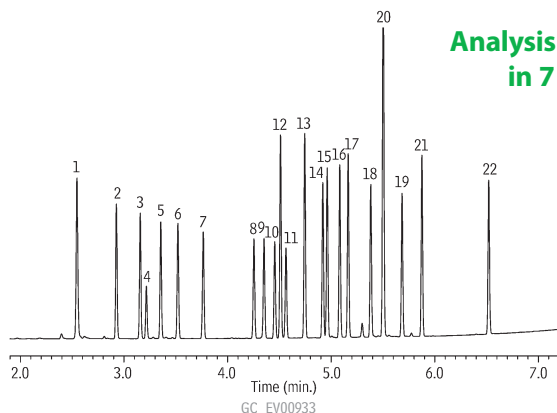


Fast GC analyses of chlorinated pesticides on Rtx®-CLPesticides and Rtx®-CLPesticides2 columns.

Rtx®-CLPesticides & Rtx®-CLPesticides2 columns (0.32 mm ID)

Rtx®-CLPesticides

Rtx®-CLPesticides2



Analysis now possible
in 7 minutes!

Columns: Rtx®-CLPesticides, 30m, 0.32mm ID, 0.32 μ m (cat.# 11141) and Rtx®-CLPesticides2, 30m, 0.32mm ID, 0.25 μ m (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, 8-80 μ g/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200 μ g/mL each component in acetone (cat.# 32000)

Inj.: 1.0 μ L 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.

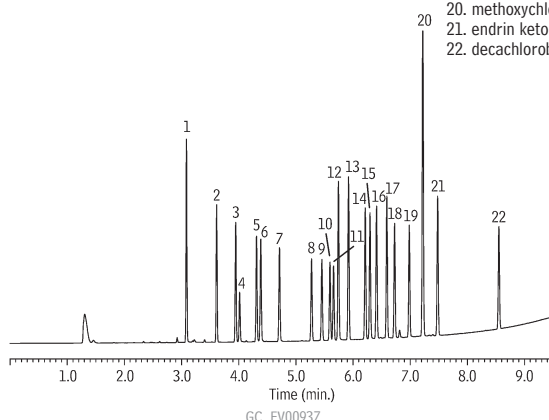
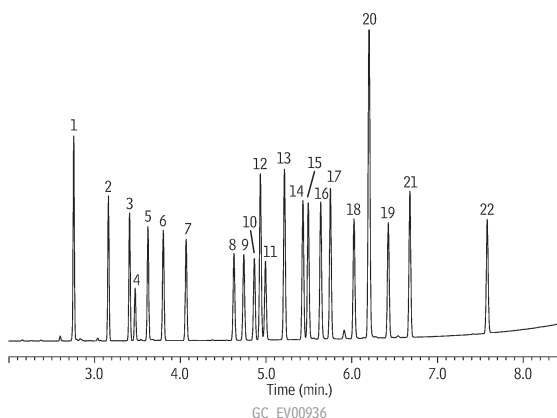
Det.: Agilent 6890 w/ μ -ECD @ 330°C

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 (0.53 mm ID)

Rtx®-CLPesticides

Rtx®-CLPesticides2



Columns: Rtx®-CLPesticides, 30m, 0.53mm ID, 0.50 μ m (cat.# 11140) and Rtx®-CLPesticides2, 30m, 0.53mm ID, 0.42 μ m (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, 8-80 μ g/mL each component in hexane/toluene (cat.# 32292), Pesticide Surrogate Mix, 200 μ g/mL each component in acetone (cat.# 32000)

Inj.: 1.0 μ L 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.: Agilent 6890 w/ μ -ECD @ 330°C

restek **innovation!**it's a **fact**

These columns are treated with Siltek® deactivation, which provides better responses for endrin, DDT, and methoxychlor.

Chlorinated Pesticides Analysis

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.

Stx®-CLPesticides Columns (fused silica with Siltek® deactivation)

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|------------------|----------|----------|
| 0.25mm | 0.25µm | -60 to 310/330°C | 11540 | 11543 |
| 0.32mm | 0.32µm | -60 to 310/330°C | | 11546 |
| | 0.50µm | -60 to 310/330°C | 11541 | 11544 |

Stx®-CLPesticides2 Columns (fused silica with Siltek® deactivation)

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|------------------|----------|----------|
| 0.25mm | 0.20µm | -60 to 310/330°C | 11440 | 11443 |
| 0.32mm | 0.25µm | -60 to 310/330°C | 11441 | 11444 |

Stx®-CLPesticides Kits

(Note: Columns are not preconnected in these kits.)

**Stx-CLPesticides Kit (0.25mm ID)** cat.# 11190 (kit), \$1050 **SAVE \$100**

| 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, Deactivated | 20403-261 | |
| 5m, 0.25mm ID Siltek Guard Column | 10026 | |

**Stx-CLPesticides Kit (0.32mm ID)** cat.# 11193 (kit), \$1080 **SAVE \$135**

| 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, Deactivated | 20403-261 | |
| 5m, 0.32mm ID Siltek Guard Column | 10027 | |

Total cost if purchased separately **\$1215**ordering **note**

Kits include Siltek® deactivated guard column.



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Improved best-in-class GC columns • Standards • Industry experts at your service.

Visit us at www.restek.com/enviro

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.



Using sophisticated computer modeling software, we created two stationary phases for separating the 53 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.

restek **innovation!**

- Better separations
- Faster analysis

Rtx®-OPPesticides Columns (fused silica)

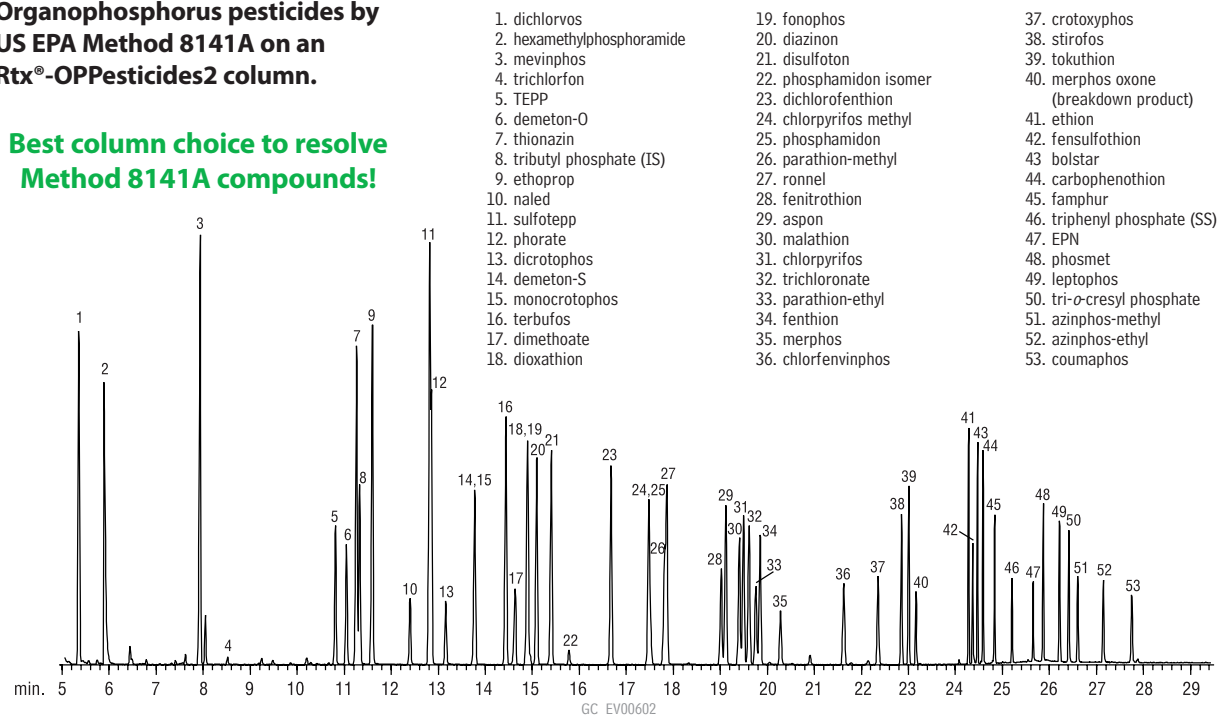
| ID | df | temp. limits | 30-Meter |
|--------|--------|------------------|----------|
| 0.32mm | 0.50µm | -20 to 310/330°C | 11239 |
| 0.53mm | 0.83µm | -20 to 310/330°C | 11240 |

Rtx®-OPPesticides2 Columns (fused silica)

| ID | df | temp. limits | 20-Meter | 30-Meter |
|--------|--------|------------------|----------|----------|
| 0.18mm | 0.20µm | -20 to 310/330°C | 11244 | \$460 |
| 0.25mm | 0.25µm | -20 to 310/330°C | | 11243 |
| 0.32mm | 0.32µm | -20 to 310/330°C | | 11241 |
| 0.53mm | 0.50µm | -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!



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
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

Brominated Flame Retardants Analysis

Rtx®-1614 Columns (fused silica)

(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.

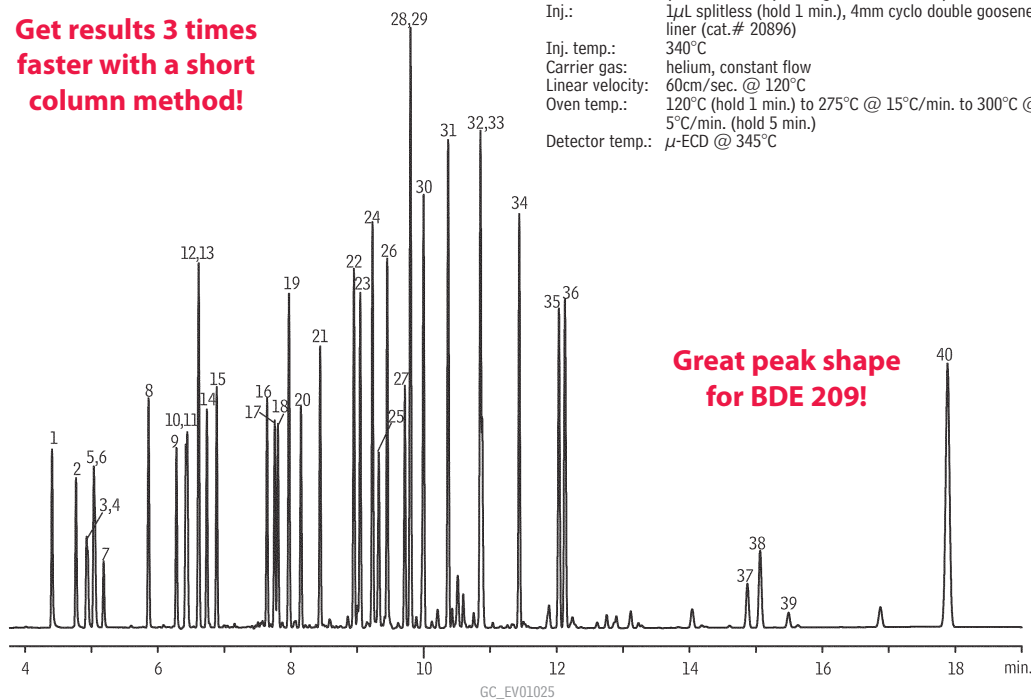
Table of Contents for
GC Chromatograms
see page 542



| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|------------------|----------|----------|
| 0.25mm | 0.10µm | -60 to 330/360°C | 10296 | 10295 |

Brominated flame retardants on an Rtx®-1614 column.

Get results 3 times
faster with a short
column method!



Column: Rtx®-1614, 15m, 0.25mm ID, 0.10µm (cat.# 10296)
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

PCB Congeners Analysis

Rtx®-PCB Columns (fused silica)

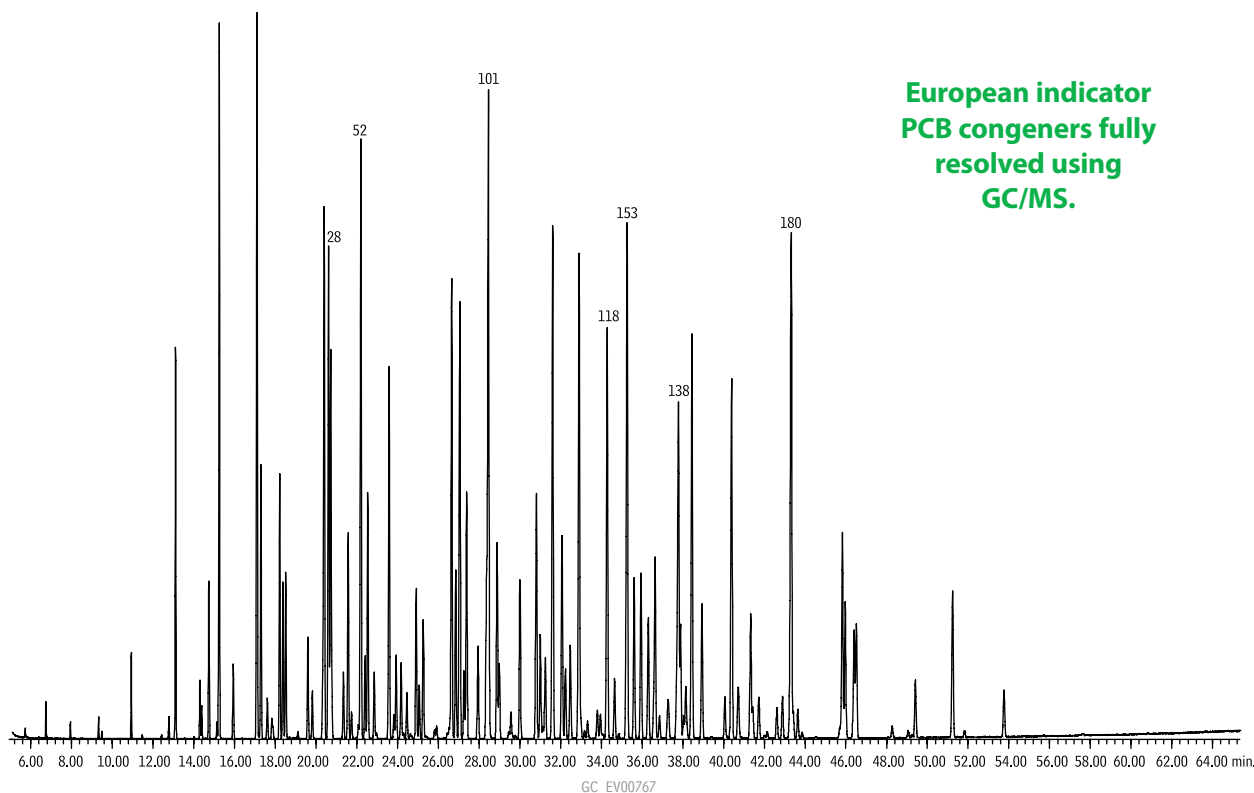
(proprietary Crossbond® phase)

- 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.

restek **innovation!**

| ID | df | temp. limits* | 20-Meter | 30-Meter | 40-Meter | 60-Meter |
|--------|--------|-------------------|----------|----------|----------|----------|
| 0.18mm | 0.18µm | 30°C to 320/340°C | 41302 | | 41303 | 41304 |
| 0.25mm | 0.25µm | 30°C to 320/340°C | | 13223 | | 13226 |
| 0.32mm | 0.50µm | 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 Columns (fused silica)

(low polarity proprietary phase)

- General purpose columns exhibiting extremely low bleed. Ideal for many GC/MS applications, including pesticides, PCB congeners (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).

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

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

similar phases

DB-XLB, VF-Xms

Chromatogram Search Tool

Search by compound name, synonym,
CAS # or keyword

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Dioxin & Furan Congeners Analysis

Rxi®-5Sil MS Columns (fused silica)

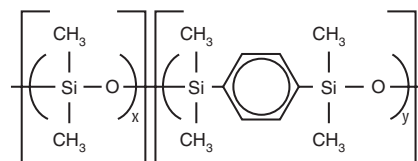
(low polarity Crossbond® silarylene phase; selectivity close to 5% phenyl/95% dimethyl arylene polysiloxane)

- 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.

| ID | df | temp. limits | 30-Meter | 60-Meter* |
|--------|--------|------------------|----------|-----------|
| 0.18mm | 0.10µm | -60 to 320/350°C | | 43607 |
| 0.25mm | 0.25µm | -60 to 330/350°C | 13623 | |

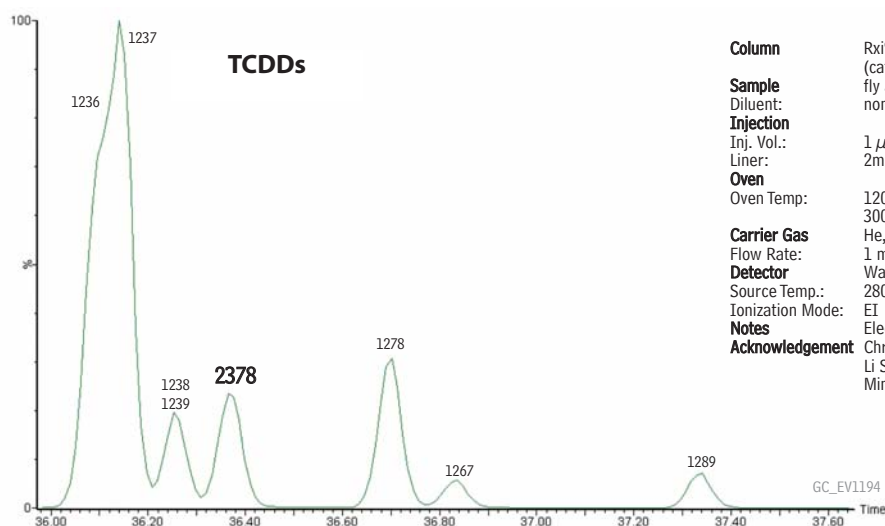
*60m, 0.18mm ID, 0.10µm column (cat.# 43607) intended for dioxin and furan analysis only.

Rxi®-5Sil MS Structuresimilar **phases**

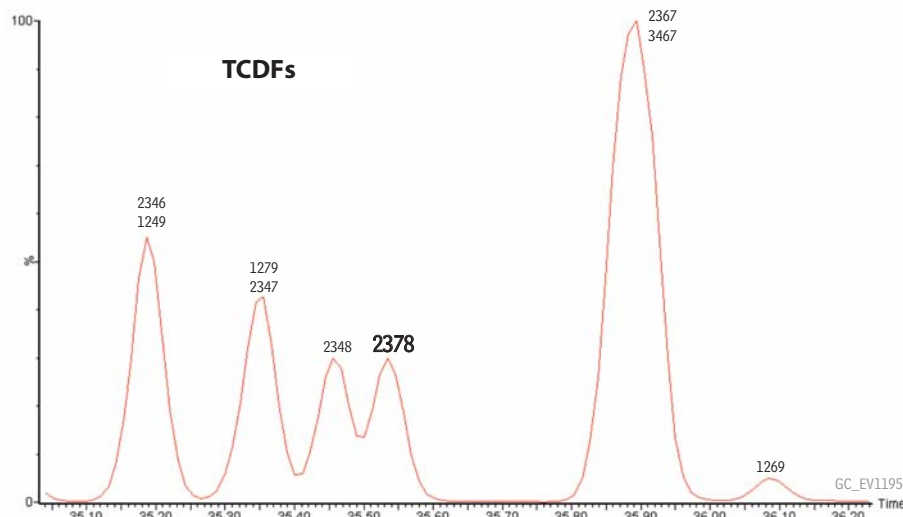
DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS

also **available****Other Dimensions!**

See **page 42** for our complete listing of Rxi®-5Sil MS columns.

Dioxins (TCDDs) and furans (TCDFs) in fly ash on an Rxi®-5Sil MS column.

Column Rxi®-5Sil MS, 60 m, 0.18 mm ID, 0.10 µm (cat.# 43607)
Sample fly ash extract
Diluent: nonane
Injection 1 µL splitless
Inj. Vol.: 2mm Splitless liner (cat.# 20712)
Liner:
Oven Oven Temp: 120 °C (hold 1 min.) to 160 °C at 10 °C/min. to 300 °C at 2.5 °C/min.
Carrier Gas He, constant flow
Flow Rate: 1 mL/min.
Detector Waters AutoSpec Ultima Mass Spectrometer
Source Temp.: 280 °C
Ionization Mode: EI
Notes Electron Ionization at 40eV
Acknowledgement Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment





restek **innovation!**

Excellent for dioxins or furans.

Dioxin & Furan Congeners Analysis

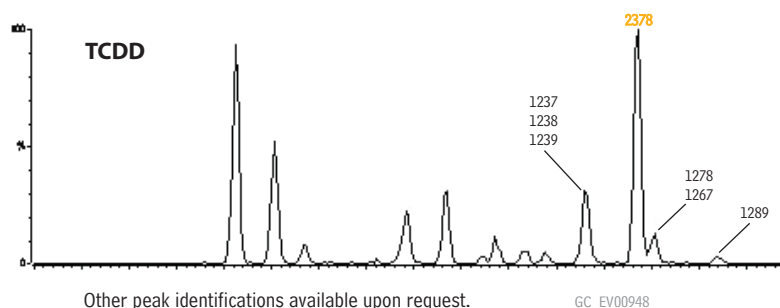
Rtx®-Dioxin2 Columns (fused silica)

(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 confirmation GC column.

| ID | df | temp. limits | 40-Meter | 60-Meter |
|--------|--------|---------------|----------|----------|
| 0.18mm | 0.18µm | 20°C to 340°C | 10759 | |
| 0.25mm | 0.25µm | 20°C to 340°C | | 10758 |

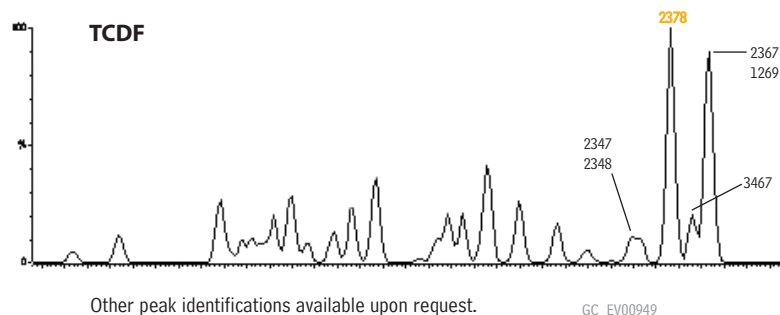
2,3,7,8-Tetrachlorodibenzodioxin resolved from other TCDD congeners, using an Rtx®-Dioxin2 column.



Other peak identifications available upon request.

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.

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

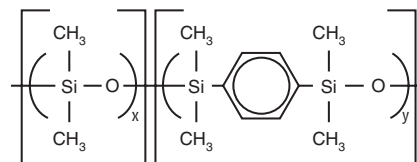
Polycyclic Aromatic Hydrocarbon (PAH) Analysis

Rxi®-5Sil MS Columns (fused silica)

(low polarity Crossbond® silarylene phase; selectivity close to 5% phenyl/95% dimethyl arylene 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 Structure



similar phases

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

also available

Get the protection without the connection!

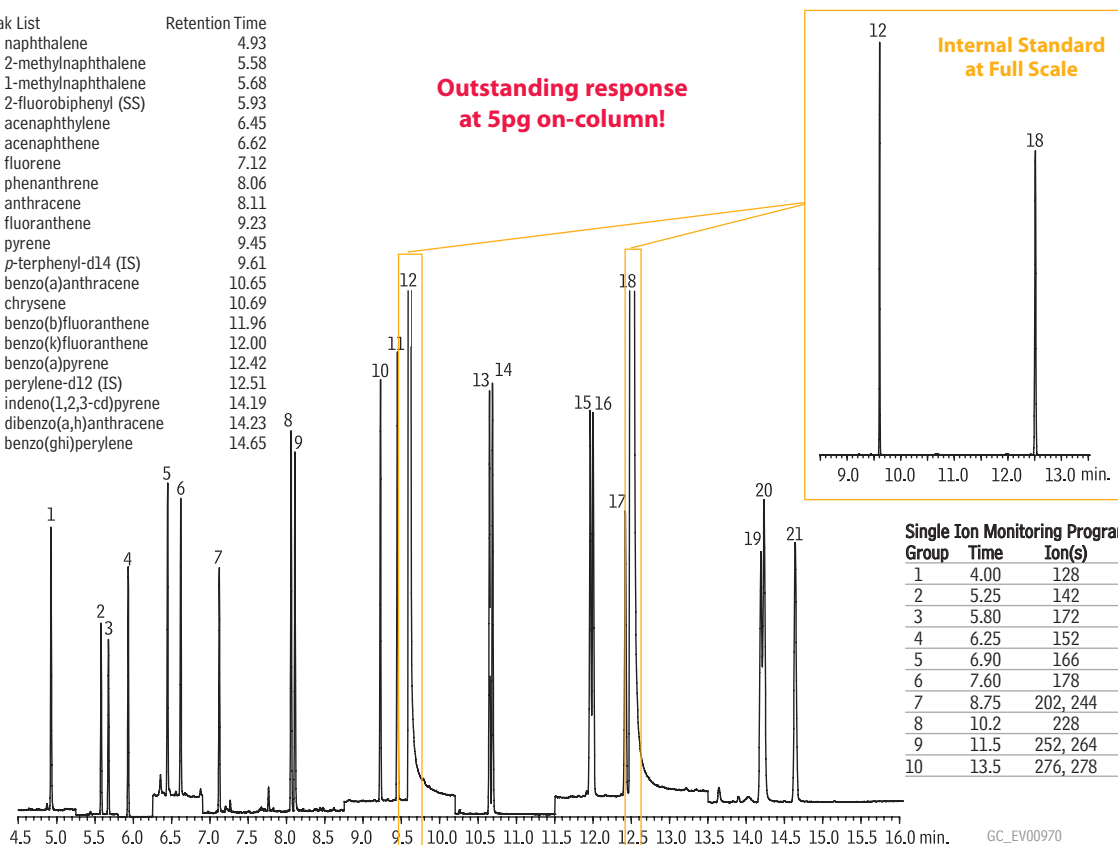
For Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns, see **page 35**.

Other Dimensions!

See **page 42** for our complete listing of Rxi®-5Sil MS columns.

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 response
at 5pg on-column!Internal Standard
at Full Scale

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 |

GC_EV00970

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)

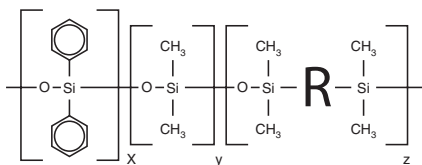
1-methylnaphthalene (cat.# 31283)
 2-methylnaphthalene (cat.# 31285)
 2-fluorobiphenyl (cat.# 31091)
 Inj.: 1.0µL (5pg on-column concentration),
 4mm Drilled Uniliner® (hole near top) inlet liner w/wool (cat.# 21055-200.5),
 pulsed splitless: pulse 20psi @ 0.2 min., 60mL/min. @ 0.15 min.

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

Rxi®-17Sil MS Structure



Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 50% phenyl/50% dimethyl arylene polysiloxane)

- 340/360 °C upper temperature limits.
- Excellent inertness for active compounds.
- Equivalent to USP phase G3.
- Low-bleed for use with sensitive detectors, such as MS.
- Excellent separation of EU-PAHs, including fluoranthenes.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|-----------------|----------|----------|----------|
| 0.25mm | 0.25µm | 40 to 340/360°C | 14120 | 14123 | 14126 |
| 0.32mm | 0.25µm | 40 to 340/360°C | 14121 | 14124 | |

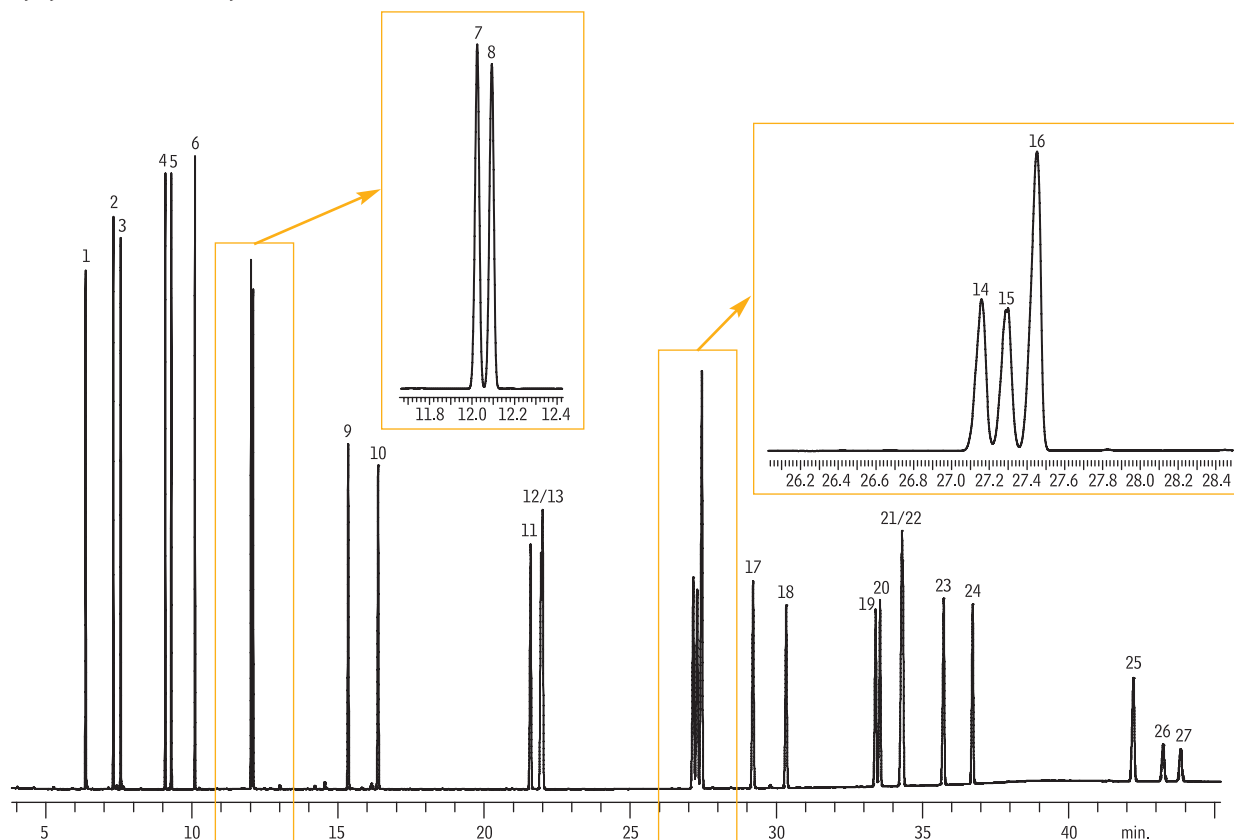
| ID | df | temp. limits | 20-Meter |
|--------|--------|-----------------|----------|
| 0.18mm | 0.18µm | 40 to 340/360°C | 14102 |
| | 0.36µm | 40 to 340/360°C | 14111 |

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

similar phases

DB-17ms, VF-17ms, BPX-50, DB-EUPAH

Polycyclic aromatic hydrocarbons on an Rxi®-17Sil MS column.



1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene

15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenz[a,h]acridine
20. Dibenz[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenz[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo[a,i]pyrene
27. Dibenzo[a,h]pyrene

Column Sample

Diluent:
Conc.:
Injection
Inj. Vol.:
Liner:
Inj. Temp.:
Purge Flow:
Oven
Oven Temp:
Carrier Gas
Flow Rate:
Detector
Instrument
Acknowledgement

Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
SV Calibration Mix #5 / 610 PAH Mix (cat.# 31011)
EPA Method 8310 PAH Mixture (cat.# 31841)
dichloromethane
10 ppm

0.5 µL splitless (hold 1.75 min.)
Auto SYS XL PSS Split/Splitless w/Wool (cat.# 21718)
320 °C
75 mL/min.

65 °C (hold 0.5 min.) to 220 °C at 15 °C/min. to 330 °C at 4 °C/min. (hold 15 min.)
He, constant flow
2.0 mL/min.
FID @ 320 °C
PE Clarus 600 GC
Instrument provided by PerkinElmer

Mineral Oil Analysis

Rtx®-Mineral Oil Columns (fused silica)

- Application specific columns meet DIN EN ISO 9377-2:2000 requirements.
- Optimized column dimensions for fast mineral oil screening.
- Surface linked phase guarantees long lifetime, robustness, and stability to 400 °C.



The Rtx®-Mineral Oil stationary phase and column dimensions were optimized for the fast screening of mineral oils in extracts from solids and water samples according to DIN EN ISO 9377-2: 2000. The 0.10 µm column is the gold standard for the method, whereas the 0.15 µm column provides more complete separation of C10 from the solvent peak when large injection sizes are used. Compared with common industry solutions, the unique surface bonding of the Rtx®-Mineral Oil column ensures long column lifetime, even at higher temperatures. These unique columns can be used at temperatures ranging from 380 °C (isothermal) to 400 °C (programmable), and each column is tested individually for bleed to ensure exceptional performance at these extreme conditions.

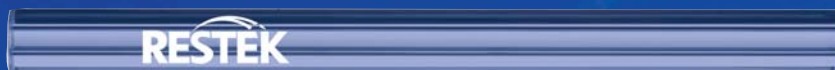
similar phases

Varian Select Mineral Oil, VF-5HT, DB-1HT, DB-5HT

| ID | df | temp. limits | 15-Meter |
|--------|--------|------------------|----------|
| 0.32mm | 0.10µm | -60 to 380/400°C | 18079 |
| | 0.15µm | -60 to 380/400°C | 18074 |
| | 0.30µm | -60 to 380/400°C | 18075 |

Sky
Inlet Liners

Looking for a Simple Solution?



New Sky™ liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace level results.

See pp. 206-211 for details.

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Volatile Organics Analysis

Rtx®-VMS Columns (fused silica)

(proprietary Crossbond® phase)

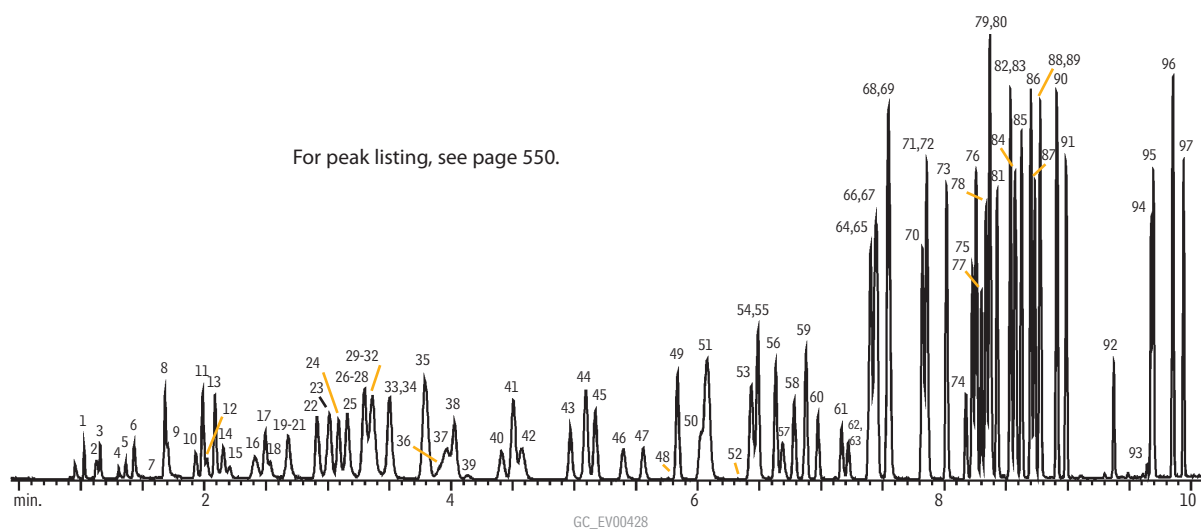
- Application-specific columns for volatile organic pollutants by GC/MS.
- Complete separation of US EPA Method 8260B compounds in less than 10 minutes.
- Stable to 260 °C.
- No known equivalent phases.

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 0.25 mm ID columns allow sample splitting at the injection port, eliminating the added expense and maintenance of a jet separator. A 0.45 mm or 0.53 mm ID column can be directly connected to the purge & trap transfer line in a system equipped with a jet separator.

| ID | df | temp. limits | 30-Meter | 60-Meter | 75-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 1.40µm | -40 to 240/260°C | 19915 | 19916 | |
| 0.32mm | 1.80µm | -40 to 240/260°C | 19919 | 19920 | |
| 0.45mm | 2.55µm | -40 to 240/260°C | 19908 | 19909 | |
| 0.53mm | 3.00µm | -40 to 240/260°C | 19985 | 19988 | 19974 |

| ID | df | temp. limits | 20-Meter | 40-Meter |
|--------|--------|------------------|-------------|-------------|
| 0.18mm | 1.00µm | -40 to 240/260°C | 49914 \$450 | 49915 \$755 |

Rapid analysis of volatile organics in US EPA Method 8260B, on an Rtx®-VMS column.



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: Vocab 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 Columns (fused silica)

(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.

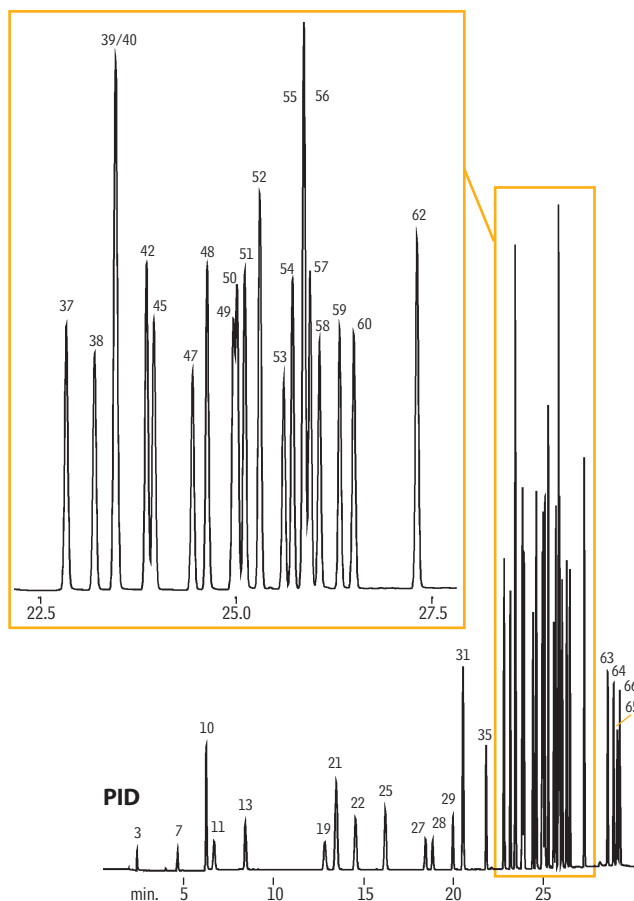
| ID | df | temp. limits | 30-Meter | 60-Meter | 75-Meter | 105-Meter |
|--------|--------|------------------|----------|----------|----------|-----------|
| 0.25mm | 1.40µm | -40 to 240/260°C | 19315 | 19316 | | |
| 0.32mm | 1.80µm | -40 to 240/260°C | 19319 | 19320 | | |
| 0.45mm | 2.55µm | -40 to 240/260°C | 19308 | | 19309 | |
| 0.53mm | 3.00µm | -40 to 240/260°C | 19385 | 19388 | 19374 | 19389 |

| ID | df | temp. limits | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|
| 0.18mm | 1.00µm | -40 to 240/260°C | 49314 | 49315 |

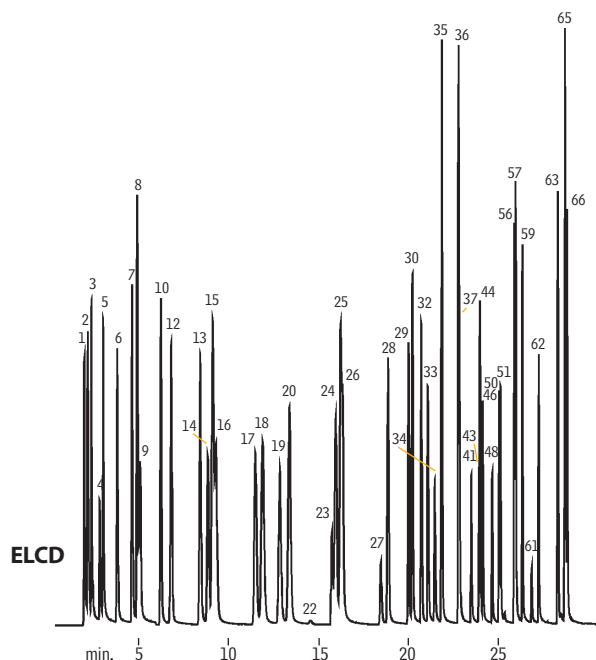
similar phases

DB-VRX

Excellent resolution of EPA Method 8021 volatile organics on an Rtx®-VRX column.



For peak listing and run conditions,
please visit us at www.restek.com
Search for GC_EV00001



GC_EV00001

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



ChromaBLOGraphy

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similar phase

DB-502.2

also available

Metal MXT® Columns

Rugged, flexible, Siltek® treated stainless steel tubing; inertness comparable to fused silica tubing. See **page 121** for our MXT®-502.2 and MXT® Volatiles columns.

similar phase

VOCOL

Volatile Organics Analysis

Rtx®-502.2 Columns (fused silica)

(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.

| ID | df | temp. limits | 30-Meter | 60-Meter | 75-Meter | 105-Meter |
|--------|--------|------------------|----------|----------|----------|-----------|
| 0.25mm | 1.40µm | -20 to 250/270°C | 10915 | 10916 | | |
| 0.32mm | 1.80µm | -20 to 250/270°C | 10919 | 10920 | | 10921 |
| 0.45mm | 2.55µm | -20 to 250/270°C | | | 10986 | |
| 0.53mm | 3.00µm | -20 to 250/270°C | 10908 | 10909 | | 10910 |

| ID | df | temp. limits | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|
| 0.18mm | 1.00µm | -20 to 250/270°C | 40914 | 40915 |

Rtx®-Volatiles Columns (fused silica)

(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.

| ID | df | temp. limits* | 30-Meter | 60-Meter | 105-Meter |
|--------|--------|------------------|----------|----------|-----------|
| 0.25mm | 1.00µm | -20 to 270/280°C | 10900 | 10903 | |
| 0.32mm | 1.50µm | -20 to 270/280°C | 10901 | 10904 | |
| 0.53mm | 2.00µm | -20 to 270/280°C | 10902 | 10905 | 10906 |

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



Solutions For Your Environmental Analyses

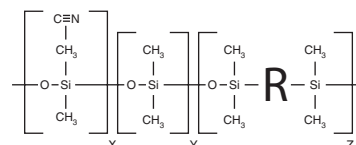
Improved best-in-class GC columns • Standards • Industry experts at your service.

Visit us at www.restek.com/enviro

Volatile Organics Analysis

**Rxi®-624Sil MS Columns (fused silica)**(midpolarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/
94% dimethyl arylene polysiloxane)

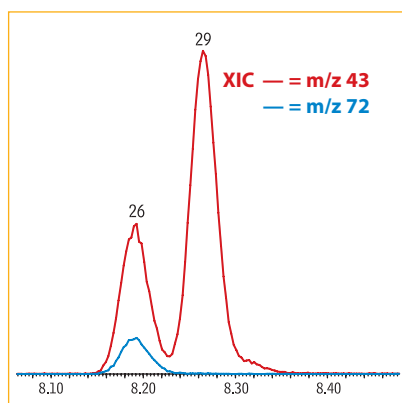
- Low bleed, high thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds, including acidic and basic compounds.
- Selective—highly selective for residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

Rxi®-624Sil MS Structure

similar phases

DB-624, HP-624, VF-624, BP-624, ZB-624,
AT-624, 007-1301, G43R

| ID | df | temp. limits | 20-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.18mm | 1.00µm | -20 to 300/320°C | 13865 | | |
| 0.25mm | 1.40µm | -20 to 300/320°C | | 13868 | |
| 0.32mm | 1.80µm | -20 to 300/320°C | | 13870 | 13872 |
| 0.53mm | 3.00µm | -20 to 280/300°C | | 13871 | |

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30m, 0.25mm ID, 1.40µm)

Resolution of critical pairs, low bleed, and high inertness make this a great column for volatiles!

for more info
www.restek.com/cat006

Column:

Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
8260A Surrogate Mix (cat.# 30240)
8260A Internal Standard Mix (cat.# 30241)
8260B MegaMix® Calibration Mix (cat.# 30633)
VOA Calibration Mix #1 (ketones) (cat.# 30006)
8260B Acetate Mix (revised) (cat.# 30489)
California Oxygenates Mix (cat.# 30465)
502.2 Calibration Mix #1 (gases) (cat.# 30042)

Conc.:

25 ppb in RO water

Injection**Inj. Temp.:**

purge and trap split (split ratio 30:1)

Purge and Trap**Instrument:**

OI Analytical 4660

Trap Type:

10 Trap

Purge:

11 min. @ 20 °C

Desorb Preheat Temp.:

180 °C

Desorb:

0.5 min. @ 190 °C

Bake:

5 min. @ 210 °C

Interface Connection:

injection port

Oven**Oven Temp:**

35 °C (hold 5 min.) to 60 °C at 11 °C/min. to 220 °C
at 20 °C/min. (hold 2 min.)

Carrier Gas:**Flow Rate:**

He, constant flow

Detector:

1.0 mL/min.

Mode:

MS

Transfer Line Temp.:

Scan

Analyzer Type:

230 °C

Source Temp.:

230 °C

Quad Temp.:

150 °C

Electron Energy:

70 eV

Solvent Delay Time:

1.5 min.

Tune Type:

BFB

Ionization Mode:

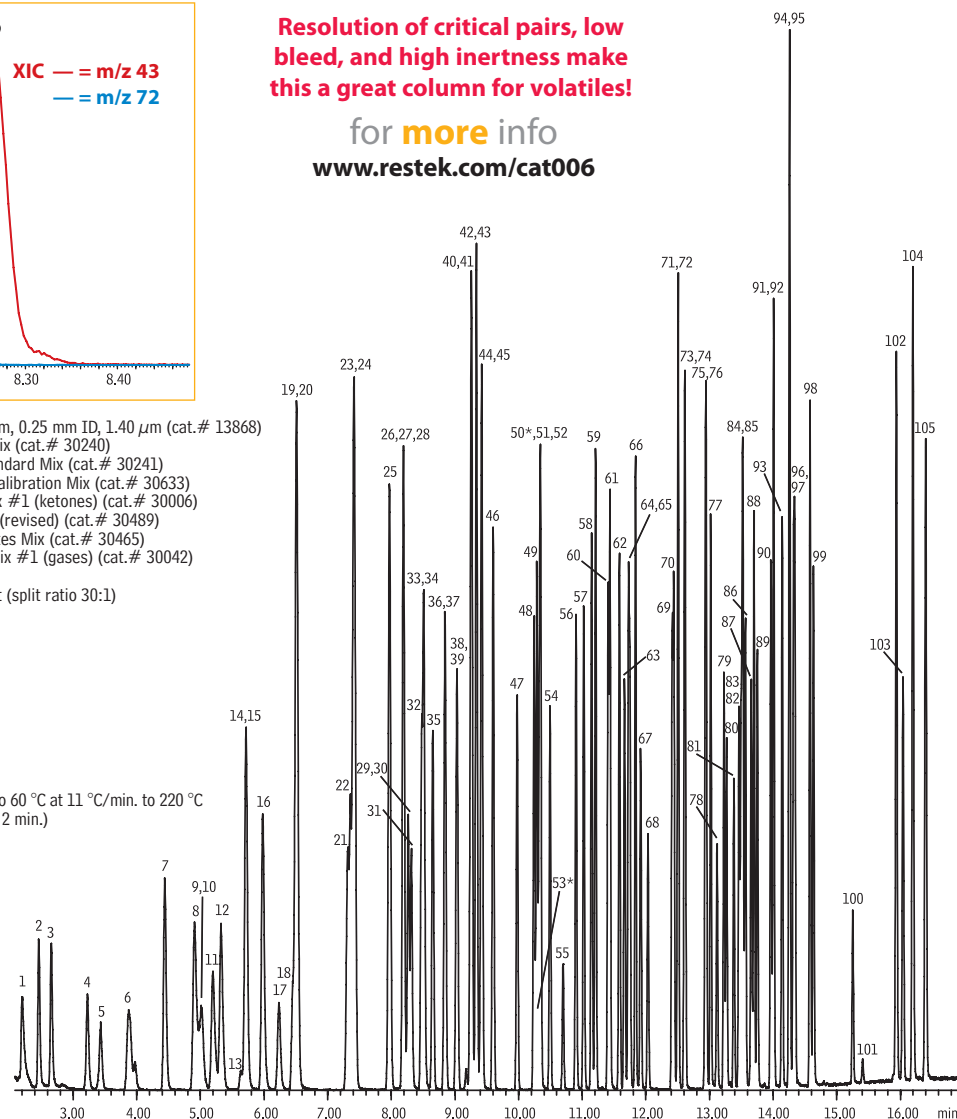
EI

Scan Range:

36-260 amu

Instrument:

Agilent 7890A GC & 5975C MSD



For peak list and complete conditions, see page 547.

GC_EV1169

GC COLUMNS

PLOT COLUMNS

PLOT Column Selection 105-107

Alumina BOND Columns

Rt-Alumina BOND/ Na_2SO_4 108
Rt-Alumina BOND/KCl108
Rt-Alumina Bond/CFC108
MXT-Alumina BOND/ Na_2SO_4 108

Molecular Sieve 5A Columns

Rt-Msieve 5A109
MXT-Msieve 5A109

Porous Polymer Columns

Rt-Q-BOND110
Rt-QS-BOND110
Rt-S-BOND110
Rt-U-BOND110
MXT-Q-BOND110
MXT-S-BOND110
PLOT Column Particle Trap111

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Next Generation GC PLOT Columns

- New bonding process minimizes particle release, reducing column blockage and protecting instrument parts.
- More consistent flow means stable retention times in Deans and related flow switching techniques.
- Outstanding peak symmetry improves impurity analysis for gases, solvents, and hydrocarbons.

Quick Reference Chart

| PLOT Column | Application | Page |
|--|--|------|
| Rt-Alumina BOND/ MXT-Alumina BOND (Na ₂ SO ₄ deactivation) | C1–C5 hydrocarbons. Purity analysis of ethylene, propylene, butenes, butadiene | 108 |
| Rt-Alumina BOND (KCl deactivation) | C1–C10 hydrocarbons, C1–C5 isomers. Purity analysis of ethylene, propylene, butene, butadiene. | 108 |
| Rt-Alumina BOND (CFC deactivation) | Multi-halogenated alkanes, C1–C-5 range. CFCs (chlorofluorocarbons) | 108 |
| Rt-Msieve 5A/ MXT-Msieve 5A | Permanent gas analysis (polarity between Q-BOND and S-BOND). He, Ne, Ar, O ₂ , N ₂ , Xe, Rn, SF ₆ , and CH ₄ , C ₂ H ₂ , CO | 109 |
| Rt-Q-BOND/ MXT-Q-BOND | Nonpolar porous polymer. High retention for solvents, alcohols, polar volatiles, CO ₂ , sulfur, and ppm water in solvents | 110 |
| Rt-QS-BOND | Intermediate polarity porous polymer. Neutral solvents, ketones, esters, hydrocarbons, and baseline separation of ethane, ethene, acetylene | 110 |
| Rt-S-BOND/ MXT-S-BOND | Intermediate polarity porous polymer. Light gases in ethylene and propylene, ketones, esters, hydrocarbons | 110 |
| Rt-U-BOND | Polar porous polymer. More retention for polar compounds | 110 |

PLOT Column Phase Cross-Reference: Similar Selectivity

| Restek | Porous Layer | Agilent/J&W | Supelco | Alltech | Varian/Chrompack | Quadrex |
|---|---|--|-----------------------|--------------|--|---------|
| Rt-Alumina BOND/Na ₂ SO ₄ MXT-Alumina BOND | Aluminum oxide | GS-Alumina | Alumina-Sulfate | AT-Alumina | CP-Al ₂ O ₃ /Na ₂ SO ₄ | — |
| Rt-Alumina BOND/KCl | Aluminum oxide | GC-Alumina KCl HP PLOT Al ₂ O ₃ | Alumina-Chloride | — | CP-Al ₂ O ₃ /KCl | — |
| Rt-Alumina BOND/CFC | | | unique product | | | |
| Rt-Msieve 5A MXT-Msieve 5A | Molecular sieve 5A | HP PLOT Molesieve | Molsieve 5A PLOT | AT-Molesieve | CP-Molesieve 5A | PLT-5A |
| Rt-Q-BOND MXT-Q-BOND | DVB porous polymer | HP PLOT Q | Supel-Q-PLOT | AT-Q | CP-PoraPlot Q, PoraBond Q | — |
| Rt-QS-BOND | Intermediate polarity porous polymer | GS-Q | — | — | — | — |
| Rt-S-BOND MXT-S-BOND | DVB vinylpyridine polymer | — | — | — | CP-PoraPlot S | — |
| Rt-U-BOND | DVB ethyleneglycol- dimethylacrylate polymer | HP-PLOT U | — | — | CP-PoraPlot U, CP-PoraBond U | — |

Next Generation of Porous Layer Open Tubular (PLOT) Columns

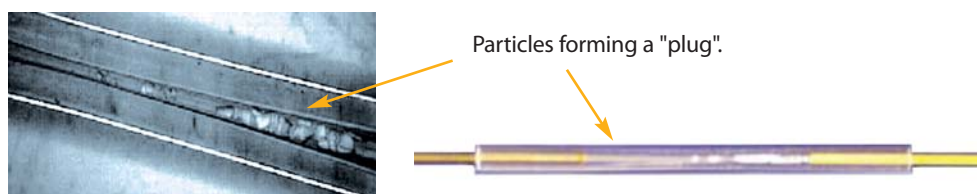
- Stabilized particle layers improve robustness and reproducibility of retention and flow.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- New manufacturing procedure reduces particle generation and improves performance of porous polymers, molecular sieves, and PLOT columns.

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 5-50 μ m 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 PLOT Columns Minimize Particle Release

Restek has developed new procedures to manufacture PLOT columns with concentric stabilized adsorption layers. These 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 fused silica columns. It is also available for select metal columns including MXT®-Alumina BOND and MXT®-Msieve 5A 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.

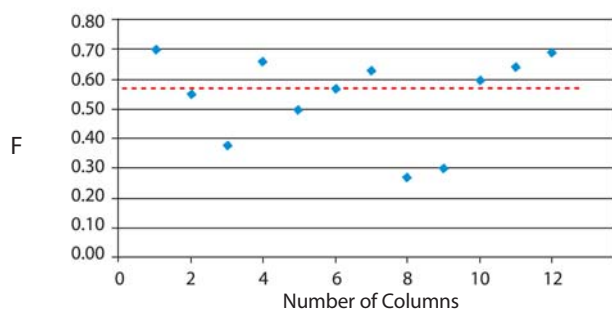


In order to evaluate flow restriction reproducibility, Restek is introducing a new factor: the flow restriction factor (F). This factor is based on the retention time of an unretained marker compound, as measured on both coated and uncoated tubing using the same backpressure setting (Equation 1). For quality control purposes, methane is used as the marker when evaluating porous polymer columns and helium is used for testing Rt®-Msieve 5A columns.

Flow restriction factor determination can be used both to assess the degree of column restriction and to evaluate the reproducibility of the column coating process. Percent flow restriction can also be calculated (Equation 2). Figure 3 shows typical results for PLOT columns manufactured using a conventional process. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns made using the new PLOT column process (Rt®-QS-BOND, bonded porous polymer). Clearly, the new manufacturing process results in greater consistency in both column coating thickness and flow restriction; which, in turn, results in more stable retention times and better performance in Deans switching and related flow switching techniques.



Figure 3 Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses.



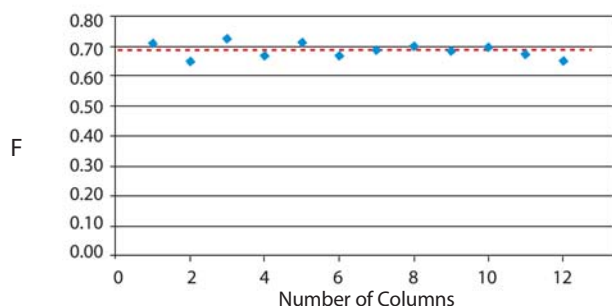
Equation 1 Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

t_R = retention time

Note, F values will always be <1 as the coated column always has more restriction than the uncoated column.

Figure 4 New PLOT columns from Restek offer consistent flow resistance, giving more reproducible results column-to-column.



Equation 2 Percent flow restriction of coated column.

$$\% \text{ restriction} = (1 - F) \times 100$$

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.





advanced
technology

Details on pages 106-107.

did you know?

Rt®-Alumina BOND columns show unique retention characteristics for hydrocarbons.



tech tip

Traces of water in the carrier gas and in the sample will affect the retention and the selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15-30 min. at 200 °C under normal carrier gas flow. 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.

for more info

For more information on
Rt®-Alumina BOND/CFC columns, see page 74.



now available!

Metal MXT® PLOT Columns

Rt®-Alumina BOND Columns

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.
5. High capacity and loadability give exceptionally symmetric peaks; ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations.

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. Extensive testing assures reproducible retention times and predictable flow behavior column-to-column.

Rt®-Alumina BOND/Na₂SO₄ Columns (fused silica PLOT)

(Na₂SO₄ deactivation)

- Acetylene/propadiene elute after butanes (impurities in acetylene/propadiene).
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.

| ID | df | temp. limits | 30-Meter | 50-Meter |
|--------|--------|--------------|----------|----------|
| 0.25mm | 4μm | to 200°C | 19775 | |
| 0.32mm | 5.00μm | to 200°C | 19757 | 19758 |
| 0.53mm | 10μm | to 200°C | 19755 | 19756 |

Rt®-Alumina BOND/KCl Columns (fused silica PLOT)

(KCl deactivation)

- Acetylene elutes before C4 hydrocarbons (impurities in butane/isobutane).
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.

| ID | df | temp. limits | 30-Meter | 50-Meter |
|--------|--------|--------------|----------|----------|
| 0.25mm | 4μm | to 200°C | 19776 | |
| 0.32mm | 5.00μm | to 200°C | 19761 | 19762 |
| 0.53mm | 10μm | to 200°C | 19759 | 19760 |

NEW!

Rt®-Alumina BOND/CFC Columns (fused silica PLOT)

- Improved inertness for halogenated compounds such as CFCs.
- Highly selective alumina based column, separates most CFCs.
- High retention and capacity for CFCs.

| ID | df | temp. limits | 30-Meter |
|--------|------|--------------|----------|
| 0.53mm | 10μm | to 200°C | 19763 |

NEW!

MXT®-Alumina BOND/Na₂SO₄ Columns (Siltek®-treated stainless steel PLOT)

Advantages of metal MXT® PLOT columns include:

- Can be made in small coil diameters—perfect for tight spaces.
- Will not spontaneously break, making them ideal for rugged environments.
- Designed for robust performance in process GCs and field instruments.

| ID | df (μm) | temp. limits | 3.5" coil 30-Meter | 7" diameter 11-pin cage 30-Meter |
|--------|---------|--------------|-----------------------|-------------------------------------|
| 0.53mm | 10μm | to 200°C | 79714-273 | 79714 |

NEW!

Molecular Sieve 5A PLOT Columns

Restek's molecular sieve 5A PLOT columns are designed for efficient separation of Ar/O₂ and other permanent gases, including CH₄, C₂H₆, 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, our 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/O₂ and H₂/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.

Rt®-Msieve 5A Columns (fused silica PLOT)

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 20µm | to 300°C | 19773 | |
| 0.32mm | 30µm | to 300°C | 19720 | 19722 |
| 0.53mm | 50µm | to 300°C | 19721 | 19723 |

MXT®-Msieve 5A Columns (Siltek®-treated stainless steel PLOT)

Advantages of metal MXT® PLOT columns include:

- Can be made in small coil diameters—perfect for tight spaces.
- Will not spontaneously break, making them ideal for rugged environments.
- Designed for robust performance in process GCs and field instruments.
- Available in 3.5" coil diameter or 7" diameter 11-pin cage.

| ID | df | temp. limits | 15-Meter | 3.5" coil 30-Meter | 7" diameter 11-pin cage 30-Meter |
|--------|------|--------------|----------|-----------------------|-------------------------------------|
| 0.25mm | 20µm | to 300°C | 79717 | | |
| 0.53mm | 50µm | to 300°C | | 79723-273 | 79723 |



advanced
technology

Details on **pages 106-107**.



did you know?

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O₂ and other permanent gases, including CH₄, C₂H₆, and CO.



tech tip

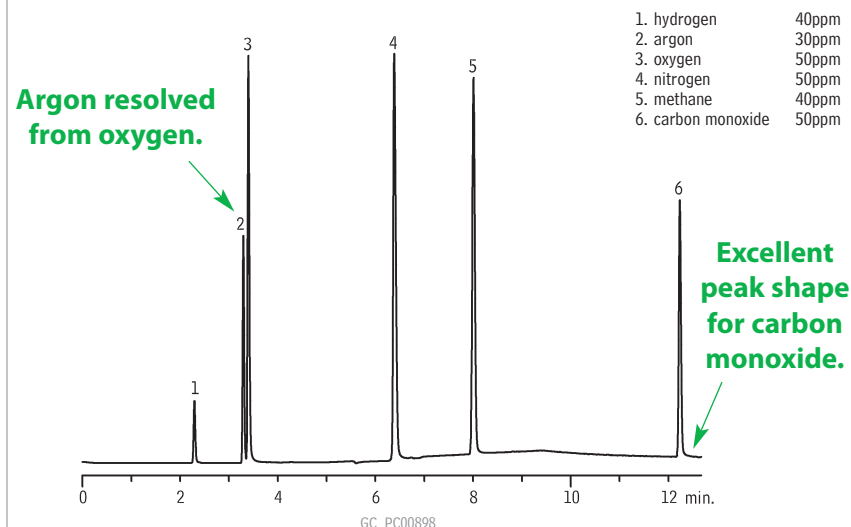
Because molecular sieve materials are very hydrophilic, they will adsorb water from the sample or carrier gas. Water contamination can have a detrimental effect on peak symmetry and can reduce the resolution of all compounds. If water contamination occurs, reactivate your Rt®-Msieve 5A PLOT column by conditioning at 300 °C with dry carrier gas flow for 3 hours.



tech tip

Carbon dioxide will not elute from molecular sieve columns. Rt®-Q-BOND is a good choice for this analysis.

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
Flow: 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

did you know?

ShinCarbon ST micropacked columns are another alternative for analyzing permanent gases.

See **page 130** for information.

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Details on pages 106-107.



For more chromatograms, see pages 652, 654 and 701-703, or use our chromatogram search tool at www.restek.com/chromatograms

least
polar

most
polar

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.

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.
- High retention for CO₂ simplifies gas analysis; CO₂ and methane separated from O₂/N₂/CO (Note: O₂/N₂/CO not separated at room temperature).
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 300 °C.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 8μm | to 280/300°C | 19764 | 19765 |
| 0.32mm | 10μm | to 280/300°C | 19743 | 19744 |
| 0.53mm | 20μm | to 280/300°C | 19741 | 19742 |

Rt®-QS-BOND Columns (fused silica PLOT)

porous divinyl benzene homopolymer

- Intermediate polarity PLOT column incorporating low 4-vinyl pyridine.
- Separates ethane, ethylene and acetylene to baseline.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 8μm | to 250°C | 19767 | 19768 |
| 0.32mm | 10μm | to 250°C | 19739 | 19740 |
| 0.53mm | 20μm | to 250°C | 19737 | 19738 |

Rt®-S-BOND Columns (fused silica PLOT)

divinylbenzene 4-vinylpyridine

- Midpolarity PLOT column, incorporating high 4-vinyl pyridine.
- Use for the analysis of nonpolar and polar compounds.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 8μm | to 250°C | 19769 | 19770 |
| 0.32mm | 10μm | to 250°C | 19747 | 19748 |
| 0.53mm | 20μm | 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 | temp. limits | 15-Meter | 30-Meter |
|--------|------|--------------|----------|----------|
| 0.25mm | 8μm | to 190°C | 19771 | 19772 |
| 0.32mm | 10μm | to 190°C | 19751 | 19752 |
| 0.53mm | 20μm | to 190°C | 19749 | 19750 |

Advantages of Metal MXT® PLOT columns include:

- Can be made in small coil diameters—perfect for tight spaces.
- Will not spontaneously break, making them ideal for rugged environments.
- Designed for robust performance in process GCs and field instruments.
- Available in 3.5" coil diameter or 7" diameter 11-pin cage.

MXT®-Q-BOND Columns (Siltek®-treated stainless steel PLOT)

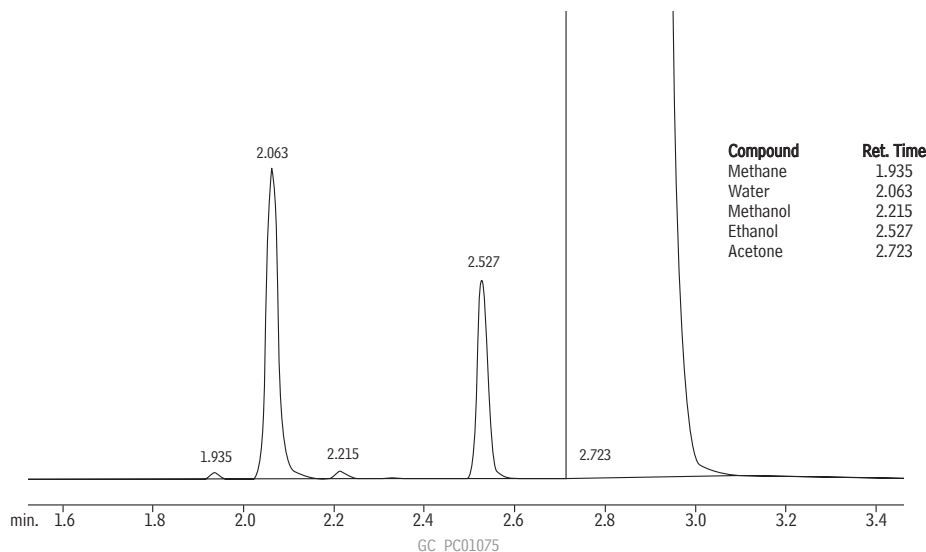
| ID | df | temp. limits | 15-Meter | 3.5" coil 30-Meter | 7" diameter 11-pin cage 30-Meter |
|--------|------|--------------|----------|-----------------------|-------------------------------------|
| 0.25mm | 8μm | to 300/320°C | 79718 | | |
| 0.53mm | 20μm | to 300/320°C | | 79716-273 | 79716 |

MXT®-S-BOND Columns (Siltek®-treated stainless steel PLOT)

| ID | df | temp. limits | 3.5" coil 30-Meter | 7" diameter 11-pin cage 30-Meter |
|--------|------|--------------|-----------------------|-------------------------------------|
| 0.53mm | 20μm | to 250°C | 79712-273 | 79712 |



Water and ethanol in acetone on an Rt®-Q-BOND PLOT column.



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

PLOT Column Particle Trap

- Includes two Press-Tight® connectors and a 2.5 m column.
- Protects detector and valves; connects 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 extreme pressure shocks and gas flow changes are anticipated. This sometimes happens when valve backflush or MS detection is used. In those extreme cases, using particle traps is recommended.

| Description | qty. | cat.# | price |
|--|------|-------|-------|
| PLOT Column Particle Trap, 2.5m, 0.32mm ID with 2 Press-Tight Connectors | ea. | 19753 | |
| PLOT Column Particle Trap, 2.5m, 0.53mm ID with 2 Press-Tight Connectors | ea. | 19754 | |



Particle Trap

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

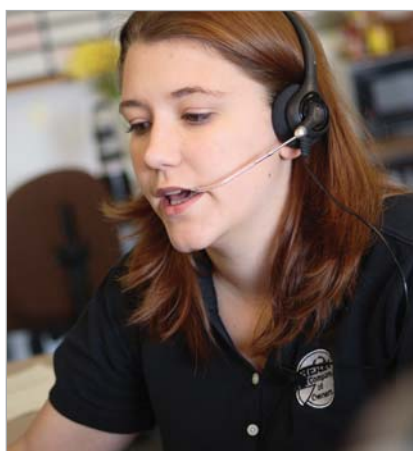
Monday–Friday 8:00 a.m.–6:00 p.m. ET

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Online: www.restek.com—24-hours a day

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 Refer to our list on pages 4-5 or visit our website at www.restek.com



Melissa Decker, Customer Service



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GC COLUMNS METAL (MXT®) CAPILLARY COLUMNS

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MXT-65117

MXT-1301117

MXT-1701118

MXT-200118

MXT-WAX118

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MXT-500 Sim Dist77, 120

MXT-502.2121

MXT-Volatiles121

MXT-624121



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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 0.18 mm, 0.25 mm, 0.32 mm, and 0.53 mm. 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 0.53 mm ID columns is 2.5 inches, and the minimum coil diameter for 0.25 mm ID columns is 1.5 inches.

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®-65 | • MXT®-65TG | • MXT®-500 SimDist |
| • MXT®-5 | • MXT®-1301 | • MXT®-Biodiesel TG | • MXT®-502.2 |
| • MXT®-20 | • MXT®-1701 | • MXT®-2887 | • MXT®-Volatiles |
| • MXT®-35 | • MXT®-200 | • MXT®-1HT SimDist | • MXT®-624 |
| • MXT®-50 | • MXT®-WAX | • MXT®-1 SimDist | • 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.
- Inertness of MXT® columns and fused silica columns is similar, due to the unique properties of the Siltek® surface treatment in MXT® columns.
- Metal columns can be coiled under 4.5 inches without breaking, ideal for small instruments.
- Coating efficiency (plates/meter) of MXT® columns is similar 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.



also
available

**Metal PLOT
columns!**

See pages 108-110.

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 0.53 mm 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.

RESTEK

CHROMALYTIC +61(0)3 9762 2034
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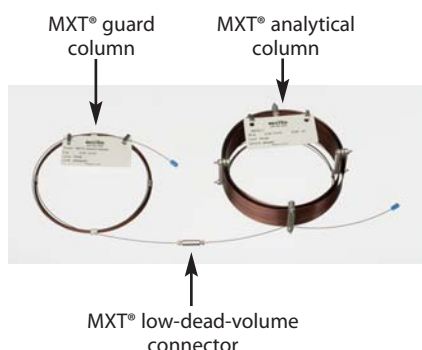
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www.restek.com 113

MXT® guard columns are tested for inertness and bleed.



Connect MXT® columns using an MXT® Low-Dead-Volume Connector!



also **available**

Column connector kits & ferrules
See page 292.

Intermediate-Polarity Deactivated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Useful for a wide range of applications.
- Compatible with most common solvents.
- Maximum temperature: 350 °C

| Nominal ID | Nominal OD | 5-Meter | 5-Meter/6-pk. | 10-Meter |
|------------|----------------|---------|---------------|----------|
| 0.28mm | 0.56 ± 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:

- Headspace analyzers.
- Air analysis equipment and concentrator units.

| Nominal ID | Nominal OD | 5-Meter | 10-Meter | 30-Meter* | 60-Meter*† |
|------------|----------------|---------|----------|-----------|------------|
| 0.28mm | 0.56 ± 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. Diameters greater than 0.10mm are tested with the Grob test mix to ensure high inertness.

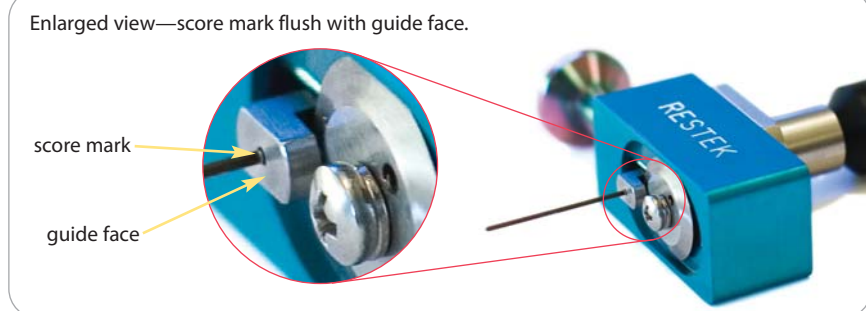
Restek Tubing Scorer for MXT® Columns

- Makes a perfect cut 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 | \$195 |
| Replacement Scoring Wheel | ea. | 20522 | \$40 |

MXT®-1 Columns (Siltek® treated stainless steel)

(nonpolar phase; Crossbond® 100% dimethyl polysiloxane)

- General purpose columns for solvent impurities, PCB congeners (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.

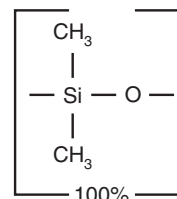
| ID | df | temp. limits | 6-Meter | 15-Meter | 30-Meter | 60-Meter | 105-Meter |
|--------|--------|------------------|--------------|----------|----------|----------|-----------|
| 0.25mm | 0.10µm | -60 to 330/430°C | | 70105 | 70116 | 70117 | 70114 |
| | 0.25µm | -60 to 430°C | | 70120 | 70123 | 70126 | 70129 |
| | 0.50µm | -60 to 400°C | | 70135 | 70138 | 70141 | 70144 |
| | 1.00µm | -60 to 340/360°C | | 70150 | 70153 | 70156 | 70159 |
| 0.28mm | 0.10µm | -60 to 430°C | 70102 \$310 | 70106 | 70109 | | |
| | 0.25µm | -60 to 430°C | | 70121 | 70124 | 70127 | |
| | 0.50µm | -60 to 400°C | | 70136 | 70139 | 70142 | |
| | 1.00µm | -60 to 320/360°C | | 70151 | 70154 | 70157 | |
| | 3.00µm | -60 to 285/360°C | | 70181 | 70184 | 70187 | |
| 0.53mm | 0.15µm | -60 to 430°C | 70101* \$310 | 70107 | | | |
| | 0.25µm | -60 to 430°C | | 70122 | 70125 | 70128 | |
| | 0.50µm | -60 to 400°C | | 70137 | 70140 | 70143 | |
| | 1.00µm | -60 to 320/360°C | | 70152 | 70155 | 70158 | |
| | 1.50µm | -60 to 310/360°C | | 70167 | 70170 | 70173 | |
| | 3.00µm | -60 to 285/360°C | | 70182 | 70185 | 70188 | |
| | 5.00µm | -60 to 270/360°C | | 70177 | 70179 | 70183 | |
| | 7.00µm | -60 to 250/360°C | | 70191 | 70192 | 70193 | |

| ID | df | temp. limits | 10-Meter | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.18mm | 0.20µm | -60 to 330/430°C | 71811 | 71812 | 71813 |
| | 0.40µm | -60 to 320/400°C | 71814 | 71815 | 71816 |

*For simulated distillation.

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

MXT®-1 Structure



similar phases

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



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-1701¹, 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-UPLOT², 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 cycles⁵, 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

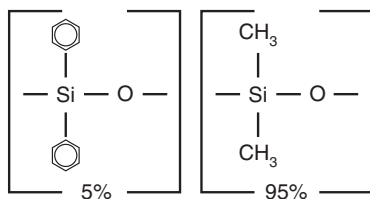
Responsible for the space GC team at LISA (Paris, France)



References

- ¹Sternberg, R., C. Szopa, D. Coscia, S. Zubrzycki, F. Raulin, C. Vidal-Madjar, H. Niemann and G. Israel *J. Chromatogr.*, 846, 307-315, (1999)
- ²C. Szopa, R. Sternberg, F. Raulin and H. Rosenbauer *Planetary and Space Science*, 51 (13) 863-877 (2003)
- ³Cabane, 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)
- ⁴Zampolli, M-G., D. Meunier, R. Sternberg, C. Szopa., F. Raulin, M. C. Pietrogrande, F. Dondi *Chirality* 18 (5):383-394 (2006)
- ⁵C. 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)

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 Columns (Siltek® treated stainless steel)

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

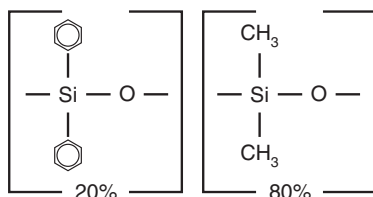
- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g. Aroclor mixes), essential oils, and semivolatiles.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G27, G36 phases.

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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 0.10µm | -60 to 430°C | 70205 | 70208 | 70211 |
| | 0.25µm | -60 to 430°C | 70220 | 70223 | 70226 |
| | 0.50µm | -60 to 400°C | 70235 | 70238 | 70241 |
| | 1.00µm | -60 to 340°C | 70250 | 70253 | 70256 |
| 0.28mm | 0.25µm | -60 to 430°C | 70221 | 70224 | 70227 |
| | 0.50µm | -60 to 400°C | 70236 | 70239 | 70242 |
| | 1.00µm | -60 to 325/360°C | 70251 | 70254 | 70257 |
| | 3.00µm | -60 to 290/360°C | 70281 | 70284 | 70287 |
| 0.53mm | 0.25µm | -60 to 430°C | 70222 | 70225 | 70228 |
| | 0.50µm | -60 to 400°C | 70237 | 70240 | 70243 |
| | 1.00µm | -60 to 325/360°C | 70252 | 70255 | 70258 |
| | 1.50µm | -60 to 300/360°C | 70267 | 70270 | 70273 |
| | 3.00µm | -60 to 290/360°C | 70282 | 70285 | 70288 |
| | 5.00µm | -60 to 270/360°C | 70277 | 70279 | 70283 |

| ID | df | temp. limits | 10-Meter | 20-Meter | 40-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.18mm | 0.20µm | -60 to 325/430°C | 71821 | 71822 | 71823 |
| | 0.40µm | -60 to 325/400°C | 71824 | 71825 | 71826 |

MXT®-20 Structure



similar phases

SPB-20, VOCOL

MXT®-20 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 0.25µm | -20 to 320/340°C | 70320 | 70323 | 70326 |
| | 1.00µm | -20 to 300/340°C | 70350 | 70353 | 70356 |
| 0.28mm | 0.25µm | -20 to 310/340°C | 70321 | 70324 | 70327 |
| | 1.00µm | -20 to 295/340°C | 70351 | 70354 | 70357 |
| | 3.00µm | -20 to 260/340°C | 70381 | 70384 | 70387 |
| 0.53mm | 0.25µm | -20 to 310/340°C | 70322 | 70325 | 70328 |
| | 1.00µm | -20 to 295/340°C | 70352 | 70355 | 70358 |
| | 3.00µm | -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.

Chromatogram Search Tool

Search by compound name, synonym, CAS # or keyword

www.restek.com/chromatograms



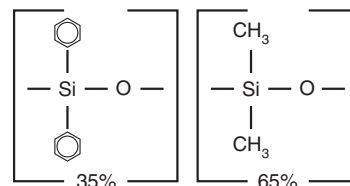
MXT®-35 Columns (Siltek® treated stainless steel)

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

- General purpose columns for organochlorine pesticides, PCB congeners (e.g. Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, and phthalate esters.
- Temperature range: 0 °C to 340 °C.
- Equivalent to USP G42 phase.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|----------------|----------|----------|-------------|
| 0.25mm | 0.50µm | 0 to 310/340°C | 70435 | 70438 | |
| | 1.00µm | 0 to 300/340°C | 70450 | 70453 | |
| 0.53mm | 1.00µm | 0 to 260/340°C | 70452 | 70455 | 70458 |
| | 1.50µm | 0 to 250/340°C | 70467 | 70470 | 70473 |
| | 3.00µm | 0 to 240/340°C | 70482 | 70485 | \$580 70488 |

MXT®-35 Structure



similar **phases**

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

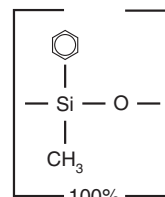
MXT®-50 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|----------------|----------|----------|----------|
| 0.53mm | 0.83µm | 0 to 270/300°C | | 70569 | |
| | 1.00µm | 0 to 260/280°C | 70552 | 70555 | 70558 |
| | 1.50µm | 0 to 250/280°C | 70567 | 70570 | 70573 |

MXT®-50 Structure



similar **phases**

HP-17, SPB-50, SP-2250

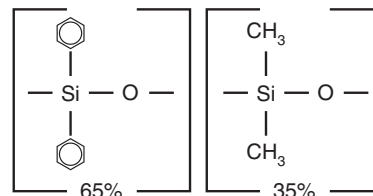
MXT®-65 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|-----------------|----------|----------|
| 0.25mm | 0.25µm | 50 to 300°C | 77020 | 77023 |
| | 0.50µm | 50 to 300°C | 77035 | 77038 |
| | 1.00µm | 50 to 280/300°C | 77050 | 77053 |

MXT®-65 Structure



similar **phases**

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

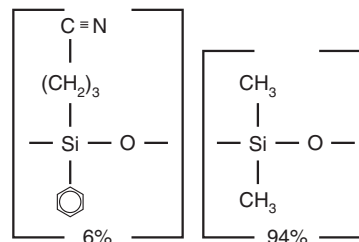
MXT®-1301 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 0.25µm | -20 to 280°C | 76020 | 76023 | 76026 |
| | 1.00µm | -20 to 260/280°C | 76050 | 76053 | 76056 |
| 0.28mm | 0.25µm | -20 to 280°C | 76021 | 76024 | 76027 |
| | 1.00µm | -20 to 260/280°C | 76051 | 76054 | 76057 |
| | 1.50µm | -20 to 250/280°C | 76066 | 76069 | 76072 |
| 0.53mm | 0.25µm | -20 to 280°C | 76022 | 76025 | 76028 |
| | 1.00µm | -20 to 260/280°C | 76052 | 76055 | 76058 |
| | 1.50µm | -20 to 250/280°C | 76067 | 76070 | 76073 |
| | 3.00µm | -20 to 240/280°C | 76082 | 76085 | 76088 |

MXT®-1301 Structure

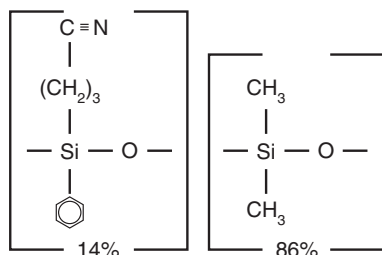


similar **phases**

DB-1301, DB-624, HP-1301, SPB-1301, SPB-624

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

MXT®-1701 Structure



similar phases

DB-1701, HP-1701, SPB-1701

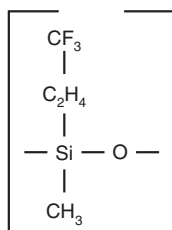
MXT®-1701 Columns (Siltek® treated stainless steel)

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

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

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 0.25μm | -20 to 280°C | 72020 | 72023 | 72026 |
| | 1.00μm | -20 to 260°C | 72050 | 72053 | 72056 |
| | 5.00μm | -20 to 260°C | 72051 | 72054 | 72057 |
| 0.28mm | 0.25μm | -20 to 280°C | 72021 | 72024 | 72027 |
| | 1.00μm | -20 to 260°C | 72051 | 72054 | 72057 |
| | 5.00μm | -20 to 250°C | 72066 | 72069 | 72072 |
| 0.53mm | 0.25μm | -20 to 280°C | 72022 | 72025 | 72028 |
| | 0.50μm | -20 to 270/280°C | 72037 | 72040 | 72043 |
| | 1.00μm | -20 to 260°C | 72052 | 72055 | 72058 |
| | 1.50μm | -20 to 250°C | 72067 | 72070 | 72073 |
| | 3.00μm | -20 to 240°C | 72082 | 72085 | 72088 |

MXT®-200 Structure



similar phases

DB-200, DB-210

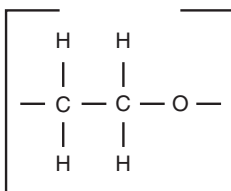
MXT®-200 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|----------|
| 0.25mm | 0.50μm | -20 to 400°C | 75035 | 75038 | |
| | 1.00μm | -20 to 310/360°C | 75050 | 75053 | |
| 0.53mm | 1.00μm | -20 to 290/360°C | 75052 | 75055 | 75058 |
| | 1.50μm | -20 to 280/360°C | 75067 | 75070 | 75073 |
| | 3.00μm | -20 to 260/360°C | 75082 | 75085 | 75088 |

MXT®-WAX Structure



similar phases

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

MXT®-WAX Columns (Siltek® treated stainless steel)

(polar phase; Crossbond® Carbowax® polyethylene glycol—provides oxidation resistance)

- 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.

| ID | df | temp. limits | 15-Meter | 30-Meter | 60-Meter |
|--------|--------|-----------------|----------|----------|----------|
| 0.25mm | 0.10μm | 40 to 260°C | 70605 | 70608 | 70611 |
| | 0.25μm | 40 to 260°C | 70620 | 70623 | 70626 |
| | 0.50μm | 40 to 260°C | 70635 | 70638 | 70641 |
| 0.28mm | 0.25μm | 40 to 250/260°C | 70621 | 70624 | 70627 |
| | 0.50μm | 40 to 250/260°C | 70636 | 70639 | 70642 |
| | 1.00μm | 40 to 240/250°C | 70651 | 70654 | 70657 |
| 0.53mm | 0.25μm | 40 to 250/260°C | 70622 | 70625 | 70628 |
| | 0.50μm | 40 to 250/260°C | 70637 | 70640 | 70643 |
| | 1.00μm | 40 to 240/250°C | 70652 | 70655 | 70658 |
| | 1.50μm | 40 to 230/250°C | 70666 | 70669 | 70672 |
| | 2.00μm | 40 to 220/250°C | 70667 | 70670 | |

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

Triglycerides in Foods Analysis

MXT®-65TG Columns (Siltek® treated stainless steel)

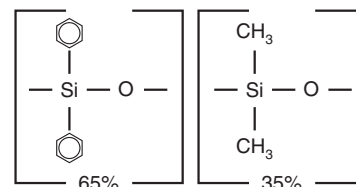
(high polarity phase; Crossbond® 65% diphenyl/35% dimethyl polysiloxane)

- 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.

| ID | df | temp. limits | 15-Meter | 30-Meter |
|--------|--------|--------------|----------|----------|
| 0.25mm | 0.10µm | 20 to 370°C | 77005 | 77008 |
| 0.53mm | 0.10µm | 20 to 370°C | 77007 | 77010 |

MXT®-65TG Structure



Biodiesel Fuels Analysis

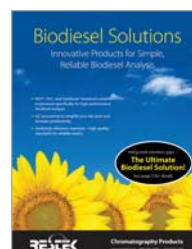
MXT®-Biodiesel TG Columns (Siltek® treated stainless steel)

- 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 0.53 mm ID column eliminates column coupling completely.

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



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Simulated Distillation (C5-C44) Analysis

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

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

- Application-specific columns for simulated distillation.
- Stable to 400 °C.

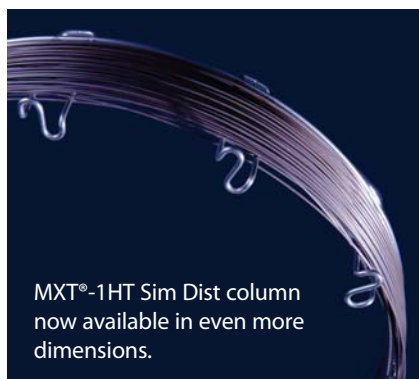
MXT®-2887 columns' stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements currently specified in ASTM method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention 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.

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

similar **phases**

DB-2887, Petrocol EX2887, CP-HT-Simdist CB

Simulated Distillation (C44-C100) Analysis



MXT®-1HT Sim Dist column
now available in even more
dimensions.

similar phases

DB-1HT, CP-HT-Simdist CB

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

(nonpolar phases)

- Stable up to 450 °C—lowest bleed for longest column lifetime.
- Reliably meet all ASTM D6352 and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation. Metal columns are a better alternative than fused silica, and the new MXT®-1HT SimDist columns are the lowest bleed, highest efficiency columns available, outperforming other metal columns for critical method parameters.

| ID | df | temp. limits | 5-Meter | 10-Meter |
|--------|--------|------------------|---------|----------|
| 0.53mm | 0.10µm | -60 to 430/450°C | 70112 | |
| | 0.20µm | -60 to 430/450°C | 70115 | |
| | 0.21µm | -60 to 430/450°C | | 70118 |
| | 0.88µm | -60 to 400/430°C | 70131 | 70134 |
| | 1.00µm | -60 to 380/400°C | | 70130 |
| | 1.20µm | -60 to 380/400°C | | 70119 |
| | 2.65µm | -60 to 360/400°C | | 70132 |
| | 5.00µm | -60 to 360/400°C | | 70133 |

MXT®-1 SimDist/MXT®-500 SimDist

- 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 SimDist and MXT®-1 SimDist phases offer true methyl silicone polarity; MXT®-500 SimDist phase is a carborane siloxane polymer.
- Stable to 430 °C.

MXT®-1 SimDist Column (Siltek® treated stainless steel)

(nonpolar phase)

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

MXT®-500 SimDist Column (Siltek® treated stainless steel)

(nonpolar phase)

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

Polywax® Calibration Materials

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

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Volatile Organics Analysis

MXT®-502.2 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits | 30-Meter | 60-Meter | 105-Meter |
|--------|--------|------------------|----------|----------|-----------|
| 0.25mm | 1.40µm | -20 to 270/320°C | 70915 | 70916 | |
| 0.28mm | 1.60µm | -20 to 250/320°C | 70919 | 70920 | 70921 |
| 0.53mm | 3.00µm | -20 to 270/320°C | 70908 | 70909 | 70910 |

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|----------|
| 0.18mm | 1.00µm | -20 to 270/320°C | 71891 | 71892 |

MXT®-Volatiles Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits* | 30-Meter | 60-Meter | 105-Meter |
|--------|--------|------------------|----------|----------|-----------|
| 0.25mm | 1.00µm | -20 to 280/320°C | 70900 | 70903 | |
| 0.28mm | 1.25µm | -20 to 280/320°C | 70924 | 70926 | 70928 |
| 0.53mm | 2.00µm | -20 to 280/320°C | 70925 | 70927 | 70929 |
| | 3.00µm | -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 Columns (Siltek® treated stainless steel)

(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.

| ID | df | temp. limits | 30-Meter | 60-Meter |
|--------|--------|------------------|----------|----------|
| 0.25mm | 1.40µm | -20 to 240/280°C | 70968 | 70969 |
| 0.53mm | 3.00µm | -20 to 240/280°C | 70971 | 70973 |

| ID | df | temp. limits | 10-Meter | 20-Meter |
|--------|--------|------------------|----------|-------------|
| 0.18mm | 1.00µm | -20 to 240/280°C | 71893 | 71894 \$745 |

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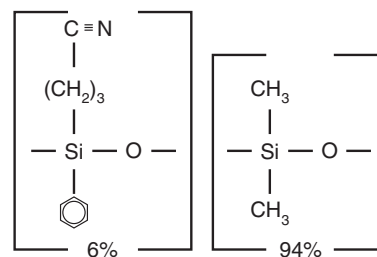
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similar **phase**

DB-502.2

similar **phase**

VOCOL

MXT®-624 Structuresimilar **phases**

DB-624, HP-624

GC COLUMNS PACKED/MICROPACKED COLUMNS

| | |
|---|-------------|
| Bonded Stationary Phases | 123-124,126 |
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| Specialty Packed Columns | 128-131 |
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11/12

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 life-times, 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 non-bonded 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.

| Hydrocarbon | Retention Time | | | |
|-------------|----------------|--------|--------|-------------|
| | 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



0.53 mm ID micropacked columns now available. See **page 132**.

Who says packed columns are old technology? Not Restek!
By combining flexible SilcoSmooth® tubing with low-bleed bonded phases, we have made the most significant improvements in packed column technology in more than 25 years!

Columns available in 0.53, 0.75, 1, 2, 3.2, & 5.2mm ID.

Bonded phase packings decrease conditioning times and bleed, and increase column lifetime.

Columns can be configured for all GC models.

Silcosmooth® tubing has a Siltek® treated surface, which is more inert than glass.

The most complete line of packing materials available.

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.

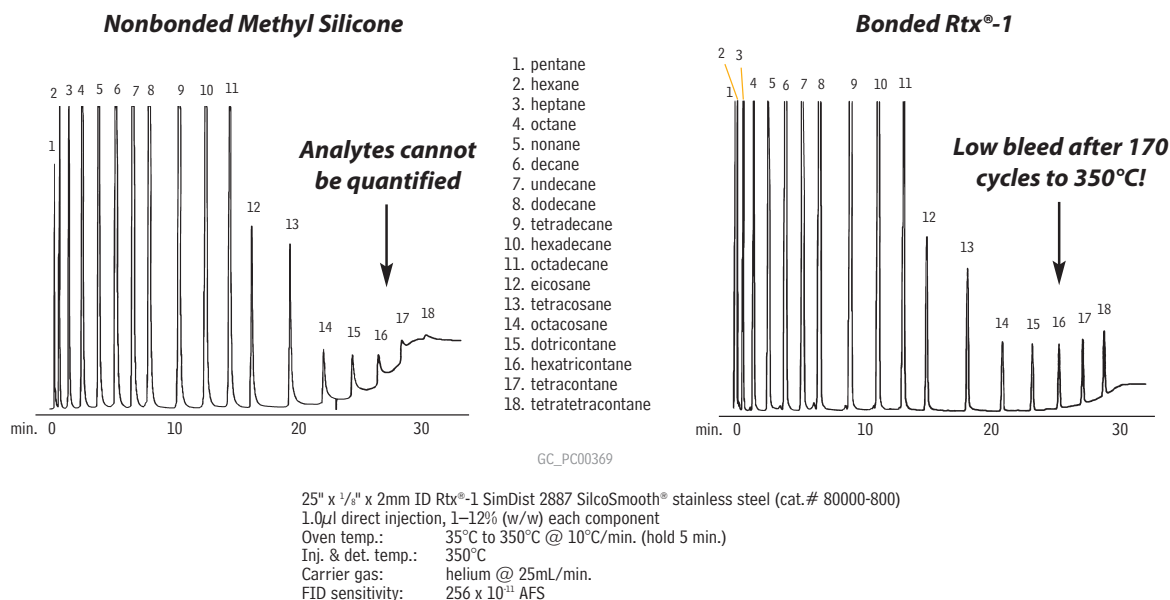
Restek's packed columns deliver the**1-2-3 PUNCH!**

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

| | |
|------------------|---|
| | BP-1, CC-1, CP-Sil 5CB, DB-1, DC-200, GE-SF-96, HP-1, HP-101, OV-1, OV-101, |
| Rtx-1 | 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.



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 the 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 / ₈ -inch OD x 5.3mm ID | ³ / ₁₆ -inch OD x 3.1mm ID ² | ¹ / ₈ -inch OD x 2.0mm ID ² | ¹ / ₁₆ -inch OD x 1.0mm ID ³ | 0.95mm OD x 0.75mm ID ⁴ | 0.74 mm OD x 0.53mm ID |
|-----------------|--|--|---|--|---------------------------------------|---------------------------|
| 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

Frits—A new alternative to glass wool and braided end plugs!

Hastelloy® and Siltek® treated frits are now available for select packed and micropacked columns!



Hastelloy® frit



Siltek® frit

Fill out the form on page 142, visit www.restek.com/packed, contact Customer Service or your Restek representative for pricing and availability.

Stock Packed Columns

please **note**

Stock packed columns are designed with a 2" void on the inlet end for on-column injections. For column configurations containing no void, add suffix -901 to the part number.

Bonded Packed Column Stationary Phases

- Low bleed levels.
- Longer column lifetimes.
- Short conditioning times.

| Bonded Phase on 100/120 Silcoport W | L (ft.) | Stainless Steel Tubing | | | price | L (m) | SilcoSmooth Tubing** | | | price |
|--|------------|------------------------|------------|---------|-------|----------|----------------------|------------|---------|-------|
| | | OD (in.) | ID (mm) | cat.#** | | | OD (in.) | ID (mm) | cat.#** | |
| 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- | |

Frits—A new alternative to glass wool and braided end plugs!

Hastelloy® and Siltek® treated frits are now available for select packed and micropacked columns!



Hastelloy® frit



Siltek® frit

Fill out the form on page 142, visit www.restek.com/packed, contact Customer Service or your Restek representative for pricing and availability.

Chromosorb®-Based Packed Columns

| On 100/120 Silcoport W*** | L (ft.) | Stainless Steel Tubing | | | price | L (m) | SilcoSmooth Tubing** | | | price |
|-----------------------------|------------|------------------------|------------|---------|-------|----------|----------------------|------------|---------|-------|
| | | OD (in.) | ID (mm) | cat.#** | | | OD (in.) | ID (mm) | cat.#** | |
| 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- | |

| On Chromosorb PAW | Mesh | L (ft.) | Stainless Steel Tubing | | | price | L (m) | SilcoSmooth Tubing** | | | price |
|-------------------|---------|------------|------------------------|------------|---------|-------|----------|----------------------|------------|---------|-------|
| | | | OD (in.) | ID (mm) | cat.#** | | | OD (in.) | ID (mm) | cat.#** | |
| 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- | |

Porous Polymer Packed Columns

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 Polymers | L (ft.) | Stainless Steel Tubing | | | price | L (m) | SilcoSmooth Tubing** | | | price |
|-----------------|------------|------------------------|------------|---------|-------|----------|----------------------|------------|---------|-------|
| | | OD (in.) | ID (mm) | cat.#** | | | OD (in.) | ID (mm) | cat.#** | |
| 80/100 Mesh | | | | | | | | | | |
| 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- | |

*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.

also **available**

Chromosorb®, Porapak, HayeSep®, and Tenax® packing materials.
See **pages 136-137**.

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.

also **available**

CarboBlack packing materials. See **page 134**.

| | | Stainless Steel Tubing | | | | | SilcoSmooth Tubing** | | | | |
|--|--------|------------------------|-------|------|---------|-------|----------------------|-------|------|---------|-------|
| | | L | OD | ID | cat.#** | price | L | OD | ID | cat.#** | price |
| On CarboBlack B | Mesh | (ft.) | (in.) | (mm) | | | (m) | (in.) | (mm) | | |
| 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 ₃ PO ₄ | 60/80 | 6 | 1/8 | 2.1 | 80455- | | 1.8 | 1/8 | 2 | 80305- | |

| | | Nickel 200 Tubing | | | | |
|------------------------------|-------|-------------------|-------|------|---------|-------|
| | | L | OD | ID | cat.#** | price |
| On CarboBlack B | Mesh | (m) | (in.) | (mm) | | |
| 5% Krytox (Ni 200 tubing) | 60/80 | 3.05 | 1/8 | 2.1 | 80127- | \$315 |

| | | Stainless Steel Tubing | | | | | SilcoSmooth Tubing** | | | | |
|--|--------|------------------------|-------|------|---------|-------|----------------------|-------|------|---------|-------|
| | | L | OD | ID | cat.#** | price | L | OD | ID | cat.#** | price |
| On CarboBlack C | Mesh | (ft.) | (in.) | (mm) | | | (m) | (in.) | (mm) | | |
| 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 ₃ PO ₄ | 60/80 | 2.5 | 3/16 | 3.1 | 80460- | | 0.75 | 3/16 | 3.1 | 80111- | |

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
Suffix -840

See page 143 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 1/8" void on detector side.

Molecular Sieve Packed Columns

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.

| | | Stainless Steel Tubing | | | | | SilcoSmooth Tubing** | | | | |
|-----------------|--------|------------------------|-------|------|---------|-------|----------------------|-------|------|---------|-------|
| | | L | OD | ID | cat.#** | price | L | OD | ID | cat.#** | price |
| Molecular Sieve | Mesh | (ft.) | (in.) | (mm) | | | (m) | (in.) | (mm) | | |
| 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.

Custom

Packed/Micropacked
Column Request Form

See page 142 or visit
www.restek.com/packed



Aromatics Analysis

D3606 Application Column (2 column set)

- Complete separation 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 revised ASTM method.

free
literature

Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

Download your free copy from
www.restek.com

lit. cat.# 580227



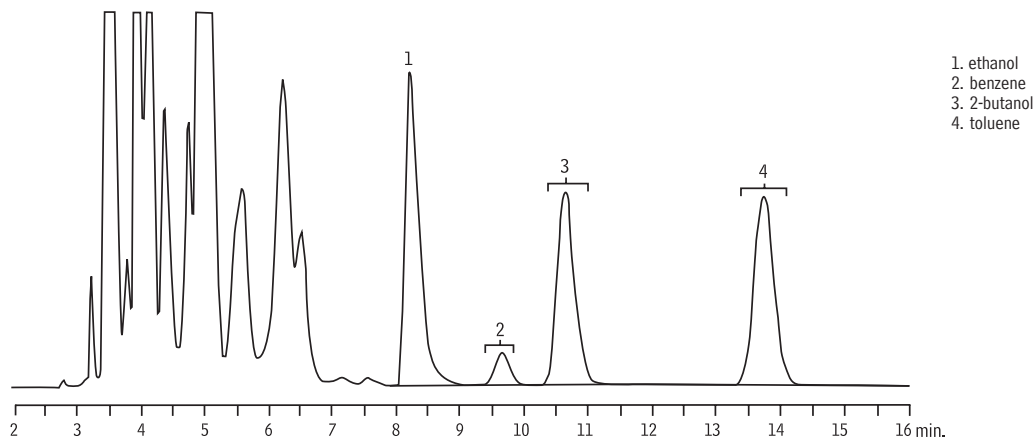
Conforms to the specifications established in ASTM method D3606-07 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.

| 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 page 143.

**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 containing ethanol 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 with internal standard
 Inj.: 200°C
 Backflush: 3 min.
 Carrier gas: helium, constant flow
 Flow rate: 20mL/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

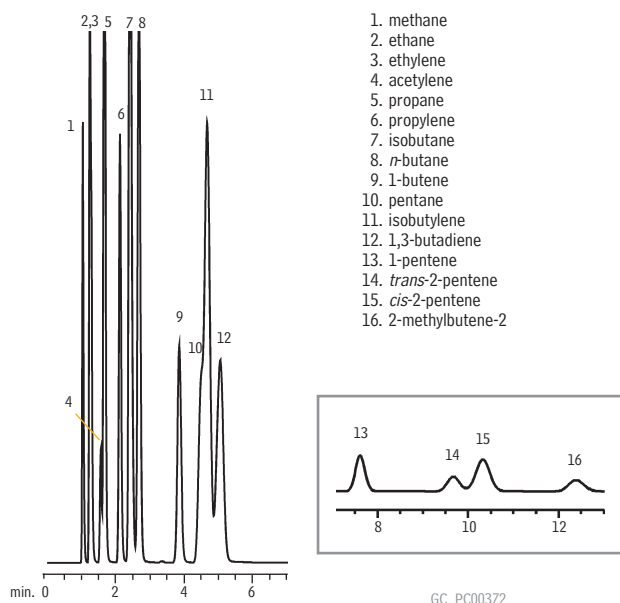
This 3-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons. (Figure 3)

| Description | cat.#* | price |
|--|--------|-------|
| <i>n</i> -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 page 143.

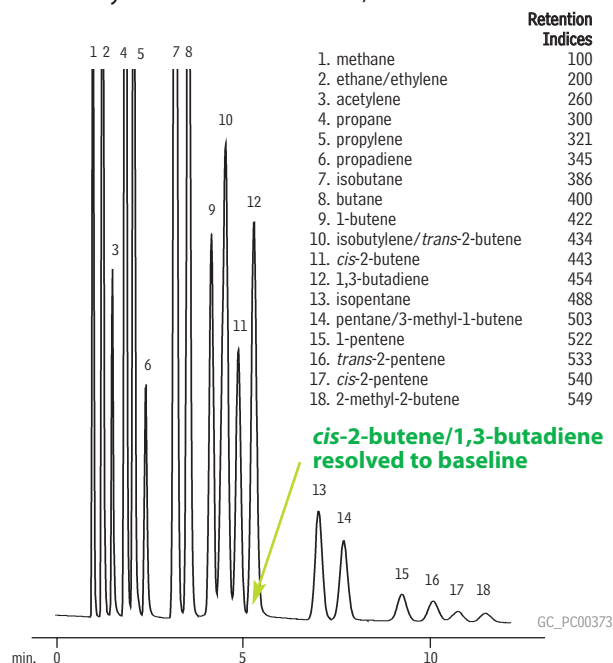
**This column set is for a valving system; therefore, packing material is filled to ends of columns.

Figure 1 *n*-Octane on Res-Sil® C packing has unique selectivity for unsaturated light hydrocarbons.



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

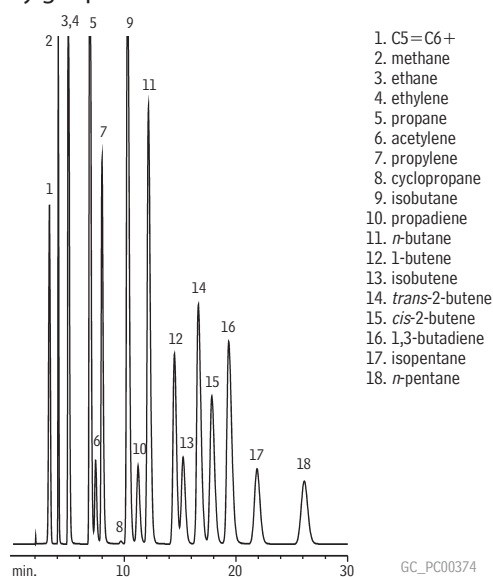
Figure 2 OPN on Res-Sil® C packing has unique selectivity for *cis*-2-butene and 1,3-butadiene.



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.



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 135** for more information on Res-Sil® packing materials.

RESTEK

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Australian Distributors
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11/12

www.restek.com 129



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 133**.

Permanent Gases & Hydrocarbon Analysis

ShinCarbon ST Packed/Micropacked Columns

- Separate permanent gases, including CO/CO₂, 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 m²/g), is the ideal medium for separating gases and highly volatile compounds by gas solid chromatography (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 Columns (packed) (SilcoSmooth® Stainless Steel)*

| OD | ID | 2-Meter |
|------------------|-------|---------|
| 1/8" SilcoSmooth | 2.0mm | 80486- |

ShinCarbon ST 100/120 Columns (micropacked) (SilcoSmooth® Stainless Steel)**

| OD | ID | 1-Meter | 2-Meter |
|--------|--------|-------------|---------|
| 1/16" | 1.0mm | 19809 \$245 | 19808 |
| 0.95mm | 0.75mm | 19810 \$245 | |

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

**Does not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 133.

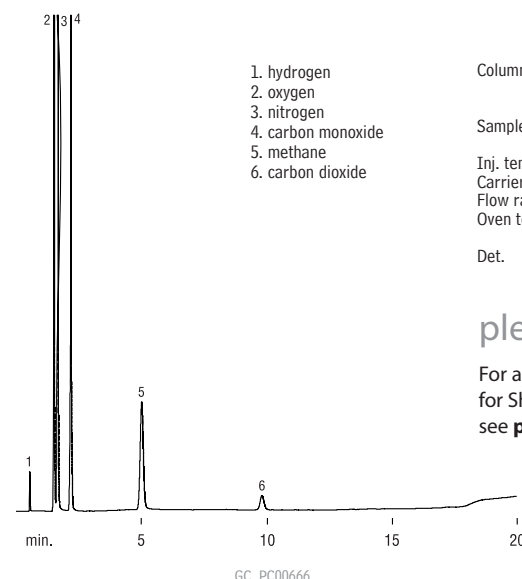
Chromatogram Search Tool

Search by compound name, synonym, CAS # or keyword

www.restek.com/chromatograms



Separate permanent gases in 10 minutes, without cryogenics.



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°C @ 8°C/min. (hold 10 min.)
Det. HID @ 200°C

please note

For additional chromatograms for ShinCarbon ST columns, see **pages 647, 649, and 652**.

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 Sulfinert® 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 Columns (packed)*

| OD | ID | 1-Meter | 2-Meter |
|-------|-------|---------|---------|
| 1/8" | 2.0mm | 80484- | 80485- |
| 3/16" | 3.1mm | 80482- | 80483- |

Rt®-XLSulfur Columns (micropacked)**

| 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.

**Does not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 133.

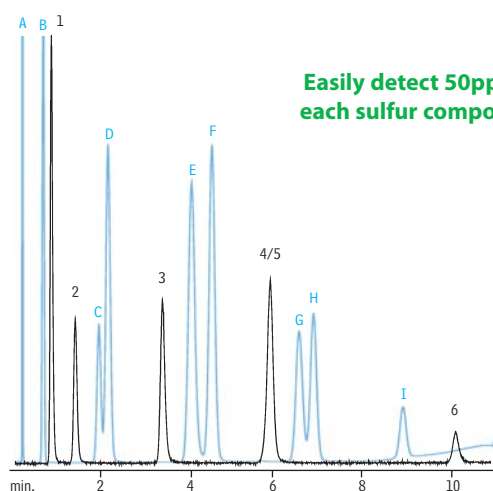
did you know?

Rt®-XLSulfur columns are optimized for low ppb-level sulfur analysis!

also available

For adapter kits for installing packed/micropacked columns, see **page 133**.

Rt®-XLSulfur micropacked column separates hydrocarbons from sulfur compounds.



Easily detect 50ppb of each sulfur compound!

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
Suffix -840

See page 143 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 1 1/2" void on detector side.

Micropacked Columns



All micropacked columns are made with inert SilcoSmooth® tubing, which is Siltek® treated for maximum inertness. See **page 125**.

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 inert Siltek® treatment, micropacked columns are a powerful tool for solving many difficult application problems. The unsurpassed inertness of SilcoSmooth® tubing is based on Siltek® deactivation, which allows the column to 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. Standard wall (1/16-inch OD) micropacked columns offer improved efficiency in packed column instruments, without the expense of converting to capillary injection systems. Smaller OD (0.74 mm and 0.95 mm OD) micropacked columns install easily into a capillary injector, using slightly larger ferrules. Micropacked columns operate at flows exceeding 10 cc/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.

Frits—A new alternative to glass wool and braided end plugs!

Hastelloy® and Siltek® treated frits are now available for select packed and micropacked columns!



Hastelloy® frit



Siltek® frit

Fill out the form on page 142, visit **www.restek.com/packed**, contact Customer Service or your Restek representative for pricing and availability.



0.53 mm ID Micropacked Columns

- Available in a variety of packing materials.
- High capacity and retention for volatile compounds.
- Can be coiled to fit any GC.

| | Mesh | ID | OD | Temp. Range | 2-Meter |
|---------------|--------|--------|--------|-------------|---------|
| HayeSep Q | 80/100 | 0.53mm | 0.74mm | up to 275°C | 19042 |
| Molesieve 5A | 80/100 | 0.53mm | 0.74mm | up to 300°C | 19041 |
| Rt-XLSulfur | 80/100 | 0.53mm | 0.74mm | up to 300°C | 19044 |
| ShinCarbon ST | 80/100 | 0.53mm | 0.74mm | up to 330°C | 19043 |

0.75 mm ID Micropacked Columns

| | | ID | OD | Temp. Range | 0.56-Meter | |
|-----------------------------------|---------|--------|--------|-------------|------------|---------|
| 20% TCEP on 80/100 Chromosorb PAW | | 0.75mm | 1/16" | 0–175°C | 19040 | \$110 |
| | Mesh | ID | OD | Temp. Range | 1-Meter | 2-Meter |
| HayeSep R | 100/120 | 0.75mm | 0.95mm | up to 250°C | 19014 | 19015 |
| HayeSep Q | 100/120 | 0.75mm | 0.95mm | up to 275°C | 19018 | 19019 |
| HayeSep N | 100/120 | 0.75mm | 0.95mm | up to 165°C | 19022 | 19023 |
| HayeSep S | 100/120 | 0.75mm | 0.95mm | up to 250°C | 19010 | 19011 |
| Molesieve 5A | 80/100 | 0.75mm | 0.95mm | up to 300°C | 19002 | 19003 |
| Molesieve 13X | 80/100 | 0.75mm | 0.95mm | up to 350°C | 19006 | 19007 |

1.00 mm ID Micropacked Columns

| | Mesh | ID | OD | Temp. Range | 1-Meter | 2-Meter |
|---------------|---------|--------|-------|-------------|---------|-------------|
| HayeSep R | 100/120 | 1.00mm | 1/16" | up to 250°C | 19012 | 19013 |
| HayeSep Q | 100/120 | 1.00mm | 1/16" | up to 275°C | 19016 | 19017 |
| HayeSep N | 100/120 | 1.00mm | 1/16" | up to 165°C | 19020 | 19021 |
| HayeSep S | 100/120 | 1.00mm | 1/16" | up to 250°C | 19008 | 19009 |
| Molesieve 5A | 80/100 | 1.00mm | 1/16" | up to 300°C | 19000 | 19001 |
| Molesieve 13X | 80/100 | 1.00mm | 1/16" | up to 350°C | 19004 | 19005 \$140 |

also **available**

For adapter kits for installing micropacked columns, see **page 133**.

Custom
Packed/Micropacked
Column Request Form
See page 142 or visit
www.restek.com/packed

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.

| Description | For 1/4" Columns | | | For 3/16" Columns | | |
|--|------------------|-------|-------|-------------------|-------|-------|
| | qty. | cat.# | price | qty. | cat.# | price |
| Packed Column Inlet Adaptor Kit for 1/4" Injection Ports | kit | 21651 | \$28 | kit | 21650 | |

Installation Kits for Micropacked Columns

| Description | qty. | cat.# | price |
|--|------|-------|-------|
| 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 | |

Installation Kit for Packed Columns

| Description | qty. | cat.# | price |
|---|------|-------|-------|
| Packed Column Installation Kit for 2mm ID columns; for valve applications. Kit contains: 1/4" stainless steel nut (1), stainless steel Valco nut (1), 1/4" Vespel/graphite ferrule (1), stainless steel Valco ferrule (1), 1/4" stainless steel front ferrule (1), 1/4" 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 <i>Injection Port Adaptor Kit</i> 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 <i>Injection Port Adaptor Kit</i> 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 | |
| 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 | ea. | 22430 | |
| Replacement 4mm Splitless Liner | ea. | 20772 | |





Lab Gas Issues?

Restek has the solution!

The ProFLOW 6000 Electronic Flowmeter measures volumetric flow for gases across a range of 0.5-500 mL/min.

See **page 274** for more information.

restek
innovation!



Silcoport® Packing 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.

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 deacti-vants 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.

| Description | Temp. Limit | Mesh | Min. Qty.† | cat.# |
|--------------|-------------|---------|------------|-------|
| Silcoport P* | 400°C | 80/100 | 100g | 25641 |
| | 400°C | 100/120 | 100g | 25642 |

*Prepared from Chromosorb P; Restek acid washed deactivation.

†Bulk quantities are available.

**Please call for
availability.**

did you know?

Silcoport support replaces

- Supelcoport
- Chromosorb W HP
- GasChrom Q 2

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

- CarboBlack B supports up to 10% loading of a nonsilicone liquid phase.
- CarboBlack C supports up to 1% loading of a nonsilicone liquid phase.
- Equivalent to Supelco's Carbo-pack™ packings.

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 Carbo-pack™ and Carbograph supports.

| Description | Temp. Limit | Mesh | Min. Qty. | cat.# | price/g |
|--|-------------|--------|-----------|-------|---------|
| CarboBlack B | 500°C | 60/80 | 10g | 25500 | |
| | 500°C | 80/120 | 10g | 25501 | |
| CarboBlack C | 500°C | 60/80 | 10g | 25502 | |
| | 500°C | 80/100 | 10g | 25503 | |
| CarboBlack BHT-100 | 150°C | 40/60 | 10g | 25504 | |
| CarboBlack III (F) | 175°C | 80/100 | 10g | 25506 | |
| 5% Carbowax 20m on CarboBlack B | 225°C | 80/120 | 10g | 25507 | |
| 6.6% Carbowax 20m on CarboBlack B | 225°C | 80/120 | 10g | 25508 | |
| 4% Carbowax 20m / 0.8% KOH on CarboBlack B | 220°C | 60/80 | 10g | 25509 | |
| 0.19% picric acid on CarboBlack C | 120°C | 80/100 | 10g | 25510 | |
| 4% Carbowax 20m on CarboBlack B-DA | 200°C | 80/120 | 10g | 25511 | |

Res-Sil® Packing Materials

- 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 (see page 129). 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.

| Description | Temp. Limit (°C) | Mesh | Min. Qty. | cat.# | price/g |
|-------------------------------|---------------------|--------|--------------|-------|---------|
| Res-Sil C | 300°C | 60/80 | 10g | 25400 | |
| | 300°C | 80/100 | 10g | 25028 | |
| Res-Sil B | 300°C | 60/80 | 10g | 25401 | |
| | 300°C | 80/100 | 10g | 25080 | |
| 1% TCEP on Res-Sil B | 175°C | 80/100 | 10g | 25081 | |
| OPN on Res-Sil C | 150°C | 80/100 | 10g | 25042 | |
| <i>n</i> -Octane on Res-Sil C | 150°C | 80/100 | 10g | 25030 | |
| 2% Carbowax 1540 on Res-Sil C | 150°C | 80/100 | 10g | 25044 | |

¹N.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 140**.

did you know?**Res-Sil replaces**

- Porasil B
- Porasil C

ChromaBLOGraphy

Topical and timely insights from top chromatographers.

Visit us at blog.restek.com



Tim Herring, 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.

Chromosorb® Packings

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.

| Description | Mesh | gm/btl. |
|-----------------------|---------|---------|
| Chromosorb P NAW | 45/60 | 100g |
| | 60/80 | 100g |
| | 80/100 | 100g |
| | 100/120 | 100g |
| Chromosorb P AW | 60/80 | 100g |
| | 80/100 | 100g |
| | 100/120 | 100g |
| Chromosorb P AW/DMDCS | 60/80 | 100g |
| | 80/100 | 100g |
| | 100/120 | 100g |
| Chromosorb W NAW | 60/80 | 100g |
| Chromosorb W AW | 60/80 | 100g |
| Chromosorb W AW/DMDCS | 60/80 | 100g |
| Chromosorb W-HP | 60/80 | 100g |

NAW—nonacid washed
 AW—acid washed
 DMDCS—dimethyldichlorosilane
 BW—base washed

Please call for availability.

Custom

Packed/Micropacked
 Column Request Form
 See page 142 or visit
www.restek.com/packed



Chromosorb® Century Packings

| Description | Temp. Limits | g/btl. | Mesh | Mesh | Mesh |
|----------------|---------------------------|--------|-------|--------|---------|
| | | | 60/80 | 80/100 | 100/120 |
| | | | cat.# | cat.# | cat.# |
| Chromosorb 101 | 275/325°C | 50g | 25608 | 25609 | 25610 |
| Chromosorb 102 | 250/300°C | 50g | 25611 | 25612 | 25613 |
| Chromosorb 103 | 275/300°C | 50g | 25614 | 25615 | 25616 |
| Chromosorb 104 | (equivalent to HayeSep C) | | | | |
| Chromosorb 106 | 250/275°C | 50g | 25620 | 25621 | 25622 |
| Chromosorb 107 | 250/275°C | 50g | 25623 | 25624 | 25625 |
| Chromosorb 108 | 250/275°C | 50g | 25626 | 25627 | 25628 |

Please call for availability.

Porapak Series Packings

| Description | Temp. Limit | g/btl. | Mesh 50/80 | | Mesh 80/100 | | Mesh 100/120 | |
|-------------|-------------|--------|------------|-------|-------------|-------|--------------|-------|
| | | | cat.# | price | cat.# | price | cat.# | price |
| Porapak P | 250°C | 20g | 25576 | | 25577 | | 25578 | |
| Porapak PS | 250°C | 20g | 25579 | | 25580 | | 25581 | |
| Porapak Q | 250°C | 26g | 25582 | | 25583 | | 25584 | |
| Porapak QS | 250°C | 26g | 25585 | | 25586 | | 25587 | |
| Porapak R | 250°C | 24g | 25588 | | 25589 | | 25590 | |
| Porapak S | 250°C | 26g | 25591 | | 25592 | | 25593 | |
| Porapak N | 190°C | 29g | 25594 | | 25595 | | 25596 | |
| Porapak T | 190°C | 31g | 25597 | | 25598 | | 25599 | |

also **available**

Custom packing materials are also available. See **page 140**.

HayeSep® Series Packings

| Description | Temp. Limit | g/btl. | Mesh 60/80 | | Mesh 80/100 | | Mesh 100/120 | |
|-------------|------------------|--------|------------|-------|-------------|-------|--------------|-------|
| | | | cat.# | price | cat.# | price | cat.# | price |
| HayeSep A | 165°C | 24g | 22560 | | 25032 | | 25033 | |
| HayeSep B | 190°C | 24g | 25561 | | 25034 | | 25035 | |
| HayeSep C | 250°C | 24g | 25562 | | 25036 | | 25037 | |
| HayeSep D | 290°C | 24g | 25563 | | 25038 | | 25039 | |
| HayeSep DIP | 290°C | 24g | 25564 | | 25565 | | 25566 | |
| HayeSep DB | 290°C | 24g | 25567 | | 25568 | | 25569 | |
| HayeSep DOX | (Use HayeSep DB) | | | | | | | |
| HayeSep N | 165°C | 24g | 25570 | | 25045 | | 25046 | |
| HayeSep P | 250°C | 24g | 25571 | | 25047 | | 25048 | |
| HayeSep Q | 275°C | 24g | 25572 | | 25049 | | 25050 | |
| HayeSep R | 250°C | 24g | 25573 | | 25051 | | 25052 | |
| HayeSep S | 250°C | 24g | 25574 | | 25053 | | 25054 | |
| HayeSep T | 165°C | 24g | 25575 | | 25055 | | 25056 | \$150 |

Tenax® Packings

| Description | Temp. Limit | Min. Qty. | Mesh 60/80 | | Mesh 80/100 | |
|-------------|-------------|-----------|------------|---------|-------------|---------|
| | | | cat.# | price/g | cat.# | price/g |
| Tenax-TA | 350°C | 10g | 25550 | | 25551 | |
| Tenax-GR | 350°C | 10g | 25552 | | 25553 | |



Restek's Learning Network

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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) | Phase | min./max. temp. (°C) |
|---|-------------------------|---|-------------------------|
| Apiezon L | 50/300 | OV-25, phenyl methyl diphenyl, 75% phenyl | 0/350 |
| <i>p,p'</i> -Azoxydiphenetole | 132/140 | OV-61, diphenyl, 33% phenyl | 0/350 |
| BC-120 | 0/125 | OV-73, 5.5% diphenyl | 0/325 |
| Bentone-34 | 0/180 | OV-101, dimethyl (fluid) | 0/350 |
| bis (2-ethoxyethyl) adipate | 0/150 | OV-105, cyanopropyl methyl | 0/275 |
| bis (2-ethylhexyl) phthalate | 150 max. | OV-202, trifluoropropyl (fluid) | 0/275 |
| bis (2-methoxyethyl) adipate | 20/100 | OV-210, trifluoropropyl (fluid) | 0/275 |
| <i>n,n'</i> -Bis(<i>p</i> -methoxybenzylidene)- α,α' -bi- <i>p</i> -toluidine (BMBT) | 189/225 | OV-215, trifluoropropyl (gum) | 0/275 |
| Carbowax 1000 | 40/150 | OV-225, cyanopropyl methylphenyl methyl | 0/265 |
| Carbowax 20M | 60/225 | OV-275, dicyanoallyl | 25/250 |
| Carbowax 20M-terephthalic acid | 60/225 | OV-330, silicone - Carbowax | 0/250 |
| Carbowax 400 | 10/100 | OV-351 | 50/270 |
| Carbowax 600 | 30/125 | OV-1701, vinyl | 0/250 |
| Cyclohexanedimethanol succinate | 100/250 | Phenyldiethanolamine succinate | 0/230 |
| DC-11 | 0/300 | Polyethylene glycol adipate (EGA) | 100/225 |
| DC-200 | 0/200 | Polyphenyl ether (5 rings) OS-124 | 0/200 |
| DC-550 | 20/250 | Polyphenyl ether (6 rings) OS-138 | 0/225 |
| DEGS-PS | 20/200 | Polypropylene glycol | 0/150 |
| Di(2-ethylhexyl)sebacate | 0/125 | Rtx-1 (Rt-101) | 0/350 |
| Diethylene glycol succinate (DEGS) | 20/200 | Rt-1000 | 50/250 |
| Diethylene glycol adipate (DEGA) | 0/200 | Rt-1200 | 25/200 |
| Diisodecyl phthalate | 0/175 | Rt-1220 | 50/200 |
| 2,4-Dimethylsulfolane | 0/50 | Rt-1500, Rt-1510 | 50/230 |
| Di- <i>n</i> -decyl phthalate | 10/175 | Rt-2100 | 0/350 |
| Dinonyl phthalate | 20/150 | Rt-2300 | 20/275 |
| Ethylene glycol adipate | 100/225 | Rt-2330, Rt-2340 | 25/275 |
| Ethylene glycol phthalate | 100/200 | Rt-608Pkd | 0/275 |
| Ethylene glycol succinate | 100/200 | Rt-Sebaconitrile | 25/110 |
| FFAP | 50/250 | Rt-XLSulfur | 250 max. |
| Fluorad FC-431, 50% solution in ethyl acetate | 40/200 | SE-30, SE-52, SE-54 | 50/300 |
| Hallcomid M-18-OL | 8/150 | Silar 5 CP, Silar 10 CP | 0/250 |
| Halocarbon 10-25 | 20/100 | Sorbitol | 150 max. |
| Halocarbon K-352 | 0/250 | Squalane | 20/100 |
| Halocarbon wax | 50/150 | Squalene | 0/100 |
| Igepal® CO-880 (Nonoxynol) | 100/200 | Stabilwax | 40/240 |
| Igepal CO-890 | 100/200 | Tetracyanoethylated pentaerythritol | 30/175 |
| Krytox | -30/260 | THEED (Tetrahydroxyethylenediamine) | 0/125 |
| Neopentyl glycol adipate | 50/225 | β,β -Thiodipropionitrile (TDPN) | 100 |
| Neopentyl glycol sebacate | 50/225 | Tricresyl phosphate | 20/125 |
| Neopentyl glycol succinate | 50/225 | 1,2,3-Tris (2-cyanoethoxy) propane (TCEP) | 0/175 |
| Nonoxynol (Igepal CO-880) | 100/200 | Triton X-100, Triton X-305 | 0/200 |
| β,β -Oxydipropionitrile | 0/75 | UC W982 | 0/300 |
| OV-1, dimethyl (gum) | 100/350 | UCON 50-HB-2000 | 0/200 |
| OV-1, vinyl | 100/350 | UCON 50-HB-280-X | 0/200 |
| OV-3, phenyl methyl | 0/350 | UCON 50-HB-5100 | 0/200 |
| OV-7, phenyl methyl dimethyl, 20% phenyl | 0/350 | UCON HB-1800-X | 200 max. |
| OV-11, phenyl methyl dimethyl, 35% phenyl | 0/350 | UCON LB-550-X | 0/200 |
| OV-17, phenyl methyl, 50% phenyl | 0/375 | Versamid 9000 | 190/275 |
| OV-22, phenyl methyl diphenyl, 65% phenyl | 0/350 | | |

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 |
| S1NS | 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 acrylonitrile 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 can be made with any of the supports listed below. The liquid stationary phases available are listed on page 138 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) (20 g).

| Support | Max. Coating % | Mesh Sizes | Price /gram |
|-----------------|----------------|------------------------|-------------|
| CarboBlack B | 1–10%* | 60/80, 80/120 | |
| CarboBlack B HT | 1–10% | 40/60 | |
| CarboBlack C | 0.1–1%* | 60/80, 80/100 | |
| HayeSep | 15% | 60/80, 80/100, 100/120 | |
| Porapak | 15% | 50/80, 80/100, 100/120 | |

Please call for availability of the following supports.

| | | |
|--|----------------------------|-------------------------------|
| 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 |
| 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.

NAW—nonacid washed

**Silicone phase.

AW—acid washed

DMDCS—dimethyldichlorosilane

BW—base washed

For coatings over 15% or quantities over 50 grams, please call your Restek representative.

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 |

ordering note

Special phases that require a surcharge:

OV®-275, OV®-330, OV®-225, BMBT, 2,4-dimethylsulfolane, Silar, OV®-1701, and XE-60. Call your Restek representative for pricing.

Custom

Packed/Micropacked
Column Request Form

See page 142 or visit
www.restek.com/packed



Custom Packed Columns

To order, 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® 80/100) (Agilent 6890) (on-column injection) (fittings kit).

Please use the custom order form on page 142 or visit
www.restek.com/packed



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)
- 3) installation kit (see page 133), frit type

Ordering Example: (2 m x 1/16" OD x 1.00 mm ID) (Siltek®-treated tubing) (5%) (Carbowax® 20M) (CarboBlack B) (80/120) (installation kit for valve applications, cat. #21065) (Siltek® frits)

Please use the custom order form on page 142 or visit
www.restek.com/packed

did you know?

Packing material in packed and micropacked columns is secured using wire braids or frits. This prevents packing material from exiting the column.

Frits—A new alternative to glass wool and braided end plugs!

Hastelloy® and Siltek® treated frits are now available for select packed and micropacked columns!



Hastelloy® frit



Siltek® frit

Fill out the form on page 142, visit www.restek.com/packed, contact Customer Service or your Restek representative for pricing and availability.

ordering note

For international pricing on custom packed or micropacked columns, please contact your Restek representative.

Packed/Micropacked Column Custom Order Form

Order: _____ Quote: _____ Reference # from previous order (if available): _____

Date: _____

Restek Account #: _____

Contact: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

Email: _____

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 _____" voidDo you want this column preconditioned? ☐ Yes (additional charge): \$30 ☐ No

Standard configuration suffix number (next page):

Frits ☐ Hastelloy® ☐ Siltek®

Special configuration (next page): Figure: _____ Dimensions: _____

Welded Tubing Reducers ☐ (additional charge): \$140

Special Instructions: _____

Fittings (check appropriate circle)☐ **KIT 1S** $\frac{1}{4}$ " brass nuts $\frac{1}{4}$ " to $\frac{1}{8}$ " V/G reducing ferrules

No additional charge

☐ **KIT 2S** $\frac{1}{4}$ " brass nuts $\frac{1}{4}$ " to $\frac{3}{16}$ " V/G reducing ferrules

No additional charge

☐ **KIT A** $\frac{1}{8}$ " brass nuts $\frac{1}{8}$ " V/G ferrules

No additional charge

☐ **KIT B** $\frac{1}{8}$ " brass nuts $\frac{1}{8}$ " brass front & back ferrules

No additional charge

☐ **KIT C** $\frac{1}{8}$ " stainless steel nuts $\frac{1}{8}$ " stainless steel front & back ferrules

Additional charge

☐ **KIT D** $\frac{1}{8}$ " stainless steel nuts $\frac{1}{8}$ " V/G ferrules

Additional charge

☐ **KIT E** $\frac{1}{4}$ " stainless steel nuts $\frac{1}{4}$ " to $\frac{1}{8}$ " V/G reducing ferrules

Additional charge

☐ **KIT F** $\frac{1}{4}$ " stainless steel nuts $\frac{1}{4}$ " to $\frac{3}{16}$ " V/G reducing ferrules

Additional charge

☐ **KIT V** $\frac{1}{8}$ " VCR fitting

check appropriate circle:

☐ Stainless Steel (additional charge)☐ Nickel (additional charge)for a **quote:**

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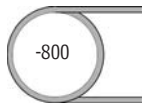
This form is also available online at:

www.restek.com/packed

V/G = Vespel®/graphite

Standard Configurations (choose one)

General Configuration



Agilent 5880, 5890, 5987, 6890, 7890



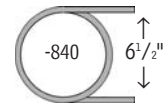
Varian 3700, Vista Series, FID



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 142, or at www.restek.com/packed)

Figure 1

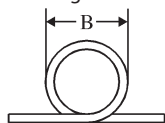


Figure 2

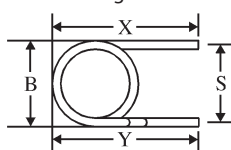


Figure 3

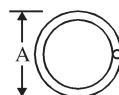


Figure 4



Figure 5

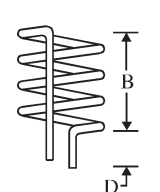
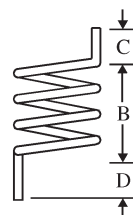
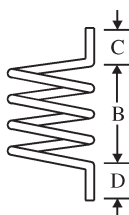
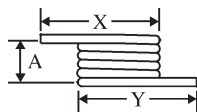
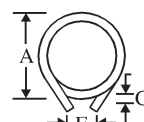


Figure 6

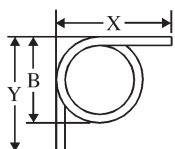


Figure 7

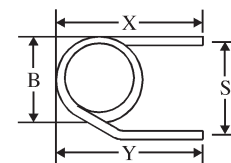


Figure 8

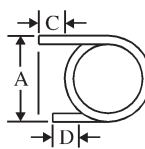


Figure 9

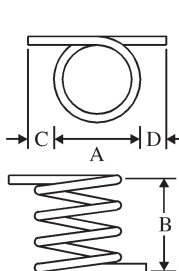


Figure 10

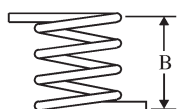
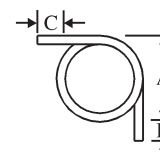


Figure 11

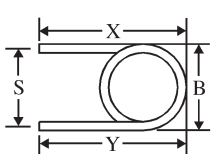


Figure 12

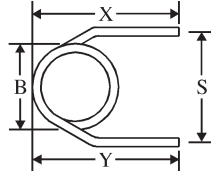


Figure 13

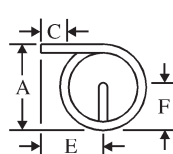


Figure 14

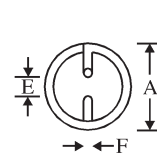
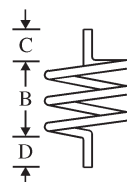
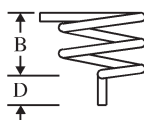
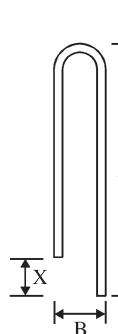


Figure 15



Rxi[®]-624SiI MS Columns

Exceptionally Inert,
Low Bleed Columns for
Volatiles Analysis

- **Optimized selectivity** for volatiles and polar compounds ensures good separations.
- **Highly inert columns** improve accuracy and allow lower detection limits, even for active compounds.
- **Most thermally stable** 624 column available; low bleed, fully MS compatible.

www.restek.com/rxi

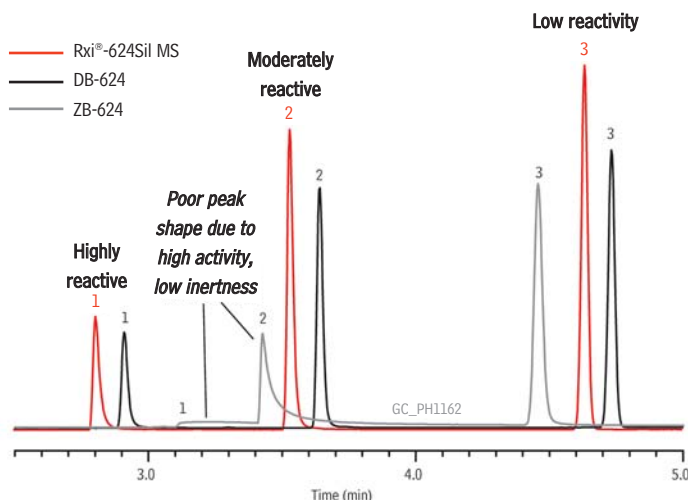
NEW! Rxi®-624Sil MS Columns: Increase Confidence in Data Accuracy

While mid polarity 624 type stationary phases are widely used for analyzing polar analytes and volatile organic compounds (VOCs), not all columns combine the selectivity needed for critical separations with the high inertness and low bleed that can further improve data quality. Whether you are developing methods for residual solvents, analyzing environmental VOCs, or running other applications for volatile organics, you can improve data quality with Rxi®-624Sil MS columns. These new columns incorporate a new stationary phase chemistry, unique column deactivation, and optimized manufacturing process that is specifically designed to provide the high inertness and thermal stability needed for greater accuracy and lower detection limits. The unique selectivity, inertness, and thermal stability of the Rxi®-624Sil MS column make it ideal for numerous applications, from detecting impurities in pharmaceuticals to monitoring environmental VOCs.

Exceptional Inertness Provides Better Peak Shape, Higher Sensitivity, and More Accurate Data

Column inertness is difficult to achieve, but critical to improving data quality. The deactivation process used for Rxi®-624Sil MS columns yields a fully passivated surface that is demonstrably more inert than other 624 columns. Comprehensive deactivation results in higher responses, more symmetric peaks, and easy, accurate integration, even for active compounds at low levels (Figures 1 and 2). Rxi®-624Sil MS columns, with their superior deactivation, provide the inertness needed for improved linearity, greater accuracy, and lower detection limits.

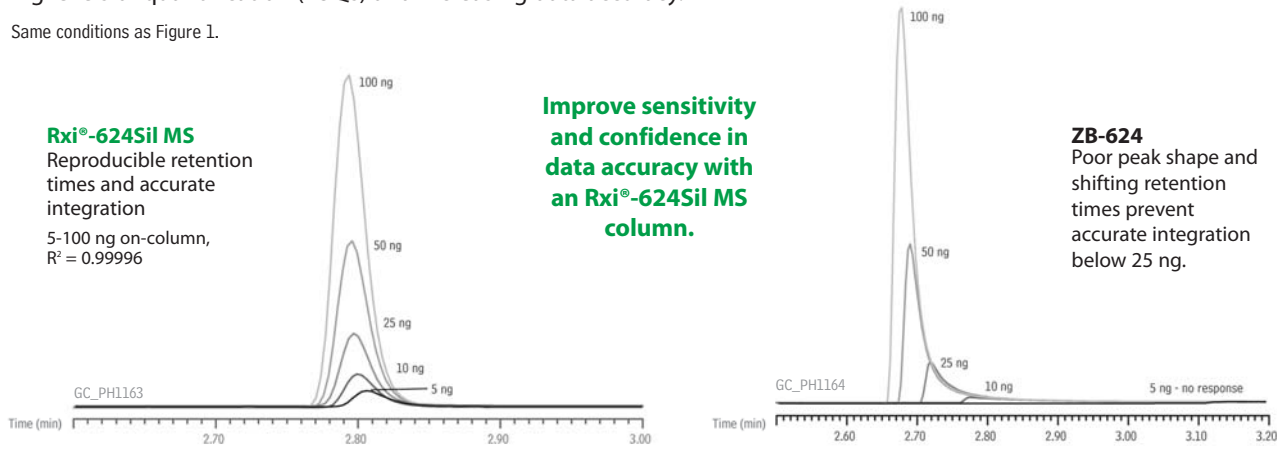
Figure 1 Highly inert Rxi®-624Sil MS columns provide better peak shape and simplify integration for active compounds at low levels (5 ng on-column).



Rxi®-624Sil MS columns give more accurate results for active compounds.

Figure 2 Active compounds like isopropylamine can be more accurately integrated on an Rxi®-624Sil MS column, lowering levels of quantification (LOQs) and increasing data accuracy.

Same conditions as Figure 1.



Lowest Bleed 624 Available—Assured GC/MS Compatibility

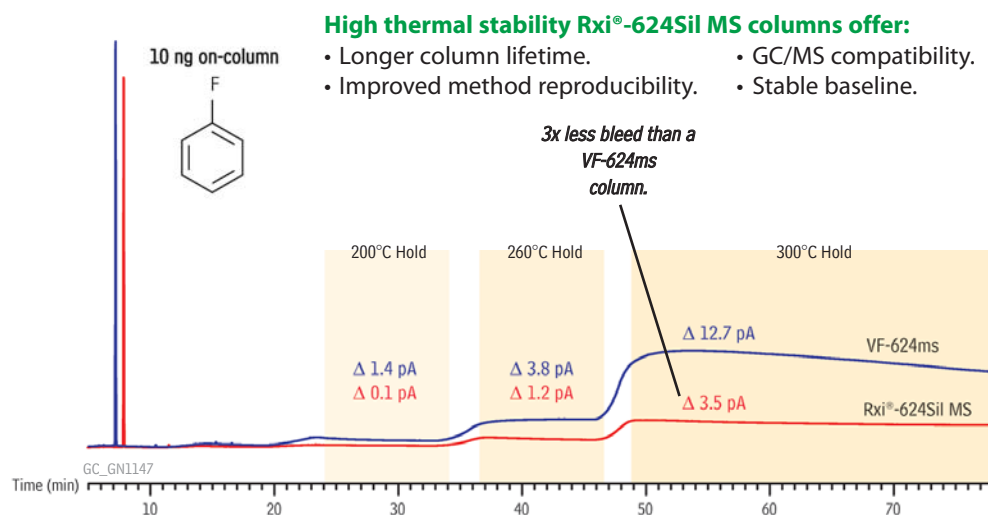
In addition to providing greater inertness and more accurate results for active compounds, the Rxi®-624Sil MS column offers higher temperature stability than any other column in its class (Table I, Figure 3). Even though most 624 columns provide adequate selectivity for polar compounds, poor thermal stability results in stationary phase bleed that can reduce column lifetime, decrease detector sensitivity, and interfere with the quantification of later eluting compounds. The highly effective stationary phase bonding chemistry of the Rxi®-624Sil MS column ensures extremely low bleed up to 320°C. While other 624 columns generate too much bleed to be useful for continuous mass spec work, the Rxi®-624Sil MS column is fully compatible with both quadrupole and ion trap mass spectrometers. In addition to MS compatibility, higher thermal stability results in more stable baselines, longer column lifetimes, and improved method reproducibility.

Table I The Rxi®-624Sil MS column has the highest thermal stability of any 624 column.

| Column | Manufacturer | Maximum Programmable Temperature |
|---------------|--------------|----------------------------------|
| Rxi-624Sil MS | Restek | 320 °C |
| VF-624ms | Varian | 300 °C |
| DB-624 | Agilent J&W | 260 °C |
| ZB-624 | Phenomenex | 260 °C |

Data obtained from company website or literature for a 30 m x 0.25 mm x 1.4 µm df column.

Figure 3 The Rxi®-624Sil MS column has the lowest bleed of any column in its class and provides true GC/MS capability.



Column: 30 m, 0.25 mm ID, 1.4 µm (Columns are of equivalent dimensions and were tested after equivalent conditioning) Sample: Fluorobenzene in methanol, 10 ng on-column; Detector: FID @ 250 °C. Complete analytical conditions for chromatogram GC_GN1147 are available at www.restek.com

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/94% dimethyl polysiloxane)

- Low bleed, high thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds, including acidic and basic compounds.
- Selective—highly selective for residual solvents, great choice for VOCs.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

| ID | df | temp. limits | 20-Meter | | 30-Meter | | 60-Meter |
|--------|--------|------------------|----------|-------|----------|-------|-------------|
| 0.18mm | 1.00µm | -20 to 300/320°C | 13865 | \$405 | | | |
| 0.25mm | 1.40µm | -20 to 300/320°C | | | 13868 | \$500 | |
| 0.32mm | 1.80µm | -20 to 300/320°C | | | 13870 | \$540 | 13872 \$900 |
| 0.53mm | 3.00µm | -20 to 280/300°C | | | 13871 | \$615 | |



get more

For more information on the new Rxi®-624Sil MS column, visit www.restek.com and review our technical literature.

- Volatile Impurities Method Development (flyer PHFL1245)
- Residual Solvent Analysis: Implementing USP<467> (flyer PHFL1018A)
- Optimized Volatiles Analysis Ensures Fast VOC Separations (online article)

NEW! Rxi®-624Sil MS Columns:

Assure Reliable Separation of Volatile Impurities in Pharmaceuticals

In the pharmaceutical industry, timing and certainty are everything. Time-to-market is a key driver for new drugs, and efficient batch testing is critical for releasing approved products. Whether developing new methods or conducting routine analysis, increasing productivity depends on choosing the right column for the application. Rxi®-624Sil MS columns provide enhanced retention of polar compounds and volatile analytes, as well as full MS compatibility, making them the best choice for many drug analyses.

Fast, Effective Method Development

Often, 1 and 5 type columns are used initially for GC/MS method development because of their thermal stability; however, their nonpolar character results in poor retention for polar compounds, which increases method development time. In contrast, effective methods can be developed quickly on mid polarity Rxi®-624Sil MS columns, because they provide greater retention and selectivity for polar compounds as well as good thermal stability. For example, highly volatile, polar alkyl halide genotoxic impurities are difficult to retain on 1s and 5s, but Rxi®-624Sil MS columns provide the retention needed to ensure adequate separation (Figure 4). Increased retention makes GC/MS analysis easier to control and ultimately allows faster method development.

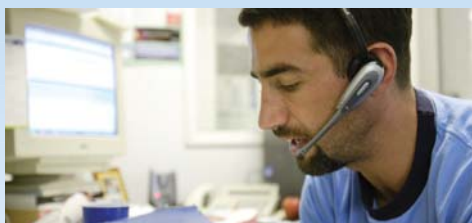
Improving Results for Routine Analysis

Once a drug is approved, fast, reliable methods are needed for routine batch analysis. Establishing system suitability is an important part of these procedures and a major factor in overall lab productivity. Rxi®-624Sil MS columns provide the optimized selectivity and guaranteed reproducibility needed to increase pass rates. For example, batch throughput can be improved for residual solvent testing under USP <467> by using a column that provides increased resolution for system suitability components (Figure 5). Greater resolution of critical pairs means higher system suitability pass rates, which allows more batches to be analyzed per shift.

Optimized phase chemistry, complete column deactivation, and tightly-controlled manufacturing make Rxi®-624Sil MS columns the best choice for many pharmaceutical applications. With better retention of polar volatiles, lower bleed, and higher inertness, Rxi®-624Sil MS columns can improve lab productivity by allowing new methods to be developed quickly and routine applications to be run more reliably.

learn more

For more pharmaceutical applications on Rxi®-624Sil MS columns, visit www.restek.com and download flyer PHFL1245.



Tim Herring, Technical Service Specialist

When running USP <467> by headspace, using a smaller bore liner (1 mm) can improve system suitability pass rates. Larger bore liners (4 mm) are used with direct liquid injection because the sample is vaporized in the injection port and the liner must be able to accommodate the solvent expansion volume. In contrast, in headspace analysis, the sample is vaporized in a vial instead of the injection port, so a large volume liner is not needed, and in fact it can be deleterious. In headspace methods, using a smaller bore liner reduces band broadening by increasing linear velocity, allowing faster sample transfer and improving resolution.

TECH TIP!

Resolution passes USP <467> criteria when using a 1mm liner (red line), but fails if a 4mm liner is used (black line).

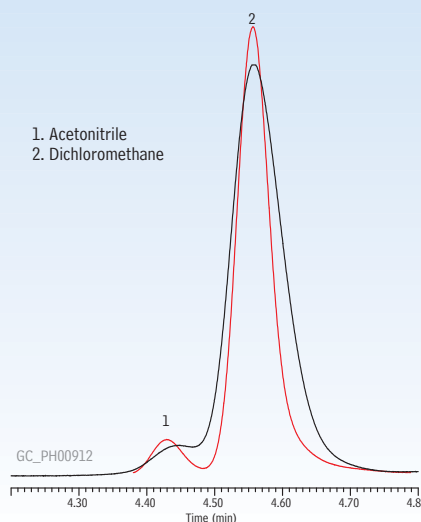
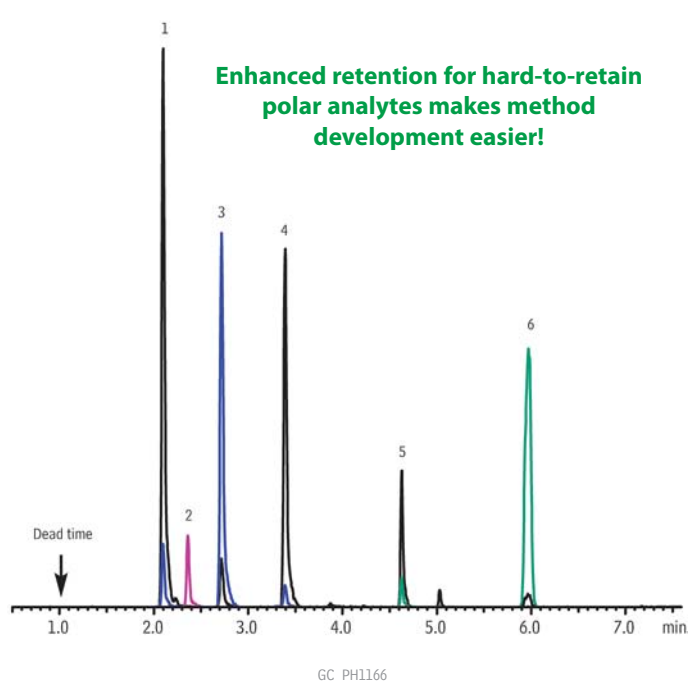


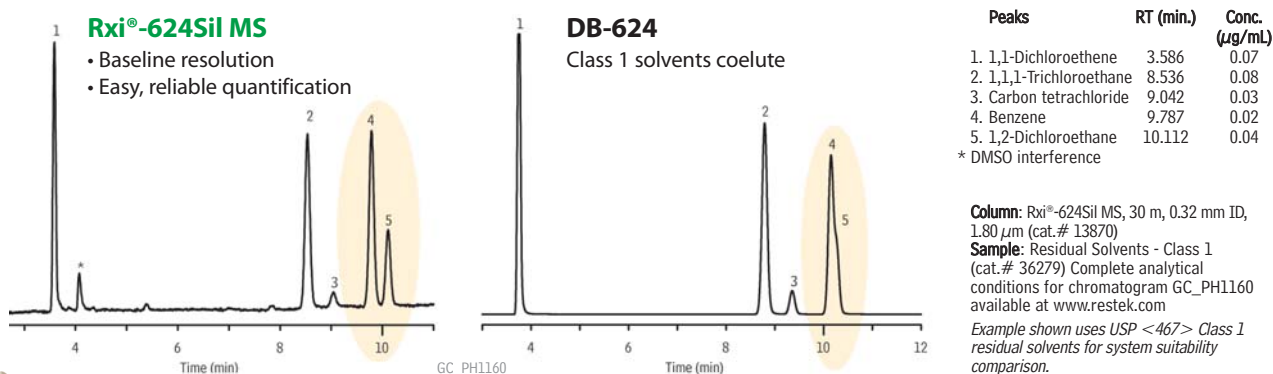
Figure 4 Polar compounds, such as alkyl halides, are highly retained on mid polarity Rxi®-624Sil MS columns, making method development faster and easier than on a nonpolar 1 or 5 type column.



| Peaks | RT (min.) |
|--------------------|-----------|
| 1. 2-Chloropropane | 2.10 |
| 2. Bromoethane | 2.36 |
| 3. 1-Chloropropane | 2.72 |
| 4. 2-Bromopropane | 3.393 |
| 5. Butyl chloride | 4.627 |
| 6. 1-Bromobutane | 5.973 |

| | |
|-----------------------------|---|
| Column | Rxi®-624Sil MS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 13865) |
| Sample | |
| Diluent: | DMSO |
| Conc.: | 1 µg/mL each compound |
| Injection | |
| Inj. Vol.: | 1 µL splitless (hold 0.5 min.) |
| Liner: | 3.5mm Single Gooseneck Liner with wool placed 3cm from top (middle) (cat.# 22286) |
| Inj. Temp.: | 220 °C |
| Purge Flow: | 3 mL/min. |
| Oven | |
| Oven Temp: | 40 °C (hold 3 min.) to 200 °C at 20 °C/min. |
| Carrier Gas | He, constant flow |
| Linear Velocity: | 40 cm/sec. |
| Detector | MS |
| Mode: | Scan |
| Transfer Line Temp.: | 280 °C |
| Analyzer Type: | Quadrupole |
| Source Temp.: | 280 °C |
| Solvent Delay Time: | 0.5 min. |
| Ionization Mode: | EI |
| Scan Range: | 30-300 amu |
| Scan Rate: | 5 scans/sec. |
| Instrument | Shimadzu 2010 GC & QP2010+ MS |
| Notes: | EIC of 42, 43, 57, 108 m/z |

Figure 5 System suitability pass rates can be improved with Rxi®-624Sil MS columns. The innovative polymer chemistry provides greater resolution of critical pairs that are difficult to separate on other 624 type columns.



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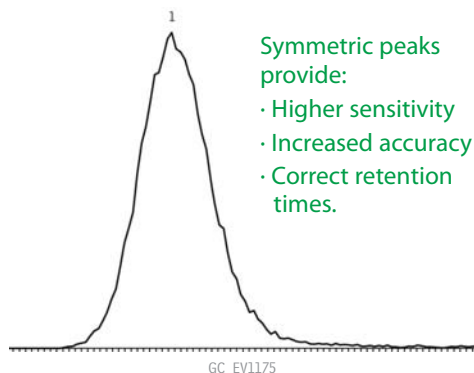


NEW! Rxi®-624Sil MS Columns: Increase Sample Throughput for Environmental VOCs

Fast sample throughput is a primary concern for environmental labs interested in improving productivity. Volatiles methods typically are time-consuming, but developing optimized procedures can be challenging because compound lists are extensive and analytes vary significantly in chemical characteristics. The selectivity and inertness of Rxi®-624Sil MS columns make them ideal for optimizing environmental volatiles methods for better resolution and faster analysis time.

Establishing conditions that maximize sample throughput can be difficult, because conditions optimized for speed can result in problematic coelutions, while conditions optimized for resolution can result in long analysis times. The exceptional inertness of Rxi®-624Sil MS columns produces highly symmetric peaks for active compounds, as shown in Figure 6, which improves resolution and allows separations to be maintained even under faster conditions. Here, an optimized method was developed using an Rxi®-624Sil MS column to maintain adequate resolution, while throughput was maximized by synchronizing purge and trap cycles with instrument cycles.

Figure 6 Exceptionally inert Rxi®-624Sil MS columns produce highly symmetric peaks for active compounds, simplifying quantification and improving accuracy.



For complete conditions visit www.restek.com and enter chromatogram GC_EV1175 in the search function.

Improve Productivity and Resolve Critical Pairs

Initially, several critical pairs were chosen for computational modeling using Pro ezGC software. The temperature program first determined by the software provided the best resolution, but also resulted in an analysis time of 19 minutes. Since the purge and trap cycle time was 16.5 minutes, other conditions were evaluated to see if adequate resolution could be maintained using a faster instrument cycle. The final program, shown in Figure 7, reduced instrument downtime by better synchronizing purge and trap cycles with instrument cycles, and also provided excellent resolution. Using these conditions, up to 36 samples can be analyzed following EPA Method 8260 in a typical 12-hour shift.

Labs interested in optimizing both sample throughput and resolution of VOCs can adopt the synchronized conditions established here on Rxi®-624Sil MS columns to maximize productivity and assure accurate, reliable results.

For the complete application, visit www.restek.com/adv002



NEW!

ProFLOW 6000 Electronic Flowmeter

Go to www.restek.com/flowmeter for product features.

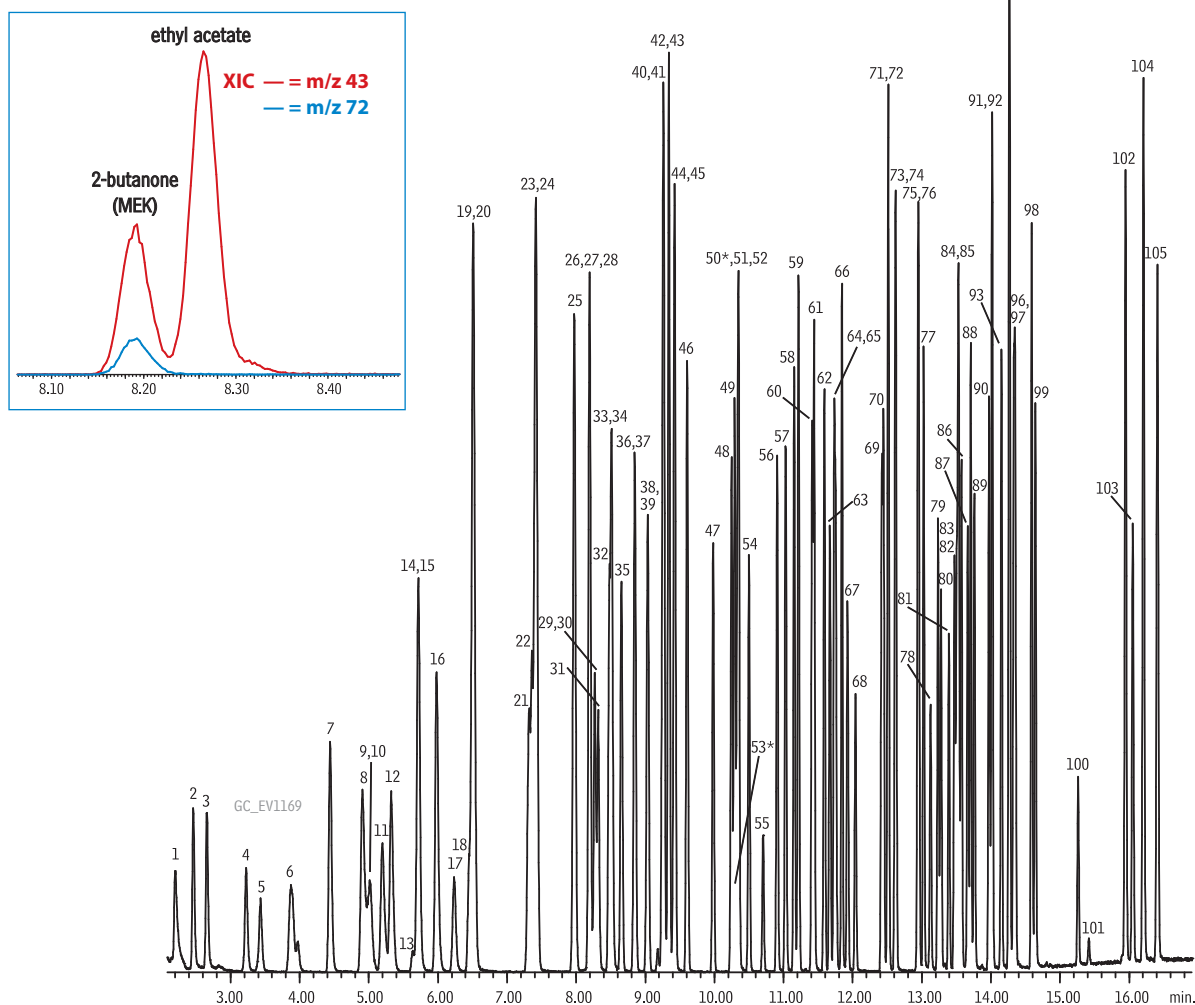


Figure 7 Using an Rxi®-624Sil MS column under optimized conditions increases productivity by assuring good resolution and minimal downtime when analyzing environmental volatiles.

Critical pairs resolved using an Rxi®-624Sil MS column under synchronized conditions:

| Peak #s | Compounds | Common Ions |
|---------|--|-------------|
| 26/29 | 2-butanone (MEK)/ethyl acetate | 43 |
| 41/42 | benzene/1,2-dichloroethane | 62 |
| 41/45 | benzene/ <i>tert</i> -amyl methyl ether (TAME) | 43 |

Analyze up to 36 samples per shift by synchronizing instrument and purge and trap cycles.



For peak identifications and conditions visit www.restek.com and enter chromatogram GC_EV1169 in the search function.

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/94% dimethyl polysiloxane)

| ID | df | temp. limits | 20-Meter | | 30-Meter | | 60-Meter | |
|--------|--------|------------------|----------|-------|----------|-------|----------|-------|
| 0.18mm | 1.00µm | -20 to 300/320°C | 13865 | \$405 | | | | |
| 0.25mm | 1.40µm | -20 to 300/320°C | | | 13868 | \$500 | | |
| 0.32mm | 1.80µm | -20 to 300/320°C | | | 13870 | \$540 | 13872 | \$900 |
| 0.53mm | 3.00µm | -20 to 280/300°C | | | 13871 | \$615 | | |



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11/12

NEW Rtx[®]-BAC Plus 1 and Rtx[®]-BAC Plus 2 Columns

Advanced Technology for Fast, Reliable Measurement of Alcohol in Blood

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and common interferences.
- Quality testing of every column with target analytes ensures reliable performance.
- 2 minute analysis time increases lab productivity.



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New Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 Columns

Advanced Technology for Fast, Reliable Measurement of Alcohol in Blood



Getting accurate, reliable results quickly is critical for labs analyzing blood alcohol concentration (BAC). New Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 columns provide definitive data in a fast, 2-minute analysis, so you can be certain of your results and maximize sample throughput.

Blood alcohol content is often determined using headspace injection and dual column GC-FID analysis. While this is a relatively straightforward procedure, column choice plays a major role in data quality and reliability. In order to produce accurate results, the primary and confirmation columns must fully separate target analytes from all interferences and produce symmetrical peaks. Due to deficiencies in selectivity and inertness, coelution and tailing peaks are observed on competitor columns, which make confident reporting of target alcohols difficult.

Best Overall Performance

New Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 columns have optimized column selectivities, which result in optimized resolution of all target compounds, as well as the retention time and elution order changes necessary for confirmation. These new columns outperform other blood alcohol column pairs and ensure baseline separation of all critical compounds, including ethanol, methanol, acetone, *tert*-butanol (IS), acetaldehyde, isopropanol, and 1-propanol (IS), in less than 2 minutes (Figure 1). The separation of *tert*-butanol is especially notable as it has recently been adopted as an internal standard for BAC headspace analysis, but coelutes with acetone on some columns.

In addition to being fully separated, target compounds exhibit excellent peak symmetry on Rtx®-BAC Plus columns, allowing more accurate integration. In contrast, alcohol peaks on competitor columns display tailing, which can make integration difficult. As shown in Table I and Figure 1, the Rtx®-BAC Plus columns produce the best peak shape for ethanol among the columns tested.

Quality Counts

Every Rtx®-BAC Plus 1 and Plus 2 column is conditioned at maximum isothermal temperature and quality tested with the analytes shown in Figure 1 to ensure reliable separations of all target compounds. Quality specifications for retention and efficiency ensure consistent column-to-column performance, and tightly controlled manufacturing results in robust columns with long lifetimes. The maximum temperature of these 100% chemically bonded columns is 260 °C.

Compared to other columns, new Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 columns offer the best overall performance for blood alcohol analysis. These columns provide fully separated, highly symmetrical peaks in a fast 2-minute analysis, allowing analysts to determine blood alcohol concentration quickly and report results with certainty.

Table I: Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 columns exhibit both baseline resolution of critical compounds and excellent peak shape compared to other blood alcohol columns available.

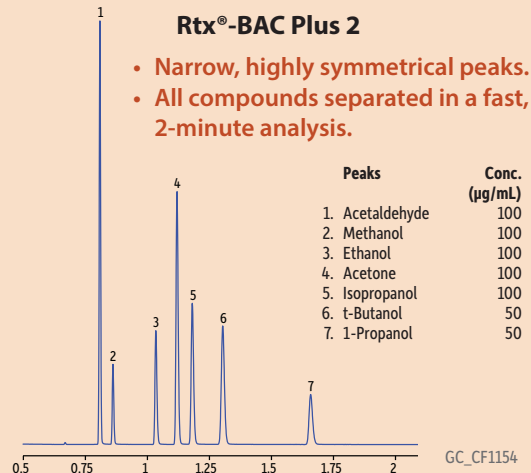
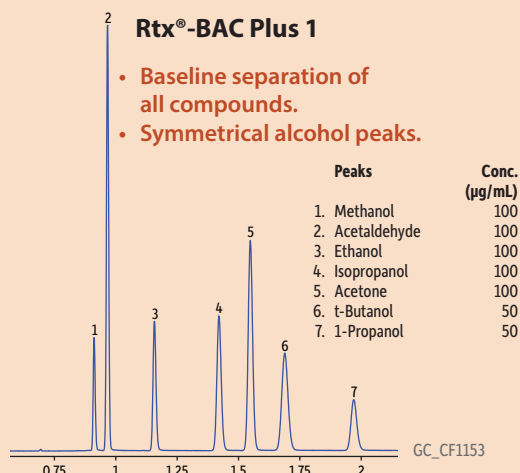
| Column | Resolution (Methanol/Acetaldehyde) | Resolution (Acetone/ <i>tert</i> -Butanol) | USP Tailing Factor (Ethanol) |
|-----------------|---------------------------------------|---|---------------------------------|
| Rtx®-BAC Plus 1 | - | 3.5 | 1.287 |
| DB®-ALC1 | - | 0.2 | 1.470 |
| ZB BAC 1 | - | 3.4 | 1.852 |
| Rtx®-BAC Plus 2 | 4.4 | - | 1.089 |
| DB®-ALC2 | 4.6 | - | 1.445 |
| ZB BAC 2 | 2.8 | - | 2.085 |

Figure 1: Rtx®-BAC Plus columns provide the best overall performance for determining blood alcohol concentration. Highly symmetrical, baseline separated peaks provide fast and definitive results for all target compounds.

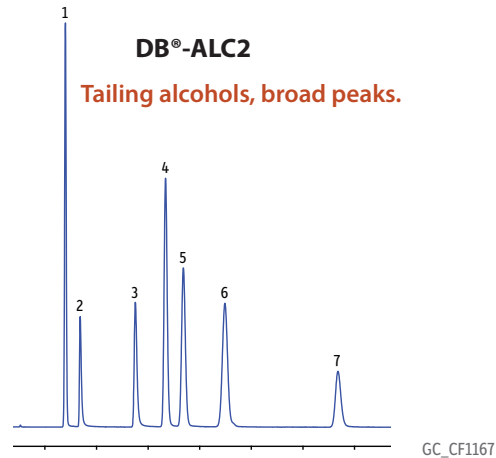
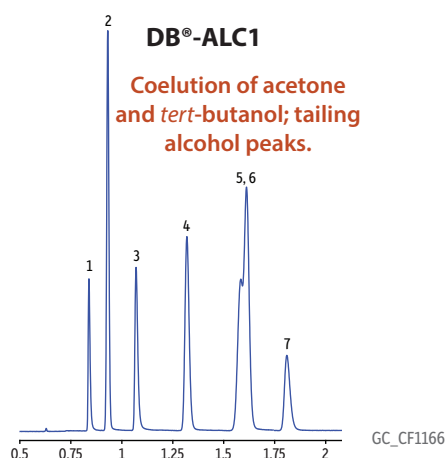
Primary Analysis

Confirmational Analysis

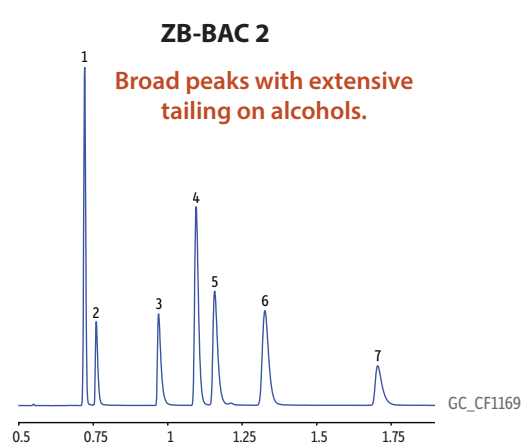
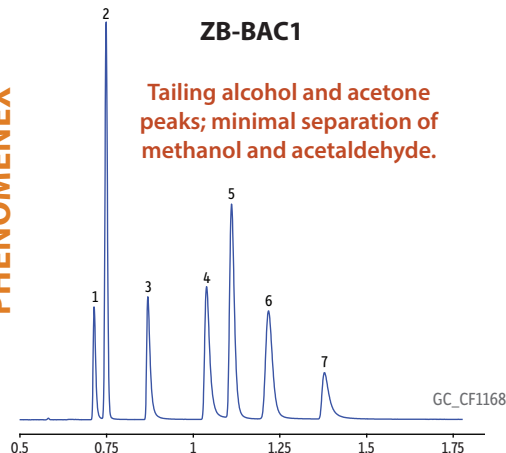
RESTEK



AGILENT



PHENOMENEX



Columns: Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004); Rtx®-BAC Plus 2, 30 m, 0.32 mm ID, 0.6 µm (cat.# 18006); DB®-ALC2 and ZB-BAC2, 30 m, 0.32 mm ID, 1.2 µm; DB®-ALC1 and ZB-BAC1, 30 m, 0.32 mm ID, 1.2 µm; Sample: 50 µL each of BAC resolution control standard n-P (cat.# 36010) and BAC resolution control standard t-B (cat.# 36011) diluted in 900 µL water in a 20 mL headspace vial; Injection: Headspace-loop split (split ratio 50:1); Liner: 1 mm ID straight inlet liner (cat.# 20972); Headspace-Loop: Inj. Port Temp.: 200 °C; Instrument: Tekmar HT3; Transfer Line Temp.: 125 °C; Valve Oven Temp.: 125 °C; Standby Flow Rate: 50 mL/min; Sample Temp.: 60 °C; Sample Equil. Time: 5 min; Vial Pressure: 30 psi; Loop Pressure: 20 psi; Loop Fill Time: 1 min; Oven: 40 °C (hold 3 min); Carrier Gas He, constant flow; Linear Velocity: 80 cm/sec @ 40 °C; Detector FID @ 240 °C; Make-up Gas: Nitrogen, 30 mL/min; Instrument Agilent/HP6890 GC; Acknowledgement: Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

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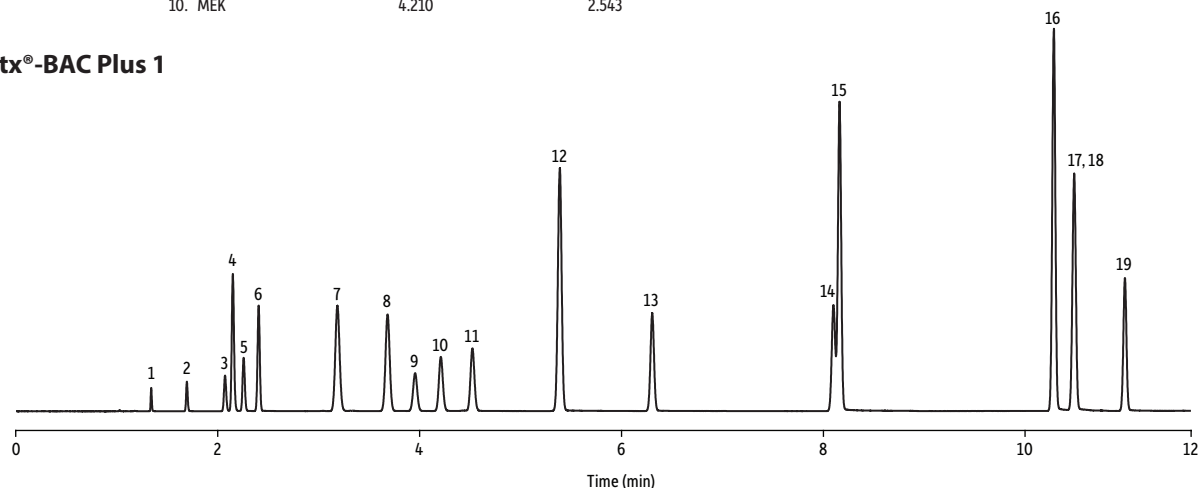
Other Applications

Rtx®-BAC Plus columns can be used for other low temperature applications for volatile organic compounds, due to their unique selectivity, retention, and inertness. For example, in the analysis of abused inhalants in Figure 2, most compounds are resolved between the columns with several elution order changes for confirmation. In addition, excellent peak shapes are observed. As shown in Figures 3 and 4, Rtx®-BAC Plus columns can also be used for single column applications, such as glycols or gamma-butyrolactone (GBL), which is a derivatized form of gamma-hydroxybutyrate (GHB). The low bleed character of these columns also makes them useful for mass spectrometry applications.

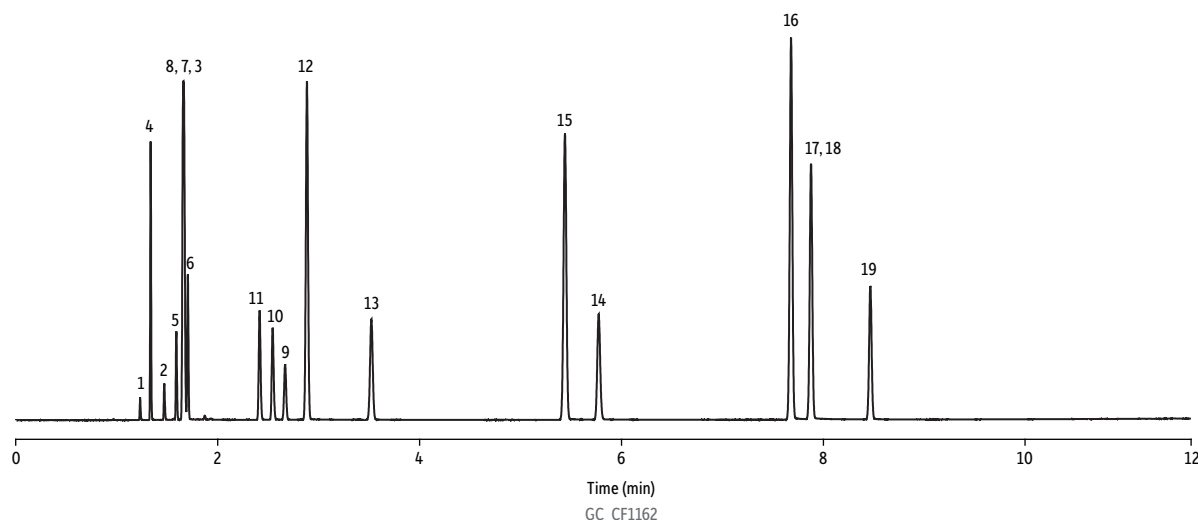
Figure 2: Dual column analysis of abused inhalants.

| Peaks | BAC Plus 1 RT (min) | BAC Plus 2 RT (min) | Peaks | BAC Plus 1 RT (min) | BAC Plus 2 RT (min) |
|-----------------------|---------------------|---------------------|-----------------------|---------------------|---------------------|
| 1. Methanol | 1.340 | 1.230 | 11. Ethyl acetate | 4.54 | 2.414 |
| 2. Ethanol | 1.694 | 1.470 | 12. Benzene | 5.390 | 2.883 |
| 3. Isopropanol | 2.072 | 1.660 | 13. Trichloroethylene | 6.306 | 3.522 |
| 4. Diethyl ether | 2.149 | 1.334 | 14. MIBK | 8.101 | 5.775 |
| 5. Acetone | 2.256 | 1.589 | 15. Toluene | 8.162 | 5.440 |
| 6. Methylene chloride | 2.405 | 1.703 | 16. Ethylbenzene | 10.286 | 7.681 |
| 7. MTBE | 3.185 | 1.660 | 17. <i>m</i> -Xylene | 10.487 | 7.879 |
| 8. Hexane | 3.683 | 1.660 | 18. <i>p</i> -Xylene | 10.487 | 7.879 |
| 9. Chloroform | 3.956 | 2.667 | 19. <i>o</i> -Xylene | 10.990 | 8.467 |
| 10. MEK | 4.210 | 2.543 | | | |

Rtx®-BAC Plus 1

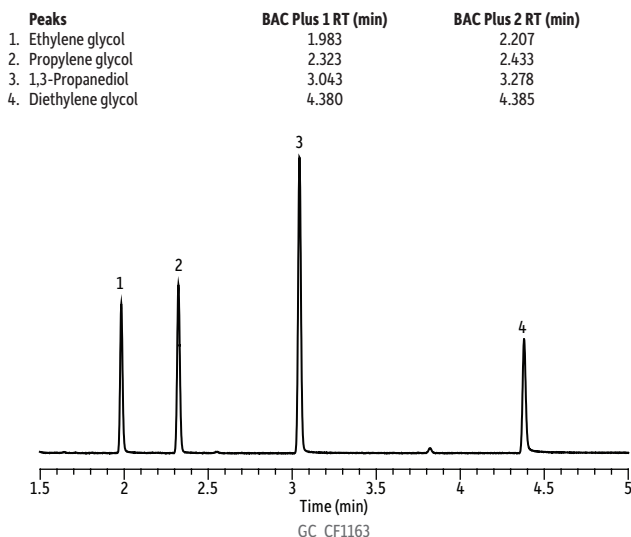


Rtx®-BAC Plus 2



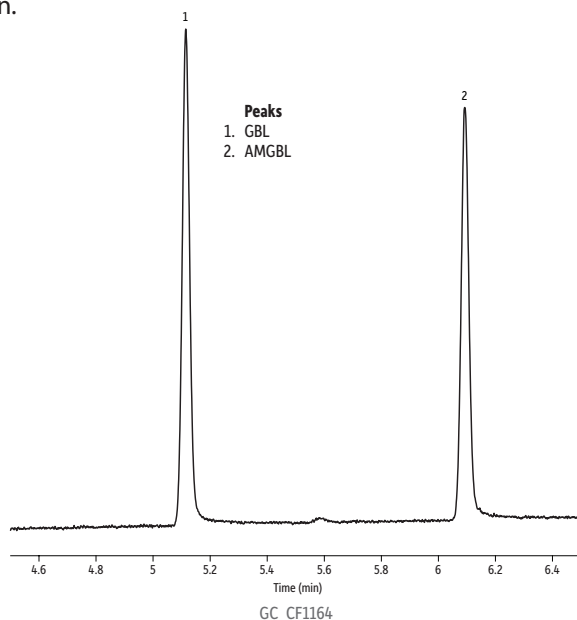
Columns: Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 μ m (cat.# 18004) and Rtx®-BAC Plus 2, 30 m, 0.32 mm ID, 0.6 μ m (cat.# 18006) using Rxi® guard column, 5 m, 0.32 mm ID (cat.# 10039) with Universal "Y" Press-Tight® connector (cat.# 20405-261); Sample: 50 μ g/mL each inhalant in water; Injection: headspace-loop split (split ratio 50:1); Liner: 1 mm straight inlet liner (cat.# 20972); Headspace-Loop: Inj. Port Temp.: 220 °C; Instrument: Tekmar HT3; Inj. Time: 3 min; Transfer Line Temp.: 125 °C; Valve Oven Temp.: 125 °C; Sample Temp.: 70 °C; Sample Equil. Time: 5 min; Vial Pressure: 30 psi; Pressurize Time: 2 min; Loop Pressure: 20 psi; Loop Fill Time: 1 min; Oven Temp: 40 °C (hold 4 min) to 120 °C at 10 °C/min (hold 0 min); Carrier Gas: He, constant flow; Linear Velocity: 50 cm/sec; Detector: FID @ 240 °C; Make-up Gas: N₂, 30 mL/min; Instrument: Agilent/HP6890 GC; Notes The Rtx®-BAC Plus 1 and Plus 2 columns were connected to the injection port using a ~12 inch section of guard column between the injection port and the Universal Y Press-Tight® connector. Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Figure 3: Separation of glycols on the Rtx®-BAC Plus 1 column.

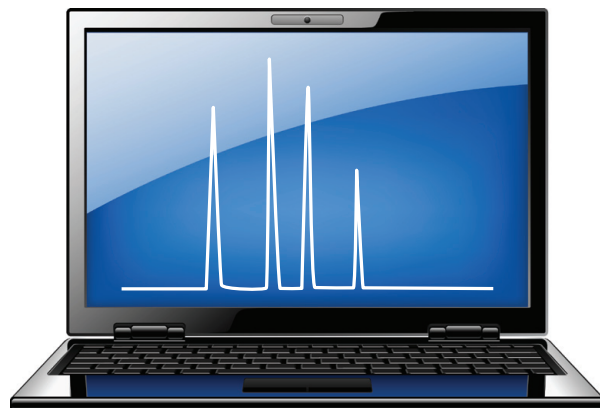


Columns: Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004); Sample: 200 µg/mL each glycol in methanol:water (40:60); Injection: 1 µL split (split ratio 20:1); Liner: Sky™ 4 mm straight inlet liner w/wool (cat.# 23300.1); Inj. Temp.: 260 °C; Oven Temp: 60 °C (hold 0 min) to 240 °C at 20 °C/min (hold 5 min); Carrier Gas: He, constant flow; Linear Velocity: 70 cm/sec; Detector: FID @ 240 °C; Make-up Gas: N₂, 30 mL/min; Instrument: Agilent/HP6890 GC; Notes: Injections were performed manually with a Merlin Microshot injector (cat.# 22229).

Figure 4: Gamma-butyrolactone (GBL) and internal standard alpha-methylene-gamma-butyrolactone (AMGBL) on an Rtx®-BAC Plus 1 column.



Columns: Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004); Sample: Gamma-butyrolactone (GBL) (cat.# 34077) and alpha-methylene-gamma-butyrolactone (AMGBL) (cat.# 34079); Injection: Headspace-loop split (split ratio 10:1); Liner: 1 mm ID straight inlet liner (cat.# 20972); Headspace-Loop: Inj. Port Temp.: 200 °C; Instrument: Tekmar HT3; Inj. Time: 1 min; Transfer Line Temp.: 125 °C; Valve Oven Temp.: 125 °C; Sample Temp.: 100 °C; Sample Equil. Time: 10 min; Vial Pressure: 30 psi; Pressurize Time: 2 min; Loop Pressure: 20 psi; Loop Fill Time: 1 min; Oven: 80 °C (hold 0 min) to 180 °C at 10 °C/min (hold 0 min); Carrier Gas He, constant flow; Linear Velocity: 48 cm/sec; Detector FID @ 240 °C; Make-up Gas: Nitrogen, 30 mL/min; Instrument Agilent/HP6890 GC; Notes: Sample was prepared by injecting 1 µL of each standard into a capped headspace vial. The mass of each compound inside the headspace vial was 1 µg. Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.



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NEW Columns and Standards for Blood Alcohol Testing

Rtx®-BAC Plus 1/Rtx®-BAC Plus 2 Columns

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and frequently encountered interferences.
- Robust and reproducible column chemistry ensures longer column lifetime and consistent results.
- 2 minute analysis time increases lab productivity.
- Stable to 260 °C

Rtx®-BAC Plus 1 Columns (fused silica)

| Description | temp. limits | cat.# |
|------------------------|------------------|-------|
| 30m, 0.32mm ID, 1.80µm | -20 to 240/260°C | 18004 |
| 30m, 0.53mm ID, 3.00µm | -20 to 240/260°C | 18005 |

Rtx®-BAC Plus 2 Columns (fused silica)

| Description | temp. limits | cat.# |
|-----------------------|------------------|-------|
| 30m, 0.32mm ID, 0.6µm | -20 to 240/260°C | 18006 |
| 30m, 0.53mm ID, 1.0µm | -20 to 240/260°C | 18007 |



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Blood Alcohol Resolution Control Standards

- 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.
- Includes 1-propanol or *tert*-butanol internal standard.
- Intended for qualitative use only.

BAC Resolution Control Standard n-P (6 components)

| | |
|---------------|----------------------------------|
| acetaldehyde | methanol |
| acetone | 1-propanol (<i>n</i> -propanol) |
| ethanol (BAC) | 2-propanol (isopropanol) |

100mg/dL each in water, 1mL/ampul

cat.# 36010 (ea.)

No data pack available.

BAC Resolution Control Standard t-B (6 components)

| | |
|----------------------------|--------------------------|
| acetaldehyde | ethanol (BAC) |
| acetone | methanol |
| <i>tert</i> -butanol (TBA) | 2-propanol (isopropanol) |

100mg/dL each in water, 1mL/ampul

cat.# 36011 (ea.)

No data pack available.

Blood Alcohol Standards (Calibration)

- NIST-traceable ethanol calibration standards.
- Calibration mixtures ranging from 0.010g/dL to 0.40g/dL in water.
- Datapak and Certificate of Analysis for each standard available on our website.

| Compound | | qty. | cat.# |
|-------------------------------------|------------|-------|-------|
| 0.010g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36276 |
| 0.015g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36232 |
| 0.02g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36233 |
| 0.025g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36234 |
| 0.04g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36235 |
| 0.05g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36257 |
| 0.08g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36262 |
| 0.1g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36236 |
| 0.15g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36237 |
| 0.16g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36417 |
| 0.2g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36238 |
| 0.3g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36239 |
| 0.4g/dL forensic ethanol solution | 1 mL/ampul | 5-pk. | 36266 |

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. |
|------------|----------------|---------|---------------|----------|----------------|
| 0.25 mm | 0.37 ± 0.04 mm | 10029 | 10029-600 | 10059 | 10059-600 |
| 0.32 mm | 0.45 ± 0.04 mm | 10039 | 10039-600 | 10064 | 10064-600 |
| 0.53 mm | 0.69 ± 0.05 mm | 10054 | 10054-600 | 10073 | 10073-600 |



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Chromatography Essentials

Sky™ 1.0 mm ID Straight Inlet Liners

Exceptionally inert, Sky™ inlet liners with state-of-the-art deactivation improve trace-level analysis.

- Increase accuracy and precision by preventing loss of sensitive analytes—even when using wool.
- Achieve lower detection limits for a wide range of active compounds.
- Ensure liner-to-liner reproducibility through consistent manufacturing and extensive testing.



Sky™ 1.0mm ID Straight Inlet Liner

for Agilent GCs equipped with split/splitless inlets

| ID x OD x Length | qty. | cat.# |
|---|--------|----------|
| Straight, Sky Technology, 1.0mm x 6.3mm x 78.5mm | ea. | 23333.1 |
| 1.0mm x 6.3mm x 78.5mm | 5-pk. | 23333.5 |
| 1.0mm x 6.3mm x 78.5mm | 25-pk. | 23333.25 |

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Restek Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek leak detector.

Leak Detector Specifications

| | |
|------------------------------|--|
| Detectable Gases: | Helium, nitrogen, argon, carbon dioxide, hydrogen |
| Battery: | Rechargeable lithium ion internal battery pack (12 hours normal operation) |
| Operating Temperature Range: | 32–120 °F (0–48 °C) |
| Humidity Range: | 0–97% |
| Warranty: | One year |
| Certifications: | CE, Ex, Japan |
| Compliance: | WEEE, RoHS |

Limits of Detection

These gases can be detected with the Restek electronic leak detector at the following leak rates:

Minimum Detectable Gas Limits and Indicating LED Color:

| |
|---|
| Helium, 1.0×10^{-5} , red LED |
| Hydrogen*, 1.0×10^{-5} , red LED |
| Nitrogen, 1.4×10^{-3} , yellow LED |
| Argon, 1.0×10^{-4} , yellow LED |
| Carbon dioxide, 1.0×10^{-4} , yellow LED |

Gas detection limits measured in atm cc/sec.

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

*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. When using it to detect hydrogen, the Restek electronic leak detector may only be used for determining trace amounts in a GC environment.

Universal “Y” Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.



| Description | ea. | 3-pk. |
|---|-----------|-----------|
| Universal “Y” Press-Tight Connector | 20405 | 20406 |
| Universal “Y” Press-Tight Connector, Deactivated | 20405-261 | 20406-261 |
| Universal “Y” Press-Tight Connector, Siltek Deactivated | 20485 | 20486 |



| Description | qty. | cat.# |
|--|------|-------|
| Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian) | ea. | 22655 |
| Small Probe Adaptor for Leak Detector | ea. | 22658 |
| Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter) | kit | 22654 |
| Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter | ea. | 22657 |

Restek carries a full line of headspace essentials
including screw-thread headspace vials & magnetic screw-thread caps!



Restek Has Added ISO Guide 34 and 17025 Accreditations



We Now Offer a Full Line of Certified Reference Materials!

Restek is proud to announce that our reference standard manufacturing and QA testing labs in Bellefonte, PA, have earned ISO Guide 34 and 17025 accreditations through A2LA. More than ever, you can rely on Restek for all of your reference standards, and now, you can also experience the advantages of our ISO accreditations:

- **Satisfy regulatory requirements** by sourcing CRMs from an accredited supplier.
- Benefit from the **exceptional product quality and customer service** needed to meet strict ISO 9001, Guide 34, and 17025 guidelines.
- Get the **same reliability and documentation with custom-formulated solutions** as you do with stock standards—both fall under Restek's accreditation.
- **Consolidate orders** by ordering primary- and secondary-source reference standards, GC and LC columns, sample prep supplies, and accessories from one vendor.

We invite you to visit www.restek.com/iso to learn more about our ISO quality credentials and view our certificates (including scopes of accreditation).

If you have any questions or would like more information, feel free to contact customer service at **814-353-1300, ext. 3**, or csreps@restek.com


Note: If your lab must use certified reference materials (CRMs), please be sure to tell your Restek representative when ordering so we can help you meet your regulatory requirements as we transition our inventory.

Lower Detection Limits with Ground-Breaking Column Technology

Rxi® technology unifies outstanding inertness, low bleed, and high reproducibility into a single high performance column line. Take variation out of the equation and get the most consistent results for trace level analysis with Rxi® columns.

Visit us at www.restek.com/rxi

phases available

- 
- Rxi®-1ms
 - Rxi®-1HT
 - Rxi®-5ms
 - Rxi®-5Sil MS
 - Rxi®-5HT
 - Rxi®-XLB
 - Rxi®-624Sil MS
 - Rxi®-35Sil MS
 - Rxi®-17
 - Rxi®-17Sil MS
 - Rxi® guard/retention gap columns

3-IN-1 TECHNOLOGY

Highest Inertness • Lowest Bleed • Exceptional Reproducibility

Lower Detection Limits with Ground-Breaking Column Technology

Rxi® columns deliver more accurate, reliable trace-level results than any other fused silica column on the market. To ensure the highest level of performance, all Rxi® capillary columns are manufactured and individually tested to meet stringent requirements for exceptional inertness, low bleed, and unsurpassed column-to-column reproducibility.

Highest Inertness

Inertness is one of the most difficult attributes to achieve in an analytical column, but it is one of the most critical as it improves peak shape, response, and retention time stability. Rxi® technology produces the most inert columns available, providing:

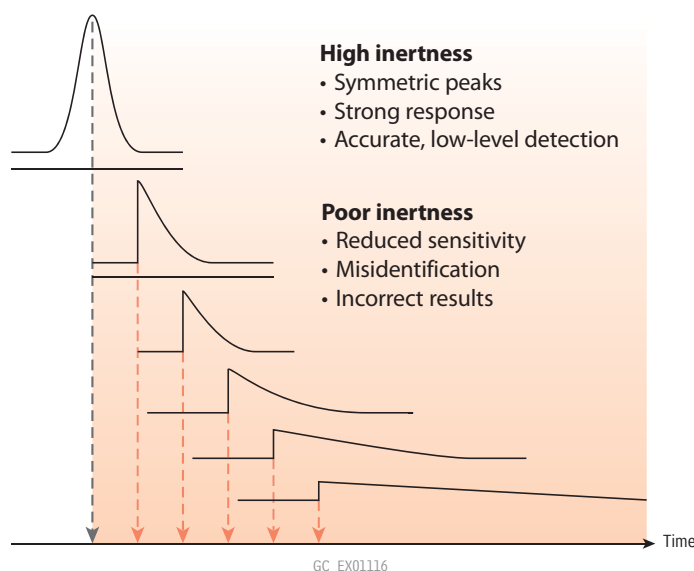
- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

Increased Signal and Reproducible Retention Times

When capillaries are not sufficiently deactivated, peaks become asymmetric, resulting in reduced signal and unpredictable retention times. As column activity increases, peak tailing becomes more pronounced, reducing peak height and causing retention time to drift (Figure 1). In practice, this means that sensitivity is lost and trace-level analytes cannot be reliably determined. In addition, even compounds at higher concentrations may be misidentified, due to retention time shifting.

A more significant problem for sample analysis is that retention time can vary with analyte concentration if the column is not highly inert. Since the amount of target analyte in samples is unknown, retention times on a poorly deactivated column can easily vary enough to move compounds outside the retention time window (Figure 2). This can result in inaccurate identifications, the need for manual integration, and additional review or analysis before results can be reported. Using inert Rxi® columns ensures that compounds elute with good signal-to-noise ratios at expected retention times, regardless of analyte concentration.

Figure 1 As column activity increases, signal decreases and retention time shifts.



Lower Detection Limits with Ground-Breaking Column Technology

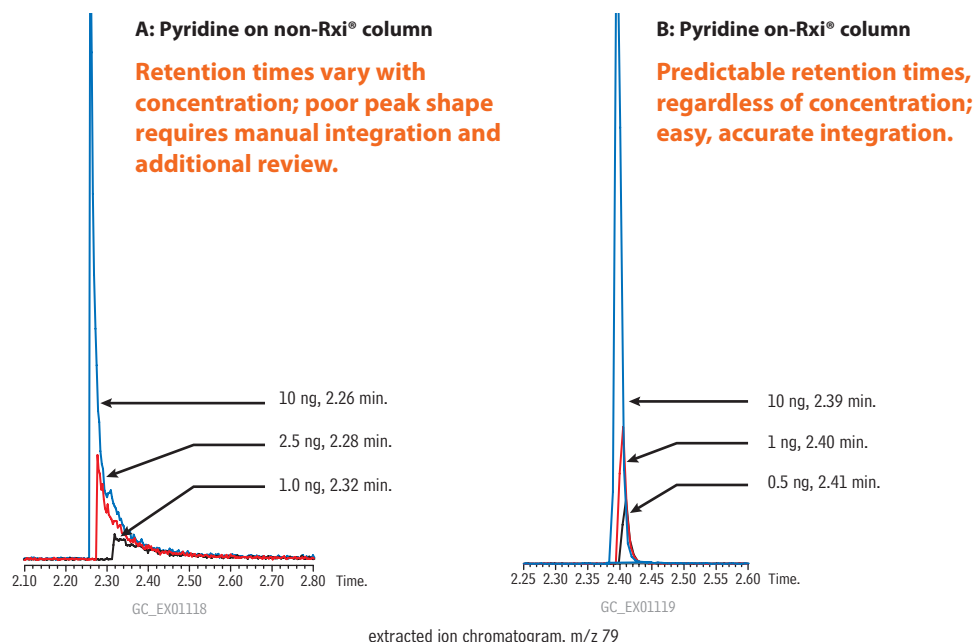
Rxi® technology unifies outstanding inertness, low bleed, and high reproducibility into a single high performance column. Take variation out of the equation and get the most consistent results for trace level analysis with Rxi® columns.

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- Rxi®-1ms
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- Rxi®-5ms
- Rxi®-5Sil MS
- Rxi®-5HT
- Rxi®-XLB
- Rxi®-624Sil MS
- Rxi®-35Sil MS
- Rxi®-17
- Rxi®-17Sil MS
- Rxi® guard/retention gap columns

Figure 2 Analyte levels in samples are unknown; only inert columns, which prevent concentration from affecting retention time, can assure accurate results.



Improved Response for Difficult Compounds

Another reason column inertness is important for trace-level analysis is that many acidic, basic, and polar compounds will tail significantly and become difficult to analyze if the column contains active sites. The remarkable neutrality of Rxi® columns solves this problem and allows a wide range of compounds to be analyzed with high sensitivity, often on a single column. All Rxi® columns are exceptionally inert as demonstrated in Figure 3 by high response factors for both pyridine (basic) and 2,4-dinitrophenol (acidic). Rxi® columns reliably produce highly symmetric peaks and improved responses for difficult compounds, indicating greater inertness than columns produced by other manufacturers (Figure 4).

Figure 3 An Rxi column gives the best overall performance for both basic and acidic compounds.

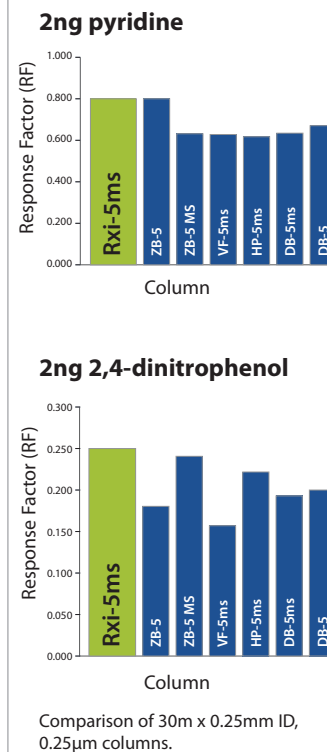
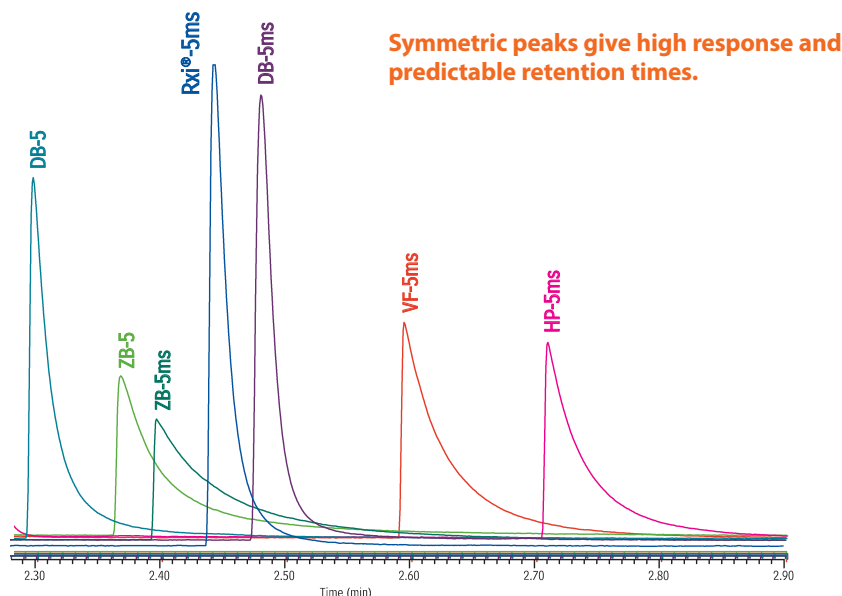


Figure 4 Rxi® columns are the most inert columns on the market providing the most symmetric peak shape for basic compounds, such as pyridine.



Comparison of 30m x 0.25mm ID, 0.25µm 5% diphenyl columns, 2ng pyridine on-column, helium carrier gas, Oven temp.: 50°C (3 min.) to 180°C @ 35°C/min. (5 min.), Det.: FID @ 250°C

Innovation & Service

"When my research group needed a GC column for a chiral separation, Restek was the only company that offered to provide us with test columns to evaluate. The willingness of Restek to work with us to find a solution to our separation problem is exceptional."

Joe Dinnocenzo,
Professor of Chemistry
Director, Center for
Photoinduced Charge Transfer
University of Rochester

How can we help you today?

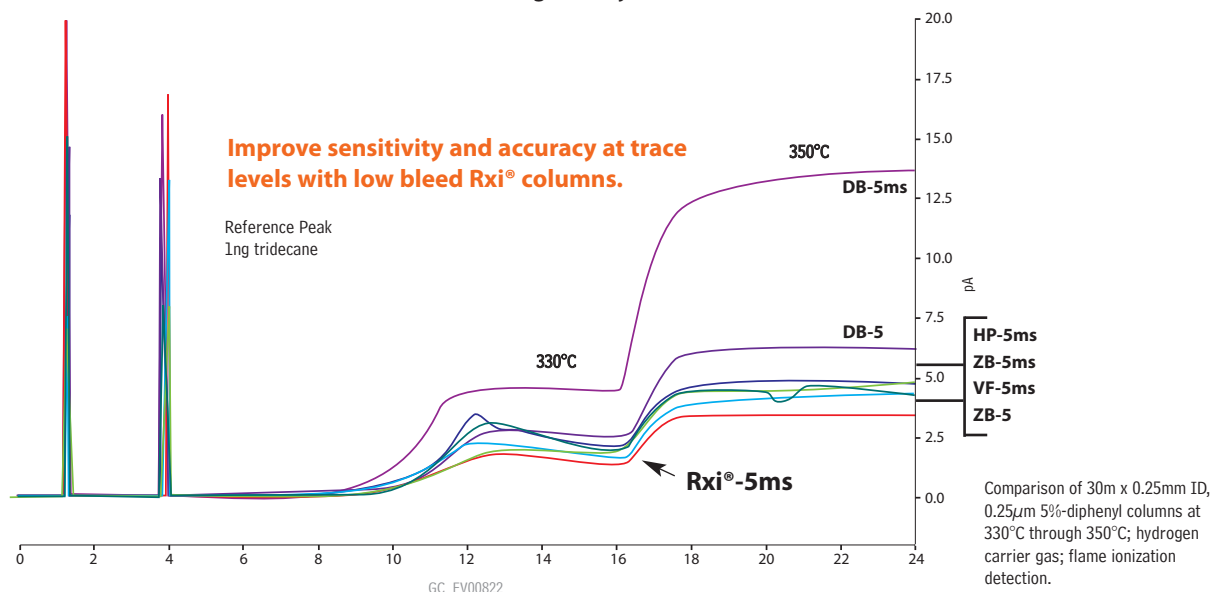
Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.

Lowest Bleed

Rxi® columns are more stable at high temperatures than any other manufacturer's column, resulting in higher system sensitivity (Figure 5). This low-bleed characteristic is the result of superior stabilization achieved by optimizing polymer cross-linking and surface deactivation technologies. Benefits of using ultra-low bleed Rxi® columns include:

- Increased sensitivity, for lower detection limits and better matches to mass spectral libraries.
- Faster system stabilization.
- Reduced detector contamination results in less downtime for maintenance.

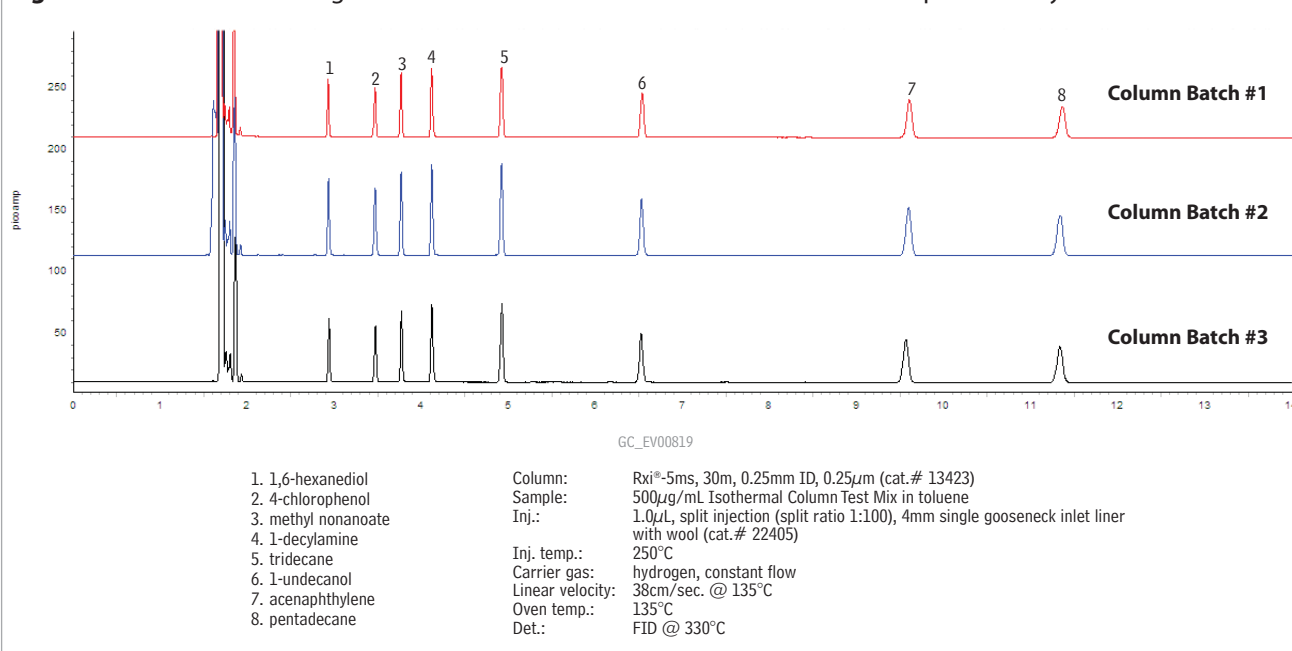
Figure 5 Rxi® columns have the lowest bleed among all major brands of columns.



Exceptional Reproducibility

Chromatographers today need to know that every column they receive is going to perform the same way as the column it replaces. Unmatched manufacturing precision and stringent quality control mean Rxi® columns exceed industry standards, resulting in the best column-to-column reproducibility available as measured by efficiency, retention, bleed, and inertness (Figure 6).

Figure 6 Rxi® columns are engineered to assure column-to-column and lot-to-lot reproducibility.



Rxi® Column Family

Rxi®-1ms (fused silica)

(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.
- Equivalent to USP G2 phase.

| 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 |
| 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 | | |
| | 0.36 | -60 to 330/350°C | | | 13311 | | |
| 0.20mm | 0.33 | -60 to 330/350°C | | 13397 | | 13398 | 13399 |

Rxi®-1HT (fused silica)

(low polarity phase, Crossbond® 100% dimethyl polysiloxane)

Outstanding thermal stability; minimal bleed even at 430°C.

| ID | df (μm) | temp. limits* | 15-Meter | 30-Meter |
|--------|---------|---------------|----------|----------|
| 0.25mm | 0.10 | -60 to 400°C | 13950 | 13951 |
| | 0.25 | -60 to 400°C | | 13952 |
| 0.32mm | 0.10 | -60 to 400°C | 13953 | 13954 |
| | 0.25 | -60 to 400°C | | 13955 |
| 0.53mm | 0.15 | -60 to 400°C | | 13956 |

*Column may be used up to 430°C, but lifetime will be reduced.

Rxi®-5ms (fused silica)

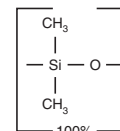
(low polarity phase, Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- General purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners or (e.g.) Aroclor mixes, solvent impurities.
- Equivalent to USP G27 phase.

| 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 |

Rxi®-1ms Structure



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

Innovation & Service

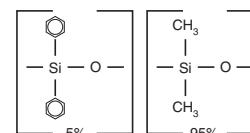
"Restek's technical support and preparation of our custom calibration standards, as well as their innovative column technology, have significantly increased the productivity of our GC/MS analyses."

Dan Wright, Lab Director
Shealy Environmental Services, Inc.

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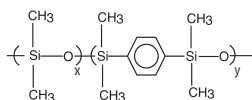
Rxi®-5ms Structure



similar phases

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

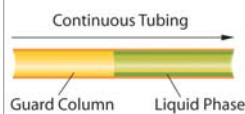
Rxi®-5Sil MS Structure



similar phases

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

Save Time!
Eliminate column
coupling with
Integra-Guard®
built-in guard
columns



similar phases

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

Rxi®-5Sil MS (fused silica)

(low polarity, proprietary silarylene phase; similar to 5% diphenyl/95% dimethyl polysiloxane)

- Phenyl groups improve thermal stability, reduce bleed, and make the phase less prone to oxidation.
- Ideal for GC/MS applications requiring high sensitivity, including use in ion trap systems.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter | 60-Meter |
|--------|---------|------------------|----------|----------|----------|
| 0.25mm | 0.10 | -60 to 330/350°C | 13605 | 13608 | |
| 0.25mm | 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 |

Rxi®-5Sil MS with Integra-Guard®

Extend column lifetime and eliminate leaks with a built-in retention gap.

| Description | qty. | cat.# |
|--|------|-----------|
| 15-Meter, 0.25mm ID, 0.25μm Rxi-5Sil MS w/10m Integra-Guard Column | ea. | 13620-127 |
| 30-Meter, 0.25mm ID, 0.25μm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13623-124 |
| 30-Meter, 0.25mm ID, 0.25μm Rxi-5Sil MS w/10m Integra-Guard Column | ea. | 13623-127 |
| 15-Meter, 0.25mm ID, 0.50μm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13635-124 |
| 30-Meter, 0.25mm ID, 0.50μm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13638-124 |
| 30-Meter, 0.25mm ID, 0.50μm Rxi-5Sil MS w/10m Integra-Guard Column | ea. | 13638-127 |
| 30-Meter, 0.32mm ID, 0.50μm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13639-125 |
| 30-Meter, 0.32mm ID, 1.00μm Rxi-5Sil MS w/5m Integra-Guard Column | ea. | 13654-125 |

Rxi®-5HT (fused silica)

(low polarity phase; 5% diphenyl/95% dimethyl polysiloxane)

- Columns processed for high temperature applications.
- 40% longer lifetime from specially designed fused silica tubing.

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

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

Rxi®-XLB (fused silica)

(low polarity proprietary silarylene phase)

- General purpose columns with unique selectivity and extremely low bleed.
- Ideal for many GC/MS applications—pesticides, semivolatiles, PCB congeners, Aroclor mixes, and PAHs.

| 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 |

Rxi®-624Sil MS (fused silica)

(midpolarity proprietary silarylene phase; similar to 6% cyanopropylphenyl/94% dimethyl polysiloxane)

Inert—excellent peak shape for a wide range of analytes, including acidic and basic compounds.

| ID | df (μm) | temp. limits | 20-Meter | 30-Meter | 60-Meter |
|--------|---------|------------------|----------|----------|----------|
| 0.18mm | 1.00 | -60 to 300/320°C | 13865 | | |
| 0.25mm | 1.40 | -60 to 300/320°C | | 13868 | |
| 0.32mm | 1.80 | -60 to 300/320°C | | 13870 | 13872 |
| 0.53mm | 3.00 | -60 to 280/300°C | | 13871 | |

Rxi®-35Sil MS (fused silica)

(midpolarity proprietary silarylene phase; similar to 35% phenyl methylpolysiloxane)

- Excellent inertness for active compounds.
- Very low bleed phase for GC/MS analysis.

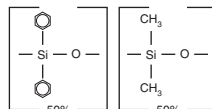
similar **phases** DB-35ms, MR2, VF-35ms

| 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 |

Rxi®-17 (fused silica)

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

General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.

similar **phases** DB-17, DB-608, CP-Sil 24 CB

| 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 |

Rxi®-17Sil MS (fused silica)(midpolarity proprietary silarylene phase; similar to 50% phenyl methyl polysiloxane)
Low-bleed for use with sensitive detectors and GC/MS.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter | 60-Meter |
|--------|---------|-----------------|----------|----------|----------|
| 0.25mm | 0.25 | 40 to 340/360°C | 14120 | 14123 | 14126 |
| 0.32mm | 0.25 | 40 to 340/360°C | 14121 | 14124 | |

| ID | df (μm) | temp. limits | 10-Meter | 20-Meter |
|--------|---------|-----------------|----------|----------|
| 0.10mm | 0.10 | 40 to 340/360°C | 14101 | |
| 0.18mm | 0.18 | 40 to 340/360°C | | 14102 |
| | 0.36 | 40 to 340/360°C | | 14111 |

Rxi® Guard/Retention Gap Columns

| 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® Column Test Mixes**Rxi® Test Mix (250ppm)** (8 components)

acenaphthylene
4-chlorophenol
n-decylamine
1,6-hexanediol
methyl nonanoate
(C9:0 FAME)

n-pentadecane (C15)
n-tridecane (C13)
1-undecanol

250μg/mL each in toluene, 1mL/ampul

cat. # 35248 (ea.)

Rxi® Test Mix (500ppm) (8 components)

acenaphthylene
4-chlorophenol
n-decylamine
1,6-hexanediol
methyl nonanoate
(C9:0 FAME)

n-pentadecane (C15)
n-tridecane (C13)
1-undecanol

500μg/mL each in toluene, 1mL/ampul

cat. # 35247 (ea.)

Rxi® Test Mix (Rev. A) (8 components)

acenaphthylene
4-chlorophenol
n-decylamine
1,6-hexanediol

methyl nonanoate
n-pentadecane
n-tridecane
1-undecanol

1,000μg/mL each in toluene, 1mL/ampul

cat. # 35241 (ea.)

Rxi®-5Sil MS/XLB Column Test Mix (8 components)

4-chlorophenol
dicyclohexylamine
2-ethylhexanoic acid
1,6-hexanediol

1-methylnaphthalene
n-tetradecane (C14)
n-tridecane (C13)
1-undecanol

350μg/mL each in methylene chloride, 1mL/ampul

cat. # 35226 (ea.)



Column Cross-Reference Table

Rxi® columns produce the same selectivity as competitor columns, but are much more inert, exhibit lower bleed, and offer exceptional reproducibility. For more accurate, reliable trace-level results, choose Rxi® columns.

| nonpolar | Restek | Phase Composition | Agilent | Varian/ Chrompack | SGE | Phenomenex | Machery-Nagel | Supelco |
|----------|---------------|---|--|--|--------|----------------|------------------------|-------------------|
| | Rxi-1ms | 100% dimethyl polysiloxane | HP-1ms UI, DB-1ms UI, HP-1, HP-1ms, DB-1 DB-1ms, Ultra-1 | VF-1ms CP-Sil 5 CP Sil 5 CB Low Bleed/MS | BP-1 | ZB-1 ZB-1ms | Optima-1 Optima-1ms | SPB-1 Equity-1 |
| | Rxi-1HT | 100% dimethyl polysiloxane | DB-1HT | | | ZB-1HT | | |
| POLARITY | Rxi-5ms | 5% diphenyl/ 95% dimethyl polysiloxane | HP-5ms UI, HP-5, HP-5ms, DB-5, Ultra-2 | CP-Sil 8 CP Sil 8 CB | BP-5 | ZB-5 | Optima-5 | SPB-5 Equity-5 |
| | Rxi-5Sil MS | 5% phenyl, 95% dimethyl arylene siloxane | DB-5ms UI, DB-5ms | VF-5ms CP-Sil 8 CB Low Bleed/MS | BPX-5 | ZB-5MS | Optima-5ms | SLB-5 |
| | Rxi-5HT | 5% diphenyl/95% dimethyl polysiloxane | DB-5HT | VF-5HT | | ZB-5HT | | |
| | Rxi-XLB | arylene/methyl modified polysiloxane | DB-XLB | VF-Xms | | | | |
| | Rxi-624Sil MS | 6% cyanopropylphenyl, 94% dimethyl arylene siloxane | DB-624, HP-624 | VF-624ms | BP-624 | ZB-624 | Optima-624 | |
| polar | Rxi-35Sil MS | 35% phenyl, 65% dimethyl arylene siloxane | DB-35ms | VF-35ms | | MR2 | | |
| | Rxi-17 | 50% diphenyl/50% dimethyl polysiloxane | HP-17, DB-17, DB-608 | CP-Sil 24 CB | | ZB-50 | | |
| | Rxi-17Sil MS | 50% phenyl, 50% dimethyl arylene siloxane | DB-17ms | VF-17ms | BPX-50 | | | |

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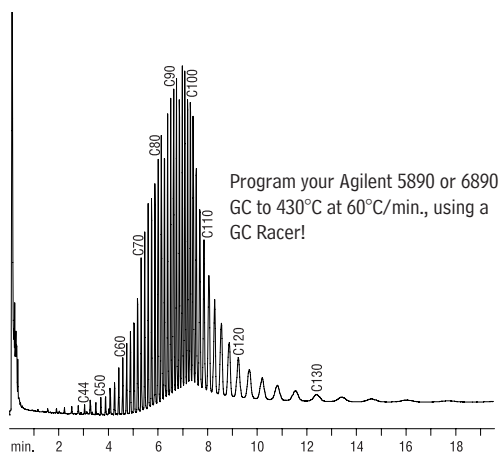
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MXT® Columns

With Restek, you are not limited to conventional phases for metal GC columns. We offer the most complete metal column line available, including many special-purpose phases.

Figure 1—Hydrocarbons, C44-C130, on an MXT®-1HT Sim Dist column.



GC_PC00543

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)
 Detector: FID/430°C
 Oven temp.: 40°C to 430°C @ 60°C/min. (hold 30 min.)

*Manufactured by Zip Scientific, distributed by Restek Corporation (see our catalog or website)

Other Stationary Phases Available:

| | | |
|----------|----------------|-----------|
| MXT®-5 | MXT®-65TG | MXT®-50 |
| MXT®-20 | MXT®-502.2 | MXT®-200 |
| MXT®-624 | MXT®-Volatiles | MXT®-BAC1 |
| MXT®-35 | MXT®-1301 | MXT®-BAC2 |
| MXT®-65 | MXT®-1701 | |

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Other Trademarks:
 Carbowax (Union Carbide Corp.), Polywax (Petrolite Specialty Polymers group)

MXT®-2887 (Silcosteel® 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 |

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

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

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

| ID | df (µm) | temp. limits | 6-Meter |
|--------|---------|--------------|---------|
| 0.53mm | 0.15 | -60 to 400°C | 70101 |

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

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

MXT®-1 (Silcosteel® treated stainless steel)

(Crossbond® 100% dimethyl polysiloxane)

| ID | df (µm) | temp. limits | 6-Meter | 15-Meter | 30-Meter | 60-Meter |
|--------|---------|------------------|----------|----------|----------|----------|
| 0.25mm | 0.10 | -60 to 330/400°C | | 70105 | 70116 | 70117 |
| | 0.25 | -60 to 360°C | | 70120 | 70123 | 70126 |
| | 0.50 | -60 to 350°C | | 70135 | 70138 | 70141 |
| | 1.00 | -60 to 340°C | | 70150 | 70153 | 70156 |
| 0.28mm | 0.10 | -60 to 360°C | 70102* | 70106 | 70109 | |
| | 0.25 | -60 to 360°C | | 70121 | 70124 | 70127 |
| | 0.50 | -60 to 330°C | | 70136 | 70139 | 70142 |
| | 1.00 | -60 to 320°C | | 70151 | 70154 | 70157 |
| 0.53mm | 3.00 | -60 to 285°C | | 70181 | 70184 | 70187 |
| | 0.15 | -60 to 400°C | 70101** | | | |
| | 0.25 | -60 to 360°C | | 70122 | 70125 | 70128 |
| | 0.50 | -60 to 330°C | | 70137 | 70140 | 70143 |
| | 1.00 | -60 to 320°C | | 70152 | 70155 | 70158 |
| | 1.50 | -60 to 310°C | | 70167 | 70170 | 70173 |
| | 3.00 | -60 to 285°C | | 70182 | 70185 | 70188 |
| | 5.00 | -60 to 270°C | | 70177 | 70179 | 70183 |
| | 7.00 | -60 to 250°C | | 70191 | 70192 | 70193 |
| ID | df (µm) | temp. limits | 10-Meter | 20-Meter | 40-Meter | |
| 0.18mm | 0.20 | -60 to 330/350°C | 71811 | 71812 | 71813 | |
| | 0.40 | -60 to 320/340°C | 71814 | 71815 | 71816 | |

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

*Temperature limits are -60 to 400°C.

**For simulated distillation.

MXT®-WAX (Silcosteel® 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°C | 70621 | 70624 | 70627 |
| | 0.50 | 40 to 250°C | 70636 | 70639 | 70642 |
| | 1.00 | 40 to 240°C | 70651 | 70654 | 70657 |
| 0.53mm | 0.25 | 40 to 250°C | 70644 | 70647 | 70650 |
| | 0.50 | 40 to 250°C | 70637 | 70640 | 70643 |
| | 1.00 | 40 to 240°C | 70652 | 70655 | 70658 |
| | 1.50 | 40 to 230°C | 70666 | 70669 | 70672 |
| | 2.00 | 40 to 220°C | 70667 | 70670 | |
| ID | df (µm) | temp. limits | 10-Meter | 20-Meter | 40-Meter |
| 0.18mm | 0.20 | 40 to 250°C | 71861 | 71862 | 71863 |
| | 0.40 | 40 to 250°C | 71864 | 71865 | 71866 |

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SimDist Setup Using Next
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SimDist Columns**

- Stable up to 450°C—lowest bleed for longest column lifetime.
- Reliably meet all ASTM D6352 and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

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- Stable up to 450°C—lowest bleed for longest column lifetime.
- Reliably meet all ASTM D6352 and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation. Metal columns are a better alternative than fused silica, and the new MXT®-1HT SimDist columns are the lowest bleed, highest efficiency column available, outperforming other metal columns for critical method parameters.

Low bleed is an important column characteristic in simulated distillation. High phase bleed shortens retention times, making it necessary to frequently rerun boiling point calibrations. In contrast, with a low bleed column, the stationary phase remains in place giving stable retention times. This results in longer in-calibration periods, extended column lifetimes, and more accurate final boiling point determinations. Efficiency is also a critical factor as columns that are higher in efficiency produce sharper peaks and higher resolution values, meaning that more samples can be analyzed before the minimum resolution specification is reached.

When compared to columns from other manufacturers, MXT®-1HT SimDist columns meet all D6352 method criteria and easily outperform competitors (Figures 1 and 2). In addition, field testing under accelerated conditions further demonstrates column robustness, even at 450°C (Figure 3). The exceptionally low bleed and high efficiency characteristics of the new MXT®-1HT SimDist columns translate directly into assured method performance, more analyses per calibration, and longer column lifetimes.

Figure 1 Low bleed, high efficiency MXT®-1HT SimDist columns outperform competitors (ASTM D6352 conditions).

Lower bleed means:

- Longer column lifetime.
- More stable calibrations.
- Accurate boiling point determinations.

RESTEK ADVANTAGE:

Longer column lifetime and more accurate data!

Higher efficiency means:

- Greater resolution; analyze more samples before method criteria are reached.
- Assured method performance.

RESTEK ADVANTAGE:

Run more samples within method specifications!

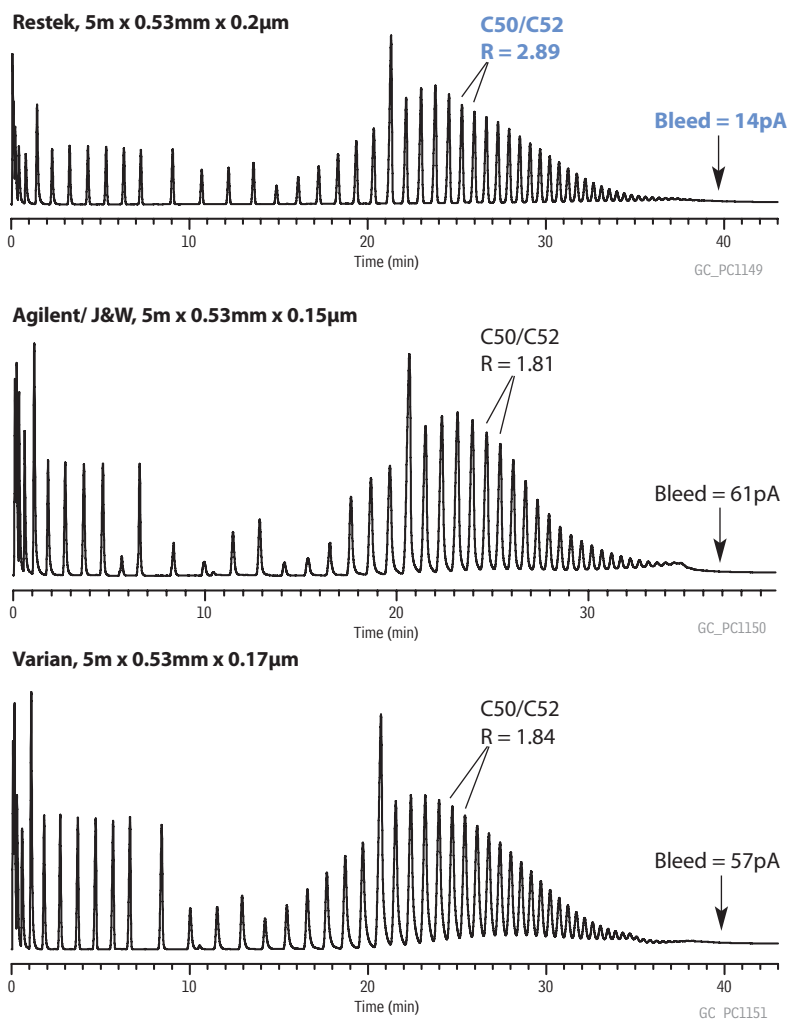
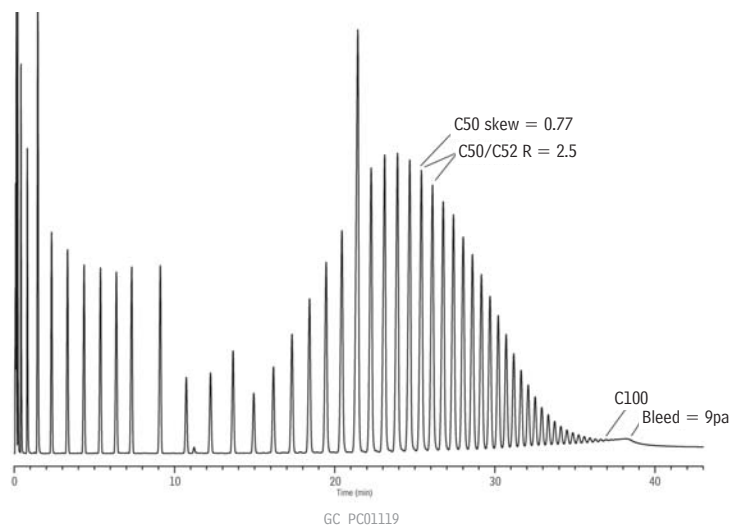


Figure 2 Superior resolution and peak shape on MXT®-1HT SimDist columns result in more accurate final boiling point determinations.



Column: MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.20 μ m (cat.# 70115)
 Sample: C5-C100, 1% in carbon disulfide
 Inj.: 1 μ L on-column (PTV)
 Inj. temp.: 53°C to 430°C @ 10°C/min. (hold 5 min.)
 Carrier gas: helium, constant flow
 Flow rate: 18mL/min.
 Oven temp.: 50°C to 430°C @ 10°C/min. (hold 5 min.)
 Det.: FID @ 430°C
 Instrument: Shimadzu 2010

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

Replaces: DB-1HT, DB-HT SimDis, CP-HT-Simdist CB

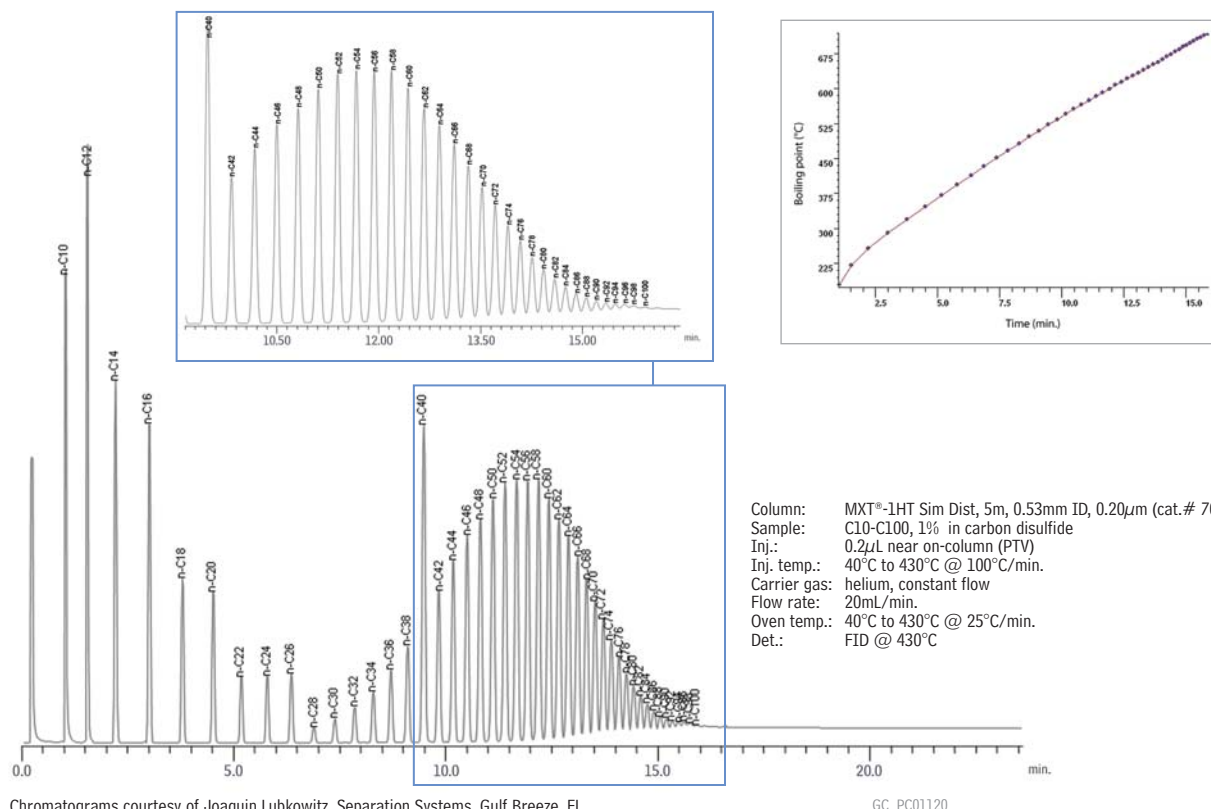
| ID | df (μ m) | temp. limits | length | cat. # |
|--------|---------------|------------------|----------|--------|
| 0.53mm | 0.10 | -60 to 430/450°C | 5-Meter | 70112 |
| 0.53mm | 0.20 | -60 to 430/450°C | 5-Meter | 70115 |
| 0.53mm | 0.21 | -60 to 430/450°C | 10-Meter | 70118 |
| 0.53mm | 0.88 | -60 to 400/430°C | 5-Meter | 70131 |
| 0.53mm | 1.0 | -60 to 380/400°C | 10-Meter | 70130 |
| 0.53mm | 1.2 | -60 to 380/400°C | 10-Meter | 70119 |
| 0.53mm | 2.65 | -60 to 360/400°C | 10-Meter | 70132 |
| 0.53mm | 5.0 | -60 to 360/400°C | 10-Meter | 70133 |

Table I: Recommended SimDist columns (100% PDMS) for use in ASTM SimDist methods.

| ASTM Method | Range | Recommended Column |
|------------------|--------------------------------|--|
| D2887 | C5-C44 | 5/10m x 0.53mm, df = 0.88 – 2.65 μ m |
| D7213 (2887-ext) | C5-C60 | 5m x 0.53mm, df = 0.15 – 1.2 μ m |
| D3710 | Gasoline up to FBP 260°C (C14) | 10m x 0.53mm, df = 2.65 μ m |
| D5307 | Crude up to FBP 538°C (C42) | 5m x 0.53mm, df = 0.2 μ m PDMS |
| D6352/D7500 | C10-C90/C7-C110 | 5m x 0.53mm, df = 0.1 – 0.2 μ m |
| D7169 | C5-C100 | 5m x 0.53mm, df = 0.2 μ m |

FBP = final boiling point

Figure 3 Robust MXT®-1HT SimDist columns meet all ASTM D6352 requirements, even under accelerated conditions.



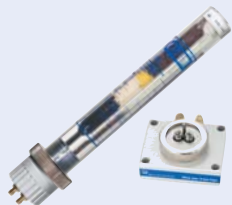
Column: MXT®-1HT Sim Dist, 5m, 0.53mm ID, 0.20 μ m (cat.# 70115)
 Sample: C10-C100, 1% in carbon disulfide
 Inj.: 0.2 μ L near on-column (PTV)
 Inj. temp.: 40°C to 430°C @ 100°C/min.
 Carrier gas: helium, constant flow
 Flow rate: 20mL/min.
 Oven temp.: 40°C to 430°C @ 25°C/min.
 Det.: FID @ 430°C

Chromatograms courtesy of Joaquin Lubkowitz, Separation Systems, Gulf Breeze, FL.

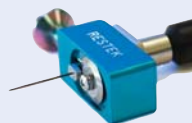


Practical Tips for High Temperature Analyses

Oxygen and moisture will dramatically reduce siloxane phase stability, especially at temperatures over 400°C. To ensure maximum column lifetime, follow these guidelines for proper instrument set-up.



- Use gas filters to remove oxygen and moisture from the carrier gas.



- When installing a column, prevent leaks by using a proper cutting device (such as a scoring wafer or MXT® tubing scorer) to ensure the column is not crushed. (cat. # 20523)



- Use graphite ferrules for column installation; Vespel®/graphite ferrules may leak, due to expansion and contraction at high temperatures (>400°C).



- Check the system for leaks using an electronic leak detector. (cat. # 22839)

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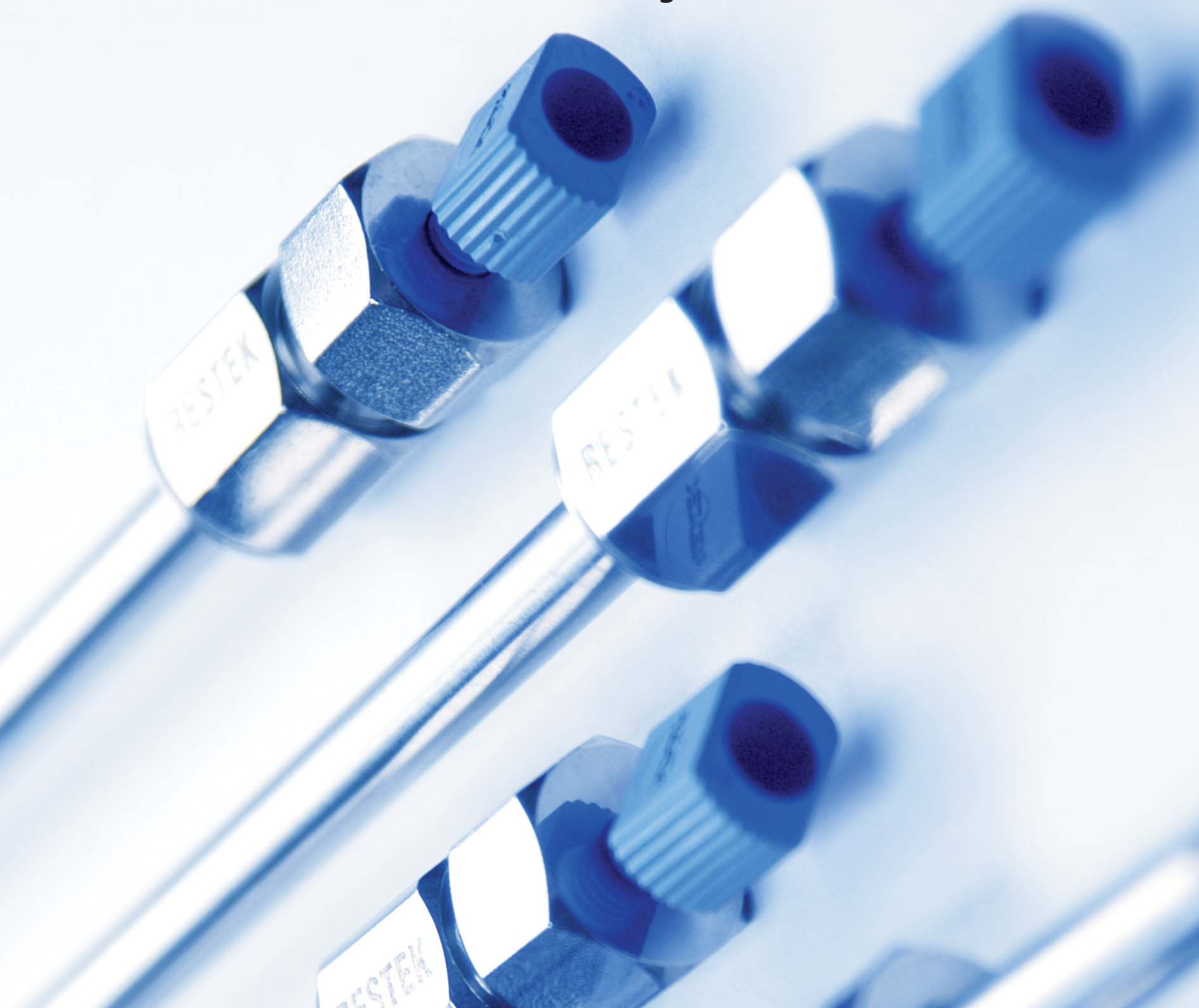
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VIVA™ Wide Pore HPLC Columns

**Exceptional Performance for Peptides,
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We start with the best wide pore silica...

- Largest available surface area in 250-350Å pores—ideal for larger molecules.
- Excellent base deactivation.
- Viva™ silica manufactured by Restek for consistency.

Conventional reversed phase HPLC packing materials with 60-150Å pores generally are poorly suited for separating peptides, proteins, or other larger biomolecules. The analyte molecules cannot access the surface area within these pores, and the pores can be fouled with large molecular weight debris. Silicas with wider pores address this need for more resolving power: theoretically, larger analytes enter the pores, access more of the surface, and are retained longer, promoting better selectivity.

For analytes with molecular weights larger than 3000, pore diameters of 250-350Å offer the best combination of retention and stability - pores larger than 500Å can make a silica impractically fragile for many applications. A narrow distribution about the mean pore diameter can aid in separating analytes that differ only slightly in hydrodynamic size. A large pore volume allows more analyte molecules into the pores, and provides better separations of complex mixtures. Pore volumes exceeding 1.2mL/g, however, make the silica particles more fragile.

In developing Viva™ wide pore silica, we evaluated materials from other manufacturers, and found some do not possess sufficient pore volume in the pore diameter range needed for effectively separating large molecules. Of the materials we tested, Viva™ 300Å silica has the greatest available surface area in 250-350Å pores (Table I), and the greatest percentage of pores narrowly distributed around the mean diameter (Figure 1).

...which makes exceptional HPLC columns...

- Excellent efficiency and peak symmetry.
- Best selectivity and retention among five tested manufacturers' columns.

We compared column efficiency, peak asymmetry, and retention for Viva™ C18 and four other popular C18 wide pore columns. Table II and Figure 2 show the Viva™ column ranked highest in retention and selectivity and produced the best peak symmetry measurements.

...for peptides, proteins, or other large molecules.

- Exceptional selectivity, for resolving larger biomolecules.
- Excellent base deactivation, for more symmetrical peaks and greater sensitivity without mobile phase modifiers.

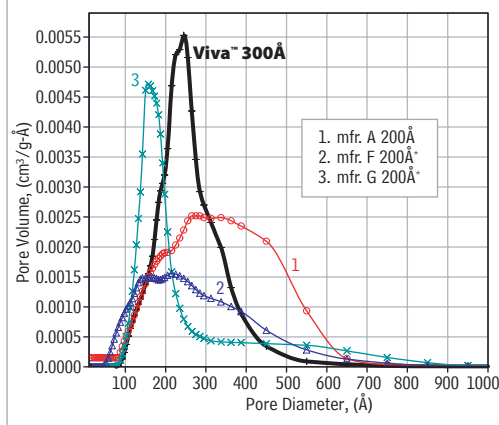
Even with wide pore packings, limitations often are encountered when samples contain closely related compounds, such as complex tryptic digests or genetic variants of a protein. These applications call for columns with maximum resolving power.

Viva™ HPLC columns are ideal for challenging analyses. To determine overall separating power, retention, and peak shape, we evaluated each manufacturer's column with peptide and protein test mixes. The Viva™ C18 column provided excellent resolution and peak shapes, as Figures 3 and 4 show.

Size exclusion studies show Viva™ wide pore columns are well suited for analyses of molecules over a weight range of approximately 800 to 212,000 Dalton. For additional technical information about Viva™ wide pore columns, request Restek Advantage 2005v1 (lit.# 59077) and 2005v2 (lit.# 59923).

Exceptionally large available surface area, a highly desirable pore volume, and a narrow pore diameter distribution help ensure effective retention of peptides, proteins, or other large molecules, and make Viva™ wide pore columns the best choice for your analysis.

Figure 1 Only Viva™ silica has a majority of pores in the 250-350Å range, in a narrow distribution. (BJH desorption)



*Materials F and G are 200Å materials being sold as 300Å.

Table I Viva™ silica has the largest available surface area in 250-350Å pores, allowing the greatest interaction with large molecules.

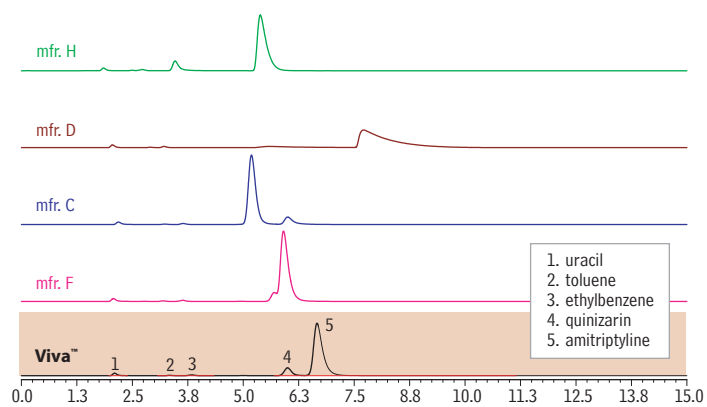
| Silica | Surface Area (m ² /g) | | | Total Pore Volume (mL/g) | |
|------------------------------|----------------------------------|----------|------------------|--------------------------|-------|
| | 0-100Å | 250-350Å | Total Desorp BET | | |
| Nominal Pore Diameter (300Å) | | | | | |
| Viva™ lot X | 1.6 | 46.5 | 144.5 | 116.9 | 0.880 |
| Viva™ lot Y | 2.3 | 40.6 | 138.6 | 112.4 | 0.823 |
| mfr. A | 2.9 | 34.4 | 118.2 | 101.6 | 0.885 |
| mfr. A | 4.2 | 33.1 | 130.3 | 111.3 | 0.941 |
| mfr. B | 3.7 | 22.2 | 83.6 | 73.9 | 0.627 |
| Nominal Pore Diameter (200Å) | | | | | |
| mfr. A | 41.0 | 2.7 | 231.6 | 189.2 | 0.852 |
| mfr. A | 34.1 | 0.9 | 243.4 | 200.0 | 0.911 |
| mfr. D* | 9.2 | 23.0 | 158.4 | 129.8 | 0.795 |
| mfr. E | 21.7 | 19.2 | 90.7 | 93.0 | 0.509 |
| mfr. F* | 24.7 | 15.6 | 105.8 | 58.5 | 0.530 |
| mfr. G* | 2.6 | 6.7 | 115.3 | 91.6 | 0.595 |

*Materials D, F, and G are 200Å materials being sold as 300Å.

Table II Viva™ wide pore columns provide the best overall performance.

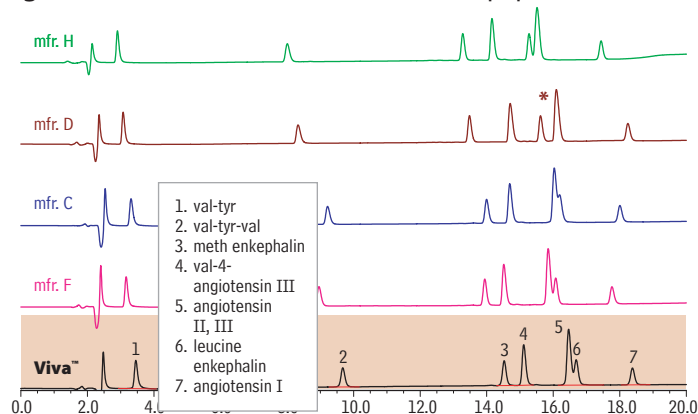
| Column | Efficiency (plates/m) | Asymmetry (biphenyl) | Retention Time (biphenyl) | Pressure |
|------------|-----------------------|----------------------|---------------------------|----------|
| | (10³) | (biphenyl) | (biphenyl) | (bar) |
| Viva™ C18 | >50 | 1.16 | 6.30 | 60 |
| mfr. F C18 | >50 | 1.30 | 5.89 | 66 |
| mfr. C C18 | ~50 | 1.46 | 5.77 | 72 |
| mfr. D C18 | >50 | 1.46 | 4.96 | 102 |
| mfr. H C18 | <50 | 1.49 | 3.79 | 80 |

150 x 2.1mm C18 phase columns, 5µm particles; reversed phase test mix



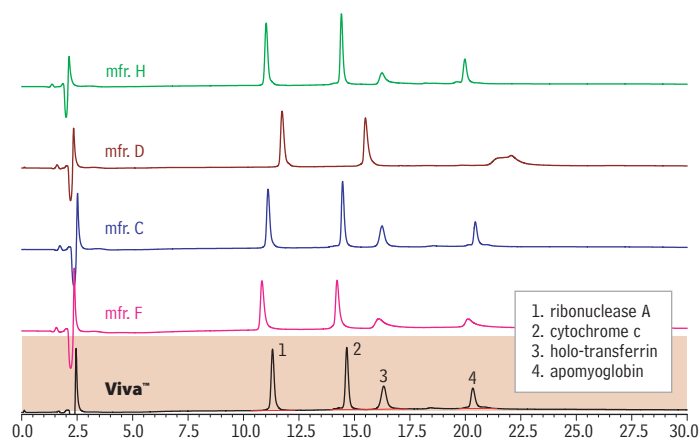
150 x 2.1mm C18 phase columns, 5 μ m particles; reversed phase test mix
Mobile Phase: water:methanol, 25:75 v/v; Flow Rate: 0.2mL/min.; Detection: UV, 254nm; Sample: 10 μ L HPLC Performance (NIST 870) Test Mix (cat. # 31699)

Figure 3 Viva™ C18: excellent resolution of peptides.



150 x 2.1mm C18 phase columns, 5 μ m particles; peptide test mix.
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 Rate: 0.2mL/min.; Detection: UV, 214nm; Injection: 20 μ L eight peptide test mix
* High levels of trace metals (~100ppm) in the silica enhance this separation.

Figure 4 Viva™ C18: superior performance with proteins.



150 x 2.1mm C18 phase columns, 5 μ m particles; four-protein test mix.
Mobile Phase: A - 0.1% TFA in water, pH 2.0, B - 0.1% TFA in acetonitrile, 20% B to 70% B in 30 min.; Flow Rate: 0.2mL/min.; Detection: UV, 214nm; Injection: Four Protein Standard Test Mix



Viva™ wide pore HPLC columns, only from Restek - we think you will be impressed!

Superior physical characteristics and strong evaluation performances show Viva™ columns are an excellent choice for analyzing peptides, proteins, or other larger molecules or biomolecules. For the best results from your large molecule analysis, talk with us about Viva™ columns, today.

C18, C8, C4, and silica columns currently available; other phases and particle sizes on request.

Bulk packing materials also are available.



guard columns

To order:

2.1mm, 3.2mm, or 4.6mm ID column with a Trident™ Integral Inlet Fitting, add "-700" to the catalog number for the column.

Example: 100mm x 4.6mm ID Viva™ C18 column with Trident™ Integral Inlet Fitting: 9514515-700

Nominal additional charge for guard cartridges and fittings for these columns, see our catalog or visit our website.

| Length | 1.0mm ID cat.# | 2.1mm ID cat.# | 3.2mm ID cat.# | 4.6mm ID cat.# |
|---------------------------------|-------------------|-------------------|-------------------|-------------------|
| Viva™ C18 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 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 |
| Viva™ C4 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 |
| Viva™ Silica 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 |

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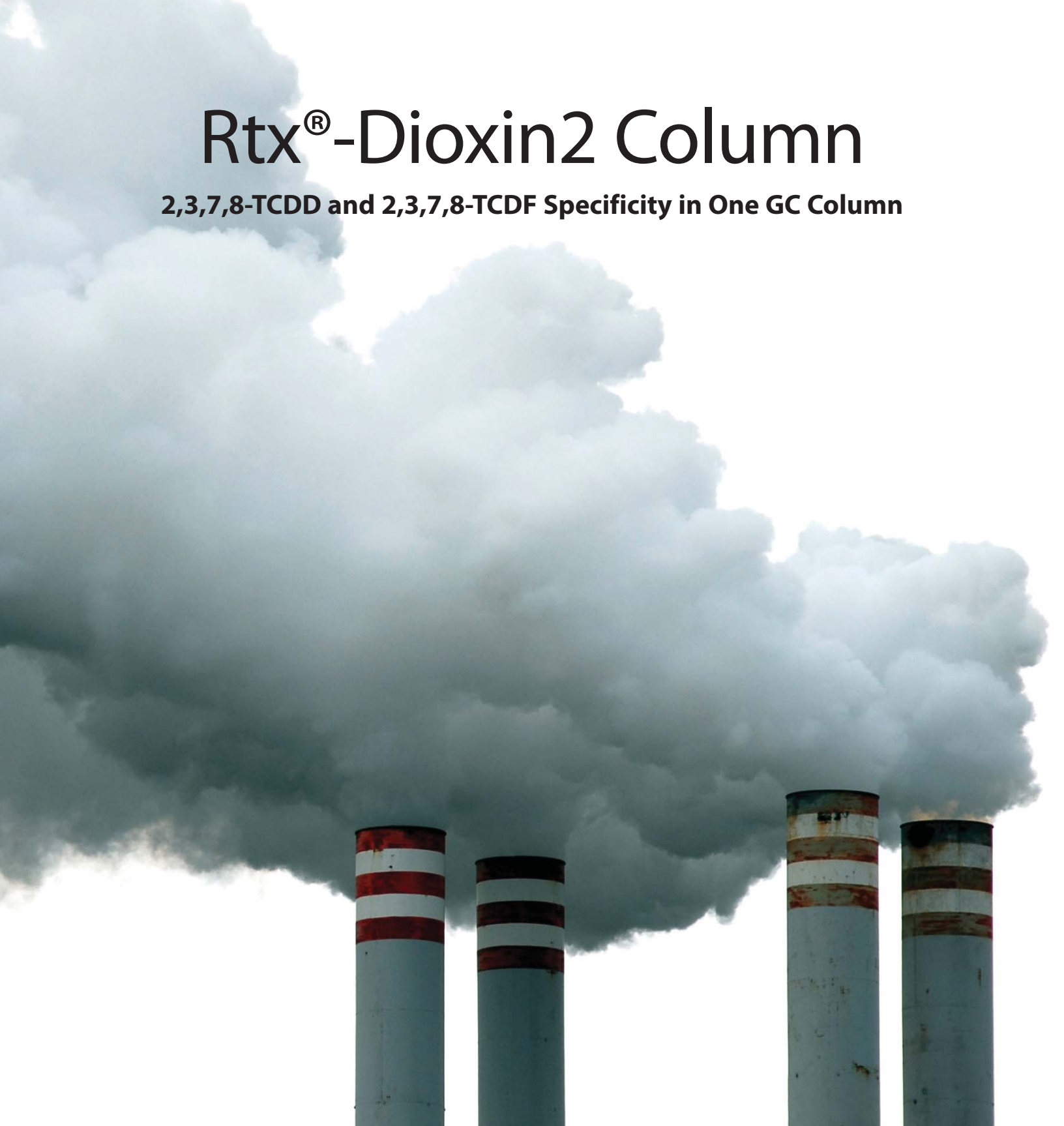
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Rtx[®]-Dioxin2 Column

2,3,7,8-TCDD and 2,3,7,8-TCDF Specificity in One GC Column



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Rtx[®]-Dioxin2 Column

- 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.

Accurate GC analysis of polychlorinated dibenzodioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congeners is a challenge, even when using a high resolution mass spectrometer. Separation of the toxic congeners (substitutions at the 2, 3, 7, and 8 positions) from the nontoxic congeners proves difficult on almost all stationary phases. Most laboratories perform an initial analysis using a 5% diphenyl/95% dimethyl polysiloxane column (e.g., an Rxi[™]-5ms column) to obtain reasonable estimates of concentrations for the 2,3,7,8-substituted congeners. For some of the target congeners, this quantification is biased toward high values, due to coelution with non-toxic congeners. For example, as many as five nontoxic TCDFs can coelute with 2,3,7,8-tetrachlorodibenzofuran in an analysis on a 5% diphenyl or equivalent column. The coelution issue has resulted in the need for confirmation columns, most commonly high cyanopropyl stationary phases (e.g., Rtx[®]-225 and Rtx[®]-2330 columns), in order to more accurately quantify the toxic congeners. Unfortunately, cyanopropyl columns exhibit poor thermal stability, and therefore offer poor lifetime. To address these issues Restek designed the Rtx[®]-Dioxin2 column, a column with unique selectivity for both 2,3,7,8 substituted dioxins and furans that also has excellent thermal stability.

Resolution of 2,3,7,8-TCDD and 2,3,7,8-TCDF

The Rtx[®]-Dioxin2 column is specific for both 2,3,7,8-TCDD and 2,3,7,8-TCDF, something that usually requires the use of at least two GC columns. The column is stable to 340°C, and is available in the dimensions commonly used for this analysis. Figure 1 shows a chromatogram of tetrachlorodibenzodioxins in lake sediment extract (certified reference material WMS-01) on a 60m, 0.25mm, 0.25µm Rtx[®]-Dioxin2 column. 2,3,7,8-TCDD is well-resolved from the other congeners in this group and can be quantified accurately in WMS-01 and other samples (Table 1). The data in Figure 2 illustrate resolution of the 2,3,7,8-TCDF congener from the nontoxic congeners in the same sediment extract analyzed on an Rtx[®]-Dioxin2 column. Values for 2,3,7,8-TCDF in a variety of sample types obtained with an Rtx[®]-Dioxin2 column compare favorably with values obtained on a cyanopropyl-type column (the column typically used for TCDF specificity) and with the certified values (Table 2). However, the quantified values from the 5% diphenyl column are biased high due to other TCDF interferences.

Table 1 Comparative results (pg/g) for 2378-TCDD in certified reference materials.

| Sample | 5% diphenyl | Rtx [®] -Dioxin2 | Certified Value |
|-------------------|-------------|---------------------------|-----------------|
| Sediment (WMS-01) | 21 | 14 | 17.7 ± 5.6 |
| Sediment | 8.5 | 9 | 6 |
| Flyash | 5.6 | 4.4 | 5 |
| Flyash-2 | < 3 | 4.4 | 4 |

WMS-01 was obtained from Wellington Laboratories, Inc., Guelph, Ontario, Canada.

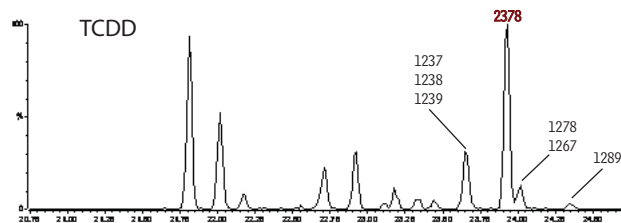
Table 2 Comparative results (pg/g) for 2378-TCDF in certified reference materials.

Note the quantitative bias for the 5% diphenyl results due to other TCDF interferences.

| Sample | 5% diphenyl | 225 | Rtx [®] -Dioxin2 | Certified Value |
|-------------------|-------------|-----|---------------------------|-----------------|
| Sediment (WMS-01) | 78 | 46 | 47 | 52.5 ± 16 |
| Sediment | 37 | 19 | 19 | 23 |
| Flyash | 240 | 38 | 32 | 31 |
| Flyash-2 | 250 | 40 | 32 | 28 |

WMS-01 was obtained from Wellington Laboratories, Inc., Guelph, Ontario, Canada.

Figure 1 2,3,7,8-Tetrachlorodibenzodioxin resolved from other TCDD congeners, using an Rtx®-Dioxin2 column..



Other peak identifications available upon request.

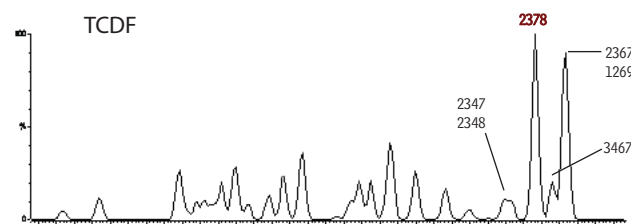
Column: Rtx-Dioxin®2, 60m, 0.25mm ID, 0.25µm (cat.# 10758)
 Sample: WMS-01 Reference Material, Wellington Laboratories
 Inj.: Splitless
 Inj. temp.: 250°C
 Carrier gas: helium, constant flow
 Flow rate: 1.5mL/min.
 Oven temp.: 130°C (hold 1.0 min.) to 200°C @ 40°C/min. to 235°C @ 3.0°C/min. to 300°C @ 5°C/min. (hold 10 min.).
 Det.: Micromass Ultima high-resolution mass spectrometer
 Ionization: EI
 Mode: SIR

also **available**

Rtx™-5ms GC Columns!

These new industry-leading low bleed and inert columns have the selectivity and life-time required by chemists using the 5% diphenyl / 95% dimethyl polysiloxane phase. Request lit. cat.# 580086 for more information.

Figure 2 Tetrachlorodibenzofuran congeners on an Rtx®-Dioxin2 column.



Other peak identifications available upon request.

Column: Rtx-Dioxin®2, 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

Resolution of PCDDs and PCDFs by Chlorination Level

Extracted ion profiles of quantitative native PCDDs and PCDFs, and window definer compounds are shown in Figure 3 and Figure 4. The tetra- through octachlorodibenzodioxin compounds are chromatographically separated by chlorination level. The tetrachlorodibenzofurans are chromatographically separated by chlorination level, except for 1,2,8,9-tetrachlorodibenzofuran and 1,3,4,6,8-pentachlorodibenzofuran, which exhibit a slight window overlap.

Conclusion

The Rtx®-Dioxin2 column is an excellent column for the analysis of dioxin and furan congeners. It has a unique selectivity for the toxic PCDDs and PCDFs, including specificity for 2,3,7,8-TCDD and 2,3,7,8-TCDF.

Acknowledgment

Chromatograms and data courtesy of Karen MacPherson and Eric Reiner, Ontario Ministry of the Environment, Toronto, Ontario, Canada.

Product Listing

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.



| 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 |

GET YOUR MIX

Time-Saving MegaMix™ Environmental Reference Mixes.

- Largest number of target analytes in one mix, formulated for maximum stability.
- Available for US EPA methods 8260, 8270, 502.2, 524.2, 525.2, 624, 625, SOM01.1, OLC 03.2, OLM 04.2, Skinner List volatiles, Skinner List semivolatiles.

MegaMix™ mixes simplify preparation of calibration mixes, and shorten preparation time, because they include a maximum numbers of compatible target analytes. In some applications a second calibration analysis has been required for coeluting target compounds, but the MegaMix™ formulation ensures all included analytes can be calibrated in one analysis (e.g., 3- and 4- methylphenol with other components in OLC 03.2 semivolatiles mix; *m*- & *p*- xylene with other components in OLC 03.2 volatiles mix).

Save time, save effort, minimize potential for preparation problems – use MegaMix™ reference mixes, only from Restek or authorized distributors.



Restek Trademarks:
Crossbond, Rtx, Rxi, Uniliner,
Restek logo.



Lit. Cat.# 580119A

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Rtx[®]-XLB

Low Bleed Capillary Columns

Lit. Cat.# 59957-INT

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HROMalytic **RESTEK** **ECH**nology
Australian Distributors
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20
YEARS

Turning Visions into Reality[™]

www.restek.com

Ultra-Low-Bleed Rtx®-XLB Columns

- Extremely low bleed, ideal for high-sensitivity GC/MS (stable to 340°C).
- Excellent resolution for semivolatile compounds in water, including environmental pollutants - pesticides - PCBs.
- Proprietary low-polarity phase, similar to DB®-XLB.

Compared to columns produced through older synthesis technologies, ultra-low-bleed Rtx®-XLB columns help ensure better detection limits and greater instrument stability in semivolatiles analysis. If noisy baselines are keeping you from taking full advantage of your high sensitivity system, or if semivolatile analytes are causing detection or resolution difficulties, an Rtx®-XLB column is your best choice for solving the problem.

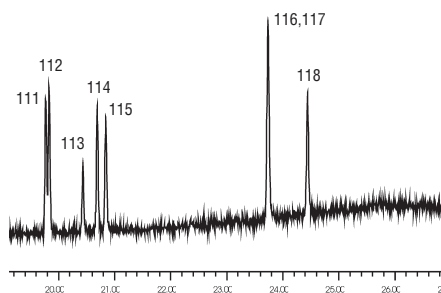
Maximize Performance from High-Sensitivity GC/MS Systems

Recent improvements to GC/MS systems design have greatly increased instrument sensitivity. Consequently, column bleed levels that formerly were acceptable now often prevent an analyst from taking full advantage of the capabilities of the system.

To address the growing need for ultra-low-bleed columns, Restek has developed Rtx®-XLB columns. Through a new approach to polymer synthesis, and state-of-the-art tubing deactivation, these columns minimize interference with high temperature analyses of high molecular weight active compounds: our bleed specification for Rtx®-XLB columns is less than 6pA at 340°C!

Figure 1 shows the bleed from an Rtx®-XLB column at 330°C, the ending temperature in US EPA Method 525 analysis of semivolatile pollutants, as observed with an Agilent 6890/5973 GC/MS. Clearly, column bleed is not a factor in this analysis.

Figure 1 An Rtx®-XLB column exhibits less than 6pA bleed—even at 330°C.



Rtx®-XLB 30m, 0.25mm ID, 0.25 μ m (cat.# 12823)
Sample: US EPA Method 525 standards, 1 μ L, 2.5ng per analyte on-column
See Figure 2 for conditions.

Semivolatile Pollutants

Low Bleed - Excellent Inertness - Isomer Resolution

The new Rtx®-XLB stationary phase, in combination with a sensitive GC/MS system, is especially well suited for analyses of high molecular weight active compounds, such as semivolatile environmental pollutants. Analysts using Rtx®-XLB columns can achieve low bleed and exceptional sensitivity with on-column concentrations of 5ng, as Figure 2 shows, or less. Figure 2 also shows that Rtx®-XLB columns offer excellent resolution of isomer pairs such as benzo(b)fluoranthene and benzo(k)fluoranthene, peaks 111 and 112.

Figure 2 Excellent inertness and selectivity for semivolatile pollutants at 5ng on-column.

Rtx®-XLB 30m, 0.25mm ID, 0.25 μ m (cat.# 12823)

Sample: US EPA Method 525 standards, 1 μ L 5ng per analyte on-column
standards used: 31824, 32420, 32421, 32422, 32423,
31825, 31826, 31828, 32291, 32415, 32436.

Inj.: pressure pulsed (0.4 min. @ 30psi), splitless (hold 0.4 min.),
4mm Drilled Uniliner® (cat.# 21055)

Inj. Temp.: 300°C

Carrier Gas: helium, constant flow

Flow Rate: 1.0mL/min.

Oven Temp.: 35°C (hold 2 min.)
to 260°C @ 20°C/min. (hold 0 min.)
to 330°C @ 6°C/min. (hold 5 min.)

Det: Agilent 5973 GC/MS

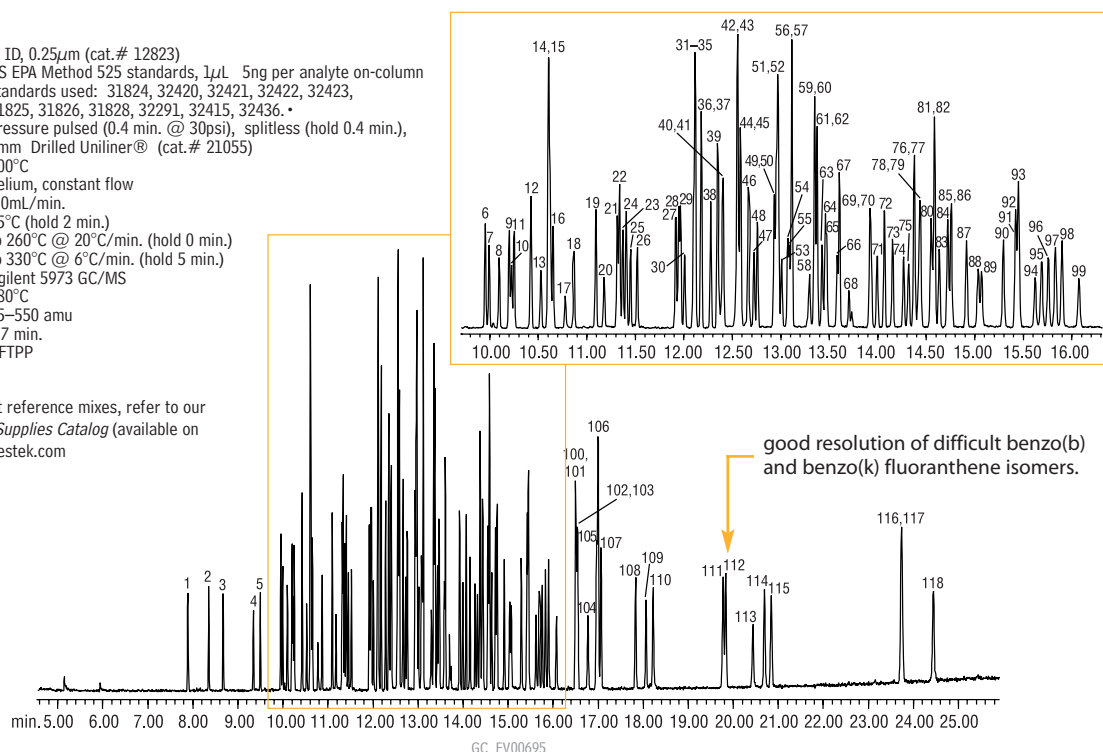
Transfer Line Temp.: 280°C

Scan Range: 45–550 amu

Solvent Delay: 4.7 min.

Tune: DFTPP

• For information about reference mixes, refer to our
2006 *Chromatography Supplies Catalog* (available on
request) or visit www.restek.com

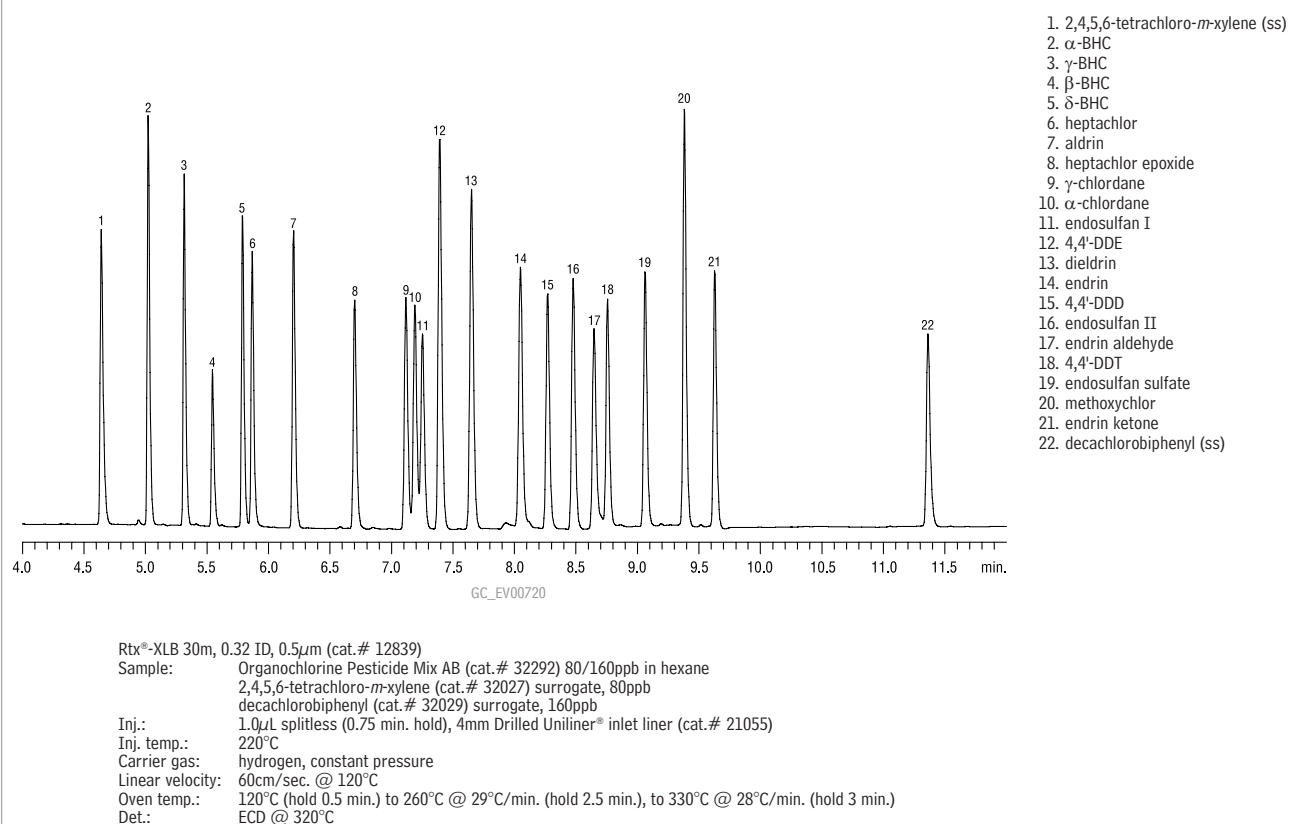


- | | | | | |
|------------------------------|-------------------------------------|--|--|--|
| 1. isophorone | 26. chlorpropham | 50. prometryne | 72. butachlor | 96. 4,4'-DDT |
| 2. 2-nitro- <i>m</i> -xylene | 27. 2,3-dichlorobiphenyl (BZ#5) | 51. ametryn | 73. stirofos (tetrachlorvinphos) | 97. triphenylphosphate |
| 3. dichlorvos | 28. atraton | 52. simetryn | 74. fenamiphos | 98. hexazinone |
| 4. hexachlorocyclopentadiene | 29. prometon | 53. δ -BHC | 75. α -chlordane | 99. endosulfan sulfate |
| 5. EPTC | 30. α -BHC | 54. heptachlor | 76. napropamide | 100. bis(2-ethylhexyl)phthalate |
| 6. butylate | 31. hexachlorobenzene | 55. chlorothalonil | 77. γ -chlordane | 101. methoxychlor |
| 7. mevinphos | 32. propazine | 56. di- <i>n</i> -butylphthalate | 78. endosulfan I | 102. 2,2',3,3',4,5',6,6'-octachlorobiphenyl (BZ#207) |
| 8. vernolate | 33. simazine | 57. terbutryn | 79. <i>trans</i> -nonachlor | 103. 2,2',3,3',4,4',6-heptachlorobiphenyl (BZ#171) |
| 9. pebulate | 34. atrazine | 58. bromacil | 80. pyrene-d10 | 104. endrin ketone |
| 10. etridiazole (Terrazole®) | 35. metribuzin | 59. chlorpyrifos | 81. pyrene | 105. benzo(a)anthracene |
| 11. dimethylphthalate | 36. diazinon | 60. metolachlor | 82. 4,4'-DDE | 106. chrysene-d12 |
| 12. acenaphthylene | 37. terbufos | 61. DCPA methyl ester (Dacthal®) | 83. 2,2',4,4',5,6'-hexachlorobiphenyl (BZ#154) | 107. chrysene |
| 13. 2,6-dinitrotoluene | 38. pronamide | 62. 2,2',3,4,6-pentachlorobiphenyl (BZ#47) | 84. <i>p</i> -terphenyl-d14 | 108. fenarimol |
| 14. acenaphthene-d10 | 39. pentachlorophenol | 63. aldrin | 85. dieldrin | 109. <i>cis</i> -permethrin |
| 15. 2-chlorobiphenyl (BZ#1) | 40. β -BHC | 64. triadimefon | 86. carboxin | 110. <i>trans</i> -permethrin |
| 16. chloroneb | 41. disulfoton | 65. cyanazine (Bladex) | 87. chlorbenzilate | 111. benzo(b)fluoranthene |
| 17. tebutiuron | 42. terbacil | 66. MGK-264 | 88. tricyclazole | 112. benzo(k)fluoranthene |
| 18. molinate | 43. phenanthrene-d10 | 67. diphenamid | 89. endrin | 113. fluridone (Sonar®) |
| 19. diethyl phthalate | 44. methyl parathion OA | 68. merphos | 90. 4,4'-DDD | 114. benzo(a)pyrene |
| 20. 2,4-dinitrotoluene | 45. phenanthrene | 69. 2,2',3,4,6-pentachlorobiphenyl (BZ#98) | 91. bis(2-ethylhexyl)adipate | 115. perylene-d12 |
| 21. propachlor | 46. anthracene | 70. heptachlor epoxide (isomer B) | 92. butyl benzyl phthalate | 116. dibenzo(a,h)anthracene |
| 22. fluorene | 47. γ -BHC (lindane) | 71. heptachlor epoxide (isomer A) | 93. endosulfan II | 117. indeno(1,2,3-cd)pyrene |
| 23. ethoprop | 48. 2,4,5-trichlorobiphenyl (BZ#29) | | 94. endrin aldehyde | 118. benzo(ghi)perylene |
| 24. cycloate | 49. alachlor | | 95. norflurazon | |

Excellent Choice for Organochlorine Pesticides

In many environmental and food laboratories, samples are analyzed for organochlorine pesticides using highly sensitive electron capture detectors (ECDs). In order to take full advantage of the detector's sensitivity, the analytical column must exhibit low bleed, to minimize background noise, and exceptional inertness, to prevent loss of labile pesticides, in addition to the selectivity necessary to separate complex mixtures. Low bleed and excellent inertness make an Rtx®-XLB column the perfect choice for this application. Figure 3 and Figure 4 (overside) show an Rtx®-XLB column will separate complex mixtures of organochlorine pesticides. Table I lists retention times for the extended list of analytes.

Figure 3 Low bleed and exceptional inertness ensure excellent results for organochlorine pesticides in US EPA Method 8081.



tech tip

In combination with an Rtx®-XLB column, a few simple adjustments to injection conditions can greatly improve sensitivity for active and high molecular weight target compounds:

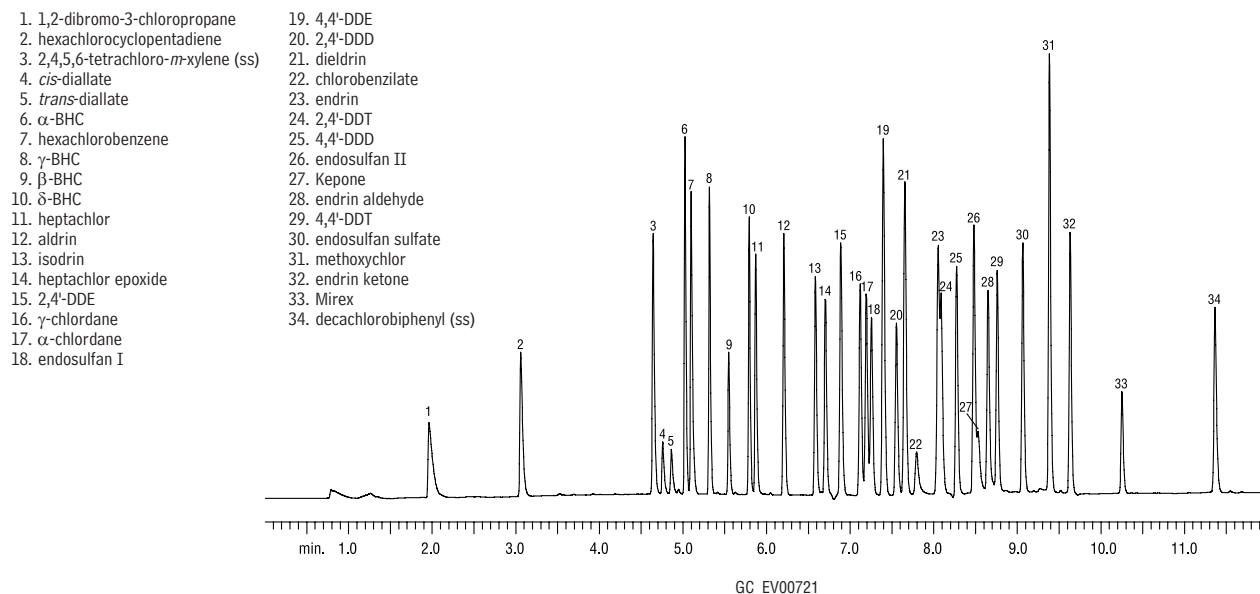
* By eliminating contact between the sample and the hot metal surfaces in the injection port, a Drilled Uniliner® inlet liner prevents analytes from degrading in the injection port. For information about Drilled Uniliner® inlet liners, request lit. cat. # 59877, or refer to our current chromatography supplies catalog.

* Pulsed injection also helps minimize breakdown, by reducing the time the analytes spend in the injection port. A 30psi/0.5 min. pulse was used to obtain Figure 2. To avoid breaking the seal between the column and a Drilled Uniliner® inlet liner, do not exceed 50psi.

* When analyzing semivolatile compounds, a 35°C initial temperature helps ensure sharp, symmetric peaks for early-eluting analytes (Figure 2).

Resolve Complex Mixtures of Organochlorine Pesticides

Figure 4 Complex mix of organochlorine pesticides resolved on an Rtx®-XLB column.



Rtx®-XLB 30m, 0.32mm ID, 0.5µm (cat.# 12839)
 Sample: 8081A pesticides, 80-160ppb in hexane
 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

Sample Components
 8081A Pesticides/Surrogates (cat.# 32292)
 8080 Organochlorine Pesticide Mix AB #2 (20 components) (cat.# 32295)
 8081a Organochlorine Pesticide Mix C #2 (7 components) (cat.# 32200)
 2,4'-DDT (cat.# 32098)
 2,4'-DDD (cat.# 32099)
 Kepone (custom)
 Mirex (custom)
 2,4,5,6-tetrachloro-*m*-xylene (ss, 20ppb) (cat.# 32027)
 decachlorobiphenyl (ss, 40ppb) (cat.# 32029)

Table 1 Retention times for extended list of organochlorine pesticides on an Rtx®-XLB column.

| Pesticide | Retention Time (min.) | Pesticide | Retention Time (min.) | Pesticide | Retention Time (min.) |
|--|-----------------------|--------------------|-----------------------|-------------------------|-----------------------|
| 1,2-dibromo-3-chloropropane | 1.96 | heptachlor | 5.87 | dieldrin | 7.65 |
| hexachlorocyclopentadiene | 3.06 | aldrin | 6.21 | chlorobenzilate | 7.80 |
| 2,4,5,6-tetrachloro- <i>m</i> -xylene (ss) | 4.64 | isodrin | 6.58 | endrin | 8.05 |
| <i>cis</i> -diallate | 4.76 | heptachlor epoxide | 6.70 | 2,4'-DDT | 8.09 |
| <i>trans</i> -diallate | 4.86 | 2,4'-DDE | 6.89 | 4,4'-DDD | 8.27 |
| α-BHC | 5.02 | γ-chlordane | 7.12 | endosulfan II | 8.48 |
| hexachlorobenzene | 5.10 | α-chlordane | 7.19 | Kepone | 8.53 |
| γ-BHC | 5.32 | endosulfan I | 7.26 | endrin aldehyde | 8.65 |
| β-BHC | 5.55 | 4,4'-DDE | 7.40 | 4,4'-DDT | 8.76 |
| δ-BHC | 5.79 | 2,4'-DDD | 7.55 | endosulfan sulfate | 9.07 |
| | | | | methoxychlor | 9.38 |
| | | | | endrin ketone | 9.63 |
| | | | | Mirex | 10.25 |
| | | | | decachlorobiphenyl (ss) | 11.36 |

Rtx®-XLB 30m, 0.32mm ID, 0.5µm (cat.# 12839)
 Sample: US EPA Method 8081A pesticides, 80-160ppb in hexane
 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

Product Listing

Rtx®-XLB Columns (fused silica)

(proprietary low-polarity phase)



| ID | df (μm) | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|---------|-----------------|----------|----------|----------|
| 0.25mm | 0.10 | 30 to 340/360°C | | 12808 | |
| | 0.25 | 30 to 340/360°C | 12820 | 12823 | 12826 |
| | 0.50 | 30 to 340/360°C | | 12838 | |
| | 1.00 | 30 to 340/360°C | 12850 | 12853 | |
| 0.32mm | 0.10 | 30 to 340/360°C | | 12809 | |
| | 0.25 | 30 to 340/360°C | 12821 | 12824 | 12827 |
| | 0.50 | 30 to 340/360°C | | 12839 | |
| | 1.00 | 30 to 340/360°C | | 12854 | |
| 0.53mm | 1.50 | 30 to 340/360°C | 12867 | 12870 | |
| | | | | | |
| ID | df (μm) | temp. limits | 12-Meter | 20-Meter | 25-Meter |
| 0.18mm | 0.18 | 30 to 340/360°C | | 42802 | |
| 0.20mm | 0.33 | 30 to 340/360°C | 42815 | | 42820 |

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



**Change columns in
minutes—without
venting!**

EZ No-Vent™ GC Column-Mass Spectrometer Connector

| Description | qty. | cat.# |
|---|-------|-------|
| EZ No-Vent™ Connector Kit for Agilent 5971/5972 and 5973 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™: 0.4mm ID | 2-pk. | 21015 |
| 0.5mm ID | 2-pk. | 21016 |
| Replacement ferrules for connecting transfer line to EZ No-Vent™: 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 |

For reference standards, please visit our website, www.restek.com

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RESTEK 20
YEARS

ISO 9001:2000
cert.# FM80397

Rxi[®]-624Sil MS

The **"Go To"** GC Column for Fast,
Effective Volatile Impurities
Method Development



Visit us at www.restek.com/pharma

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ECHnology Pty Ltd
Australian Distributors; Importers & Manufacturers

Rxi[®]-624Sil MS

The **Go To** GC Column for Fast, Effective Volatile Impurities Method Development

In drug development, time-to-market is everything, but finding the right column can be laborious and time-consuming. Commonly, “624” (6% cyanopropyl phenyl/94% dimethyl polysiloxane) type columns are used for GC/FID impurity analyses to provide the necessary selectivity, but when mass spectrometry is needed, method development often starts with lower bleed “1” (100% dimethyl polysiloxane) and “5” (5% diphenyl/95% dimethyl polysiloxane) type columns. Now, you can get to market faster and more efficiently by using a single column that combines these attributes—the new Rxi[®]-624Sil MS column. With enhanced retention and selectivity of polar compounds, compatibility with mass spec detectors, and unsurpassed inertness, Rxi[®]-624Sil MS columns are the most broadly applicable GC columns available to the pharmaceutical industry. Speed up successful method development by making Rxi[®]-624Sil MS columns your “go to” column of choice for polar impurities.

Go To...the right column first

For better retention of polar analytes and improved accuracy, peak shape, and response for active compounds.

Go To...mass spec directly

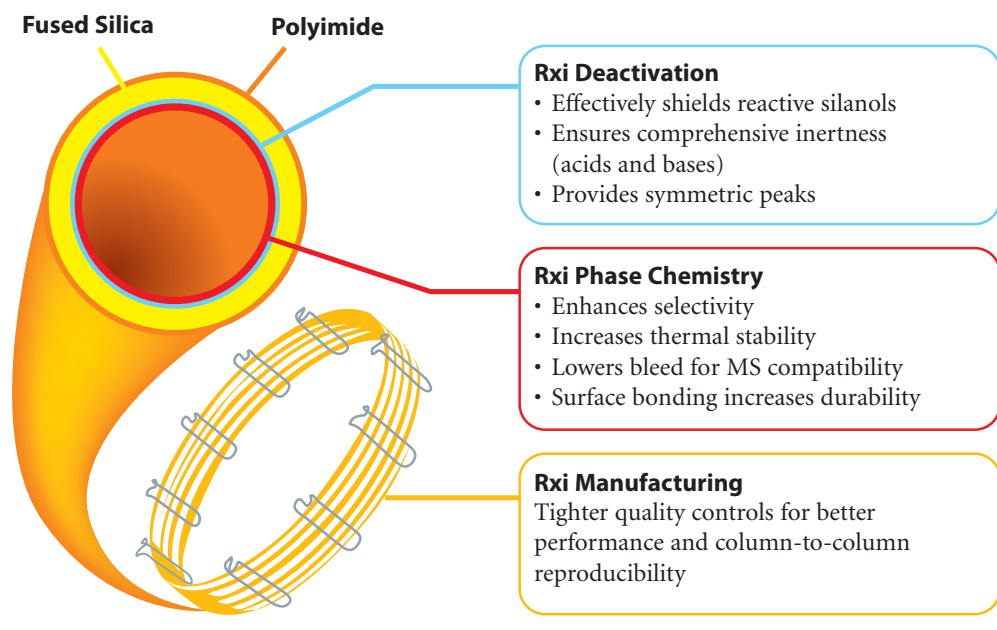
With the lowest bleed 624 column available; stable up to 320 °C, for easy transfer of methods to GC/MS.

Go To...the next batch faster

With the best-in-class G43 for USP methods.

How did we create the **Rxi** Column Family?

We’ve optimized phase chemistry, column deactivation, and our manufacturing process to ensure the comprehensive performance that makes Rxi[®]-624Sil MS columns the best starting point for method development.

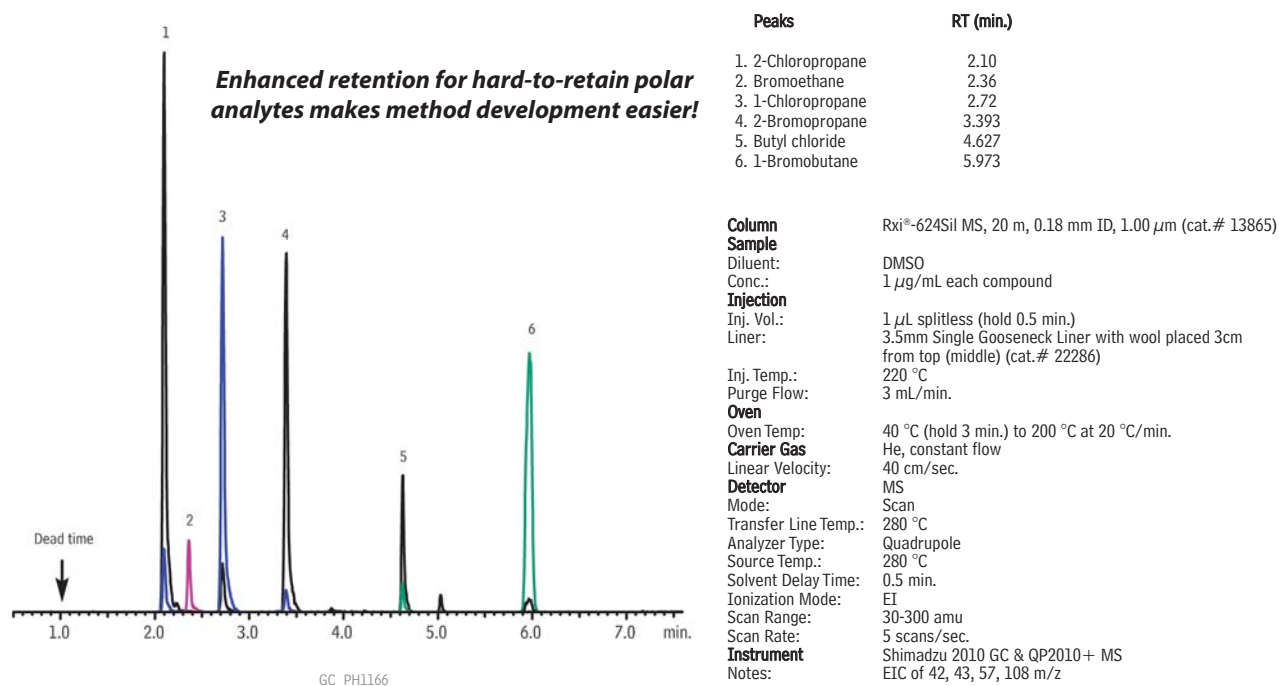


Go To...the Right Column First

Balanced Retention Simplifies Method Development For Polar Impurities

While “1s and 5s” are often used initially in GC/MS method development because of their thermal stability, their nonpolar character results in poor retention for polar compounds and costs additional development time. In contrast, midpolarity Rxi®-624Sil MS columns provide improved retention and selectivity for polar compounds and are also more compatible with polar injection solvents. Highly volatile, polar alkyl halide genotoxic impurities, for example, are difficult to retain on 1s and 5s, but the Rxi®-624Sil MS column provides higher retention capacity, making GC/MS analysis easier to control and allowing faster method development (Figure 1).

Figure 1 Polar compounds, such as alkyl halides, are highly retained on midpolarity Rxi®-624Sil MS columns, making method development faster and easier than on a nonpolar 1 or 5 type column.



Visit www.restek.com/rxi for detailed comparisons and to learn how exceptional Rxi® inertness, bleed, and reproducibility can improve your data.



The versatility of an Rxi®-624Sil MS column makes it a perfect fit for Quality By Design.



Go To...the Right Column First

Balanced Inertness Gives Higher Data Quality— Excellent Peak Symmetry and Reproducibility for Active Compounds

In addition to offering better retention of polar analytes, Rxi®-624Sil MS columns are exceptionally inert, reducing the need to switch columns when developing methods for active compounds, such as amines. Amines are commonly found on pharmaceutical impurities and can interact with surface silanols resulting in a tailing peak. Proper deactivation is the best way to combat this, and Rxi® technology provides the most balanced deactivation, assuring good peak symmetry for both basic and acidic compounds. Columns that are not effectively deactivated for basic compounds produce unacceptable peak tailing (Figure 2). In contrast, the Rxi®-624Sil MS column provides excellent peak shape, which leads to consistent peak integration, improved linearity, and higher method sensitivity (Figure 3).

Figure 2 Innovative Rxi® deactivation technology provides excellent peak symmetry at 5 ng on-column for primary, secondary, and tertiary amines, which is not possible on competitive columns.

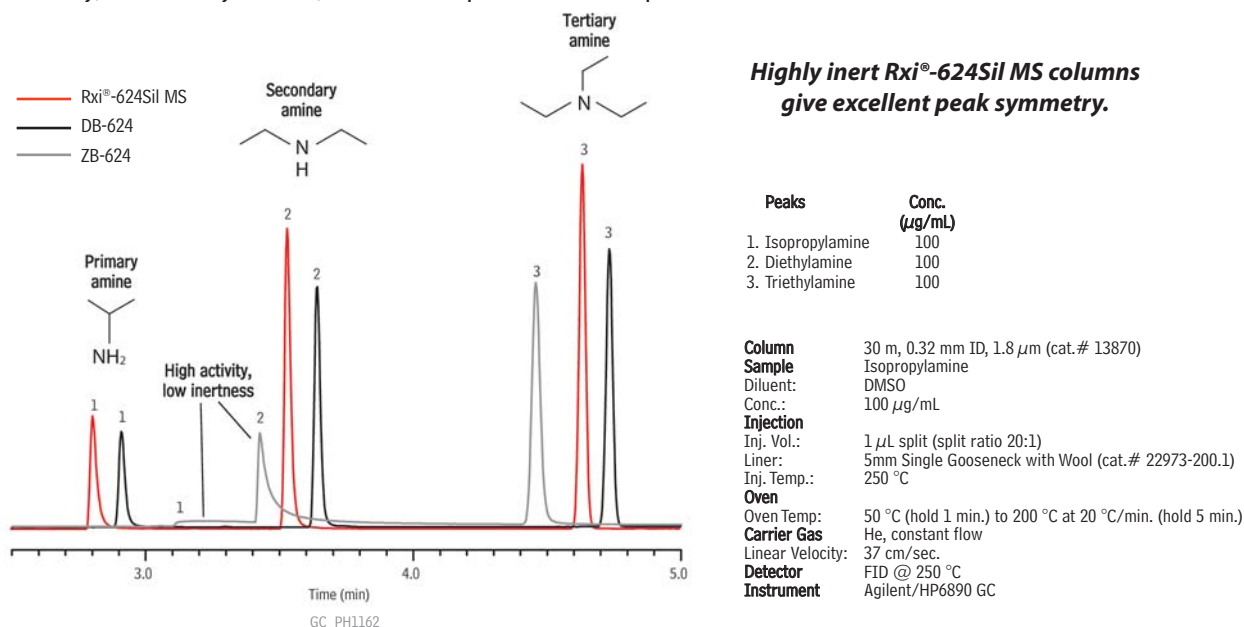
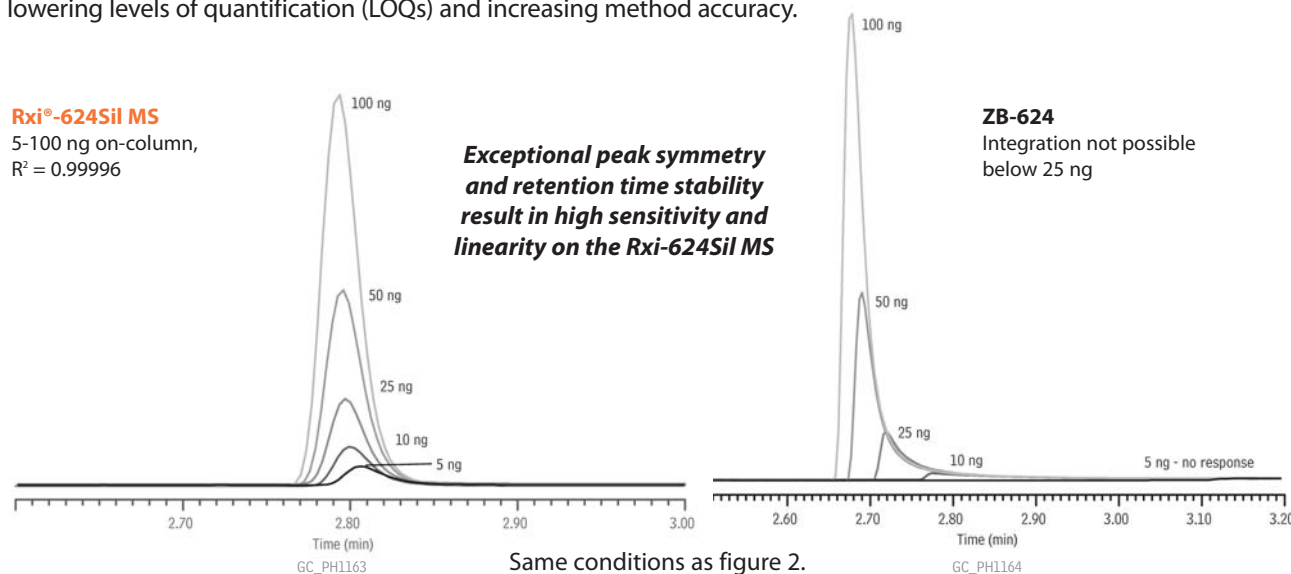


Figure 3 Primary amines, such as isopropylamine, can be more accurately integrated on an Rxi®-624Sil MS column, lowering levels of quantification (LOQs) and increasing method accuracy.



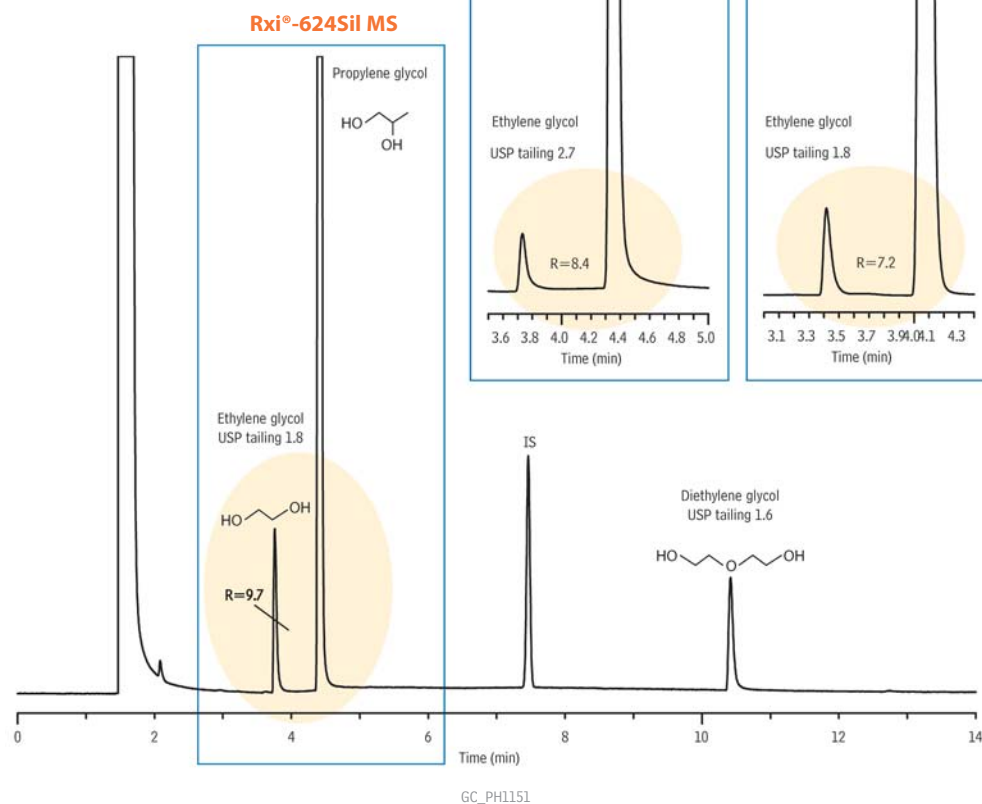
Go To...the Right Column First

Other active compounds, such as glycols, also exhibit peak tailing as a result of reactivity with the chromatographic system. For example, when analyzing ethylene glycol and diethylene glycol in glycerin according to a new FDA Guidance for Industry, only the Rxi®-624Sil MS column gives the selectivity and peak symmetry needed for these reactive compounds (Figure 4). Satisfy this and other industry guidances quickly, by choosing the right column, the first time.

Figure 4 Rxi®-624Sil MS columns provide the best overall inertness and selectivity for ethylene glycol and diethylene glycol impurities in glycerin, glycol, or sorbitol solutions.

Best in Class—Rxi®-624Sil MS

| | Rxi®-624Sil MS | ZB-624 | DB-624 |
|---|----------------|--------|--------|
| USP tailing (ethylene glycol) | 1.8 | 2.7 | 1.8 |
| Resolution (ethylene glycol/propylene glycol) | 9.7 | 8.4 | 7.2 |



Column 30 m, 0.32 mm ID, 1.80 μ m (cat.# 13870)
Sample methanol
Diluent:
Injection 1 μ L split (split ratio 10:1)
Inj. Vol.: 5mm Single Gooseneck with Wool (cat.# 22973-200.1)
Liner: 220 °C
Inj. Temp.:
Oven
Oven Temp: 100 °C (hold 4 min.) to 120 °C at 50 °C/min. (hold 10 min.) to 220 °C at 50 °C/min. (hold 6 min.)
Carrier Gas He, constant flow
Linear Velocity: 40 cm/sec.
Detector FID @ 250 °C
Instrument Agilent/HP6890 GC
Notes Columns tested: Rxi®-624Sil MS, ZB-624, and DB-624

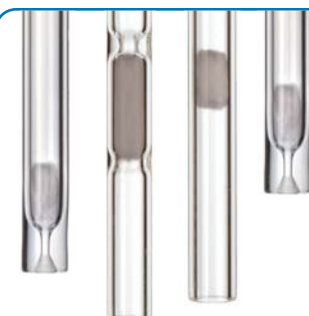
| Peaks | RT (min.) | Conc. (mg/mL) |
|-----------------------------|-----------|---------------|
| Ethylene glycol | 3.757 | 0.05 |
| Propylene glycol | 4.422 | 2.0 |
| 2,2,2-Trichloroethanol (IS) | 7.461 | 0.1 |
| Diethylene glycol | 10.416 | 0.05 |

Innovation & Service

"Having a background in LC/MS/MS does not automatically qualify one to run GC/MS. Julie Kowalski spent time with me to help me decide which column would be the best for my application as well as which consumables I would need to do routine maintenance. The time and knowledge she shared with me saved me multiple headaches and will keep me a loyal Restek customer!"

Richard, Biologist
 National Institute of Health

How can we help you today?
 Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.



Couple the right column with the right liner. Visit www.restek.com/liners for a complete selection.



Go To...Mass Spec Directly

High Thermal Stability and Low Bleed for GC/MS Compatibility

While midpolarity 624 type columns offer better retention of polar analytes than 1s and 5s, most 624s have low thermal stability and generate too much column bleed to be useful for mass spec work. However, the Rxi®-624Sil MS column is fully compatible with mass spectrometry, due to stabilizing technology that delivers the highest thermal stability and lowest bleed of any polar capillary column in its class (Table I, Figure 5). Eliminate the need to change columns when mass spec is required—unlike other 624 columns, Rxi®-624Sil MS columns take your method directly to GC/MS. Keep the same 624 retention and selectivity, but leave the bleed behind.

Table I The Rxi®-624Sil MS column has the highest thermal stability of any 624 column.

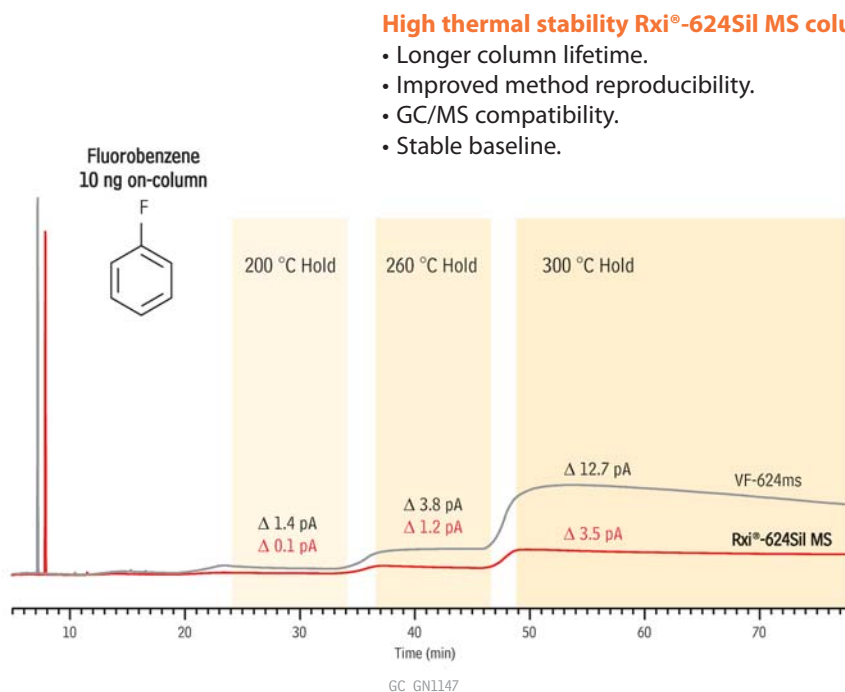
| Column | Manufacturer | Highest Temperature Limit (Isothermal) |
|----------------|--------------|--|
| Rxi®-624Sil MS | Restek | 320 °C |
| VF-624ms | Varian | 300 °C |
| DB-624 | Agilent J&W | 260 °C |
| ZB-624 | Phenomenex | 260 °C |



**Ideal for use
with FID and MS
detectors.**

Data obtained from company website or literature for a 30 m x 0.25 mm x 1.4 µm df column.

Figure 5 The Rxi®-624Sil MS column has the lowest bleed of any column in its class, providing true GC/MS capability.



Column 30 m, 0.25 mm ID, 1.4 µm (cat.# 13868)
Sample Fluorobenzene (cat.# 30030)
Diluent: methanol
Conc.: 200 µg/mL
Injection
Inj. Vol.: 1 µL split (split ratio 20:1)
Liner: 4mm Split Liner with Wool (cat.# 20781)
Inj. Temp.: 220 °C
Oven
Oven Temp: 40 °C (hold 5 min.) to 60 °C at 20 °C/min. (hold 5 min.) to 120 °C at 20 °C/min. (hold 5 min.) to 200 °C at 20 °C/min. (hold 10 min.) to 260 °C at 20 °C/min. (hold 10 min.) to 300 °C at 20 °C/min. (hold 20 min.)
Carrier Gas
Linear Velocity: 40 cm/sec.
Detector FID @ 250 °C
Instrument Agilent/HP6890 GC
Notes Columns are of equivalent dimensions and were tested after equivalent conditioning.



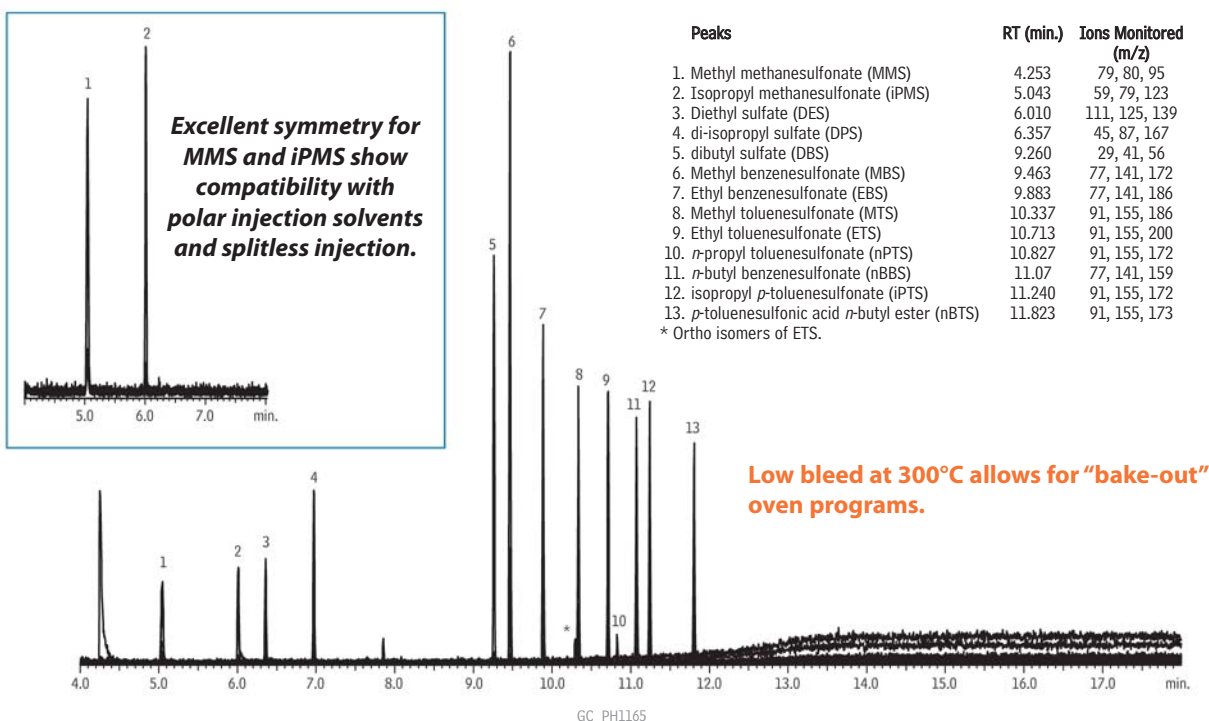
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Go To...Mass Spec Directly

Selective, Retentive, and Compatible with Polar Injection Solvents

The Rxi®-624Sil MS column combines the thermal stability of a mass spec friendly column with the selectivity, retention, and injection solvent compatibility needed to analyze polar impurities. For example, when analyzing mesylate, besylate, and tosylate genotoxic impurities by GC/MS, the Rxi®-624Sil MS column provides excellent selectivity, stability, and sensitivity (Figure 6). The innovative stationary phase is compatible with a variety of injection solvents, allowing splitless injection techniques to be used for heightened sensitivity. Bleed-free thermal stability allows oven “bake-out” programs to be used for contaminant removal and longer column life-times.

Figure 6 The Rxi®-624Sil MS phase is more compatible with polar injection solvents than 1 or 5 type columns, providing higher sensitivity and less time needed for optimizing injection parameters.



Column Rxi®-624Sil MS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 13865)
Sample
 Diluent: 90:10 acetonitrile:water
 Conc.: 500 ng/mL
Injection
 Inj. Vol.: 1 µL splitless (hold 0.5 min.)
 Inj. Liner: 3.5mm Single Gooseneck Liner with wool placed 3cm from top (middle) (cat.# 22286)
 Inj. Temp.: 220 °C
 Purge Flow: 3 mL/min.
Oven
 Oven Temp: 80 °C (hold 2 min.) to 300 °C at 20 °C/min. (hold 5 min.)
Carrier Gas
 Carrier Gas: He, constant flow
 Linear Velocity: 45 cm/sec.

Detector MS
 Mode: SIM
 Transfer Line Temp.: 280 °C
 Analyzer Type: Quadrupole
 Source Temp.: 280 °C
 Solvent Delay Time: 4 min.
 Ionization Mode: EI
Instrument Shimadzu 2010 GC & QP2010+ MS
Acknowledgement In collaboration with Merck and Company

Fast GC Analysis



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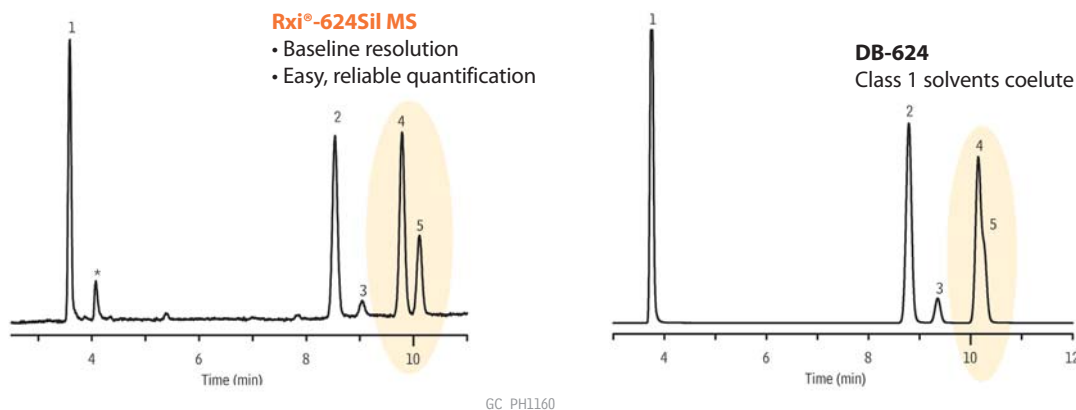


Go To...the Next Batch Faster

Improve Pass Rates with the Best-In-Class G43 for USP <467>

System suitability is a major factor in overall lab productivity, and Rxi®-624Sil MS columns provide the optimized selectivity and guaranteed reproducibility needed to increase pass rates. For example, batch throughput can be improved for USP <467> residual solvents analysis by using a column that provides increased resolution and sensitivity for system suitability components (Figures 7 and 8). Benefits include industry-leading resolution of acetonitrile and dichloromethane, as well as benzene and 1,2-dichloroethane. No other 624 type column performs as well as Rxi®-624Sil MS columns for these critical system suitability requirements.

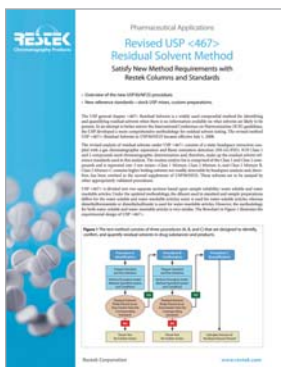
Figure 7 Improve system suitability pass rates—the innovative polymer chemistry of the Rxi®-624Sil MS column provides greater resolution of critical pairs.



| Peaks | RT (min.) | Conc. (µg/mL) | Column | Pressure |
|--------------------------|-----------|---------------|---|--|
| 1. 1,1-Dichloroethene | 3.586 | 0.07 | Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870) | Equilibration Time: 0.05 min. |
| 2. 1,1,1-Trichloroethane | 8.536 | 0.08 | Residual Solvents - Class 1 (cat.# 36279) | Loop Pressure: 5 psi |
| 3. Carbon tetrachloride | 9.042 | 0.03 | Diluent: water | Loop Fill Time: 0.1 min. |
| 4. Benzene | 9.787 | 0.02 | headspace-loop split (split ratio 5:1) | Oven |
| 5. 1,2-Dichloroethane | 10.112 | 0.04 | 1mm Split (cat.# 20972) | Oven Temp: 40 °C (hold 20 min.) to 240 °C at 10 °C/min. (hold 20 min.) |
| * DMSO interference | | | | Carrier Gas |
| | | | | Linear Velocity: 35 cm/sec. |
| | | | | Dead Time: 1.45 min. @ 40 °C |
| | | | | Detector: FID @ 250 °C |
| | | | | Data Rate: 5 Hz |
| | | | | Instrument: Agilent/HP6890 GC |
| | | | | Acknowledgement: Teledyne Tekmar |

Columns were tested under identical operating conditions and after identical conditioning.

For the complete application note and technical tips on USP<467>, visit www.restek.com/usp467.



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Save time and money with mixes prepared to your specific solvent set and concentrations. The more you buy the less you pay per ampule!

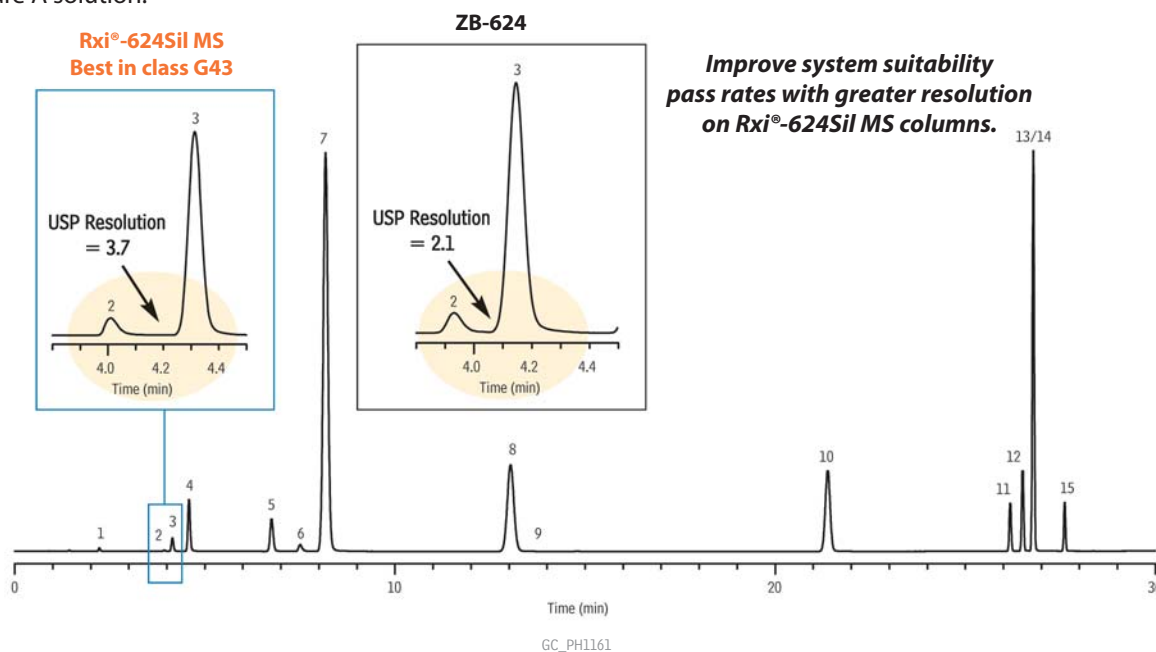
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Go To...the Next Batch Faster

Figure 8 The Rxi®-624Sil MS column provides best-in-class system suitability performance for the USP <467> Class 2 Mixture A solution.



| Peaks | RT (min.) | Conc. (µg/mL) | | | |
|-------------------------------------|-----------|---------------|----------------------|--------|-------|
| 1. Methanol | 2.281 | 25.00 | 8. Methylcyclohexane | 14.099 | 9.83 |
| 2. Acetonitrile | 4.009 | 3.42 | 9. 1,4-Dioxane | 15.054 | 3.17 |
| 3. Dichloromethane | 4.313 | 5.00 | 10. Toluene | 22.018 | 7.42 |
| 4. <i>trans</i> -1,2-Dichloroethene | 4.798 | 7.83 | 11. Chlorobenzene | 26.570 | 3.00 |
| 5. <i>cis</i> -1,2-Dichloroethene | 7.028 | 7.83 | 12. Ethylbenzene | 26.837 | 3.07 |
| 6. Tetrahydrofuran | 7.706 | 5.75 | 13. <i>m</i> -Xylene | 27.147 | 10.85 |
| 7. Cyclohexane | 8.708 | 32.33 | 14. <i>p</i> -Xylene | 27.147 | 2.53 |
| | | | 15. <i>o</i> -Xylene | 27.927 | 1.63 |

Columns were tested under identical operating conditions and after identical conditioning. See Figure 7 for conditions.

Screw-Thread Headspace Vials (18mm)

| Description | Volume | Color | Dimensions | 100-pk. | 1000-pk. |
|----------------|--------|-------|------------|---------|----------|
| Headspace Vial | 10mL | Clear | 22 x 45mm | 23084 | 23085 |
| Headspace Vial | 10mL | Amber | 22 x 45mm | 23088 | 23089 |
| Headspace Vial | 20mL | Clear | 22 x 75mm | 23082 | 23085 |
| Headspace Vial | 20mL | Amber | 22 x 75mm | 23086 | 23089 |

Caps not included.



Magnetic Screw-Thread Caps (18mm)

| Description | Septa Material | 100-pk. | 1000-pk. |
|-------------------------|------------------------|---------|----------|
| Magnetic Caps and Septa | PTFE/Silicone | 23090 | 23091 |
| Magnetic Caps and Septa | PTFE/Silicone for SPME | 23092 | 23093 |
| Magnetic Caps and Septa | PTFE/Red Chlorobutyl | 23094 | 23095 |



Hot Swap Capillary Column Nuts

Quickly change columns for USP <467> Procedures A and B using a Hot Swap Capillary Column Nut

| Description | qty. | cat.# |
|--|------|-------|
| For use with "compact" Agilent-style ferrules. | | |
| Hot Swap Capillary Column Nut | ea. | 22348 |
| For use with standard 1/8"-type ferrules. | | |
| Hot Swap Capillary Column Nut | ea. | 22347 |



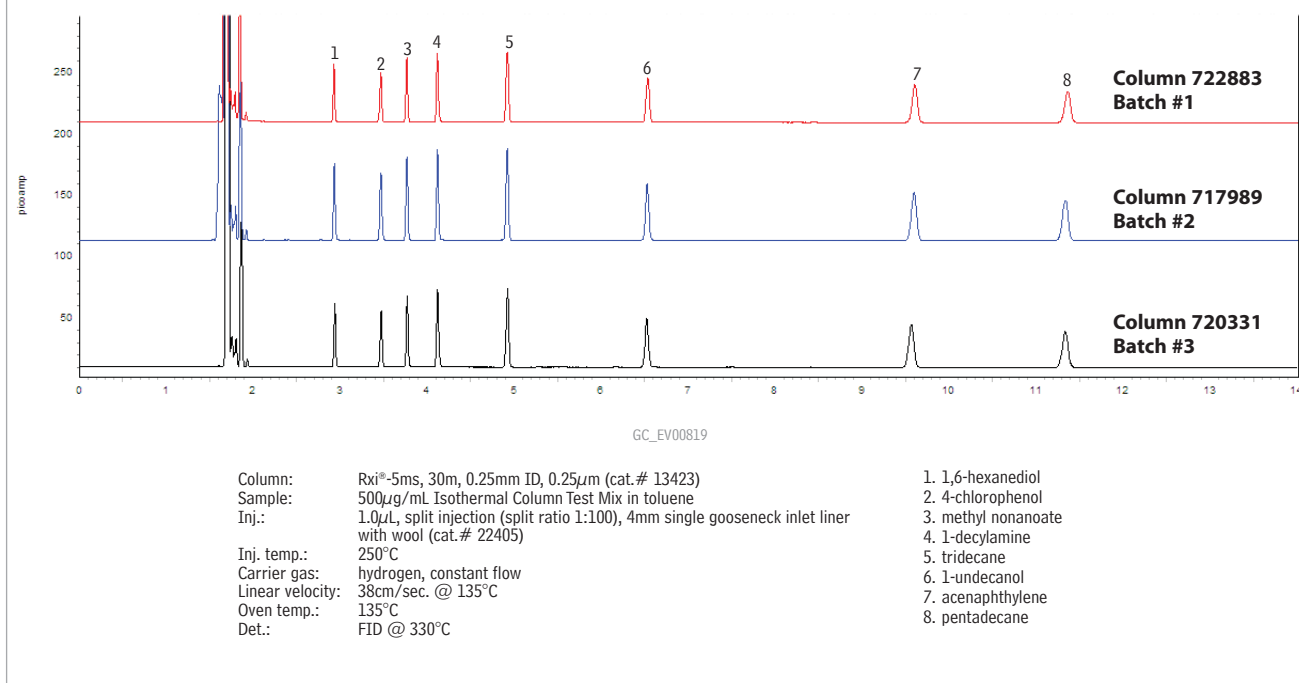
NOTE: For proper operation, oven fan must be kept operational during change out or risk of burn may occur.

Go To...the Next Batch Faster

Guaranteed Reliable Column-to-Column Performance

Reliable column-to-column performance also contributes to lab productivity as less column variation means faster setup and more consistent results. Rxi® column technology has enabled Restek to tighten our quality control standards and guarantee consistency. Columns from multiple manufacturing batches show the excellent reproducibility obtained using the new Rxi® manufacturing process (Figure 9). All Rxi® columns are individually tested to assure performance.

Figure 9 Three manufacturing batches of Rxi® columns show excellent reproducibility.



Go To...Rxi®-624Sil MS Columns for Faster Method Development

Optimized phase chemistry, column deactivation, and manufacturing make Rxi®-624Sil MS columns the “go to” column for pharmaceutical method development. With better retention of polar compounds than 1 and 5 type columns, lower bleed than any other 624 column, and unsurpassed inertness, Rxi®-624Sil MS columns offer the most comprehensive performance, allowing you to develop successful methods quickly, easily, and reliably. Try one for your next method today.

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"When my research group needed a GC column for a chiral separation, Restek was the only company that offered to provide us with test columns to evaluate. The willingness of Restek to work with us to find a solution to our separation problem is exceptional."

Joe Dinnocenzo,
Professor of Chemistry
Director, Center for Photoinduced Charge Transfer
University of Rochester

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Rxi®-624Sil MS Columns (fused silica)

(mid polarity Crossbond® silarylene phase; equivalent to 6% cyanopropylphenyl/94% dimethyl polysiloxane)

- Low bleed, high thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds, including acidic and basic compounds.
- Selective—highly selective for residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

| ID | df (µm) | temp. limits | 20-Meter | 30-Meter | 60-Meter |
|--------|---------|------------------|----------|----------|----------|
| 0.18mm | 1.00 | -20 to 300/320°C | 13865 | | |
| 0.25mm | 1.40 | -20 to 300/320°C | | 13868 | |
| 0.32mm | 1.80 | -20 to 300/320°C | | 13870 | 13872 |
| 0.53mm | 3.00 | -20 to 280/300°C | | 13871 | |



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.

| Description | qty. | cat.# |
|--|------|-------|
| Leak Detector with Hard-Sided Carrying Case and Universal Charger Set (US, UK, European, Australian) | ea. | 22839 |
| Soft-Side Storage Case | ea. | 22657 |
| Small Probe Adaptor | ea. | 22658 |

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.



GC/MS Cleaning Kit

| Description | qty. | cat.# |
|--|------|-------|
| 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 |



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for Mass Spectrometry

- Air stable.
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| Description | qty. | cat.# |
|---|------|-------|
| 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 |
| Electron Multiplier for Applied Biosystems (Sciex) | | |
| For API 300, 3000 & 4000 Applied Biosystems | ea. | 23077 |
| Electron Multiplier for Thermo Finnigan GC/MS | | |
| For Thermo TRACE DSQ, DSQII, and Polaris-Q GC/MS | ea. | 23081 |

*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.





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Rtx[®]-5Sil MS Columns

Enhanced Performance

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Rtx®-5Sil MS Columns

- Inert, high temperature stable polymer (Figure 1).
- Faster analyses.
- Longer column lifetime.

Enhanced Column Performance

Our new polymer and new manufacturing process greatly enhance the performance of Rtx®-5Sil MS columns in analyses of semivolatile environmental compounds. Figure 2 shows a sub 17-minute analysis of more than 100 semivolatile environmental compounds, using a 30m x 0.25mm ID Rtx®-5Sil MS column. Typically, this many compounds, or more, are targets in these analyses. In most circumstances a 0.25mm ID Rtx®-5Sil MS column with a 0.50µm phase film best combines fast analysis time with extended column lifetime.

Figure 1 Rtx®-5Sil MS polymer.

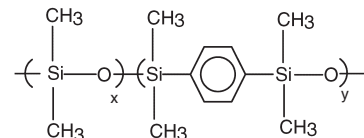
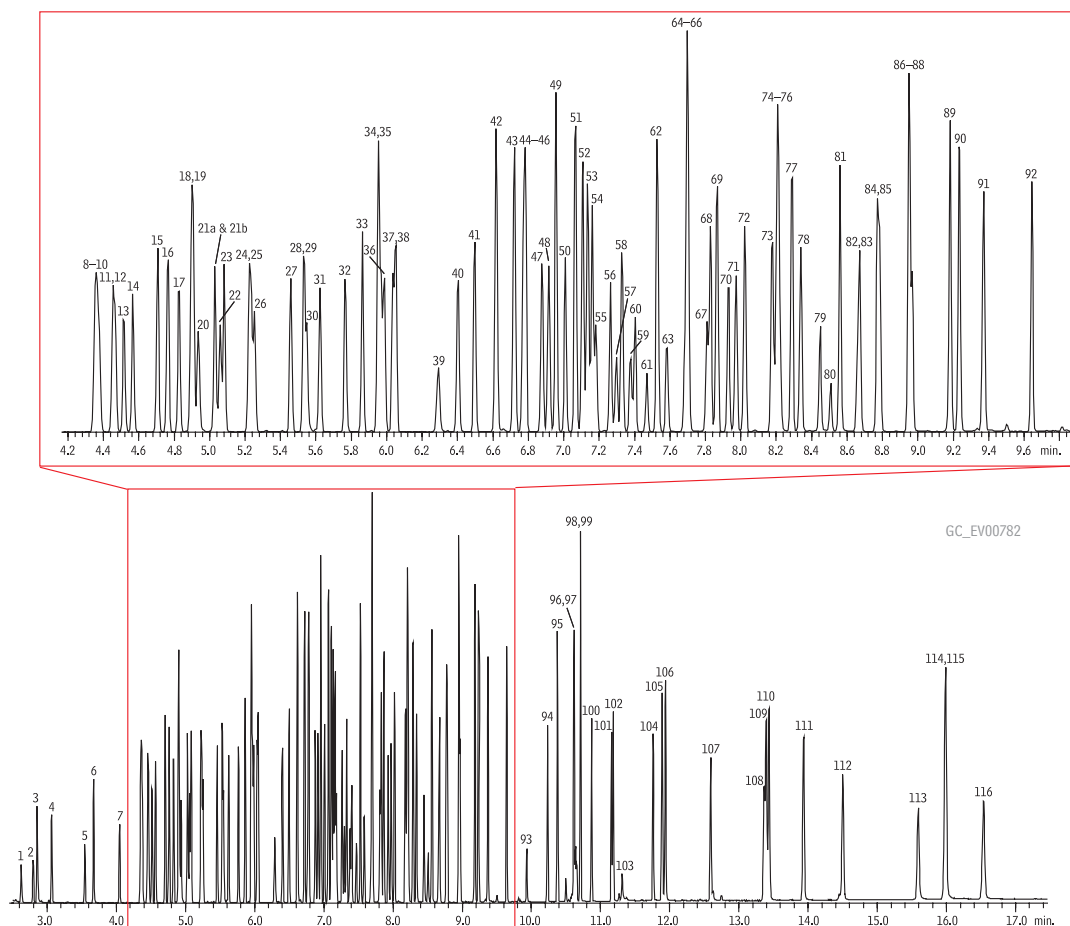


Figure 2 16.5-Minute analysis of semivolatile organics in US EPA Method 8270D Appendix IX, using a 30m x 0.25mm ID Rtx®-5Sil MS column.



Column: Rtx®-5Sil MS 30m, 0.25mm ID, 0.50µm (cat.# 12738)
 Sample: US EPA Method 8270D Appendix IX mix
 8270 MegaMix® (cat.# 31850)
 Appendix IX Mix #2 (cat.#31806)
 Acid Surrogate Mix (4/89 SOW) (cat.# 31063)
 B/N Surrogate Mix (4/89 SOW) (cat.# 31062)
 Inj.: 0.5µL, splitless, 100ppm each compound (50ng on column)
 2mm Cyclo double gooseneck splitless inlet liner
 (cat.# 20907), 0.3 min. splitless hold time, 0.4 min.
 pressure pulse @ 30psi
 Inj. temp.: 250°C
 Carrier gas: helium, constant flow
 Flow rate: 1.1mL/min.

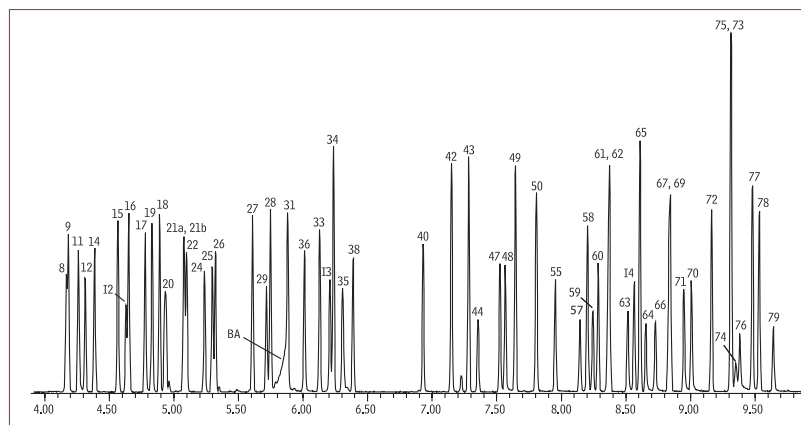
Oven temp.: 50°C (hold 0.5 min.) to 310°C @ 25°C/min.
 (hold 0 min.) to 330°C @ 4°C/min. (hold 4 min.)
 Det.: MS
 Det. temp.: 280°C
 Transfer line
 temp.: 280°C
 Scan range: 35-550 amu
 Solvent Delay: 1 min.
 Tune: DFTPP
 Ionization: EI
 Instrument: Agilent 6890 / 5973

Some analysts prefer using shorter, narrower ID columns to analyze for semivolatiles. When using such columns, both matrix interferences and on-column amounts of target compounds must be reduced, so the column is not overloaded, and to maintain column lifetime. Figure 3 shows an 18-minute analysis of 90 semivolatile pollutants, surrogates, and internal standards on a 20m x 0.18mm ID Rtx®-5Sil MS column. A splitless injection was used, but results are equivalent with split injections.

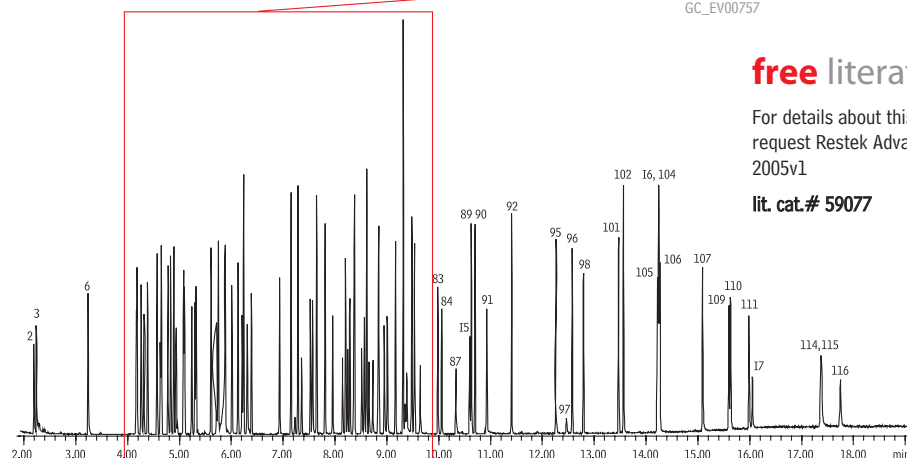
Figure 3 90 semivolatile analytes separated in 18 minutes on a 20m x 0.18mm ID Rtx®-5Sil MS column.

Compounds in Figures 2 & 3

1. 1,4-dioxane
2. N-nitrosodimethylamine
3. pyridine
4. ethyl methacrylate
5. methyl methanesulfonate
6. 2-fluorophenol
7. ethyl methanesulfonate
8. phenol-d₆
9. phenol
10. benzaldehyde
11. aniline
12. bis(2-chloroethyl)ether
13. pentachloroethane
14. 2-chlorophenol
15. 1,3-dichlorobenzene
16. 1,4-dichlorobenzene
17. benzyl alcohol
18. 2-methylphenol
19. 1,2-dichlorobenzene
20. bis(2-chloroisopropyl)ether
- 21a. 4-methylphenol
- 21b. 3-methylphenol
22. N-nitroso-di-*n*-propylamine
23. acetophenone
24. hexachloroethane
25. nitrobenzene-d₅
26. nitrobenzene
27. isophorone
28. 2,4-dimethylphenol
- BA. benzoic acid*
29. 2-nitrophenol
30. diallate (isomer)
31. bis(2-chloroethoxy)methane
32. 2,4-dichlorophenol
33. 1,2,4-trichlorobenzene
- I3. naphthalene-d₈*
34. naphthalene
35. 4-chloroaniline
36. 2,6-dichlorophenol
37. hexachloropropene
38. hexachlorobutadiene
39. ϵ -caprolactam
40. 4-chloro-3-methylphenol
41. isosafrole (*cis*)
42. 2-methylnaphthalene
43. 1-methylnaphthalene
44. hexachlorocyclopentadiene
45. isosafrole (*trans*)
46. 1,2,4,5-tetrachlorobenzene
47. 2,4,6-trichlorophenol
48. 2,4,5-trichlorophenol
49. 2-fluorobiphenyl
50. 2-chloronaphthalene
51. biphenyl
52. safrole
53. 1-chloronaphthalene
54. diphenyl ether
55. 2-nitroaniline
56. 1,4-naphthoquinone



GC_EV00757



free literature

For details about this analysis,
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- | | | | |
|-------------------------------|---------------------------------|----------------------------------|--------------------------------------|
| 57. 1,4-dinitrobenzene | 73. 4-chlorophenyl phenyl ether | 89. phenanthrene | I6. chrysene-d12* |
| 58. dimethylphthalate | 74. 4-nitroaniline | 90. anthracene | 106. chrysene |
| 59. 1,3-dinitrobenzene | 75. fluorene | 91. carbazole | 107. di- <i>n</i> -octyl phthalate |
| 60. 2,6-dinitrotoluene | 76. 4,6-dinitro-2-methylphenol | 92. di- <i>n</i> -butylphthalate | 108. 7,12-dimethylbenzo(a)anthracene |
| 61. 1,2-dinitrobenzene | 77. diphenylamine | 93. 4-nitroquinoline-N-oxide | 109. benzo(b)fluoranthene |
| 62. acenaphthylene | 78. azobenzene | 94. isodrin | 110. benzo(k)fluoranthene |
| 63. 3-nitroaniline | 79. 2,4,6-tribromophenol | 95. fluoranthene | 111. benzo(a)pyrene |
| I4. acenaphthene-d10* | 80. 1,3,5-trinitrobenzene | 96. pyrene | I7. perylene-d12* |
| 64. 2,4-dinitrophenol | 81. phenacetin | 97. benzidine | 112. 3-methylcholanthrene |
| 65. acenaphthene | 82. diallate | 98. <i>p</i> -terphenyl-d14 | 113. dibenzo(a,j)acridine |
| 66. 4-nitrophenol | 83. 4-bromophenyl phenyl ether | 99. Aramite | 114. indeno(1,2,3-cd)pyrene |
| 67. 2,4-dinitrotoluene | 84. hexachlorobenzene | 100. chlorobenzilate | 115. dibenzo(a,h)anthracene |
| 68. pentachlorobenzene | 85. atrazine | 101. benzyl butyl phthalate | 116. benzo(ghi)perylene |
| 69. dibenzofuran | 86. pronamide | 102. bis(2-ethylhexyl)adipate | |
| 70. 2,3,5,6-tetrachlorophenol | 87. pentachlorophenol | 103. Kepone | |
| 71. 2,3,4,6-tetrachlorophenol | I5. phenanthrene-d10* | 104. bis(2-ethylhexyl)phthalate | |
| 72. diethyl phthalate | 88. pentachloronitrobenzene | 105. benzo(a)anthracene | |

* Present in Figure 3 only

Column: Rtx®-5Sil MS, 20m, 0.18mm ID, 0.36 μ m (cat.# 42704)
Sample: US EPA Method 8270D analytes, 10ppm each (10ng on column)
8270 MegaMix® (cat.# 31850),
Benzidine (cat.# 31441),
Benzoic Acid (cat.# 31415),
2,4-Dinitrophenol (cat.# 31291),
Acid Surrogate Mix (4/89 SOW) (cat.# 31063),
B/N Surrogate Mix (4/89 SOW) (cat.# 31062)
Inj.: 1.0 μ L, splitless, 4mm ID gooseneck splitless inlet liner
(cat.# 20798), splitless hold time 0.15 min.,
pressure pulse 0.20 min. @ 30psi

GC: Agilent 6890
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1.2mL/min.
Oven temp.: 50°C (hold 0.5 min.) to 330°C @ 18°C/min. (hold 3 min.)
Det.: Agilent 5973 GC/MS
Transfer line temp.: 280°C
Scan range: 35-550 amu
Solvent Delay: 1 min.
Tune: DFTPP
Ionization: EI

Table 1. Response factors and linearity for active semivolatile compounds.*

| Compound | CAS # | On-Column Quantity | | | | | | | Mean RRF | RSD (%) |
|---------------------------|------------|--------------------|-------|-------|-------|-------|-------|-------|----------|---------|
| | | 1ng | 4ng | 10ng | 20ng | 50ng | 80ng | 160ng | | |
| N-nitrosodimethylamine | 39885-14-8 | 0.876 | 0.940 | 0.980 | 0.969 | 0.940 | 0.958 | 0.946 | 0.956 | 2 |
| pyridine | 110-86-1 | 1.438 | 1.641 | 1.707 | 1.724 | 1.597 | 1.634 | 1.607 | 1.652 | 3 |
| aniline | 62-53-3 | 3.762 | 3.989 | 4.056 | 3.941 | 3.614 | 3.391 | 2.975 | 3.661 | 12 |
| 2,4-dichlorophenol | 120-83-2 | 0.280 | 0.314 | 0.308 | 0.308 | 0.269 | 0.252 | 0.239 | 0.282 | 11 |
| hexachlorocyclopentadiene | 77-47-4 | 0.258 | 0.310 | 0.311 | 0.337 | 0.301 | 0.289 | 0.278 | 0.304 | 7 |
| 3-nitroaniline | 99-09-2 | 0.344 | 0.433 | 0.437 | 0.417 | 0.419 | 0.408 | 0.367 | 0.413 | 6 |
| 2,4-dinitrophenol | 51-28-5 | 0.075 | 0.123 | 0.153 | 0.162 | 0.185 | 0.176 | 0.155 | 0.159 | 14 |
| 4-nitrophenol | 100-02-7 | 0.145 | 0.201 | 0.215 | 0.213 | 0.220 | 0.219 | 0.197 | 0.211 | 4 |
| azobenzene | 103-33-3 | 1.390 | 1.606 | 1.568 | 1.502 | 1.440 | 1.347 | 1.162 | 1.437 | 11 |
| pentachlorophenol | 87-86-5 | 0.096 | 0.128 | 0.146 | 0.147 | 0.143 | 0.141 | 0.141 | 0.141 | 5 |
| benzidine | 92-87-5 | 0.710 | 1.149 | 1.162 | 1.047 | 1.085 | 1.040 | 1.015 | 1.083 | 6 |
| benzo(b)fluoranthene | 205-99-2 | 1.117 | 1.289 | 1.405 | 1.383 | 1.280 | 1.273 | 1.320 | 1.325 | 4 |

*The 1ng value is not included in the mean relative response factor (RRF) or relative standard deviation (RSD).

Assured Column Quality

To guarantee individual column performance and column-to-column reproducibility, we test every Rtx®-5Sil MS column we make. Our isothermal test verifies coating efficiency, film thickness, inertness, and bleed.

Rtx®-5Sil MS Columns (fused silica)

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

| ID | df (µm) | temp. limits | 15-Meter | 25-Meter | 30-Meter | 40-Meter | 60-Meter |
|--------|---------|------------------|----------|----------|----------|----------|----------|
| 0.25mm | 0.10 | -60 to 330/350°C | 12705 | | 12708 | | |
| | 0.25 | -60 to 330/350°C | 12720 | | 12723 | | 12726 |
| | 0.50 | -60 to 330/350°C | 12735 | | 12738 | | 12796 |
| | 1.00 | -60 to 325/350°C | 12750 | | 12753 | | 12797 |
| 0.28mm | 0.25 | -60 to 330/350°C | 12790 | | 12793 | | |
| | 0.50 | -60 to 330/350°C | 12791 | | 12794 | | |
| | 1.00 | -60 to 325/350°C | 12792 | | 12795 | | |
| 0.32mm | 0.10 | -60 to 330/350°C | 12706 | | 12709 | | |
| | 0.25 | -60 to 330/350°C | 12721 | | 12724 | | 12780 |
| | 0.50 | -60 to 330/350°C | 12736 | | 12739 | | |
| | 1.00 | -60 to 325/350°C | 12751 | 12781 | 12754 | | 12782 |
| 0.45mm | 1.50 | -60 to 310/330°C | | | | 12798 | |
| 0.53mm | 0.50 | -60 to 320/340°C | 12737 | | 12740 | | |
| | 1.00 | -60 to 320/340°C | 12752 | | 12755 | | |
| | 1.50 | -60 to 310/330°C | 12767 | | 12770 | | |
| ID | df (µm) | temp. limits | 10-Meter | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 0.18mm | 0.18 | -60 to 330/350°C | 42703 | | 42702 | | |
| | 0.36 | -60 to 330/350°C | | | 42704 | | |
| 0.20mm | 0.20 | -60 to 330/350°C | | | | 42706 | 42707 |
| | 0.33 | -60 to 330/350°C | | 42705 | | | |
| | 0.35 | -60 to 330/350°C | | 42708 | | | 42709 |

for more info

Rtx®-5Sil MS columns are optimized for use with conventional MS detectors but, for the fastest analyses, they are equally compatible with time-of-flight mass spectrometers. To see a 9-minute TOFMS analysis of semivolatiles on an Rtx®-5Sil MS column, request Restek Advantage 2005v1 (page 8).

lit. cat.# 59077

did you know?

Split injections of semivolatiles can reduce analysis time, relative to splitless injections, due to the characteristically sharp analyte focus at the column inlet.

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Lit. Cat.# 59204B

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Simple, Sensitive HPLC/UV Analysis for Paraquat and Diquat

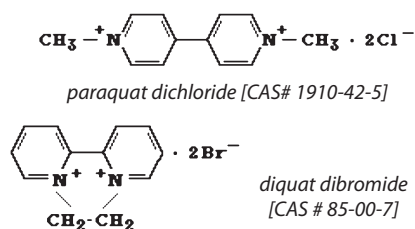
Using High-Recovery Solid Phase Extraction and an Ultra Quat HPLC Column

Paraquat (1,1'-dimethyl-4,4'-bipyridylium dichloride, $C_{12}H_{14}N_2Cl_2$), and diquat (1,1'-ethylene-2,2'-bipyridilium dibromide, $C_{12}H_{12}N_2Br_2$, Figure 1), are non-selective contact herbicides, plant growth regulators and desiccants widely used in agriculture to control broadleaf and aquatic weeds. Paraquat has been used to kill illegal marijuana plants in the US and Mexico. Paraquat is listed by the US Environmental Protection Agency as a Restricted Use Pesticide (RUP). Additionally, these herbicides have been banned, or

their use restricted, in several European countries and in Japan, and the World Health Organization considers them moderately hazardous pesticides. These herbicides must be monitored routinely because of their significant toxicity to humans through oral ingestion or respiratory or dermal contact. Despite the fact that the half-life of either compound in water can be less than 48 hours, there is great concern about even low-level human exposure (US EPA Safe Drinking Water Act maximum contamination level = 20ppb for diquat).

Figure 1

Paraquat and diquat herbicides.



Depending on the initial sample matrix, these herbicides have been analyzed using colorimetric spectrophotometry, enzyme linked immunosorbent assay (ELISA), or liquid scintillation counting (LCS), but HPLC analysis with UV or fluorescence detection has gained wide acceptance. The highly charged quaternary amines are difficult to retain by standard reversed phase HPLC, however, and alternative approaches are required. Most widely used is an ion exchange column coupled to a post-column reactor that creates a fluorescing complex. Detection is highly sensi-

tive, but the drawbacks are the costs of the specialty column—often exceeding \$1,000 US—and of the post-column derivatization unit and fluorescence detector. This supplemental hardware can be beyond the budget of smaller laboratories.

A less costly technique, described in US EPA Method 549.2, calls for a conventional HPLC column and hardware and incorporates an ion pairing agent in the mobile phase. This analytical system is less complex, but adequate, with detection limits of 0.44µg/L for diquat and 0.8µg/L for paraquat, based on solid phase extraction of a 250mL water sample. The mobile phase for Method 549.2 consists of water, phosphoric acid, acetonitrile, heptane or hexane sulfonic acid (ion pairing agent), and diethylamine (DEA). Diethylamine likely was included to reduce tailing on columns that exhibit high silanol activity. The sulfonic acids also can reduce tailing but, additionally, the ion pair complexes they form allow better retention of the highly charged quaternary amines. Unfortunately, this complicated chemistry and methodology, in combination with variation among manufacturers' HPLC columns, can present serious problems. In addition to amplifying the potential for mixing inconsistencies and errors, the complex mobile phase has three significant flaws: 1) Acid/base reaction between DEA and the ion pair reagent consumes both, eliminating the ion pairing capacity of the system and restoring the potential for peak tailing. A sulfonic acid ion pair reagent alone should eliminate tailing by the analytes and, as neutral species, they should not be affected by residual silanols. 2) The mobile phase lacks a true buffer control system needed for reproducible retention in an ion pair system. 3) The exact pH of the mobile phase—a critical issue for an ion pairing method—is not specified.

Because they are highly charged, paraquat and diquat will not be retained well on an alkyl stationary phase, and any standard reversed phase HPLC technique that relies on the hydrophobicity of the column and the strength of the mobile phase likely will fail to achieve a separation. So, if altering the hydrophobicity of the stationary phase will not be effective, the next choice is to lower the hydrophilicity of the mobile phase. A separation system we have developed for paraquat and diquat makes use of a different analytical property—chaotropism: disruption of water's ability to solvate ions, thereby altering the charged interactions among the analyte, the mobile phase, and the stationary phase. In this case, by dispersing the analyte's charge, the solubility of the highly polar analyte on a non-polar substrate (the stationary phase) can be enhanced. Retention of the analyte is maximized because it remains longer on the adsorbed solvent layer (acetonitrile) present on the stationary phase. The chaotropic agents are inorganic anionic salts added to the aqueous portion of the mobile phase.¹

To minimize interactions between the analytes and residual silanols or metal ions in the column, and consequent tailing and unwanted / unpredictable retention, we began by manufacturing a new column packing for this application, using high purity (type B) silica, and designed a stationary phase to give proper selectivity and analyte retention. To complement the new column, we developed a mobile phase additive that alters the chemical nature of the analytes as perceived by the column and mobile phase. This chaotropic agent reduces the ability of water to solvate the analytes by hydrogen bonding, thereby greatly improving retention—and resolution. The analysis can be performed on any HPLC system capable of performing Method 549.2 (Figure 2).

Unlike ion pairing techniques, this new approach requires only acetonitrile, water, and solvation-blocking Ultra Quat Reagent Solution (cat.# 32441) to accomplish the separation. We chose acetonitrile for the organic component of the mobile phase for its inability to hydrogen bond—it disrupts hydrogen bonding in the system.^a Using solid phase extractin (SPE) to concentrate the analytes, the Ultra Quat column, and note that the conditions listed for Figure 2, the detection limit is 6ppb for either herbicide—a detectable amount of 0.12 nanograms on column, and the analysis is completed in less than 10 minutes. Data are summarized in Table I and the consistency of the analytical method is demonstrated in Figure 2. To confirm sensitivity, we inject 20μL of multiple

Figure 2

Consistent resolution, retention times, and peak symmetry for paraquat and diquat reference standards, using an Ultra Quat column.

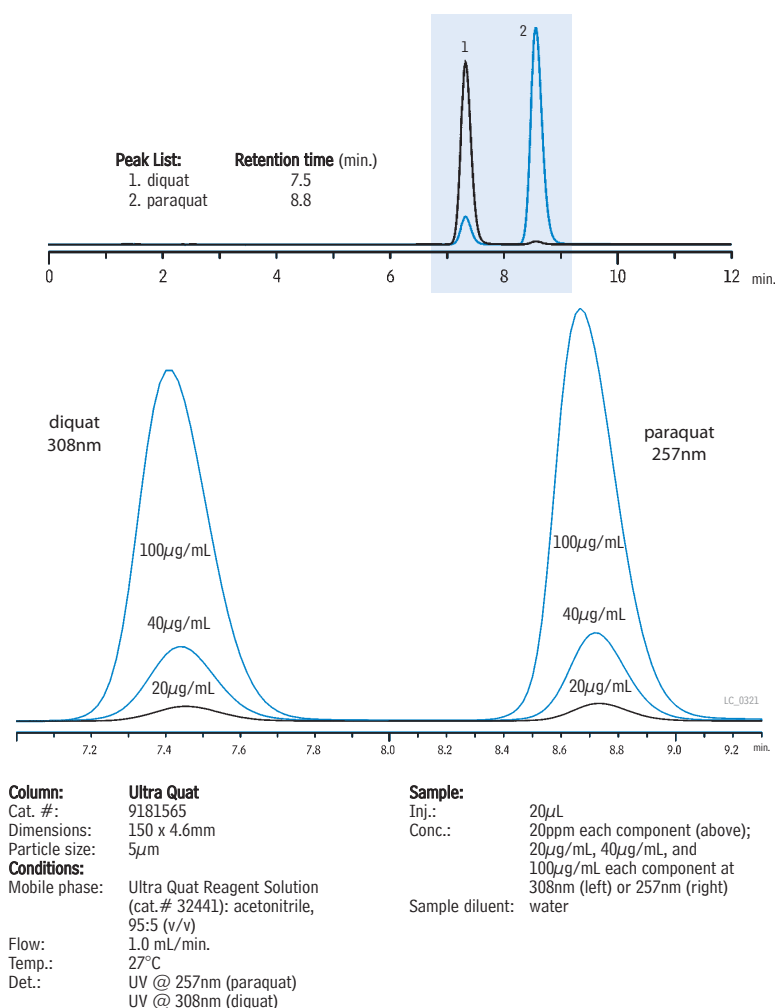


Table III

High recoveries of paraquat and diquat after solid phase extraction, using Ultra Quat SPE Tubes.

| Analyte | % Recovery | %RSD |
|----------|------------|------|
| paraquat | 97.2 | 5.4 |
| Diquat | 100.3 | 5.6 |

1L samples, N=5

Table I

Approximate detection/quantitation limits for paraquat and diquat, using an Ultra Quat column, SPE, and the simplified HPLC/UV method.^b

On column limit of detection (LOD): 0.12ng
On column limit of quantitation (LOQ): 0.4ng

| Sample Volume (mL) | Injection Volume (μL) | Limit of Detection (ppb) | Limit of Quantification (ppb) |
|--------------------|-----------------------|--------------------------|-------------------------------|
| 1 | 20 | 6 | 20 |
| 100 | 20 | 0.06 | 0.2 |
| 250 | 20 | 0.024 | 0.08 |
| 1000 | 20 | 0.006 | 0.02 |
| 1 | 100 | 1.2 | 4 |
| 100 | 100 | 0.012 | 0.04 |
| 250 | 100 | 0.0048 | 0.016 |
| 1000 | 100 | 0.0012 | 0.004 |
| 1 | 200 | 0.6 | 2 |
| 100 | 200 | 0.006 | 0.02 |
| 250 | 200 | 0.0024 | 0.008 |
| 1000 | 200 | 0.0006 | 0.002 |

Table II

Solid phase extraction of paraquat and diquat.

Sample Extraction

SPE Tube: Ultra Quat SPE, 6mL/500mg (cat.# 25499)
Tube Conditioning: 4mL acetonitrile, then 4mL deionized water
Sample: 1L water passed through tube @ 20-25mL/min.
Tube Wash: Rinse inner surface of tube with a minimal volume (1-2mL) of deionized water
Tube Dry: Less than 30 sec.
Extraction: 2mL acidic elution solution.* Allow to soak into bed for up to 1 min.; follow with 2 x 2mL acidic elution solution. Pass solutions through bed at a slow, dropwise rate into deactivated collection vessels.** Neutralize samples with 5-7μL concentrated ammonium hydroxide; adjust final volume to 5mL for analysis (if necessary, dilute with deionized HPLC grade water).

*1mL 85% H₃PO₄ diluted to 1L with deionized HPLC grade water (0.1% solution).

**Collection and analytical vessels must be deactivated before use (see text).

dilutions of Paraquat & Diquat Calibration Mix (cat# 32437) into the system, and monitor for paraquat at 257nm and for diquat at 308nm.

Note that EPA Method 549.2 requires retesting of all samples if the response for the reference standards changes by more than 20% over the time of the analysis. We find all reference standards show degradation after only 1 hour in untreated glassware, and the lowest concentrations are affected most. 30% losses in response are not uncommon; a reference standard of 6ppb diquat in water was undetectable. This makes non-reactive glassware critical; all volumetric ware and vials used for preparing and extracting samples containing paraquat and diquat, or paraquat/diquat reference standards, must be deactivated. In our studies we use dimethyldichlorosilane (DMDCS) to deactivate all glassware.

To achieve the lowest detection levels, solid phase extraction (SPE) is used to extract, clean, and concentrate the samples. The extraction procedure in EPA Method 549.2 relies on the same ion pairing technique as the HPLC method, and would not be compatible with our simplified, chaotropic analytical method. Using the new SPE procedure detailed in Table II, we removed UV interferences and concentrated the herbicide analytes 200-fold before analysis. The simple and rugged procedure, using an optimized weak cation exchanger (Ultra Quat SPE), produced the quantitative and highly reproducible recovery results detailed in Table III. Sample volumes of up to 1 liter can be extracted through this procedure. The water samples we used did not require pH adjustment, but all samples should be at pH 6-7 to assure that the analytes are fully charged before extraction. Glassware used for extraction was deactivated using DMDCS, following label directions, and the extracted samples were stored and analyzed in Silcote CL7-deactivated autosampler vials. By concentrating the SPE eluate to a smaller volume, or increasing the injection volume, quantification and detection limits can be further reduced.

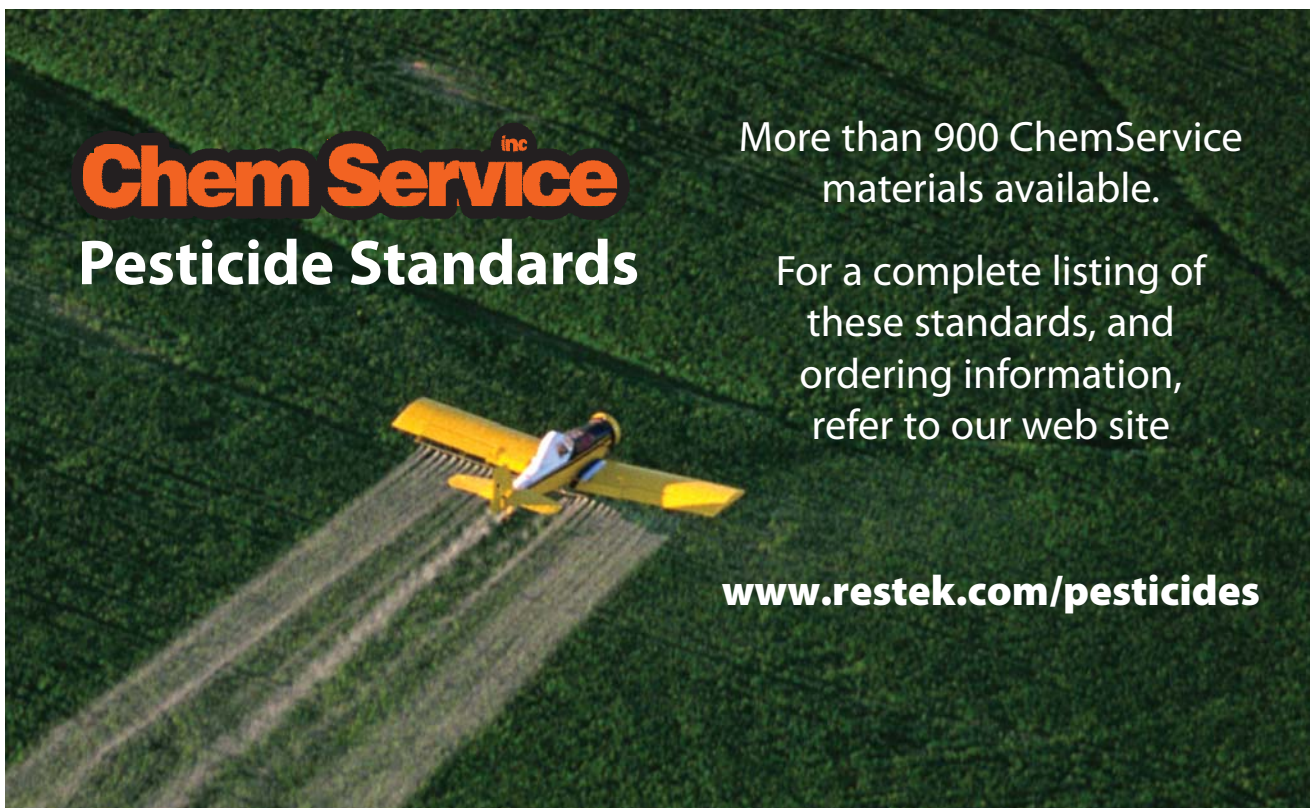
Our specially designed Ultra Quat HPLC column, Ultra Quat Reagent Solution, Ultra Quat SPE tubes, and paraquat/diquat reference materials, used according to the conditions described here, will not only simplify your analysis, but will also provide the most accurate and consistent information about paraquat and diquat.

^aAn appropriate solvent, such as acetonitrile, must be used for this separation. Organic solvents that can form hydrogen bonds will cause loss of retention.

^bNote that limits will vary with differing systems and levels of optimization. The detector will detect a finite lower amount of material (e.g., 0.12ng), but as this amount is present in an increasingly larger volume, the detected *concentration* will be lower.

Reference

1. Pan, L., R. LoBrutto, Y.V. Kazakevich, R. Thompson *Influence of inorganic mobile phase additives on the retention, efficiency and peak symmetry of protonated basic compounds in reversed phase liquid chromatography*; J. Chromatogr. A, 1049: 63-73 (2004).



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www.restek.com/pesticides



Ultra Quat HPLC Column

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 when used with Ultra Quat Reagent Solution mobile phase additive (cat. # 32441).

| Length | 4.6mm ID cat.# |
|---------------------|-------------------|
| 5µm Column 150mm | 9181565 |

Ultra Quat columns in other dimensions are available on request.

To order a column with a Trident™ Integral Inlet Fitting, add "-700" to the catalog number for the column: 9181565-700. Nominal additional charge.

Ultra Quat Guard Cartridges and Guard Cartridge Fittings

| Length | 2.1mm ID cat.# | 4.0mm ID cat.# |
|--|-------------------|-------------------|
| 10mm | 918150212, 3-pk. | 918150210, 3-pk. |
| 20mm | 918150222, 2-pk. | 918150220, 2-pk. |
| Description | qty. | cat.# |
| XG-XF Fitting for 10mm Guard Cartridge | ea. | 25026 |
| XG-XF Fitting for 20mm Guard Cartridge | ea. | 25062 |

Ultra Quat Solid Phase Extraction Cartridges

These cartridges have been specifically designed to provide consistent and reproducible results US EPA Method 549.2: HPLC analysis of paraquat/diquat.

| Description | Tube Volume, Bed Weight | qty. | cat.# |
|---------------------------|----------------------------|--------|-------|
| Ultra Quat SPE Cartridges | 6mL, 500mg | 30-pk. | 25499 |



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 Seal† | 24671 | 24672 |
| 2.0mL Amber Vial, Deactivated, PTFE/Natural Rubber Seal† | 24673 | 24674 |
| 2.0mL Clear Vial, Untreated, PTFE/Natural Rubber Seal | 21196 | 21197 |
| 2.0mL Amber Vial, Untreated, PTFE/Natural Rubber Seal | 21198 | 21199 |
| 2.0mL Clear Vial, Untreated, PTFE/Silicone Seal | 24646 | 24647 |
| 2.0mL Amber Vial, Untreated, PTFE/Silicone Seal | 24648 | 24649 |

†Silcote™ CL7 deactivation.

Ultra Quat Reagent Solution

Use to prepare 1 liter of mobile phase.

In water, 20mL/ampul cat. # 32441 (ea.)

Paraquat & Diquat Calibration Mix

diquat dibromide paraquat dichloride

1,000µg/mL each in water, 1mL/ampul cat. # 32437 (ea.)

Dimethyldichlorosilane (DMDCS)

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 producing a deactivated surface. A detailed procedure is included with the product.

dimethyldichlorosilane (DMDCS)

Neat, 20mL/ampul cat. # 31840 (ea.)

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into Reality, the Restek logo.



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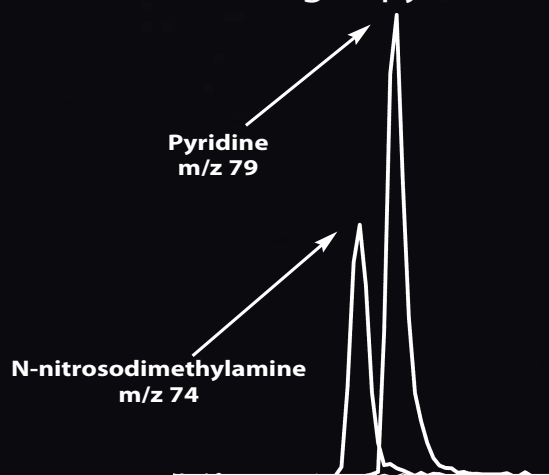


Rxi™ -5ms Columns

Restek's Exceptionally Inert (Rxi™)
Fused Silica Capillary Columns

- Unsurpassed inertness for low level basic and acidic compounds.
- Ultra-low bleed
- Reliable performance, guaranteed column-to-column reproducibility

Sharp, symmetric peak
for 0.5ng of pyridine!



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Rxi™-5ms Fused Silica Columns

Restek's Exceptionally Inert (Rxi™) Fused Silica Capillary Columns

- Unsurpassed inertness for low level basic and acidic compounds.
- Ultra-low bleed
- Reliable performance, guaranteed column-to-column reproducibility
- Guaranteed to work perfectly with retention time-locking software.

The Ultimate High Performance Fused Silica Capillary Column

The Restek research chemists have developed new technology for making GC capillary columns, including new deactivation chemistry, new polymer synthesis routes, and a new manufacturing process. The overall results of these efforts are columns demonstrating unsurpassed inertness, ultra-low bleed, and totally reliable column-to-column performance.

Excellent Inertness

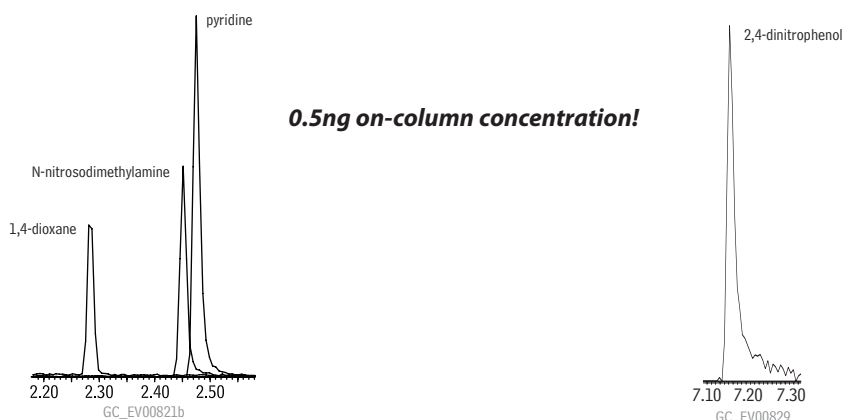
Many acidic and basic compounds require the inertness of Rxi™-5ms columns. We use 2,4-dinitrophenol (acidic) and pyridine (basic) to evaluate the inertness of our columns. Surface activity in the column is revealed by the peak shapes for these analytes, and sub-nanogram test quantities make for a stringent test. The data below show the peak response for 0.5ng of pyridine and 0.5ng of 2,4-dinitrophenol on an Rxi™-5ms, 30m x 0.25mm, 0.25µm film column. Rxi™-5ms columns' excellent inertness allows acidic or basic compounds to be analyzed under the same conditions.



Restek's exceptionally inert (Rxi™) fused silica capillary columns:

The processes we use to make new Rxi™ columns enable us to **guarantee** highly uniform performance, column-to-column and lot to lot, including perfect match-up with retention time-locking software. It is our promise and commitment to you that every Rxi™ column you receive will be **exactly** as good as the one it replaces.

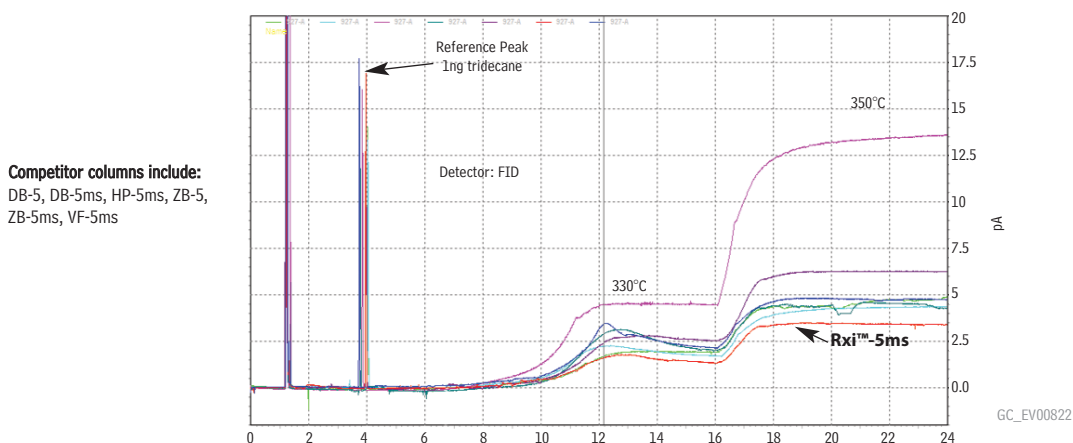
Figure 1 Rxi™-5ms columns provide excellent sensitivity and symmetry for difficult compounds.



Ultra Low Bleed

Bleed from Rxi™-5ms columns is negligible, simplifying trace-level GC/MS analysis or detection by electron capture (ECD), nitrogen-phosphorus (NPD), or other sensitive methods. The graph below shows the bleed from 30m x 0.25mm, 0.25µm film columns. Compared to the other columns, including silarylene type phases, the Rxi™-5ms column exhibits the lowest bleed.

Figure 2 Chromatographic profiles for widely used columns prove Rxi™-5ms has the lowest bleed!



Reliable Column-to-Column Performance

Chromatographers need to know every column they receive is going to perform in the same way as the column it replaces. Rxi™-5ms column technology has enabled us to tighten our quality control standards for passing columns, and guarantees column reproducibility. Columns from three manufacturing batches show the excellent reproducibility of retention times and peak shape assured by the new manufacturing process.

Figure 3 Three manufacturing batches of Rxi™ columns show excellent reproducibility (isothermal test mix).

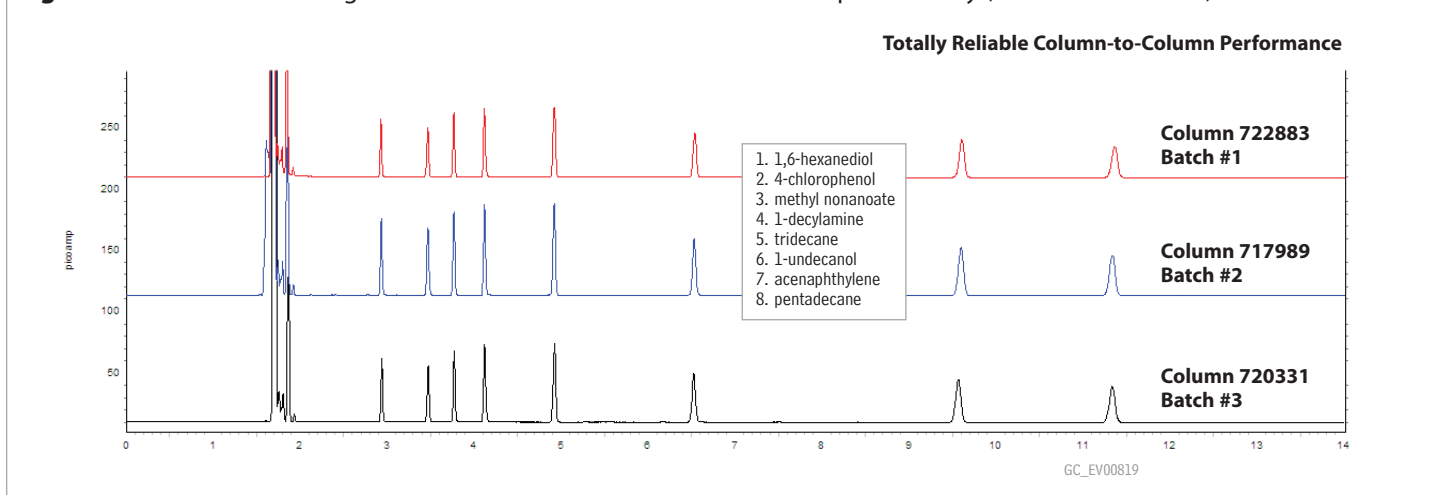
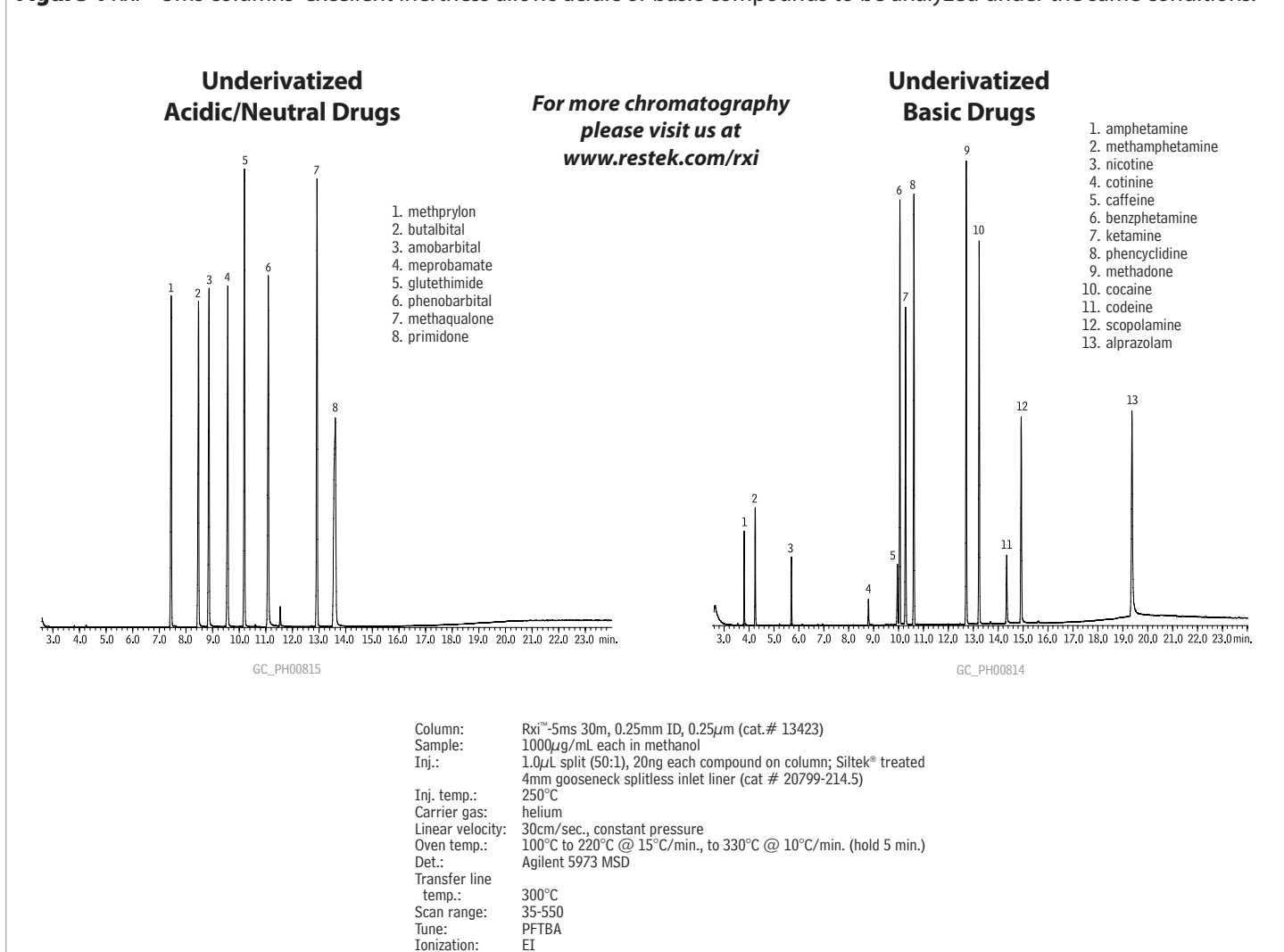
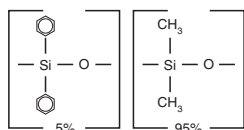


Figure 4 Rxi™-5ms columns' excellent inertness allows acidic or basic compounds to be analyzed under the same conditions.





Guaranteed Quality and Reliability

Restek is committed to supplying the most reliable GC columns in the industry. Every Rxi™-5ms column is individually challenged to pass our stringent requirements for film thickness, selectivity, inertness, coating efficiency, and bleed. We believe Rxi™-5ms column technology produces the most reliable columns available, anywhere, and it is our promise and commitment to you that every Rxi™-5ms column you receive will be as good as the one it replaces.

Rxi™-5ms Fused Silica Columns

- Nonpolar 5% diphenyl 95% dimethylpolysiloxane phase (equivalent to USP phase G27).
- Most widely used general purpose column.
- Temperature range: -60°C to 330/350°C (330° = bleed tested temperature/350° = maximum operating temperature).



Typical Applications: alcohols, amines, aromatic hydrocarbons, bile acids, drugs, US EPA methods, esters, fatty acid methyl esters (FAMES), flavors and aromas, glycerides, halogenated hydrocarbons, herbicides, hydrocarbons, organic acids, oxygenates, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, phenols, polymers, solvents, steroids, sugars, sulfur compounds.

Similar to these phases: DB-5, DB-5ms, HP-5, HP-5ms, SPB-5, Equity-5, SLB-5, Ultra-5, BPX-5, 007-5, AT-5, Optima-5, ZB-5, ZB-5ms, VF-5ms, CP-Sil 8 CB, Rtx-5, Rtx-5MS, Xti-5
Selectivity of Rxi-5ms is equivalent to HP-5 and HP-5ms.

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 | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 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 |

Rxi™ Test Mix (Rev. A) (8 components)

| | |
|----------------|------------------|
| acenaphthylene | methyl nonanoate |
| 4-chlorophenol | n-pentadecane |
| n-decylamine | n-tridecane |
| 1,6-hexanediol | 1-undecanol |

1,000μg/mL each in toluene, 1mL/ampul
cat. # 35241 (ea.)

For more chromatography please visit us at
www.restek.com/rxi

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The Ultimate High Performance
Fused Silica Capillary Column



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New Rxi™-1ms Fused Silica Columns

Restek's Exceptionally Inert (Rxi™) Fused Silica Capillary Columns

- Stable at high temperatures; improved signal to noise ratios.
- Excellent inertness for acids and bases; predictable column performance.
- Engineered to assure column to column reproducibility.

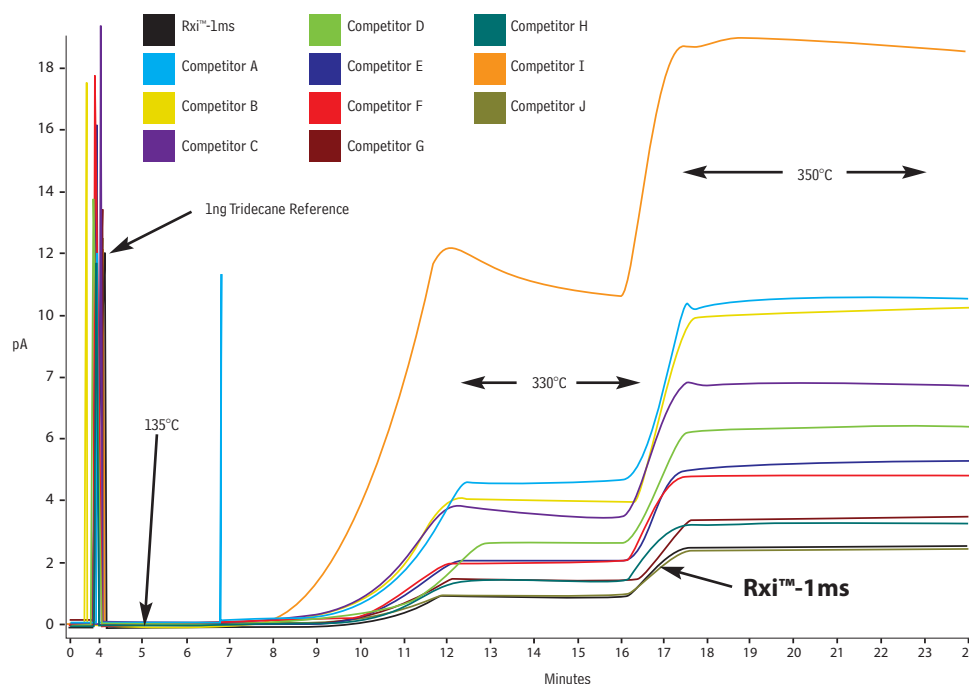
The combination of ultra low bleed and unsurpassed inertness make the Rxi™-1ms the best column choice for analysis using a 100% Polydimethyl siloxane stationary phase.

Lowest Bleed

Restek chemists have developed a new GC column manufacturing technique that assures low bleed, unsurpassed inertness, and exceptionally reproducible columns from batch to batch. The reduced bleed and increased inertness produced by the new manufacturing process result in increased signal to noise ratios and thus lower detection limits for active compounds. The Rxi™-1ms column offers maximum compound response for quantitative GC and GC/MS analysis.

We compared the bleed profiles of ten competitor columns at both 330°C and 350°C to the Rxi™-1ms column. At both temperatures the Rxi™-1ms column exhibits the lowest bleed level or equivalent of all the columns tested.

Figure 1 The Rxi™-1ms column has the lowest bleed available, allowing better accuracy and lower detection limits for active compounds.



please note

Columns included in the comparison are BP-1, DB-1, DB-1ms, EQ-1, HP-1, HP-1ms, Rtx-1, Rxi-1ms, VF-1ms, ZB-1, and ZB-1ms. The bleed profiles in Figure 1 are labeled randomly.

Column: 100% dimethyl polysiloxane 30m, 0.25 ID, 0.25µm
Sample: 1 ng. on column tridecane in dichloromethane
Inj.: 1.0µL split (split ratio 40:1), 4mm splitless inlet liner (cat.# 20799)
Inj. temp.: 250°C
Carrier gas: helium, constant pressure
Linear velocity: 60cm/sec. @ 135°C
Oven temp.: 135°C (hold 6 min.) to 330°C @ 30°C/min. (hold 4 min.) to 350°C @ 15°C/min. rate (hold 6 min.)
Det.: FID @350°C

Unsurpassed Inertness

The Rxi™-1ms exhibits excellent inertness for both acidic and basic compounds. We used 2, 4-dinitrophenol (acidic) and pyridine (basic) to evaluate the Rxi™-1ms column. This test is stringent, with an on-column amount of 0.5ng for each compound. Surface activity in the column is revealed by the peak shapes and response factors for acidic and basic compounds. The outstanding inertness of the Rxi™-1ms column allows acidic and basic compounds to be run under the same conditions, as shown below.

Figure 2 Basic analytes on an Rxi™-1ms column (0.5ng each; extracted ion chromatograms).

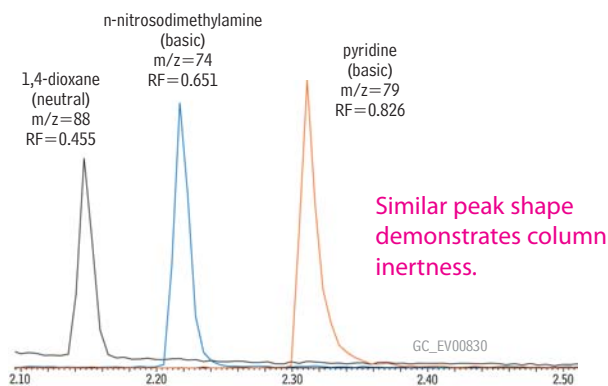


Figure 3 Acidic analyte on an Rxi™-1ms column (0.5ng; extracted ion chromatogram).

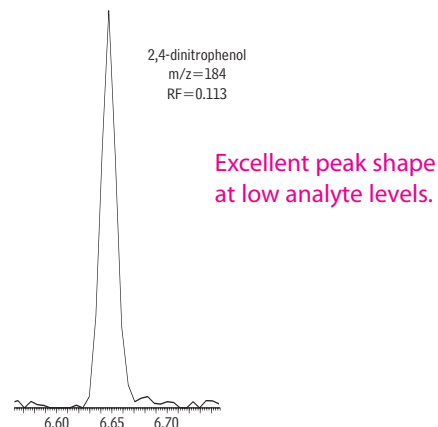
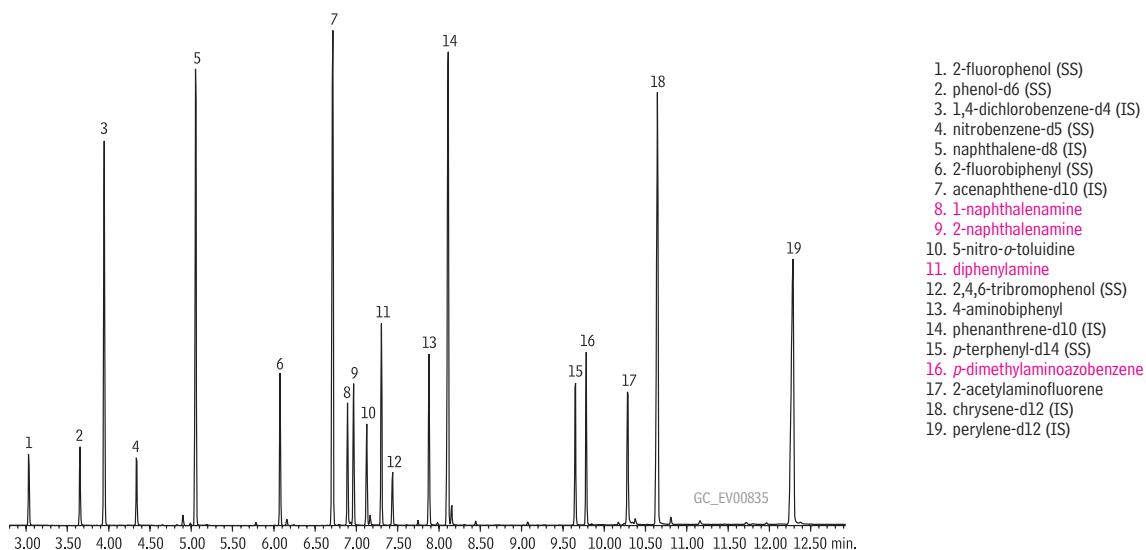


Figure 4 Outstanding peak symmetry even for difficult basic compounds at 5.0ng on an Rxi™-1ms column.



Column: Rxi™-1ms, 30m, 0.25mm ID, 0.25μm (cat.# 13323)
Sample: Custom Appendix IX Mix, plus 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, 5μg/mL each analyte (internal standards 25μg/mL), split (10:1)
4mm Drilled Uniliner® inlet liner (hole at 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 0.5 min.) to 300°C @ 25°C/min. (hold 5 min.)
Det.: Agilent 5973 MSD
Transfer line temp.: 280°C
Scan range: 35-550 amu
Solvent delay: 2.35 min.
Tune: DFTPP
Ionization: EI

Conclusion

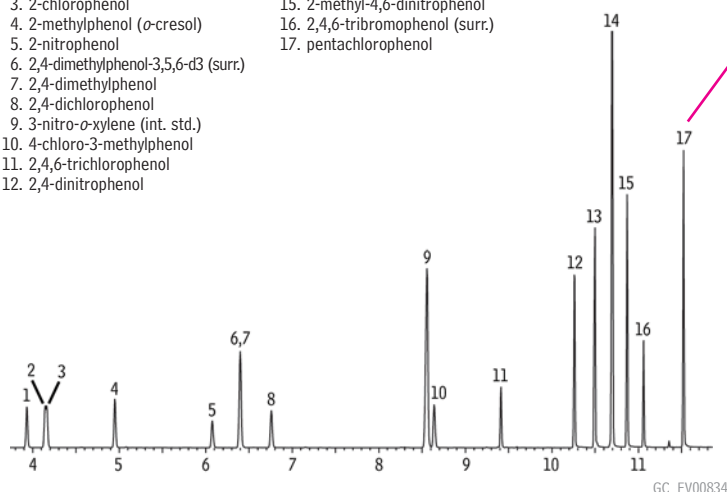
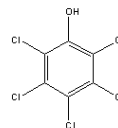
The Rxi™-1ms column is the new industry standard for 100% dimethyl polysiloxane columns. Column bleed is the lowest in the industry, improving compound signal to noise ratios and allowing lower detection limits for active compounds. The unsurpassed inertness of the column allows both acidic and basic compounds to be analyzed, often under the same conditions. We guarantee you will be 100% satisfied with the performance of the Rxi™-1ms column.

Figure 5 Excellent peak shape for acidic compounds, even phenols, at 5.0ng on an Rxi™-1ms column (extracted ion chromatogram).

1. phenol
2. 2-chlorophenol-d4 (surr.)
3. 2-chlorophenol
4. 2-methylphenol (*o*-cresol)
5. 2-nitrophenol
6. 2,4-dimethylphenol-3,5,6-d3 (surr.)
7. 2,4-dimethylphenol
8. 2,4-dichlorophenol
9. 3-nitro-*o*-xylene (int. std.)
10. 4-chloro-3-methylphenol
11. 2,4,6-trichlorophenol
12. 2,4-dinitrophenol

13. 4-nitrophenol
14. 2,3,4,5-tetrachlorophenol (int. std.)
15. 2-methyl-4,6-dinitrophenol
16. 2,4,6-tribromophenol (surr.)
17. pentachlorophenol

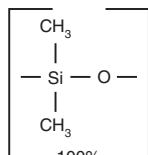
pentachlorophenol



Column: Rxi™-1ms, 30m, 0.25mm ID, 0.25µm (cat.# 13323)
Sample: US EPA Method 528 Mix: Phenols Fortification Mix, EPA 528 (cat.# 31695), Internal Standard Mix, EPA 528 (cat.# 31696), Surrogate Standard Mix, EPA 528 (cat.# 31697)
Inj.: 1.0µL, 5µg/mL each analyte (internal standards 25µg/mL), split (10:1) 4mm Drilled Uniliner® inlet liner (hole at 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 0.5 min.) to 130°C @ 8°C/min., to 300°C @ 50°C/min. (hold 1 min.)
Det.: Agilent 5973 MSD

replace these similar phases

DB-1, DB-1ms, HP-1,
HP-1ms, Ultra-1, SPB-1,
Equity-1, ZB-1, VF-1ms,
Rtx-1, Rtx-1ms



Restek Trademarks:
Crossbond, Restek logo, Rtx,
Rxi, Uniliner.

For other trademark
attributions, please refer to
our catalog.

Rxi™-1ms Fused Silica Columns

- General purpose columns for drugs of abuse, essential oils, hydrocarbons, pesticides, polychlorinated biphenyl (PCB) congeners or (e.g.) Aroclor® mixes, sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Nonpolar phase (Crossbond® 100% dimethyl polysiloxane) Equivalent to USP G2 phase.
- Temperature range: -60°C to 330/350°C
(330°=bleed tested temperature/350°=maximum operating temperature).

(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 | |
| 0.53mm | 4.00 | -60 to 330/350°C | | 13396 | | |
| | 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 | | |
| | | | | | | |
| ID | df (μm) | temp. limits | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 0.18mm | 0.18 | -60 to 330/350°C | | 13302 | \$385 | |
| 0.20mm | 0.33 | -60 to 330/350°C | 13397 | | 13398 | 13399 |

RESTEK

Lit. Cat.# 580075B-INT

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HRMalytic RESTEK '07
Australian Distributors
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ISO 9001:2000
cert.# FM80397

New Rxi™ columns

from Restek—the innovators in column technology



Unsurpassed inertness

Ultra-low bleed

Guaranteed reproducibility

Unmatched performance



Turning Visions into Reality™

www.restek.com



New Rxi™ Columns

Exceptionally Inert Capillary Columns

- Unsurpassed inertness for low level basic and acidic compounds.
- Ultra-low bleed.
- Assured column-to-column reproducibility.
- Guaranteed to work perfectly with retention time-locking software.



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Rxi™ columns were developed from Restek's unwavering passion to create capillary columns superior to all others.

Our mission was to invent a column that had the **highest inertness**, the **lowest bleed**, and the **greatest reproducibility** in every measurable facet of performance. The end result of our work had to be clearly observable as better than any column used in the past, by chromatographers in any laboratory around the world. **Clearly different and absolutely the best** were the non-negotiable goals of our research.

To achieve these aims, we hired the world's best polymer chemists and built a new, fully-equipped facility. The products this team is developing, Rxi™ columns, genuinely have exceeded our goals. The first of these new columns, Rxi™-1ms and Rxi™-5ms columns, are absolutely the best on the market today. How are they different? Until now, powerful new MS systems have been capable of analyzing low levels of active compounds, but column limitations have kept analysts from using this ability to their advantage. Now, with Rxi™ columns, you can chromatograph sub-nanogram levels of acidic and basic compounds in one analysis. Other columns exhibit peak tailing for these active compounds, causing integration errors and producing non-linear calibration curves, and thereby limiting low-level analysis. Only Rxi™ technology will enable you to reliably chromatograph both acidic and basic compounds at previously unattainable trace levels.

www.restek.com/rxi

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A new industry standard

HROMalytic Chromatography
Products '08
Australian Distributors **ECH**nology

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We guarantee bleed from Rxi™ columns will be the lowest bleed of any column you have ever used.

In addition, we tightened our column dimension and column production specifications, to ensure the highest efficiency and most

reproducible retention indices,

thereby creating a new industry

standard. You will find support of

our claims and enthusiasm on the succeeding pages of this booklet. Simply put, an Rxi™ column will be the

best of the best columns you have ever used, unequivocally – you have our 100% satisfaction guarantee!

**An Rxi™ column will be the best of the best
columns you have ever used – you have our
100% satisfaction guarantee!**

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5



Unsurpassed inertness

CHROMMalytic Chromatography
Products '08
Australian Distributors **TECH**nology

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Tailing peaks and poor responses for active compounds reveal surface activity in a column. In contrast, the peak shapes for 0.5ng of pyridine (basic) and for 2,4-dinitrophenol (acidic), on page 9, demonstrate the excellent inertness of Rxi™-5ms columns. Basic and acidic compounds can be analyzed on the same column, often under the same conditions.

An Rxi™ column's inertness allows analysis of active compounds at levels not attainable with other manufacturers' columns.

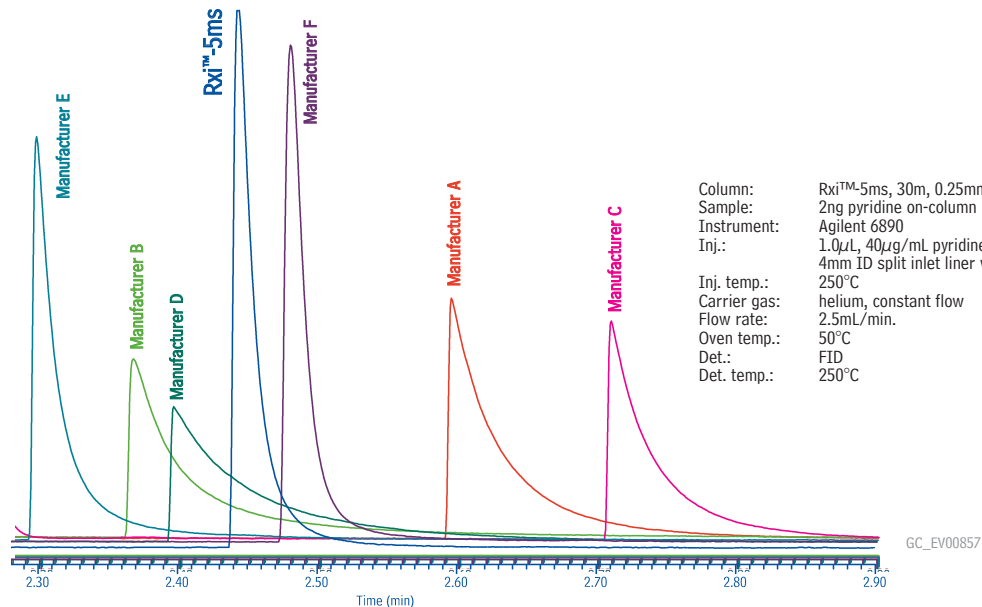
www.restek.com/rxi

7

Unsurpassed inertness

An Rxi™-5ms column provides the most symmetric peak for pyridine, a basic compound.

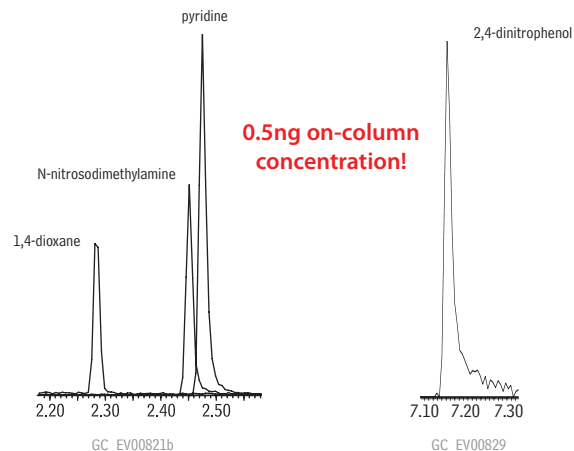
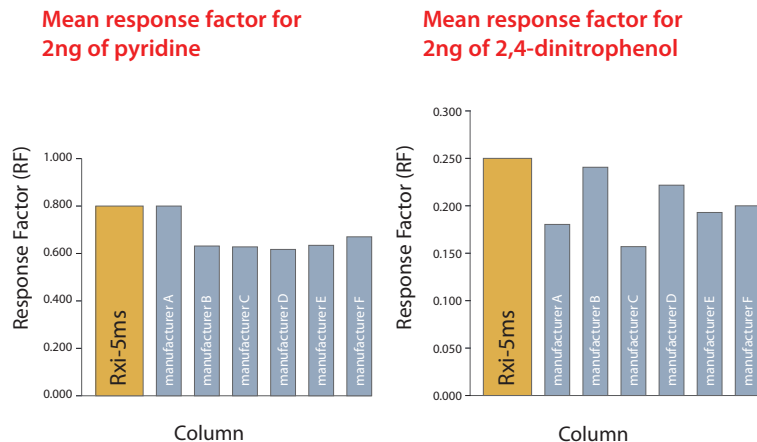
Among columns from 7 manufacturers, the Rxi™-5ms column produces the most symmetric peak for pyridine. Each overlay is 2ng of pyridine on-column, at 50°C, on a 30m x 0.25mm ID, 0.25µm column.



An Rxi™-5ms column gives the best overall performance for both basic and acidic compounds.

In addition to pyridine, 2,4-dinitrophenol, an acidic compound, was acquired at 2ng on-column. An Rxi™-5ms column gives the best response for both the basic compound and the acidic compound. Comparison of 30m x 0.25mm ID, 0.25µm columns.

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



www.restek.com/rxi

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Ultra-low bleed

With the lowest column bleed in the industry, Rxi™-5ms columns improve detection for trace level GC/MS analysis. Ultra-low bleed also reduces conditioning time after instrument maintenance.

**Save time and money through
faster baseline stabilization.**

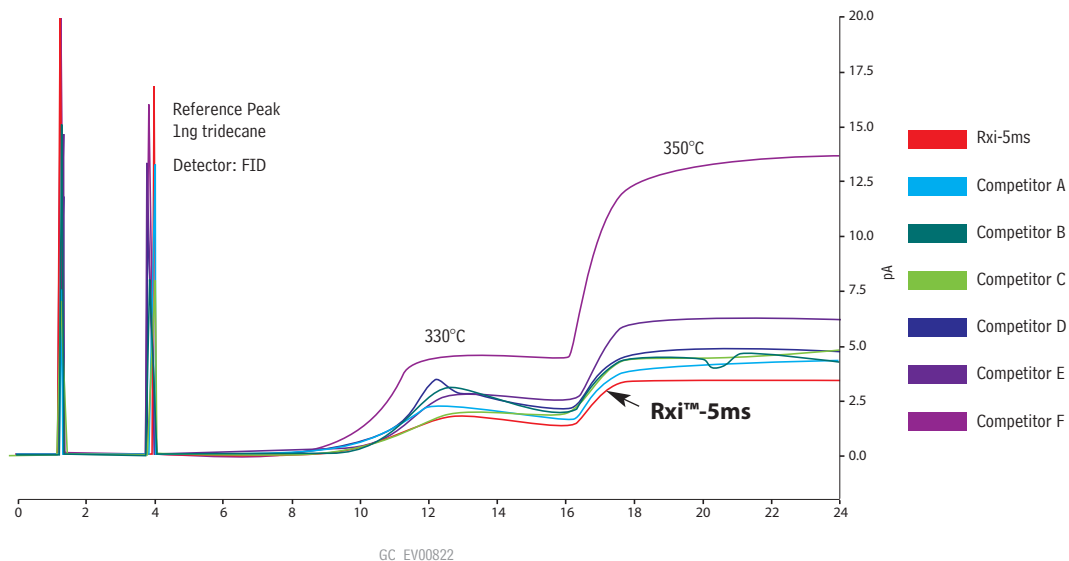
www.restek.com/rxi

11

Ultra-low bleed

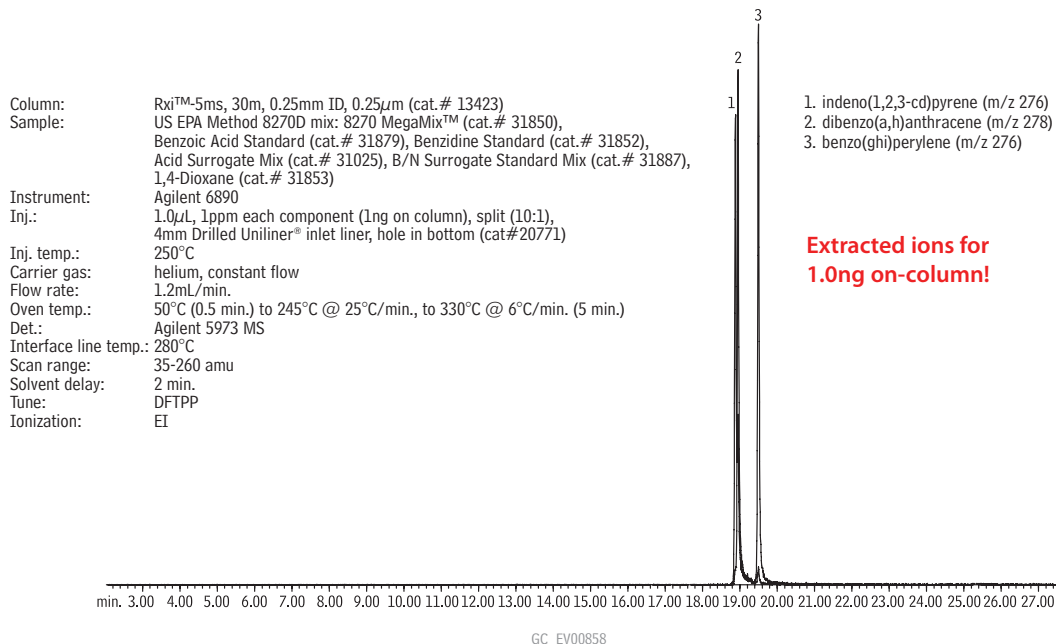
Rxi™-5ms columns have the lowest bleed among all major brands of columns.

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



Ultra-low bleed makes Rxi™ columns ideal for GC/MS applications.

This chromatogram shows an excellent signal-to-noise ratio for late-eluting polycyclic aromatic hydrocarbons (PAHs), using an Rxi™-5ms column and MS detection.



Consistently low bleed, column after column.



Our average is less than half of the industry standard!

Mean = **1.9 pA**
 Std. dev. = 0.7 pA

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Guaranteed
reproducibility



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Consistency is everything. You want every new column you install to provide the

same performance. With Rxi™ column technology, we guarantee it: every new column will perform exactly as the column it replaces.

Rxi™ -1ms and Rxi™ -5ms columns are perfect for use with Retention Time Locking (RTL) or other retention indices software.

www.restek.com/rxi

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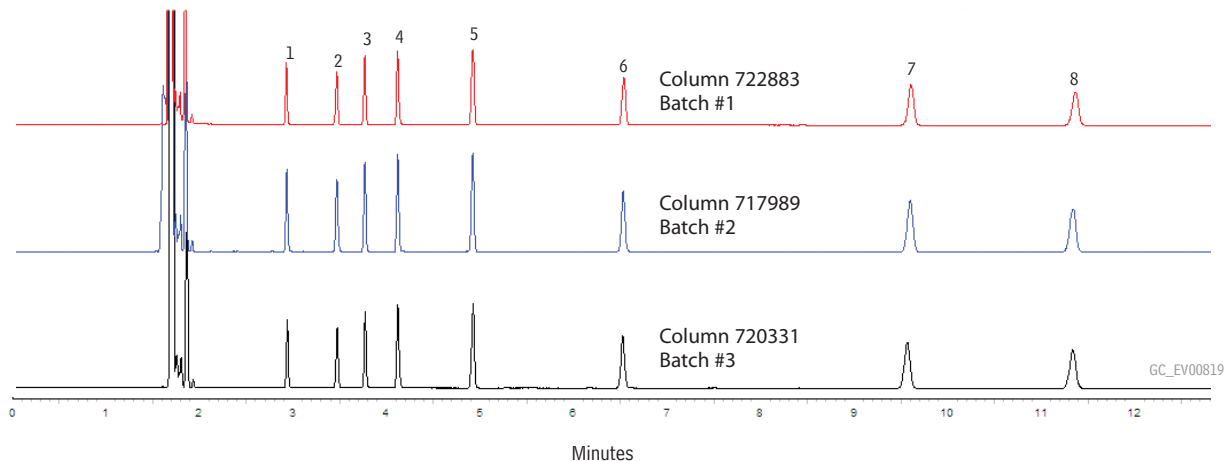
Guaranteed reproducibility

Rxi™ column technology assures reliable column-to-column performance.

The examples shown here are for 30m x 0.25mm ID, 0.25µm Rxi™-5ms columns from three manufactured batches. We perform this isothermal test on every column, to verify that our tight quality control specifications are met.

Isothermal test mix:

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



Rxi™ columns are held to rigorous quality control standards, to guarantee column to column reproducibility.

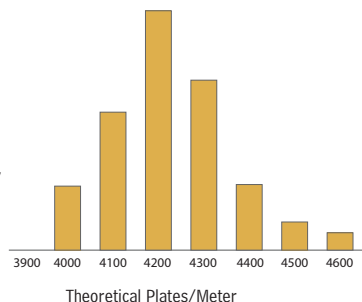
Every column is individually tested for coating efficiency, selectivity, film thickness, inertness, and bleed, and is proven to meet our stringent specifications.

Theoretical Plates/Meter

Rxi™-5ms

(30m x 0.25mm, 0.25µm)

Narrow distribution ensures high column coating efficiency, which means the resolution power will be consistent, column-to-column.

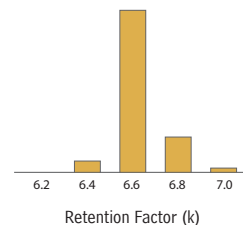


Retention Factor (k)

Rxi™-5ms

(30m x 0.25mm, 0.25µm)

Narrow distribution ensures consistent polymer film thickness, which means retention times will be consistent, column-to-column

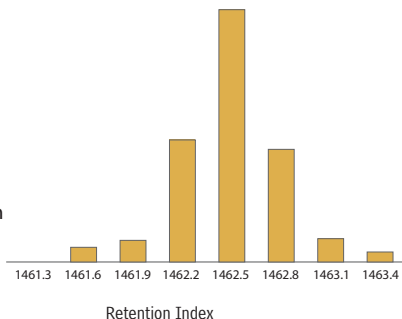


Retention Index: Acenaphthalene

Rxi™-5ms

(30m x 0.25mm, 0.25µm)

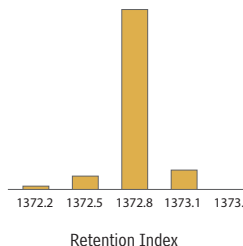
Narrow distribution ensures consistent column selectivity, which means relative retention times will be consistent, column-to-column



Retention Index: Undecanol

Rxi™-5ms

(30m x 0.25mm, 0.25µm)



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Unmatched performance

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No other column guarantees the combination of inertness, ultra-low bleed, and reproducibility

of Rxi™-1ms and Rxi™-5ms columns.

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. It is our promise that every new

Rxi™ column will be as good as the one it replaces.

The Rxi™ column combination of inertness, ultra-low bleed, and column-to-column reproducibility guarantees you columns that will have the longest lifetimes of any columns on the market.

www.restek.com/rxi

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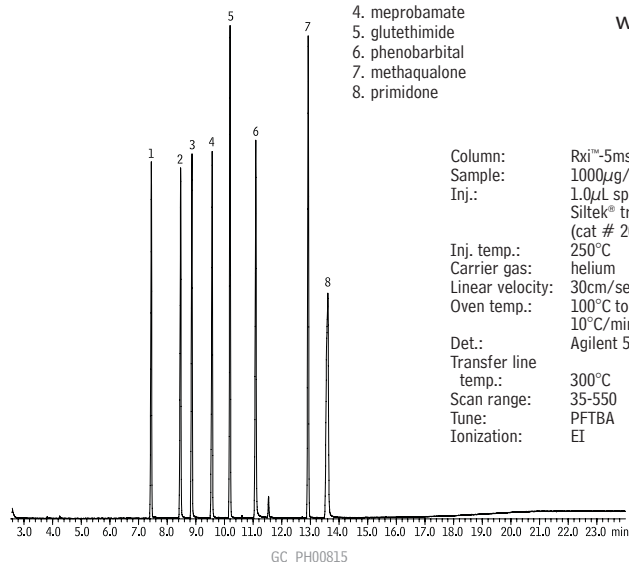
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Unmatched performance

Use an inert Rxi™-5ms column to analyze acidic and basic compounds under the same conditions.

Underivatized Acidic/Neutral Drugs

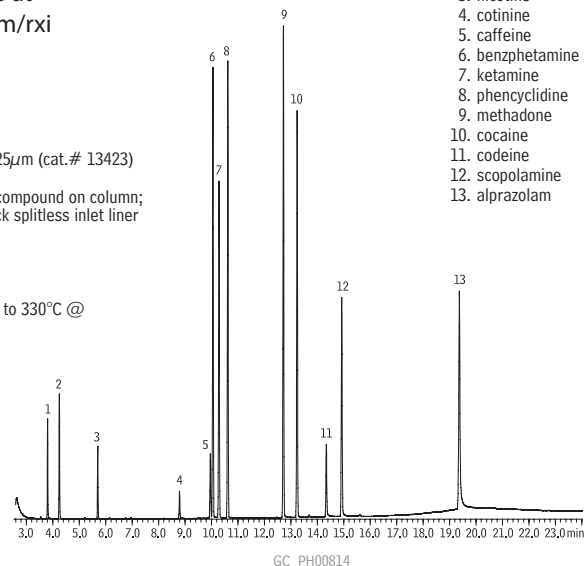


1. methprylon
2. butalbital
3. amobarbital
4. meprobamate
5. glutethimide
6. phenobarbital
7. methaqualone
8. primidone

For additional applications
please visit us at
www.restek.com/rxi

Column: Rxi™-5ms 30m, 0.25mm ID, 0.25µm (cat.# 13423)
Sample: 1000µg/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

Underivatized Basic Drugs

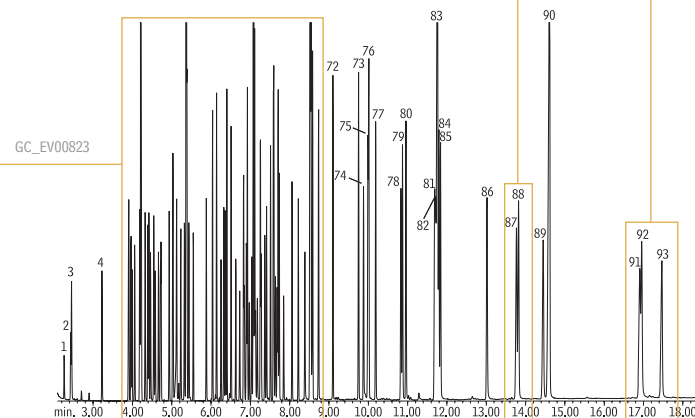
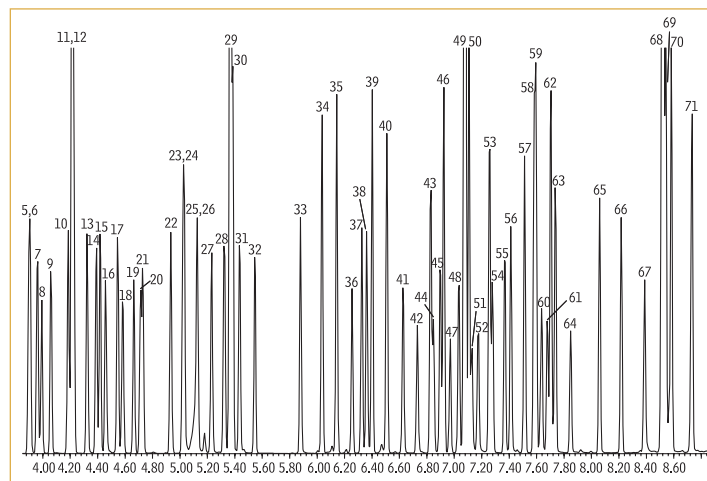
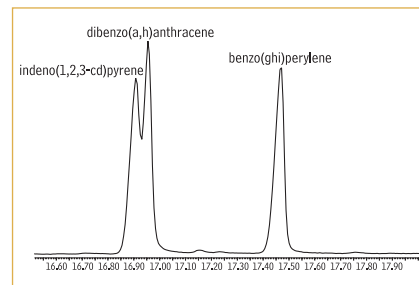
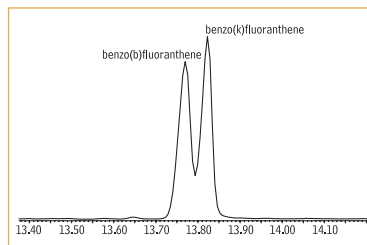


1. amphetamine
2. methamphetamine
3. nicotine
4. cotinine
5. caffeine
6. benzphetamine
7. ketamine
8. phencyclidine
9. methadone
10. cocaine
11. codeine
12. scopolamine
13. alprazolam

Use an Rxi™-5ms column to analyze acidic and basic compounds in semivolatiles methods.

Column: Rxi™-5ms, 30m, 0.25mm ID, 0.25 μ m (cat.# 13423)
 Sample: 1.0 μ L, US EPA Method 8270D mix (cat.# 31850, cat.# 31879, cat.# 31852, cat.# 31025, cat.# 31887, cat.# 31853)
 10ppm each analyte (10ng on column), splitless (hold 0.1 min.)
 4mm Drilled Uniliner® inlet liner (cat.# 20771)
 Instrument: Agilent 6890
 Inj. temp.: 250°C
 Carrier gas: helium, constant flow, 1.2mL/min.
 Oven temp.: 50°C (hold 0.5 min.) to 265°C @ 25°C/min., to 330°C @ 6°C/min. (hold 2 min.)
 Det.: Agilent 5973 GC/MS: transfer line temp.: 280°C scan range: 35-550 amu, solvent delay: 2 min., tune: DFTPP, ionization: EI

For peak identifications, please visit www.restek.com/rxi



www.restek.com/rxi

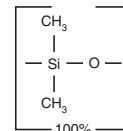
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replace these similar phases

DB-1, DB-1ms, HP-1,
HP-1ms, Ultra-1, SPB-1,
Equity-1, ZB-1, VF-1ms,
Rtx-1, Rtx-1ms

Rxi™-1ms Fused Silica Columns

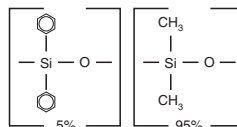
- General purpose columns for drugs of abuse, essential oils, hydrocarbons, pesticides, polychlorinated biphenyl (PCB) congeners or (e.g.) Aroclor® mixes, sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Nonpolar phase (Crossbond® 100% dimethyl polysiloxane) Equivalent to USP G2 phase.
- Temperature range: -60°C to 330/350°C
(330°=bleed tested temperature/350°=maximum operating temperature).



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

Rxi™-5ms Fused Silica Columns

- General purpose columns for alcohols, amines, aromatic hydrocarbons, bile acids, drugs, US EPA methods, esters, fatty acid methyl esters (FAMES), flavours and aromas, glycerides, halogenated hydrocarbons, herbicides, hydrocarbons, organic acids, oxygenates, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, phenols, polymers, solvents, steroids, sugars, sulfur compounds. Most widely used general purpose column.
- Nonpolar phase (Crossbond® 5% diphenyl / 95% dimethyl polysiloxane) Equivalent to USP G27 phase.
- Temperature range: -60°C to 330/350°C
(330° = bleed tested temperature/350° = maximum operating temperature).



replace these
similar phases

DB-5, DB-5ms, HP-5,
HP-5ms, SPB-5, SLB-5,
Equity-5, Ultra-5, BPX-5,
007-5, AT-5, Optima-5,
ZB-5, ZB-5ms, VF-5ms,
CP-Sil 8 CB, Rtx-5,
Rtx-5ms, Xti-5

Selectivity of Rxi-5ms is
equivalent to HP-5 and HP-5ms.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter | 60-Meter | |
|--------|---------|------------------|----------|----------|----------|----------|
| 0.25mm | 0.25 | -60 to 330/350°C | 13420 | 13423 | 13426 | |
| | 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 | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 0.18mm | 0.18 | -60 to 330/350°C | | 13402 | | |
| | 0.36 | -60 to 330/350°C | | 13411 | | |
| 0.20mm | 0.33 | -60 to 330/350°C | 13497 | | 13498 | 13499 |

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Want more information about Rxi™ Columns?
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Ultra II™ LC Columns

The Column Line Designed for Optimal Chromatography
on **Any LC System**, Based on Highly Inert Restek Silica

Available Phases:

- C18
- Silica
- Biphenyl
- PFP Propyl
- Aromax
- Aqueous C18

Available Particle Sizes:

- 1.9µm for UHPLC
- 2.2µm for UFLC and RRLC
- 3µm and 5µm for HPLC

**More phases
coming soon!**



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10



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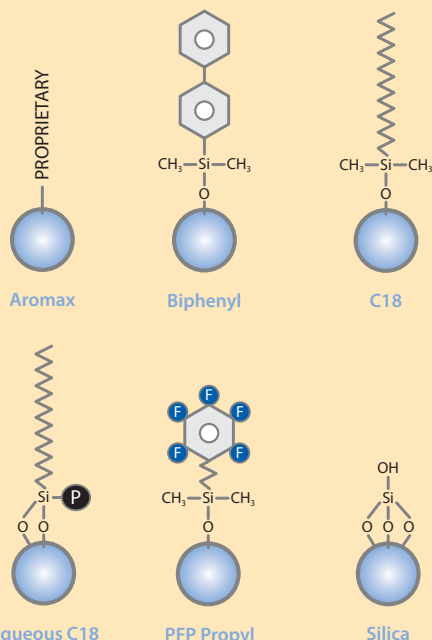
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Ultra II™ LC Columns

The Ultra II™ product line is the first LC column line specifically designed for universal application—optimal chromatography on any system. This column line is built on a highly inert, high surface area silica that is completely Restek manufactured, providing excellent column-to-column reproducibility. Only Ultra II™ columns are available in a comprehensive range of particle sizes (1.9µm, 2.2µm, 3µm, and 5µm), creating truly scalable chromatography on any type of LC instrument, from conventional to ultra-high pressure systems. Ultra II™ columns are available in traditional phases (C18, Aqueous C18, Silica) and unique chemistries which provide alternate selectivity (Biphenyl, Aromax, PFP Propyl).



Ultra II™ Aromax Columns (USP L11)

Ultra II Aromax is a unique reversed phase material that exhibits superior retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This column is a great alternative to our Biphenyl phase when increased retention is required. A very suitable choice for analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

Ultra II™ Biphenyl Columns (USP L11)

A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This is a great alternative to a C18 column when alternative selectivity is desired. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

Ultra II™ C18 Columns (USP L1)

A retentive, highly pure material that exhibits excellent peak shape for a wide range of compounds. This is a robust and very reproducible general-purpose reversed phase column.

Ultra II™ Aqueous C18 Columns (USP L1)

Highly retentive and selective for reversed phase separations of polar analytes. Highly base-deactivated. Compatible with highly aqueous (up to 100%) mobile phases.

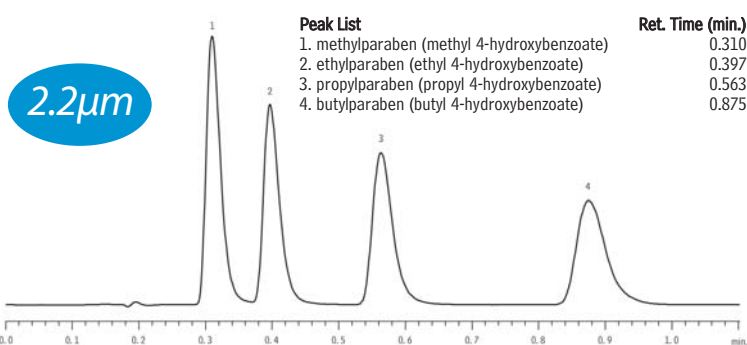
Ultra II™ PFP Propyl Columns (USP L43)

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, and halogenated compounds.

Ultra II™ Silica Columns (USP L3)

High surface area. Type B silica packing.

Parabens on Ultra II™ C18

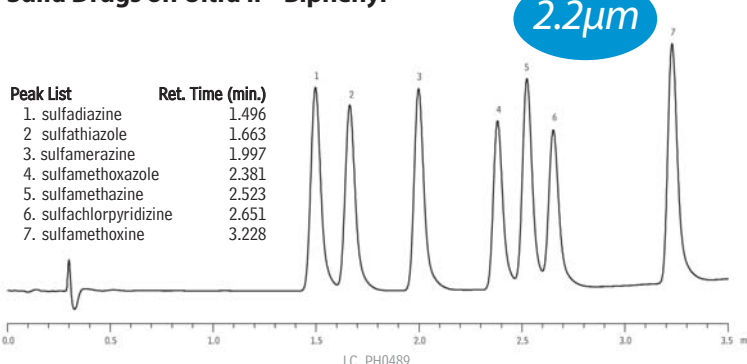


Sample:
Inj.: 1µL
Conc.: 50µg/mL each component
Sample diluent: methanol

Column:
Cat.#: 9604853
Dimensions: 50mm x 3.0mm
Particle size: 2.2µm
Pore size: 100Å

Conditions:
Instrument: Shimadzu Prominence UFLCXR
Mobile phase: 0.1% formic acid in water:methanol (35:65)
Flow: 1.5mL/min.
Temp.: 30°C
Pressure: 630bar
Det.: UV @ 254nm

Sulfa Drugs on Ultra II™ Biphenyl



Sample:
Inj.: 3µL
Conc.: 25µg/mL each component
Sample diluent: methanol

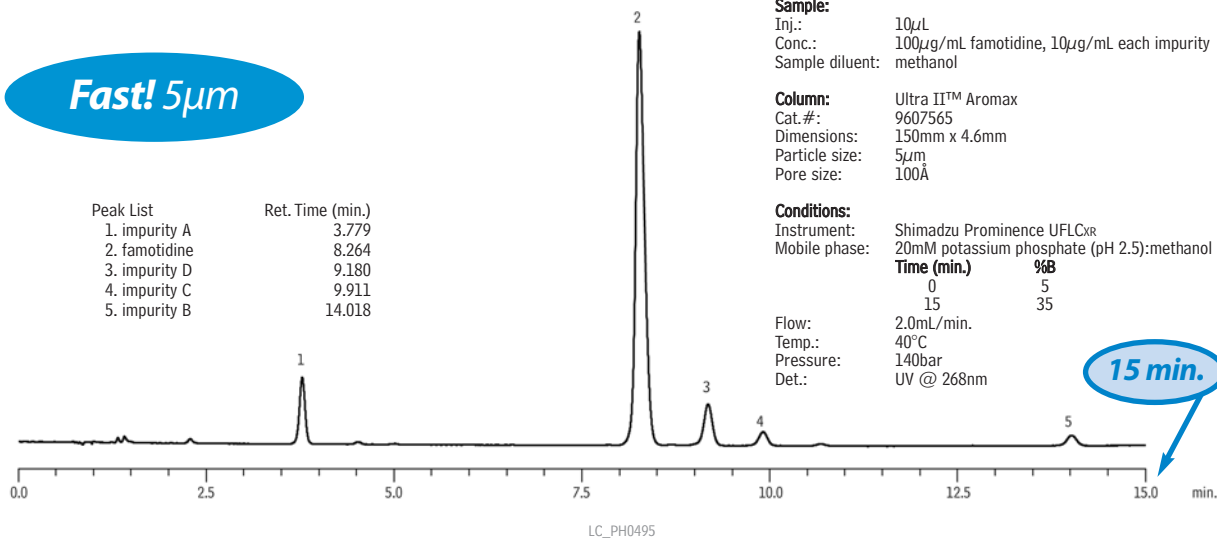
Column:
Cat.#: 9609853
Dimensions: 50mm x 3.0mm
Particle size: 2.2µm
Pore size: 100Å

Conditions:
Instrument: Shimadzu Prominence UFLCXR
Mobile phase: A. 0.1% formic acid in water
B. methanol
Time (min.)
0 25 65
Flow: 1.0mL/min.
Temp.: 30°C
Pressure: 540bar
Det.: UV @ 254nm

Famotidine on Ultra II™ Aromax

Fast! 5μm

| Peak List | Ret. Time (min.) |
|---------------|------------------|
| 1. impurity A | 3.779 |
| 2. famotidine | 8.264 |
| 3. impurity D | 9.180 |
| 4. impurity C | 9.911 |
| 5. impurity B | 14.018 |



Sample:
 Inj.: 10μL
 Conc.: 100μg/mL famotidine, 10μg/mL each impurity
 Sample diluent: methanol

Column: Ultra II™ Aromax
 Cat.#: 9607565
 Dimensions: 150mm x 4.6mm
 Particle size: 5μm
 Pore size: 100Å

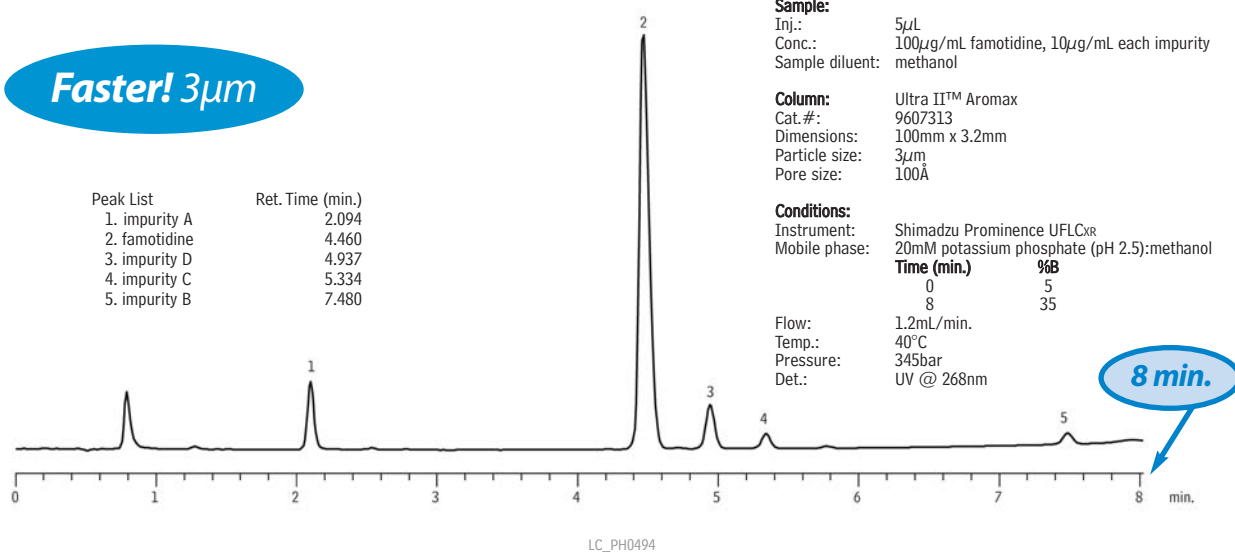
Conditions:
 Instrument: Shimadzu Prominence UFLC_{XR}
 Mobile phase: 20mM potassium phosphate (pH 2.5):methanol

| Time (min.) | %B |
|-------------|----|
| 0 | 5 |
| 15 | 35 |

Flow: 2.0mL/min.
 Temp.: 40°C
 Pressure: 140bar
 Det.: UV @ 268nm

Faster! 3μm

| Peak List | Ret. Time (min.) |
|---------------|------------------|
| 1. impurity A | 2.094 |
| 2. famotidine | 4.460 |
| 3. impurity D | 4.937 |
| 4. impurity C | 5.334 |
| 5. impurity B | 7.480 |



Sample:
 Inj.: 5μL
 Conc.: 100μg/mL famotidine, 10μg/mL each impurity
 Sample diluent: methanol

Column: Ultra II™ Aromax
 Cat.#: 9607313
 Dimensions: 100mm x 3.2mm
 Particle size: 3μm
 Pore size: 100Å

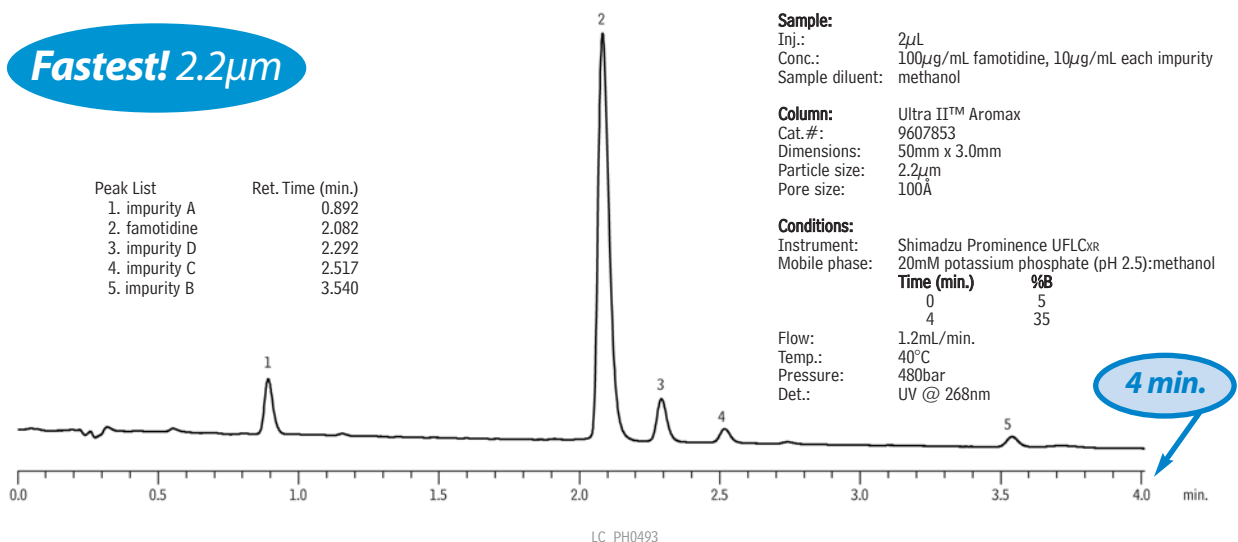
Conditions:
 Instrument: Shimadzu Prominence UFLC_{XR}
 Mobile phase: 20mM potassium phosphate (pH 2.5):methanol

| Time (min.) | %B |
|-------------|----|
| 0 | 5 |
| 8 | 35 |

Flow: 1.2mL/min.
 Temp.: 40°C
 Pressure: 345bar
 Det.: UV @ 268nm

Fastest! 2.2μm

| Peak List | Ret. Time (min.) |
|---------------|------------------|
| 1. impurity A | 0.892 |
| 2. famotidine | 2.082 |
| 3. impurity D | 2.292 |
| 4. impurity C | 2.517 |
| 5. impurity B | 3.540 |



Sample:
 Inj.: 2μL
 Conc.: 100μg/mL famotidine, 10μg/mL each impurity
 Sample diluent: methanol

Column: Ultra II™ Aromax
 Cat.#: 9607853
 Dimensions: 50mm x 3.0mm
 Particle size: 2.2μm
 Pore size: 100Å

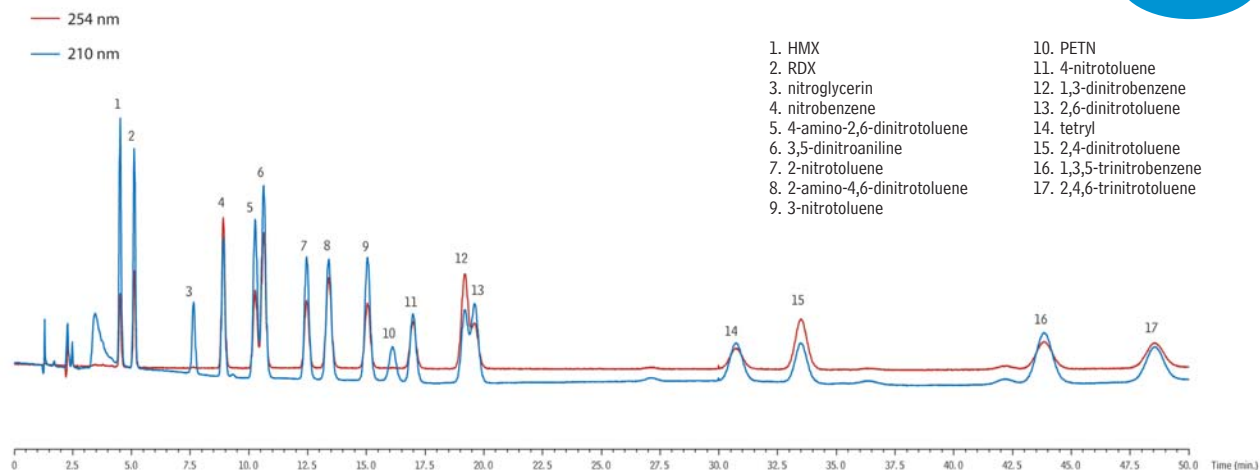
Conditions:
 Instrument: Shimadzu Prominence UFLC_{XR}
 Mobile phase: 20mM potassium phosphate (pH 2.5):methanol

| Time (min.) | %B |
|-------------|----|
| 0 | 5 |
| 4 | 35 |

Flow: 1.2mL/min.
 Temp.: 40°C
 Pressure: 480bar
 Det.: UV @ 268nm

Explosives on Ultra II™ Aromax

5μm



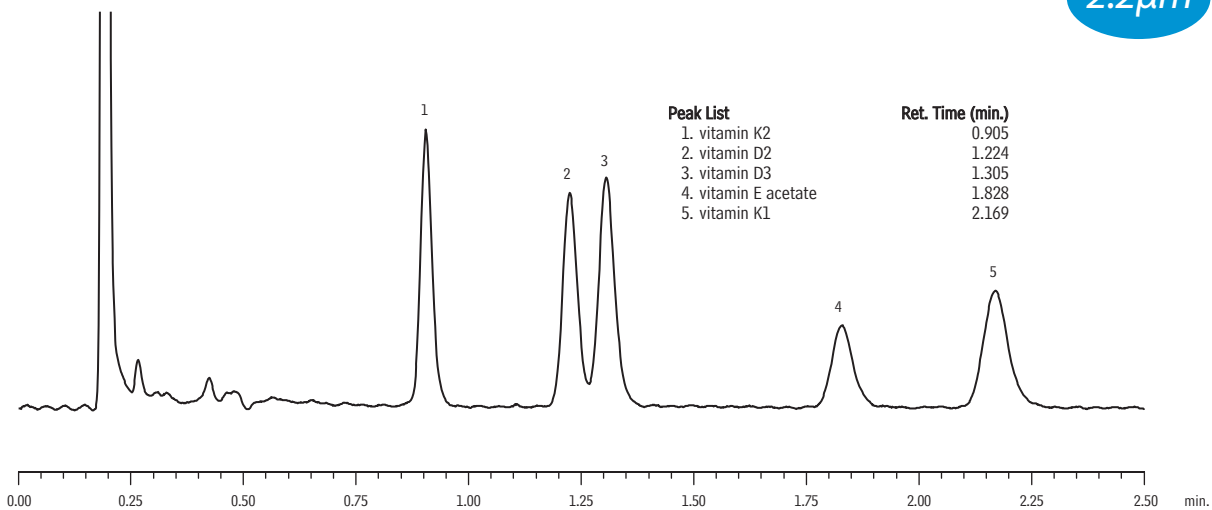
LC_EV0484

Sample: Nitroaromatics and Nitramine Explosives by HPLC, EPA 8330B (cat.# 33204)
Inj.: 10μL
Conc.: 10μg/mL each component
Sample diluent: methanol
Column: Ultra II™ Aromax
Cat.#: 9607575
Dimensions: 250mm x 4.6mm
Particle size: 5μm
Pore size: 100Å

Conditions:
Instrument: Shimadzu Prominence
Mobile phase: water:methanol, 35:65 (v/v)
Flow: 1.2mL/min.
Temp.: 30°C
Pressure: 170bar
Det.: UV @ 254nm and 210nm

Fat Soluble Vitamins on Ultra II™ C18

2.2μm



LC_PH0492

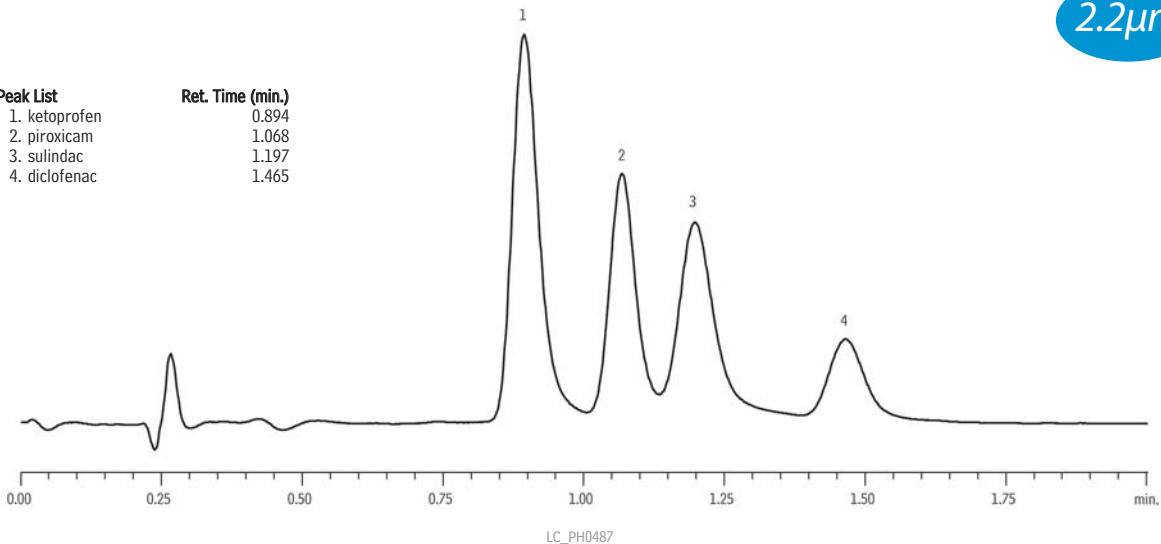
Sample:
Inj.: 1μL
Conc.: 100μg/mL each component
Sample diluent: acetone
Column: Ultra II™ C18
Cat.#: 9604853
Dimensions: 50mm x 3.0mm
Particle size: 2.2μm
Pore size: 100Å

Conditions:
Instrument: Shimadzu Prominence UFLCxr
Mobile phase: acetonitrile:methanol (85:15)
Flow: 1.5mL/min.
Temp.: ambient
Pressure: 280bar
Det.: UV @ 230nm

NSAIDs on Ultra II™ Biphenyl

2.2μm

| Peak List | Ret. Time (min.) |
|---------------|------------------|
| 1. ketoprofen | 0.894 |
| 2. piroxicam | 1.068 |
| 3. sulindac | 1.197 |
| 4. diclofenac | 1.465 |



Sample:
 Inj.: 5μL
 Conc.: 15μg/mL each component
 Sample diluent: methanol

Column: Ultra II™ Biphenyl
 Cat.#: 9609853
 Dimensions: 50mm x 3.0mm
 Particle size: 2.2μm
 Pore size: 100Å

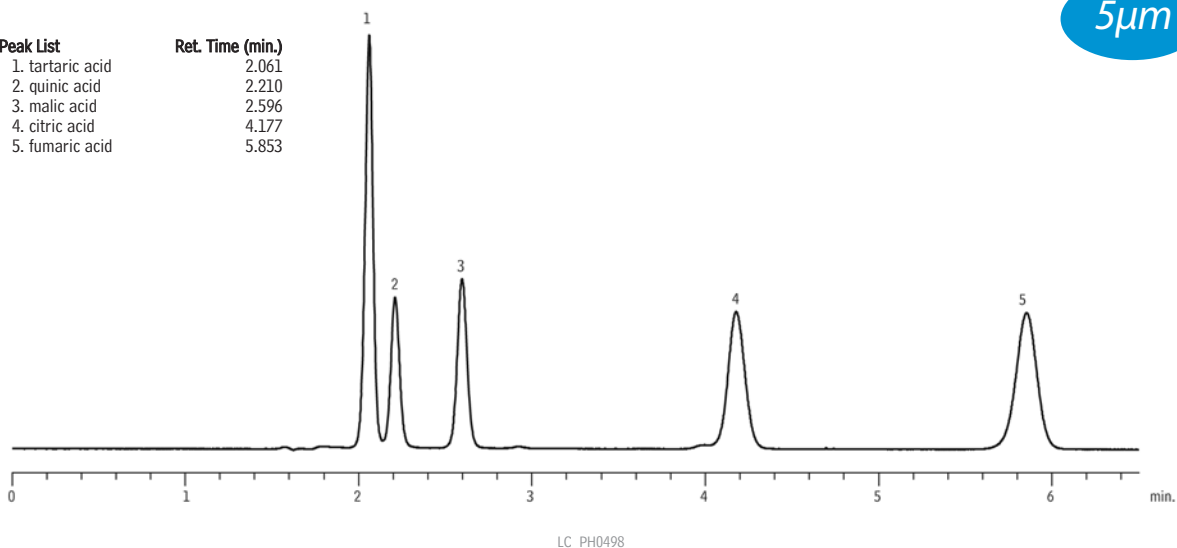
Conditions:
 Instrument: Shimadzu Prominence UFLCxr
 Mobile phase: 20mM potassium phosphate, pH 2.5: methanol (30:70)

Flow: 1.2mL/min.
Temp.: 40°C
Pressure: 460bar
Det.: UV @ 254nm

Organic Acids on Ultra II™ Aqueous C18

5μm

| Peak List | Ret. Time (min.) |
|------------------|------------------|
| 1. tartaric acid | 2.061 |
| 2. quinic acid | 2.210 |
| 3. malic acid | 2.596 |
| 4. citric acid | 4.177 |
| 5. fumaric acid | 5.853 |



Sample:
 Inj.: 5μL
 Conc.: 10μg/mL fumaric acid, 2,000μg/mL each other acids
 Sample diluent: water

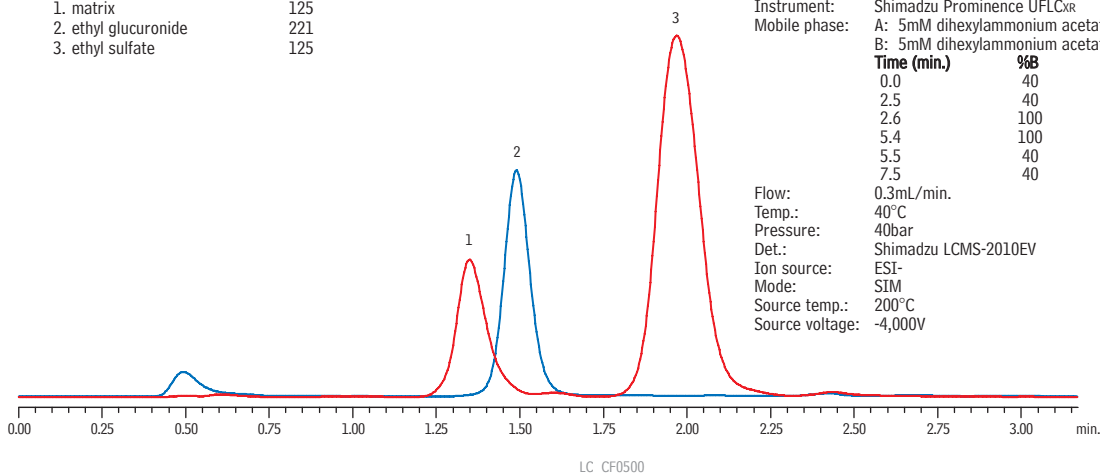
Column: Ultra II™ Aqueous C18
 Cat.#: 9608565
 Dimensions: 150mm x 4.6mm
 Particle size: 5μm
 Pore size: 100Å

Conditions:
 Instrument: Shimadzu Prominence UFLCxr
 Mobile phase: 100% 20mM potassium phosphate (pH 2.5)
 Flow: 1.0mL/min.
 Temp.: 30°C
 Pressure: 80bar
 Det.: UV @ 226nm

Alcohol Metabolites on Ultra II™ Biphenyl

5µm

| Peak List | m/z |
|----------------------|-----|
| 1. matrix | 125 |
| 2. ethyl glucuronide | 221 |
| 3. ethyl sulfate | 125 |



Sample:
 Inj.: 5µL
 Conc.: 5µg/mL each component
 Sample diluent: urine diluted 1:10 with mobile phase

Column: Ultra II™ Biphenyl
 Cat.#: 9609552
 Dimensions: 50mm x 2.1mm
 Particle size: 5µm
 Pore size: 100Å

Conditions:
 Instrument: Shimadzu Prominence UFLCXR
 Mobile phase: A: 5mM dihexylammonium acetate in water
 B: 5mM dihexylammonium acetate in methanol

| Time (min.) | %B |
|-------------|-----|
| 0.0 | 40 |
| 2.5 | 40 |
| 2.6 | 100 |
| 5.4 | 100 |
| 5.5 | 40 |
| 7.5 | 40 |

Flow: 0.3mL/min.
 Temp.: 40°C
 Pressure: 40bar
 Det.: Shimadzu LCMS-2010EV
 Ion source: ESI-
 Mode: SIM
 Source temp.: 200°C
 Source voltage: -4,000V

Cannabinoids on Ultra II™ Biphenyl

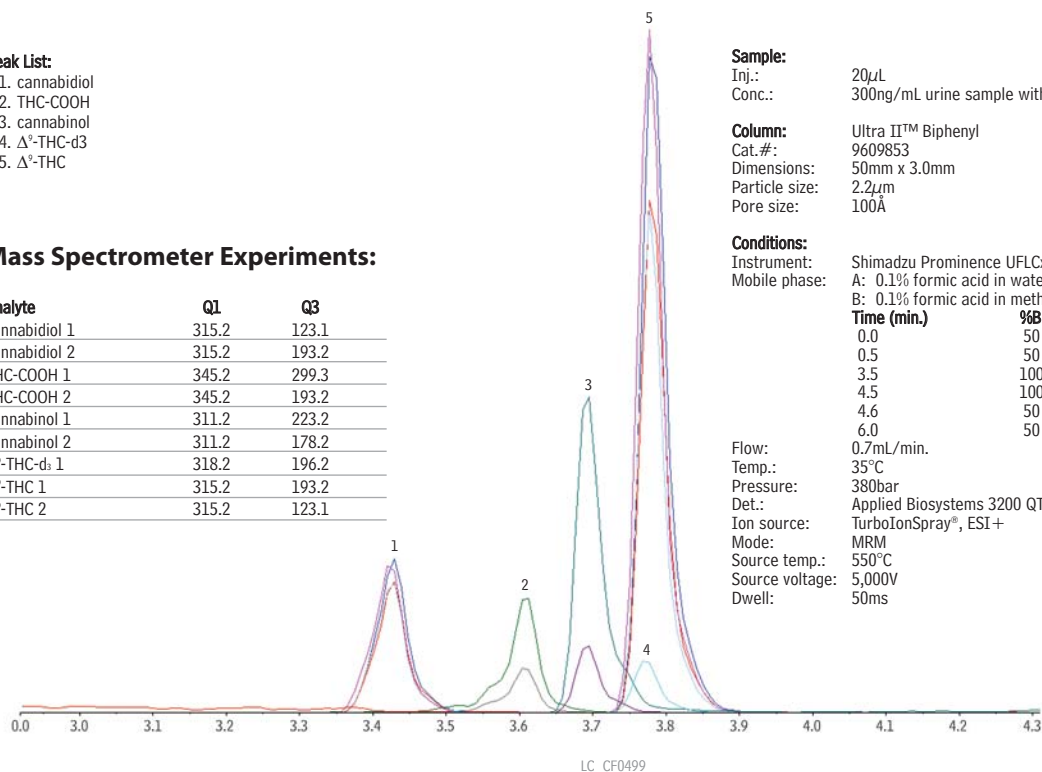
2.2µm

Peak List:

1. cannabidiol
2. THC-COOH
3. cannabinol
4. Δ⁹-THC-d3
5. Δ⁹-THC

Mass Spectrometer Experiments:

| Analyte | Q1 | Q3 |
|--------------------------------------|-------|-------|
| cannabidiol 1 | 315.2 | 123.1 |
| cannabidiol 2 | 315.2 | 193.2 |
| THC-COOH 1 | 345.2 | 299.3 |
| THC-COOH 2 | 345.2 | 193.2 |
| cannabinol 1 | 311.2 | 223.2 |
| cannabinol 2 | 311.2 | 178.2 |
| Δ ⁹ -THC-d ₃ 1 | 318.2 | 196.2 |
| Δ ⁹ -THC 1 | 315.2 | 193.2 |
| Δ ⁹ -THC 2 | 315.2 | 123.1 |



Sample:
 Inj.: 20µL
 Conc.: 300ng/mL urine sample with 50ng/mL internal standard

Column: Ultra II™ Biphenyl
 Cat.#: 9609853
 Dimensions: 50mm x 3.0mm
 Particle size: 2.2µm
 Pore size: 100Å

Conditions:
 Instrument: Shimadzu Prominence UFLCXR
 Mobile phase: A: 0.1% formic acid in water
 B: 0.1% formic acid in methanol

| Time (min.) | %B |
|-------------|-----|
| 0.0 | 50 |
| 0.5 | 50 |
| 3.5 | 100 |
| 4.5 | 100 |
| 4.6 | 50 |
| 6.0 | 50 |

Flow: 0.7mL/min.
 Temp.: 35°C
 Pressure: 380bar
 Det.: Applied Biosystems 3200 QTRAP™ LC/MS/MS system
 Ion source: TurboIonSpray®, ESI+
 Mode: MRM
 Source temp.: 550°C
 Source voltage: 5,000V
 Dwell: 50ms

Ultra II™ Silica Columns (USP L3)

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 0%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

| 1.9µm Column, 2.1mm | cat. # |
|---------------------|---------|
| 30mm | 9600232 |
| 50mm | 9600252 |
| 100mm | 9600212 |
| 2.2µm Column, 3.0mm | cat. # |
| 30mm | 9600833 |
| 50mm | 9600853 |
| 100mm | 9600813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9600331 |
| 50mm | 9600351 |
| 100mm | 9600311 |
| 150mm | 9600361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9600332 |
| 50mm | 9600352 |
| 100mm | 9600312 |
| 150mm | 9600362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9600333 |
| 50mm | 9600353 |
| 100mm | 9600313 |
| 150mm | 9600363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9600335 |
| 50mm | 9600355 |
| 100mm | 9600315 |
| 150mm | 9600365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9600531 |
| 50mm | 9600551 |
| 100mm | 9600511 |
| 150mm | 9600561 |
| 200mm | 9600521 |
| 250mm | 9600571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9600532 |
| 50mm | 9600552 |
| 100mm | 9600512 |
| 150mm | 9600562 |
| 200mm | 9600522 |
| 250mm | 9600572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9600533 |
| 50mm | 9600553 |
| 100mm | 9600513 |
| 150mm | 9600563 |
| 200mm | 9600523 |
| 250mm | 9600573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9600535 |
| 50mm | 9600555 |
| 100mm | 9600515 |
| 150mm | 9600565 |
| 200mm | 9600525 |
| 250mm | 9600575 |

Ultra II™ Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9609833 |
| 50mm | 9609853 |
| 100mm | 9609813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9609331 |
| 50mm | 9609351 |
| 100mm | 9609311 |
| 150mm | 9609361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9609332 |
| 50mm | 9609352 |
| 100mm | 9609312 |
| 150mm | 9609362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9609333 |
| 50mm | 9609353 |
| 100mm | 9609313 |
| 150mm | 9609363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9609335 |
| 50mm | 9609355 |
| 100mm | 9609315 |
| 150mm | 9609365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9609531 |
| 50mm | 9609551 |
| 100mm | 9609511 |
| 150mm | 9609561 |
| 200mm | 9609521 |
| 250mm | 9609571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9609532 |
| 50mm | 9609552 |
| 100mm | 9609512 |
| 150mm | 9609562 |
| 200mm | 9609522 |
| 250mm | 9609572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9609533 |
| 50mm | 9609553 |
| 100mm | 9609513 |
| 150mm | 9609563 |
| 200mm | 9609523 |
| 250mm | 9609573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9609535 |
| 50mm | 9609555 |
| 100mm | 9609515 |
| 150mm | 9609565 |
| 200mm | 9609525 |
| 250mm | 9609575 |

1.9µm coming soon!

Ultra II™ Aromax Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 3µm Column, 1.0mm | cat. # |
|-------------------|---------|
| 30mm | 9607331 |
| 50mm | 9607351 |
| 100mm | 9607311 |
| 150mm | 9607361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9607332 |
| 50mm | 9607352 |
| 100mm | 9607312 |
| 150mm | 9607362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9607333 |
| 50mm | 9607353 |
| 100mm | 9607313 |
| 150mm | 9607363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9607335 |
| 50mm | 9607355 |
| 100mm | 9607315 |
| 150mm | 9607365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9607531 |
| 50mm | 9607551 |
| 100mm | 9607511 |
| 150mm | 9607561 |
| 200mm | 9607521 |
| 250mm | 9607571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9607532 |
| 50mm | 9607552 |
| 100mm | 9607512 |
| 150mm | 9607562 |
| 200mm | 9607522 |
| 250mm | 9607572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9607533 |
| 50mm | 9607553 |
| 100mm | 9607513 |
| 150mm | 9607563 |
| 200mm | 9607523 |
| 250mm | 9607573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9607535 |
| 50mm | 9607555 |
| 100mm | 9607515 |
| 150mm | 9607565 |
| 200mm | 9607525 |
| 250mm | 9607575 |

1.9µm & 2.2µm coming soon!

ordering note

Guard cartridges are available, visit our website at www.restek.com for ordering information.

Visit us at www.restek.com/ultra2 for our most complete listing of Ultra II™ columns.

Ultra II™ C18 Columns (USP L1)

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 19%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 1.9µm Column, 2.1mm | cat. # |
|---------------------|---------|
| 30mm | 9604232 |
| 50mm | 9604252 |
| 100mm | 9604212 |
| 2.2µm Column, 3.0mm | cat. # |
| 30mm | 9604833 |
| 50mm | 9604853 |
| 100mm | 9604813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9604331 |
| 50mm | 9604351 |
| 100mm | 9604311 |
| 150mm | 9604361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9604332 |
| 50mm | 9604352 |
| 100mm | 9604312 |
| 150mm | 9604362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9604333 |
| 50mm | 9604353 |
| 100mm | 9604313 |
| 150mm | 9604363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9604335 |
| 50mm | 9604355 |
| 100mm | 9604315 |
| 150mm | 9604365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9604531 |
| 50mm | 9604551 |
| 100mm | 9604511 |
| 150mm | 9604561 |
| 200mm | 9604521 |
| 250mm | 9604571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9604532 |
| 50mm | 9604552 |
| 100mm | 9604512 |
| 150mm | 9604562 |
| 200mm | 9604522 |
| 250mm | 9604572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9604533 |
| 50mm | 9604553 |
| 100mm | 9604513 |
| 150mm | 9604563 |
| 200mm | 9604523 |
| 250mm | 9604573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9604535 |
| 50mm | 9604555 |
| 100mm | 9604515 |
| 150mm | 9604565 |
| 200mm | 9604525 |
| 250mm | 9604575 |

Ultra II™ Aqueous C18 Columns (USP L1)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9608833 |
| 50mm | 9608853 |
| 100mm | 9608813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9608331 |
| 50mm | 9608351 |
| 100mm | 9608311 |
| 150mm | 9608361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9608332 |
| 50mm | 9608352 |
| 100mm | 9608312 |
| 150mm | 9608362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9608333 |
| 50mm | 9608353 |
| 100mm | 9608313 |
| 150mm | 9608363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9608335 |
| 50mm | 9608355 |
| 100mm | 9608315 |
| 150mm | 9608365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9608531 |
| 50mm | 9608551 |
| 100mm | 9608511 |
| 150mm | 9608561 |
| 200mm | 9608521 |
| 250mm | 9608571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9608532 |
| 50mm | 9608552 |
| 100mm | 9608512 |
| 150mm | 9608562 |
| 200mm | 9608522 |
| 250mm | 9608572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9608533 |
| 50mm | 9608553 |
| 100mm | 9608513 |
| 150mm | 9608563 |
| 200mm | 9608523 |
| 250mm | 9608573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9608535 |
| 50mm | 9608555 |
| 100mm | 9608515 |
| 150mm | 9608565 |
| 200mm | 9608525 |
| 250mm | 9608575 |

1.9µm coming soon!

PATENTS & TRADEMARKS

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Ultra II™ PFP Propyl Columns (USP L43)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 11%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9606833 |
| 50mm | 9606853 |
| 100mm | 9606813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9606331 |
| 50mm | 9606351 |
| 100mm | 9606311 |
| 150mm | 9606361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9606332 |
| 50mm | 9606352 |
| 100mm | 9606312 |
| 150mm | 9606362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9606333 |
| 50mm | 9606353 |
| 100mm | 9606313 |
| 150mm | 9606363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9606335 |
| 50mm | 9606355 |
| 100mm | 9606315 |
| 150mm | 9606365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9606531 |
| 50mm | 9606551 |
| 100mm | 9606511 |
| 150mm | 9606561 |
| 200mm | 9606521 |
| 250mm | 9606571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9606532 |
| 50mm | 9606552 |
| 100mm | 9606512 |
| 150mm | 9606562 |
| 200mm | 9606522 |
| 250mm | 9606572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9606533 |
| 50mm | 9606553 |
| 100mm | 9606513 |
| 150mm | 9606563 |
| 200mm | 9606523 |
| 250mm | 9606573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9606535 |
| 50mm | 9606555 |
| 100mm | 9606515 |
| 150mm | 9606565 |
| 200mm | 9606525 |
| 250mm | 9606575 |

1.9µm coming soon!



Lit. Cat.# GNTS1177-INT

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Biphenyl

Leading Resolution in LC



Ultra II[®]
LC Columns

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ECH Pty Ltd
AUSTRALIAN Distributors www.chromtech.net.au

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Chromatography Products

www.restek.com

Website : www.chromtech.net.au E-mail : info@chromtech.net.au TeNo : 03 9762 2034 . . . in AUSTRALIA

Ultra II® Biphenyl Columns

Greater Versatility—Increased Method Performance



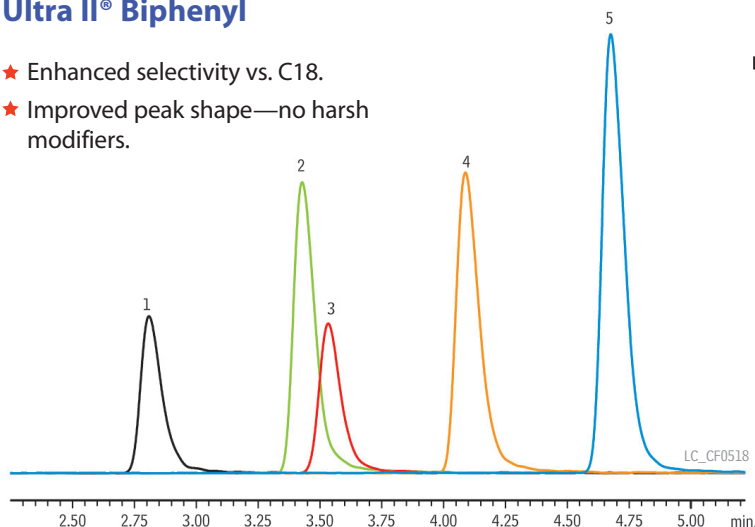
- Resolve a wider range of compound chemistries compared to a C18 or phenyl column.
- Easy separations with methanolic mobile phases—no acetonitrile needed.
- Perfect for drugs of abuse, pharmaceuticals, metabolites and more.
- Enhanced and alternate selectivity—ideal for method development and column switching.

Biphenyl columns are unique as they combine the performance of a traditional alkyl phase (C8 or C18) with that of a phenyl phase, providing unmatched versatility for method developers. Extensive research went into creating this new phase, which offers excellent retention for both polar and nonpolar compounds. The bonding of two phenyl groups end-to-end is what makes Biphenyl columns unique in structure and truly unparalleled in performance. Rather than using a straight chain hexyl linker, the Biphenyl phase incorporates an aryl linker, making it more hydrophobic than conventional phenyls. The overall result is a phase that offers the highest degree of aromatic selectivity and hydrophobic retention of any phenyl phase. Maximize method development success with versatile Biphenyl columns—**no other phase can provide both C18- and phenyl-like performance in a single column.**

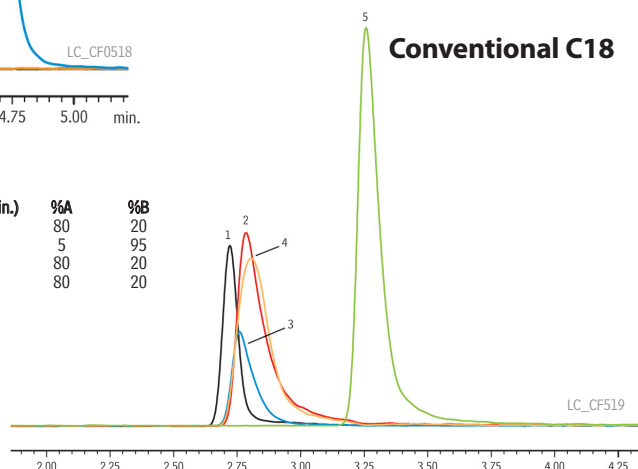
Amphetamines (LC/MS ESI+)

Ultra II® Biphenyl

- ★ Enhanced selectivity vs. C18.
- ★ Improved peak shape—no harsh modifiers.



Conventional C18



Columns Ultra II® Biphenyl (cat.# 9609552)
Conventional C18
Dimensions: 50 mm x 2.1 mm ID
Particle Size: 5 µm
Pore Size: 100 Å
Temp.: 30 °C
Sample
Diluent: mobile phase
Conc.: 2 µg/mL
Inj. Vol.: 5 µL
Mobile Phase

| Time (min.) | Flow (mL/min.) | %A | %B |
|-------------|----------------|----|----|
| 0 | 0.3 | 80 | 20 |
| 10 | 0.3 | 5 | 95 |
| 10.1 | 0.3 | 80 | 20 |
| 12.0 | 0.3 | 80 | 20 |

A: 0.1% formic acid in water
B: 0.1% formic acid in **methanol**

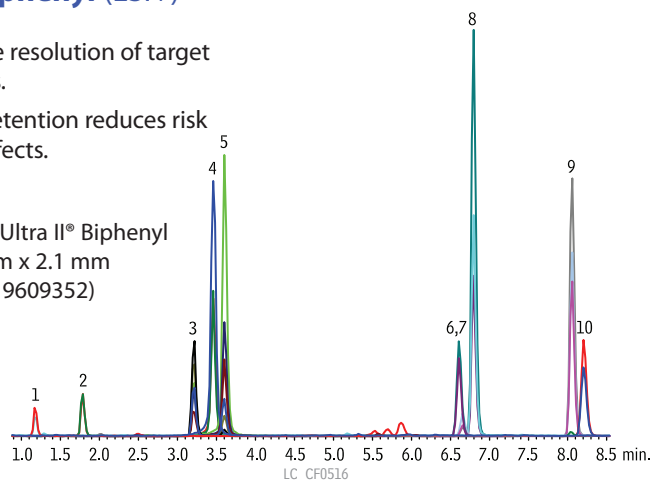


Pain Management Drugs in Urine

Ultra II® Biphenyl (ESI+)

- ★ Fast, reliable resolution of target compounds.
- ★ Improved retention reduces risk of matrix effects.

3 µm Ultra II® Biphenyl
50 mm x 2.1 mm
(cat.# 9609352)



Sample

Conc.: 50 ng/mL, diluted 10x in mobile phase

Inj. Vol.: 5 µL

Mobile Phase

A: 0.1% formic acid in water
B: 0.1% formic acid in methanol

Detector

Acknowledgement

Applied Biosystems/MDS Sciex LC/MS/MS, Model# API 5000™
Special thanks to Applied Biosystems for providing instrument time.

| Time (min.) | Flow (mL/min.) | %A | %B |
|-------------|----------------|----|-----|
| 0 | 0.5 | 90 | 10 |
| 10 | 0.5 | 0 | 100 |
| 10.1 | 0.5 | 90 | 10 |
| 12 | 0.5 | 90 | 10 |

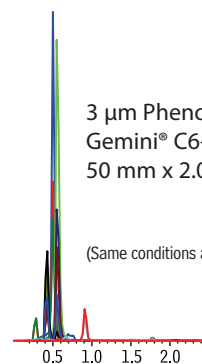
Peaks

- | | |
|------------------|------------------|
| 1. Acetaminophen | 6. Fentanyl |
| 2. Morphine | 7. Buprenorphine |
| 3. Codeine | 8. Lorazepam |
| 4. Oxycodone | 9. Diazepam |
| 5. Hydrocodone | 10. Methadone |

Phenomenex® Gemini® C6-Phenyl

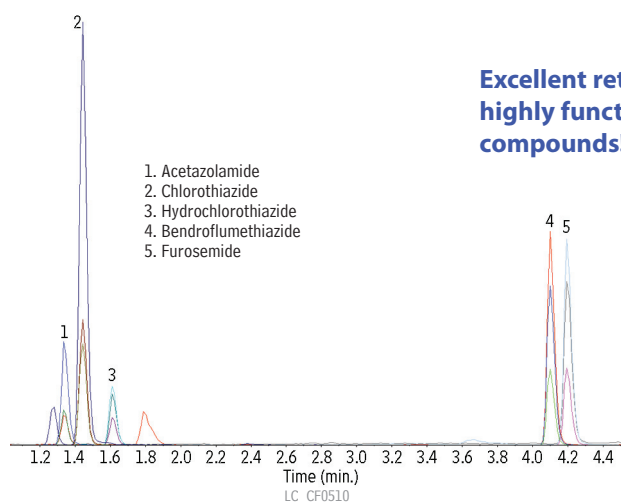
- Poor retention, inadequate resolution from matrix.
- Isobaric interferences prevent quantification.

3 µm Phenomenex®
Gemini® C6-Phenyl
50 mm x 2.0 mm



Diuretics

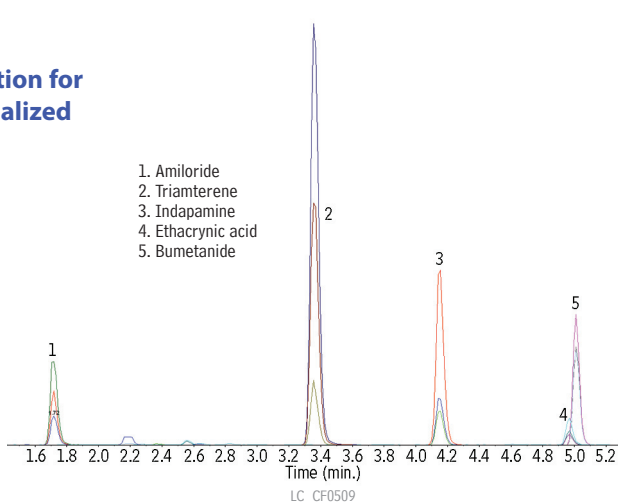
Ultra II® Biphenyl (ESI-)



1. Acetazolamide
2. Chlorothiazide
3. Hydrochlorothiazide
4. Bendroflumethiazide
5. Furosemide

Excellent retention for highly functionalized compounds!

Ultra II® Biphenyl (ESI+)



1. Amiloride
2. Triamterene
3. Indapamine
4. Ethacrynic acid
5. Bumetanide

Column

Ultra II® Biphenyl (cat.# 9609352)
Dimensions: 50 mm x 2.1 mm ID
Particle Size: 3 µm
Temp.: 40°C

Sample

Conc.: 50 ng/mL, diluted 10x in mobile phase
Inj. Vol.: 5 µL

Mobile Phase

A: 0.1% formic acid in water
B: 0.1% formic acid in methanol

| Time (min.) | Flow (mL/min.) | %A | %B |
|-------------|----------------|----|-----|
| 0 | 0.5 | 90 | 10 |
| 6.00 | 0.5 | 0 | 100 |
| 6.1 | 0.5 | 90 | 10 |
| 8.00 | 0.5 | 90 | 10 |

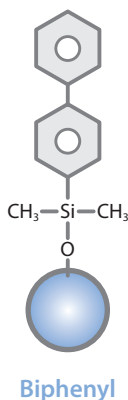
Detector

Acknowledgement

Applied Biosystems/MDS Sciex LC/MS/MS, Model# API 5000™
Special thanks to Applied Biosystems for providing instrument time.

For more information on reducing matrix effects, visit www.restek.com/adv005





Ultra II® Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm, 5µm, or 10µm
pore size: 100Å
carbon load: 15%

endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This is a great alternative to a C18 column when alternative selectivity is desired. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

| Length | 1.0mm ID cat.# | 2.1mm ID cat.# | 3.0mm ID cat.# | 3.2mm ID cat.# | 4.6mm ID cat.# |
|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1.9µm Columns | | | | | |
| 30mm | | 9609232 | 9609233 | | |
| 50mm | | 9609252 | 9609253 | | |
| 100mm | | 9609212 | 9609213 | | |
| 2.2µm Columns | | | | | |
| 30mm | | 9609832 | 9609833 | | |
| 50mm | | 9609852 | 9609853 | | |
| 100mm | | 9609812 | 9609813 | | |
| 3µm Columns | | | | | |
| 30mm | 9609331 | 9609332 | — | 9609333 | 9609335 |
| 50mm | 9609351 | 9609352 | — | 9609353 | 9609355 |
| 100mm | 9609311 | 9609312 | — | 9609313 | 9609315 |
| 150mm | 9609361 | 9609362 | — | 9609363 | 9609365 |
| 5µm Columns | | | | | |
| 30mm | 9609531 | 9609532 | — | 9609533 | 9609535 |
| 50mm | 9609551 | 9609552 | — | 9609553 | 9609555 |
| 100mm | 9609511 | 9609512 | — | 9609513 | 9609515 |
| 150mm | 9609561 | 9609562 | — | 9609563 | 9609565 |
| 200mm | 9609521 | 9609522 | — | 9609523 | 9609525 |
| 250mm | 9609571 | 9609572 | — | 9609573 | 9609575 |

HPLC Prep Columns, 5µm particles

- Easy scale-up from Restek analytical columns.
- 10µm particles also available.

| Dimensions Length x ID | Ultra II Biphenyl cat.# |
|---------------------------|-------------------------------|
| 50 x 10mm | 9609557 |
| 50 x 21.2mm | 9609558 |
| 50 x 30mm | 9609559 |
| 50 x 50mm | 9609550 |
| 100 x 10mm | 9609517 |
| 100 x 21.2mm | 9609518 |
| 100 x 30mm | 9609519 |
| 100 x 50mm | 9609510 |
| 150 x 10mm | 9609567 |
| 150 x 21.2mm | 9609568 |
| 150 x 30mm | 9609569 |
| 150 x 50mm | 9609560 |
| 250 x 10mm | 9609577 |
| 250 x 21.2mm | 9609578 |
| 250 x 30mm | 9609579 |
| 250 x 50mm | 9609570 |

PATENTS & TRADEMARKS

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Ultra II® Prep Column Guard Cartridges

| Dimensions (L x ID) | 5µm | 10µm |
|---------------------|-----------|-----------|
| 10 x 10mm | 960950214 | 960900214 |

Prep Column Guard Cartridge Holders

| Dimensions (L x ID) | qty. | cat.# |
|---------------------|------|-------|
| 10 x 10mm | ea. | 24991 |
| 10 x 21.2mm | ea. | 24992 |



for more information visit
www.restek.com/biphenyl

RESTEK

Lit. Cat.# GNFL1277-INT

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Thames River

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AUSTRALIAN Distributors www.chromtech.net.au

10

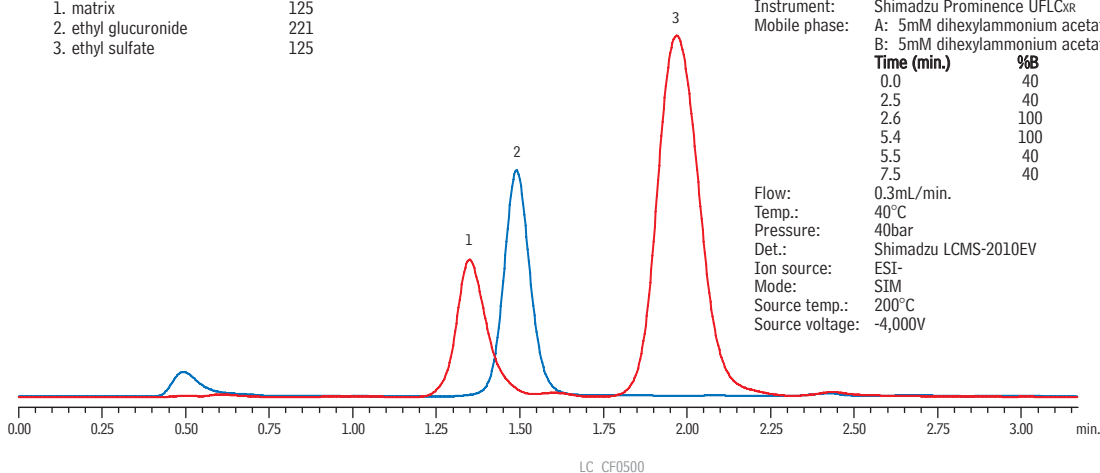
9001:2008
cert.# FM80397

Website : www.chromtech.net.au E-mail : info@chromtech.net.au TeNo : 03 9762 2034 ... in AUSTRALIA

Alcohol Metabolites on Ultra II™ Biphenyl

5µm

| Peak List | m/z |
|----------------------|-----|
| 1. matrix | 125 |
| 2. ethyl glucuronide | 221 |
| 3. ethyl sulfate | 125 |



Sample:
 Inj.: 5µL
 Conc.: 5µg/mL each component
 Sample diluent: urine diluted 1:10 with mobile phase

Column: Ultra II™ Biphenyl
 Cat.#: 9609552
 Dimensions: 50mm x 2.1mm
 Particle size: 5µm
 Pore size: 100Å

Conditions:
 Instrument: Shimadzu Prominence UFLCXR
 Mobile phase: A: 5mM dihexylammonium acetate in water
 B: 5mM dihexylammonium acetate in methanol

| Time (min.) | %B |
|-------------|-----|
| 0.0 | 40 |
| 2.5 | 40 |
| 2.6 | 100 |
| 5.4 | 100 |
| 5.5 | 40 |
| 7.5 | 40 |

Flow: 0.3mL/min.
 Temp.: 40°C
 Pressure: 40bar
 Det.: Shimadzu LCMS-2010EV
 Ion source: ESI-
 Mode: SIM
 Source temp.: 200°C
 Source voltage: -4,000V

Cannabinoids on Ultra II™ Biphenyl

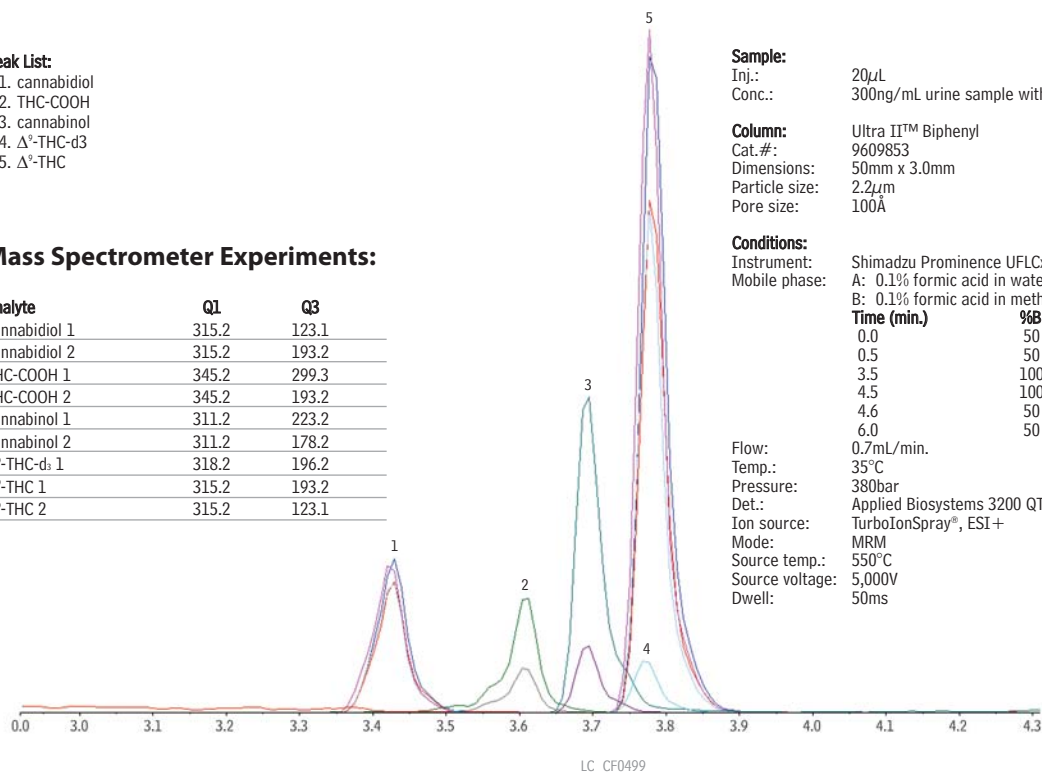
2.2µm

Peak List:

1. cannabidiol
2. THC-COOH
3. cannabinol
4. Δ⁹-THC-d3
5. Δ⁹-THC

Mass Spectrometer Experiments:

| Analyte | Q1 | Q3 |
|--------------------------------------|-------|-------|
| cannabidiol 1 | 315.2 | 123.1 |
| cannabidiol 2 | 315.2 | 193.2 |
| THC-COOH 1 | 345.2 | 299.3 |
| THC-COOH 2 | 345.2 | 193.2 |
| cannabinol 1 | 311.2 | 223.2 |
| cannabinol 2 | 311.2 | 178.2 |
| Δ ⁹ -THC-d ₃ 1 | 318.2 | 196.2 |
| Δ ⁹ -THC 1 | 315.2 | 193.2 |
| Δ ⁹ -THC 2 | 315.2 | 123.1 |



Sample:
 Inj.: 20µL
 Conc.: 300ng/mL urine sample with 50ng/mL internal standard

Column: Ultra II™ Biphenyl
 Cat.#: 9609853
 Dimensions: 50mm x 3.0mm
 Particle size: 2.2µm
 Pore size: 100Å

Conditions:
 Instrument: Shimadzu Prominence UFLCXR
 Mobile phase: A: 0.1% formic acid in water
 B: 0.1% formic acid in methanol

| Time (min.) | %B |
|-------------|-----|
| 0.0 | 50 |
| 0.5 | 50 |
| 3.5 | 100 |
| 4.5 | 100 |
| 4.6 | 50 |
| 6.0 | 50 |

Flow: 0.7mL/min.
 Temp.: 35°C
 Pressure: 380bar
 Det.: Applied Biosystems 3200 QTRAP™ LC/MS/MS system
 Ion source: TurboIonSpray®, ESI+
 Mode: MRM
 Source temp.: 550°C
 Source voltage: 5,000V
 Dwell: 50ms

Ultra II™ Silica Columns (USP L3)

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 0%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

| 1.9µm Column, 2.1mm | cat. # |
|---------------------|---------|
| 30mm | 9600232 |
| 50mm | 9600252 |
| 100mm | 9600212 |
| 2.2µm Column, 3.0mm | cat. # |
| 30mm | 9600833 |
| 50mm | 9600853 |
| 100mm | 9600813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9600331 |
| 50mm | 9600351 |
| 100mm | 9600311 |
| 150mm | 9600361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9600332 |
| 50mm | 9600352 |
| 100mm | 9600312 |
| 150mm | 9600362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9600333 |
| 50mm | 9600353 |
| 100mm | 9600313 |
| 150mm | 9600363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9600335 |
| 50mm | 9600355 |
| 100mm | 9600315 |
| 150mm | 9600365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9600531 |
| 50mm | 9600551 |
| 100mm | 9600511 |
| 150mm | 9600561 |
| 200mm | 9600521 |
| 250mm | 9600571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9600532 |
| 50mm | 9600552 |
| 100mm | 9600512 |
| 150mm | 9600562 |
| 200mm | 9600522 |
| 250mm | 9600572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9600533 |
| 50mm | 9600553 |
| 100mm | 9600513 |
| 150mm | 9600563 |
| 200mm | 9600523 |
| 250mm | 9600573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9600535 |
| 50mm | 9600555 |
| 100mm | 9600515 |
| 150mm | 9600565 |
| 200mm | 9600525 |
| 250mm | 9600575 |

Ultra II™ Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9609833 |
| 50mm | 9609853 |
| 100mm | 9609813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9609331 |
| 50mm | 9609351 |
| 100mm | 9609311 |
| 150mm | 9609361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9609332 |
| 50mm | 9609352 |
| 100mm | 9609312 |
| 150mm | 9609362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9609333 |
| 50mm | 9609353 |
| 100mm | 9609313 |
| 150mm | 9609363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9609335 |
| 50mm | 9609355 |
| 100mm | 9609315 |
| 150mm | 9609365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9609531 |
| 50mm | 9609551 |
| 100mm | 9609511 |
| 150mm | 9609561 |
| 200mm | 9609521 |
| 250mm | 9609571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9609532 |
| 50mm | 9609552 |
| 100mm | 9609512 |
| 150mm | 9609562 |
| 200mm | 9609522 |
| 250mm | 9609572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9609533 |
| 50mm | 9609553 |
| 100mm | 9609513 |
| 150mm | 9609563 |
| 200mm | 9609523 |
| 250mm | 9609573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9609535 |
| 50mm | 9609555 |
| 100mm | 9609515 |
| 150mm | 9609565 |
| 200mm | 9609525 |
| 250mm | 9609575 |

1.9µm coming soon!

Ultra II™ Aromax Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 3µm Column, 1.0mm | cat. # |
|-------------------|---------|
| 30mm | 9607331 |
| 50mm | 9607351 |
| 100mm | 9607311 |
| 150mm | 9607361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9607332 |
| 50mm | 9607352 |
| 100mm | 9607312 |
| 150mm | 9607362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9607333 |
| 50mm | 9607353 |
| 100mm | 9607313 |
| 150mm | 9607363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9607335 |
| 50mm | 9607355 |
| 100mm | 9607315 |
| 150mm | 9607365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9607531 |
| 50mm | 9607551 |
| 100mm | 9607511 |
| 150mm | 9607561 |
| 200mm | 9607521 |
| 250mm | 9607571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9607532 |
| 50mm | 9607552 |
| 100mm | 9607512 |
| 150mm | 9607562 |
| 200mm | 9607522 |
| 250mm | 9607572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9607533 |
| 50mm | 9607553 |
| 100mm | 9607513 |
| 150mm | 9607563 |
| 200mm | 9607523 |
| 250mm | 9607573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9607535 |
| 50mm | 9607555 |
| 100mm | 9607515 |
| 150mm | 9607565 |
| 200mm | 9607525 |
| 250mm | 9607575 |

1.9µm & 2.2µm coming soon!

ordering note

Guard cartridges are available, visit our website at www.restek.com for ordering information.

Visit us at www.restek.com/ultra2 for our most complete listing of Ultra II™ columns.

Ultra II™ C18 Columns (USP L1)

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 19%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 1.9µm Column, 2.1mm | cat. # |
|---------------------|---------|
| 30mm | 9604232 |
| 50mm | 9604252 |
| 100mm | 9604212 |
| 2.2µm Column, 3.0mm | cat. # |
| 30mm | 9604833 |
| 50mm | 9604853 |
| 100mm | 9604813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9604331 |
| 50mm | 9604351 |
| 100mm | 9604311 |
| 150mm | 9604361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9604332 |
| 50mm | 9604352 |
| 100mm | 9604312 |
| 150mm | 9604362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9604333 |
| 50mm | 9604353 |
| 100mm | 9604313 |
| 150mm | 9604363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9604335 |
| 50mm | 9604355 |
| 100mm | 9604315 |
| 150mm | 9604365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9604531 |
| 50mm | 9604551 |
| 100mm | 9604511 |
| 150mm | 9604561 |
| 200mm | 9604521 |
| 250mm | 9604571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9604532 |
| 50mm | 9604552 |
| 100mm | 9604512 |
| 150mm | 9604562 |
| 200mm | 9604522 |
| 250mm | 9604572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9604533 |
| 50mm | 9604553 |
| 100mm | 9604513 |
| 150mm | 9604563 |
| 200mm | 9604523 |
| 250mm | 9604573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9604535 |
| 50mm | 9604555 |
| 100mm | 9604515 |
| 150mm | 9604565 |
| 200mm | 9604525 |
| 250mm | 9604575 |

Ultra II™ Aqueous C18 Columns (USP L1)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9608833 |
| 50mm | 9608853 |
| 100mm | 9608813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9608331 |
| 50mm | 9608351 |
| 100mm | 9608311 |
| 150mm | 9608361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9608332 |
| 50mm | 9608352 |
| 100mm | 9608312 |
| 150mm | 9608362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9608333 |
| 50mm | 9608353 |
| 100mm | 9608313 |
| 150mm | 9608363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9608335 |
| 50mm | 9608355 |
| 100mm | 9608315 |
| 150mm | 9608365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9608531 |
| 50mm | 9608551 |
| 100mm | 9608511 |
| 150mm | 9608561 |
| 200mm | 9608521 |
| 250mm | 9608571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9608532 |
| 50mm | 9608552 |
| 100mm | 9608512 |
| 150mm | 9608562 |
| 200mm | 9608522 |
| 250mm | 9608572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9608533 |
| 50mm | 9608553 |
| 100mm | 9608513 |
| 150mm | 9608563 |
| 200mm | 9608523 |
| 250mm | 9608573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9608535 |
| 50mm | 9608555 |
| 100mm | 9608515 |
| 150mm | 9608565 |
| 200mm | 9608525 |
| 250mm | 9608575 |

1.9µm coming soon!

PATENTS & TRADEMARKS

Restek patents and trademarks are the property of Restek Corporation. Other trademarks appearing in Restek literature or on its website are the property of their respective owners.

Ultra II™ PFP Propyl Columns (USP L43)

Physical Characteristics:

particle size: 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 11%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

| 2.2µm Column, 3.0mm | cat. # |
|---------------------|---------|
| 30mm | 9606833 |
| 50mm | 9606853 |
| 100mm | 9606813 |
| 3µm Column, 1.0mm | cat. # |
| 30mm | 9606331 |
| 50mm | 9606351 |
| 100mm | 9606311 |
| 150mm | 9606361 |
| 3µm Column, 2.1mm | cat. # |
| 30mm | 9606332 |
| 50mm | 9606352 |
| 100mm | 9606312 |
| 150mm | 9606362 |
| 3µm Column, 3.2mm | cat. # |
| 30mm | 9606333 |
| 50mm | 9606353 |
| 100mm | 9606313 |
| 150mm | 9606363 |
| 3µm Column, 4.6mm | cat. # |
| 30mm | 9606335 |
| 50mm | 9606355 |
| 100mm | 9606315 |
| 150mm | 9606365 |
| 5µm Column, 1.0mm | cat. # |
| 30mm | 9606531 |
| 50mm | 9606551 |
| 100mm | 9606511 |
| 150mm | 9606561 |
| 200mm | 9606521 |
| 250mm | 9606571 |
| 5µm Column, 2.1mm | cat. # |
| 30mm | 9606532 |
| 50mm | 9606552 |
| 100mm | 9606512 |
| 150mm | 9606562 |
| 200mm | 9606522 |
| 250mm | 9606572 |
| 5µm Column, 3.2mm | cat. # |
| 30mm | 9606533 |
| 50mm | 9606553 |
| 100mm | 9606513 |
| 150mm | 9606563 |
| 200mm | 9606523 |
| 250mm | 9606573 |
| 5µm Column, 4.6mm | cat. # |
| 30mm | 9606535 |
| 50mm | 9606555 |
| 100mm | 9606515 |
| 150mm | 9606565 |
| 200mm | 9606525 |
| 250mm | 9606575 |

1.9µm coming soon!



Lit. Cat.# GNTS1177-INT

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Restek pHidelity™ C18

pH-Stable HPLC Columns

- Stable up to pH 12 – superior chromatography for basic compounds.
- Patented barrier technology protects silica particles.
- True C18 selectivity, for simpler and more reproducible analyses.



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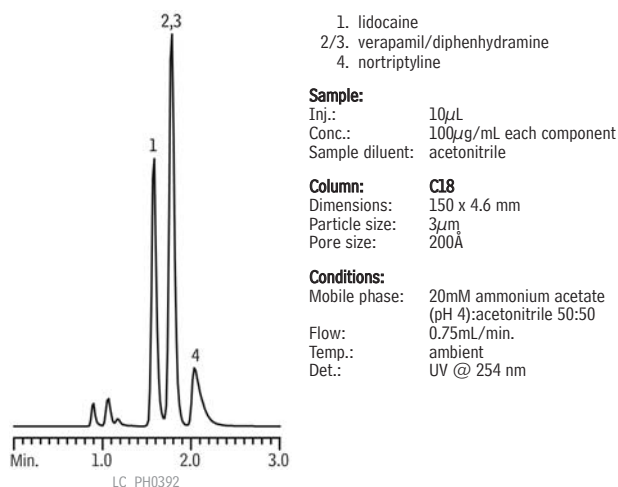
www.restek.com 800-356-1688 • 814-353-1300

Restek pHidelity™ C18 pH Stable HPLC Columns

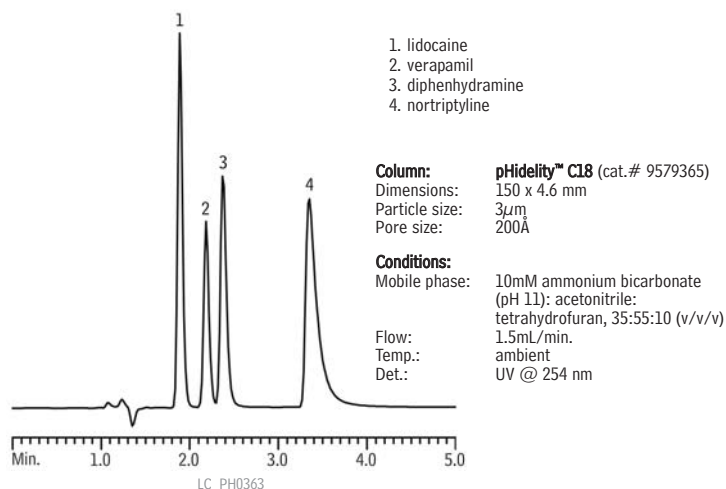
We are pleased to introduce pHidelity™ pH-stable HPLC columns, designed for analyses that require, or benefit from, extreme pH conditions. pHidelity™ columns incorporate a proprietary barrier layer that protects the base silica particle, and a secondary layer that provides the functional stationary phase ligand. pHidelity™ columns can be used routinely up to pH 12 – a significant improvement over the typical pH 2.5 to 7.5 range for silica-based materials. pHidelity™ columns give you more control over analyte retention and resolution; mobile phase pH can be increased to enhance retention of basic analytes – without sacrificing column lifetime.

Using a high pH mobile phase is an easy way to improve peak retention, resolution, and symmetry in a test mix of compounds varying in pKa values.

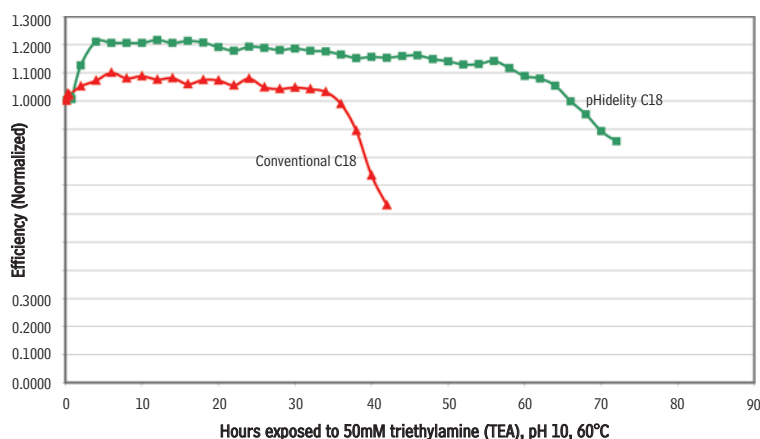
A) Poor separation of bases under typical conditions on a conventional C18 column at pH 4



B) Complete separation of bases on a pHidelity™ column at pH 11



pHidelity™ C18 columns - exceptional performance under accelerated high pH stability testing conditions.



pHidelity™ C18 Columns

Physical Characteristics:

particle size: 3 µm
pore size: 200 Å

pH range: 1 to 12
temperature limit: 80°C

3 µm Column, 4.6mm

| | cat. # |
|-------------------------------------|-------------|
| 30mm | 9579335 |
| 50mm | 9579355 |
| 100mm | 9579315 |
| 150mm | 9579365 |
| 30mm (with Trident™ Inlet Fitting) | 9579335-700 |
| 50mm (with Trident™ Inlet Fitting) | 9579355-700 |
| 100mm (with Trident™ Inlet Fitting) | 9579315-700 |
| 150mm (with Trident™ Inlet Fitting) | 9579365-700 |

pHidelity™ C18 Guard Cartridges

| | qty. | cat. # |
|------------|-------|-----------|
| 10 x 4.0mm | 3-pk. | 957930210 |
| 20 x 4.0mm | 2-pk. | 957930220 |

Restek Trademarks:
pHidelity, Trident, Restek logo.



Lit. Cat.# 580145

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Ultra II™ LC Columns

The Column Line Designed for Optimal Chromatography
on **Any LC System**, Based on Highly Inert Restek Silica

Available Phases:

- C18
- Biphenyl
- Aromax
- Silica
- PFP Propyl
- Aqueous C18

Available Particle Sizes:

- 1.9µm for UHPLC
- 2.2µm for UFLC and RRLC
- 3µm and 5µm for HPLC

**More phases
coming soon!**



Chromatography Products

www.restek.com

New! 1.9 μ m Pinnacle™ DB C18

Small Particle HPLC Columns

- Pinnacle™ DB HPLC columns now available in a <2 μ m particle size!
- High quality, Restek manufactured silica and bonded phases.
- Optimize your ultra high pressure separations.
- Additional phases available—please inquire.



Chromatography Products

www.restek.com 800-356-1688 • 814-353-1300

1.9µm Pinnacle™ DB C18 HPLC Columns

Restek's popular Pinnacle™ DB HPLC columns are now 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 C18 HPLC Columns

Physical Characteristics:

| | |
|----------------------|-------------------------|
| particle size: 1.9µm | endcap: yes |
| pore size: 140Å | pH range: 2.5 - 10 |
| carbon load: 11% | temperature limit: 80°C |

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding.

| Length | 2.1mm ID cat.# |
|----------------------|-------------------|
| 1.9µm Columns | |
| 30mm | 9414232 |
| 50mm | 9414252 |
| 100mm | 9414212 |

also available

Pinnacle™ DB C18 Columns also are available in 3µm and 5µm particle sizes.

Pinnacle™ DB C18 Columns (USP L1)

| Length | 2.1mm ID cat.# |
|--------------------|-------------------|
| 3µm Columns | |
| 30mm | 9414332 |
| 50mm | 9414352 |
| 100mm | 9414312 |
| 5µm Columns | |
| 30mm | 9414532 |
| 50mm | 9414552 |
| 100mm | 9414512 |

Figure 1—Pinnacle™ DB silica particle size distribution chart shows an exceptionally tight, symmetrical distribution around 1.9µm with no <1µm particles.

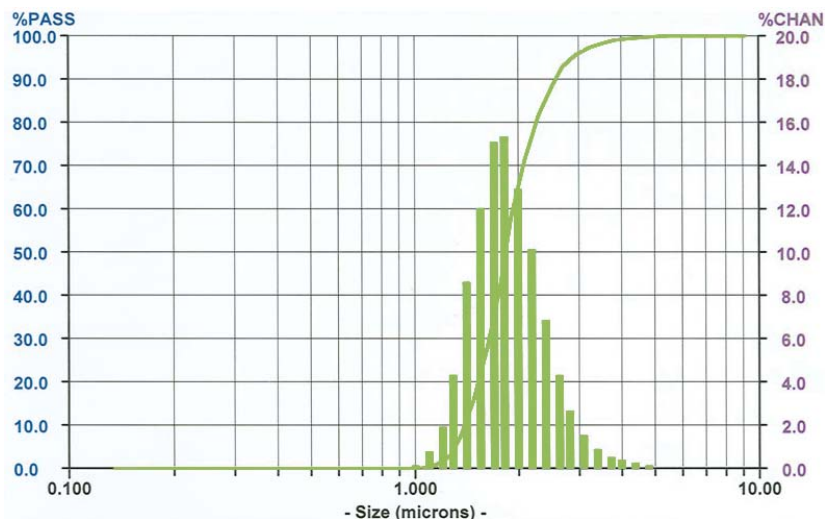


Figure 2—Excellent peak symmetry and efficiency on a 1.9µm Pinnacle™ DB C18 column, using a reversed phase test mix.

Peak List:

| | |
|----------------|------------|
| 1. uracil | 3.00 mg/mL |
| 2. benzene | 0.02 mg/mL |
| 3. naphthalene | 0.50 mg/mL |
| 4. biphenyl | 0.06 mg/mL |

Sample:

| | |
|-----------------|------------------------|
| Inj.: | 2µL |
| Sample diluent: | water:methanol (25:75) |
| Sample temp.: | ambient |

Column:

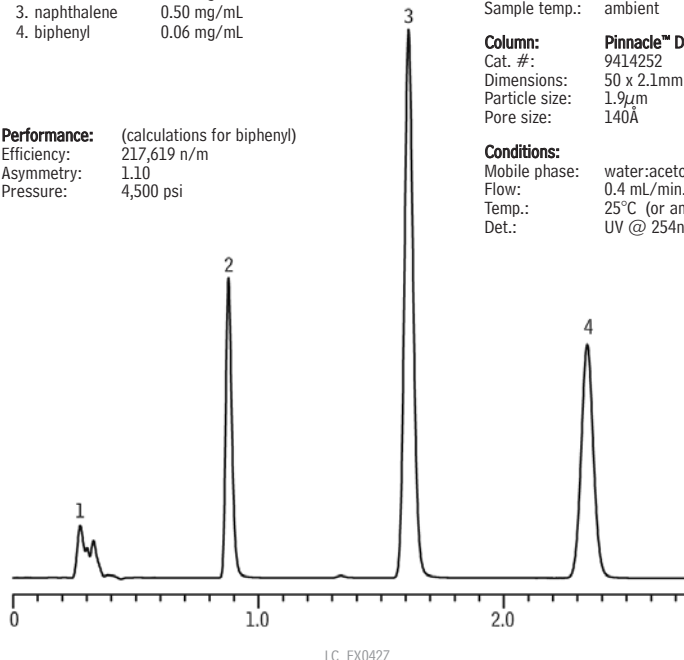
| | |
|----------------|-----------------------------|
| Cat. #: | Pinnacle™ DB C18 9414252 |
| Dimensions: | 50 x 2.1mm |
| Particle size: | 1.9µm |
| Pore size: | 140Å |

Performance:

| | |
|-------------|-----------------------------|
| | (calculations for biphenyl) |
| Efficiency: | 217,619 n/m |
| Asymmetry: | 1.10 |
| Pressure: | 4,500 psi |

Conditions:

| | |
|---------------|----------------------------|
| Mobile phase: | water:acetonitrile (45:55) |
| Flow: | 0.4 mL/min. |
| Temp.: | 25°C (or ambient) |
| Det.: | UV @ 254nm |



Restek Trademarks: Pinnacle, Restek logo.

Available from: LECO Australia Pty Ltd - Ph: 61 2 9894 5955 - Fx: 61 2 9894 5247 - Email: australia@leco.com



Lit. Cat.# 580147

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Rxi™-1ms Fused Silica Columns

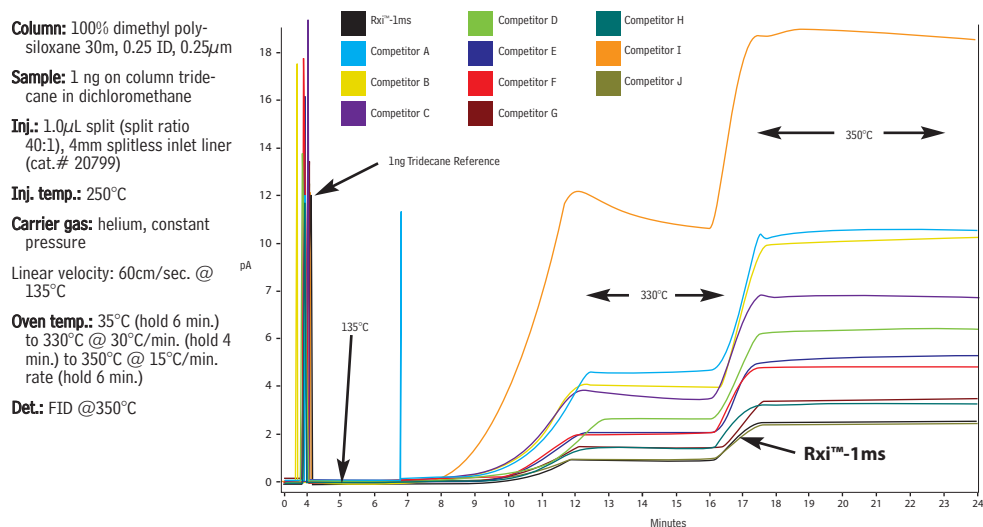
Restek's Exceptionally Inert (Rxi™) Fused Silica Capillary Columns

- Stable at high temperatures; improved signal to noise ratios.
- Excellent inertness for acids and bases; predictable column performance.
- Engineered to assure column-to-column reproducibility.

The combination of ultra-low bleed and unsurpassed inertness make the Rxi™-1ms the best column choice for analyses using a 100% polydimethyl siloxane stationary phase.

We compared the bleed profiles of ten competitor columns at both 330°C and 350°C to the Rxi™-1ms column. At both temperatures the Rxi™-1ms column exhibits the lowest bleed level or equivalent of all the columns tested.

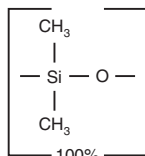
Figure 1 The Rxi™-1ms column has the lowest bleed available, allowing better accuracy and lower detection limits for active compounds.



20% OFF

similar phases

DB-1, DB-1ms, HP-1, HP-1ms, Ultra-1, SPB-1, Equity-1



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.
- Equivalent to USP G2 phase.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter | 60-Meter | |
|--------|---------|------------------|-----------|-----------|-----------|-----------|
| 0.25mm | 0.25 | -60 to 330/350°C | 13320-R25 | 13323-R25 | 13326-R25 | |
| | 0.50 | -60 to 330/350°C | 13335-R25 | 13338-R25 | 13341-R25 | |
| | 1.00 | -60 to 330/350°C | 13350-R25 | 13353-R25 | 13356-R25 | |
| 0.32mm | 0.25 | -60 to 330/350°C | 13321-R25 | 13324-R25 | 13327-R25 | |
| | 0.50 | -60 to 330/350°C | 13336-R25 | 13339-R25 | 13342-R25 | |
| | 1.00 | -60 to 330/350°C | 13351-R25 | 13354-R25 | 13357-R25 | |
| 0.53mm | 4.00 | -60 to 330/350°C | | 13396-R25 | | |
| | 0.50 | -60 to 330/350°C | 13337-R25 | 13340-R25 | | |
| | 1.00 | -60 to 330/350°C | 13352-R25 | 13355-R25 | | |
| | 1.50 | -60 to 330/350°C | 13367-R25 | 13370-R25 | 13373-R25 | |
| ID | df (μm) | temp. limits | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 0.18mm | 0.18 | -60 to 330/350°C | | 13302-R25 | | |
| 0.20mm | 0.33 | -60 to 330/350°C | 13397-R25 | | 13398-R25 | 13399-R25 |

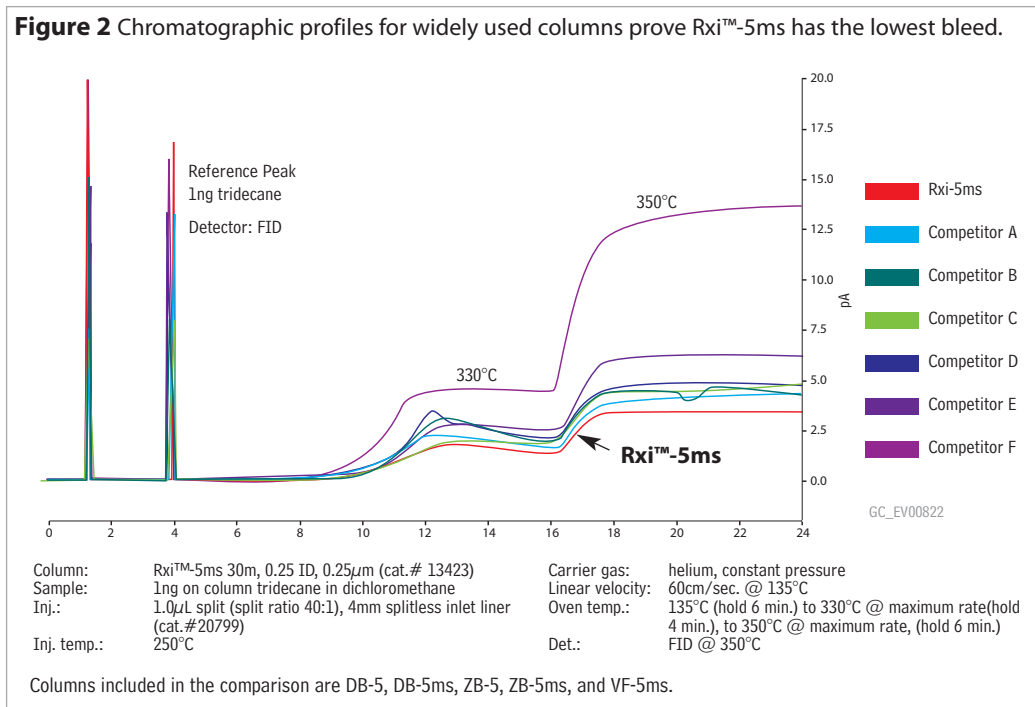
Rxi™-5ms Fused Silica Columns

Restek's Exceptionally Inert (Rxi™) Fused Silica Capillary Columns

- Unsurpassed inertness for low level basic and acidic compounds.
- Ultra-low bleed
- Reliable performance, guaranteed column-to-column reproducibility
- Guaranteed to work perfectly with retention time-locking software.

Ultra Low Bleed

Bleed from Rxi™-5ms columns is negligible, simplifying trace-level GC/MS analysis or detection by electron capture (ECD), nitrogen-phosphorus (NPD), or other sensitive methods. The graph below shows the bleed from 30m x 0.25mm, 0.25µm film columns. Compared to the other columns, including silarylene type phases, the Rxi™-5ms column exhibits the lowest bleed.



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

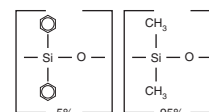
- General purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners or (e.g.) Aroclor® mixes, solvent impurities.
- Equivalent to USP G27 phase.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter | 60-Meter | |
|--------|---------|------------------|-----------|-----------|-----------|-----------|
| 0.25mm | 0.25 | -60 to 330/350°C | 13420-R25 | 13423-R25 | 13426-R25 | |
| | 0.40 | -60 to 330/350°C | | 13481-R25 | | |
| | 0.50 | -60 to 330/350°C | 13435-R25 | 13438-R25 | 13441-R25 | |
| | 1.00 | -60 to 330/350°C | 13450-R25 | 13453-R25 | 13456-R25 | |
| 0.32mm | 0.25 | -60 to 330/350°C | 13421-R25 | 13424-R25 | 13427-R25 | |
| | 0.50 | -60 to 330/350°C | 13436-R25 | 13439-R25 | 13442-R25 | |
| | 1.00 | -60 to 330/350°C | 13451-R25 | 13454-R25 | 13457-R25 | |
| 0.53mm | 0.25 | -60 to 330/350°C | 13422-R25 | 13425-R25 | | |
| | 0.50 | -60 to 330/350°C | 13437-R25 | 13440-R25 | | |
| | 1.00 | -60 to 330/350°C | 13452-R25 | 13455-R25 | | |
| | 1.50 | -60 to 330/350°C | 13467-R25 | 13470-R25 | | |
| ID | df (μm) | temp. limits | 12-Meter | 20-Meter | 25-Meter | 50-Meter |
| 0.18mm | 0.18 | -60 to 330/350°C | | 13402-R25 | | |
| | 0.30 | -60 to 330/350°C | | 13409-R25 | | |
| | 0.36 | -60 to 330/350°C | | 13411-R25 | | |
| 0.20mm | 0.33 | -60 to 330/350°C | 13497-R25 | | 13498-R25 | 13499-R25 |

20% OFF

similar phases

DB-5, HP-5, HP-5ms, Ultra-2, SPB-5, Equity-5

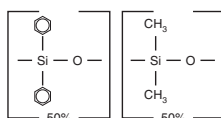


20% DISCOUNT

on any stock Rxi™-1ms, Rxi™-5ms, Rxi™-17 or Rxi™-50

similar phases

DB-17, DB-608



Rxi™-17 (mid-polarity phase; Crossbond® 50% diphenyl / 50% dimethyl polysiloxane)

- General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter |
|--------|---------|-----------------|-----------|-----------|
| 0.25mm | 0.25 | 40 to 280/300°C | 13520-R25 | 13523-R25 |
| | 0.50 | 40 to 280/300°C | 13535-R25 | 13538-R25 |
| | 1.00 | 40 to 280/300°C | 13550-R25 | 13553-R25 |
| 0.32mm | 0.25 | 40 to 280/300°C | 13521-R25 | 13524-R25 |
| | 0.50 | 40 to 280/300°C | 13536-R25 | 13539-R25 |
| | 1.00 | 40 to 280/300°C | 13551-R25 | 13554-R25 |
| 0.53mm | 0.25 | 40 to 280/300°C | 13522-R25 | 13525-R25 |
| | 0.50 | 40 to 280/300°C | 13537-R25 | 13540-R25 |
| | 0.83 | 40 to 280/300°C | | 13569-R25 |
| | 1.00 | 40 to 280/300°C | 13552-R25 | 13555-R25 |
| | 1.50 | 40 to 280/300°C | 13567-R25 | 13570-R25 |

Rxi™-50 (mid-polarity phase; Crossbond® 100% methylphenyl polysiloxane)

- General purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Temperature range: 0°C to 320°C.
- Equivalent to USP G3 phase.

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

| ID | df (μm) | temp. limits* | 15-Meter | 30-Meter | 60-Meter |
|--------|---------|----------------|-----------|-----------|-----------|
| 0.25mm | 0.10 | 0 to 300/320°C | 10505-R25 | 10508-R25 | |
| | 0.25 | 0 to 300/320°C | 10520-R25 | 10523-R25 | 10526-R25 |
| | 0.50 | 0 to 290/310°C | 10535-R25 | 10538-R25 | 10541-R25 |
| | 1.00 | 0 to 280/300°C | 10550-R25 | 10553-R25 | 10556-R25 |
| 0.32mm | 0.10 | 0 to 300/320°C | 10506-R25 | 10509-R25 | |
| | 0.25 | 0 to 300/320°C | 10521-R25 | 10524-R25 | 10527-R25 |
| | 0.50 | 0 to 290/310°C | 10536-R25 | 10539-R25 | 10542-R25 |
| | 1.00 | 0 to 280/300°C | 10551-R25 | 10554-R25 | 10557-R25 |
| 0.53mm | 0.25 | 0 to 280/300°C | 10522-R25 | | |
| | 0.50 | 0 to 270/290°C | 10537-R25 | 10540-R25 | 10543-R25 |
| | 0.83 | 0 to 270/290°C | | 10569-R25 | |
| | 1.00 | 0 to 260/280°C | 10552-R25 | 10555-R25 | 10558-R25 |
| | 1.50 | 0 to 250/270°C | 10567-R25 | 10570-R25 | 10573-R25 |
| ID | df (μm) | temp. limits | 10-Meter | 20-Meter | 40-Meter |
| 0.18mm | 0.20 | 0 to 310/330°C | 40501-R25 | 40502-R25 | 40503-R25 |
| | 0.40 | 0 to 300/320°C | 40510-R25 | 40511-R25 | 40512-R25 |

Restek Trademarks: Crossbond, Rtx, Rxi, Restek logo. For other trademark attributions, please refer to our catalog.

Offer cannot be combined with any other promotion or discount. **Expires October 31, 2007**



New Generation of Porous Layer Open Tubular (PLOT) Columns

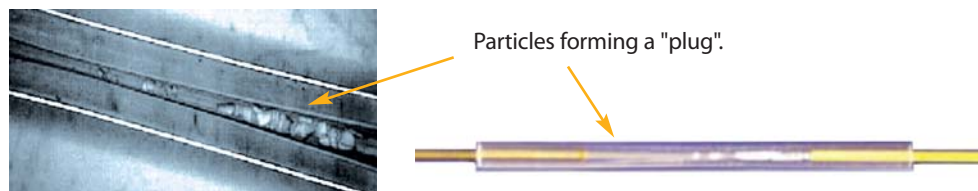
- Stabilized particle layers improve robustness and reproducibility of retention and flow.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- New manufacturing procedure reduces particle generation and improves performance of porous polymers, molecular sieves, and PLOT columns.

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 5-50 μ m 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.

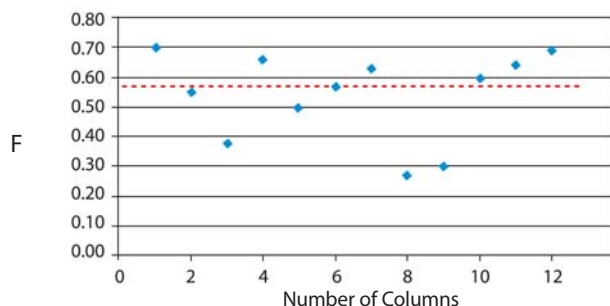
Figure 2 Inconsistent coating thicknesses result in restrictions that cause significant variation in flow.



In order to evaluate flow restriction reproducibility, Restek is introducing a new factor: the flow restriction factor (F). This factor is based on the retention time of an unretained marker compound, as measured on both coated and uncoated tubing using the same backpressure setting (Equation 1). For quality control purposes, methane is used as the marker when evaluating porous polymer columns and helium is used for testing Rt®-Msieve 5A columns.

Flow restriction factor determination can be used both to assess the degree of column restriction and to evaluate the reproducibility of the column coating process. Percent flow restriction can also be calculated (Equation 2). Figure 3 shows typical results for PLOT columns manufactured using a conventional process. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns made using the new PLOT column process (Rt®-QS-BOND, bonded porous polymer). Clearly, the new manufacturing process results in greater consistency in both column coating thickness and flow restriction; which, in turn, results in more stable retention times and better performance in Deans switching and related flow switching techniques.

Figure 3 Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses.



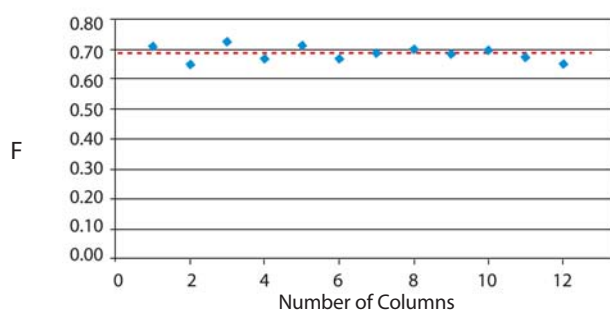
Equation 1 Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

t_R = retention time

Note, F values will always be <1 as the coated column always has more restriction than the uncoated column.

Figure 4 Restek's new stabilized PLOT columns offer consistent flow resistance, giving more reproducible results column-to-column.



Equation 2 Percent flow restriction of coated column.

$$\% \text{ restriction} = (1 - F) \times 100$$

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.

PLOT Column Phase Cross-Reference: Similar Selectivity

| Restek | Porous Layer | Agilent/J&W | Supelco | Alltech | Varian/Chrompack | Quadrex |
|---|---|-------------------------------------|------------------|--------------|--|---------|
| Rt-Alumina BOND / Na ₂ SO ₄ | Aluminum oxide | GS-Alumina, HP PLOT S, HP PLOT M | Alumina-PLOT | AT-Alumina | CP-Al ₂ O ₃ /Na ₂ SO ₄ | — |
| Rt-Alumina BOND / KCl | Aluminum oxide | GC-Alumina KCl | — | — | CP-Al ₂ O ₃ /KCl | — |
| 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-UPLLOT | — | — | CP-PoraPlot U, PoraBond U | — |

Rt®-Alumina BOND Columns

- Applications for C1-C10 volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations.
- High capacity and loadability give exceptionally symmetric peaks.
- Reproducible retention times and predictable flow behavior column-to-column.



Traces of water in the carrier gas and samples will affect the retention and selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15-30 min. at 200°C under normal carrier gas flow. Periodic conditioning ensures excellent run-to-run retention time reproducibility.

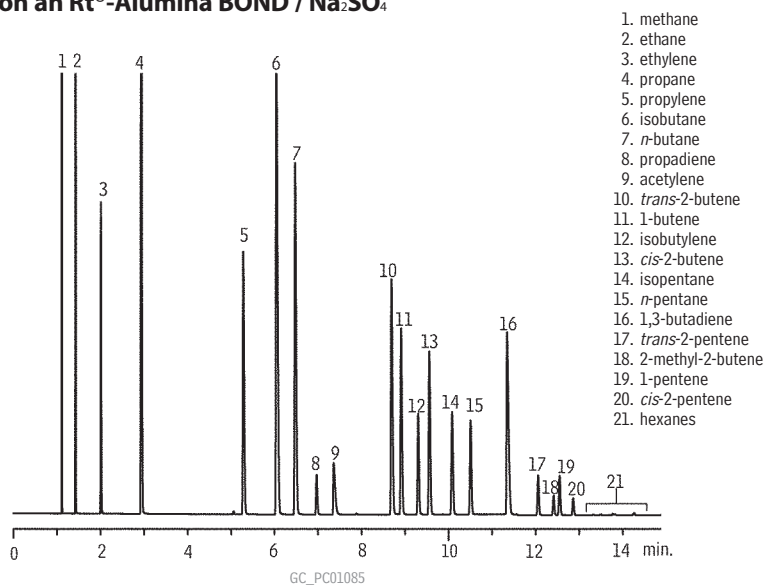
The maximum programmable temperature for an Rt®-Alumina BOND column is 200°C. Higher temperatures cause irreversible changes to the porous layer adsorption properties.

Rt®-Alumina BOND / Na₂SO₄

- Acetylene/propadiene elute after butanes (impurities in acetylene/propadiene).
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.

| ID | df (μm) | temp. limits | 30-Meter | 50-Meter |
|--------|---------|--------------|----------|----------|
| 0.32mm | 5 | to 200°C | 19757 | 19758 |
| 0.53mm | 10 | to 200°C | 19755 | 19756 |

Refinery gas on an Rt®-Alumina BOND / Na₂SO₄



Column: Rt®-Alumina BOND / Na₂SO₄, 50m, 0.53mm ID, 10μm (cat.# 19756)
Sample: refinery gas
Inj.: 10μL split (split vent flow 80mL/min.), 2mm single gooseneck liner (cat.# 20795)
Inj. temp.: 200°C
Carrier gas: hydrogen, constant pressure, 8.0psi
Linear velocity: 74cm/sec. @ 45°C
Oven temp.: 45°C (hold 1 min.) to 200°C @ 10°C/min. (hold 3.5 min.)
Det.: FID @ 200°C



Rt®-Alumina BOND columns now available with KCl deactivation!

Rt®-Alumina BOND / KCl

- Acetylene elutes before C4 hydrocarbons (impurities in butane/isobutane).
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.

| ID | df (μm) | temp. limits | 30-Meter | 50-Meter |
|--------|---------|--------------|----------|----------|
| 0.32mm | 5 | to 200°C | 19761 | 19762 |
| 0.53mm | 10 | to 200°C | 19759 | 19760 |

Rt®-Msieve 5A PLOT Columns

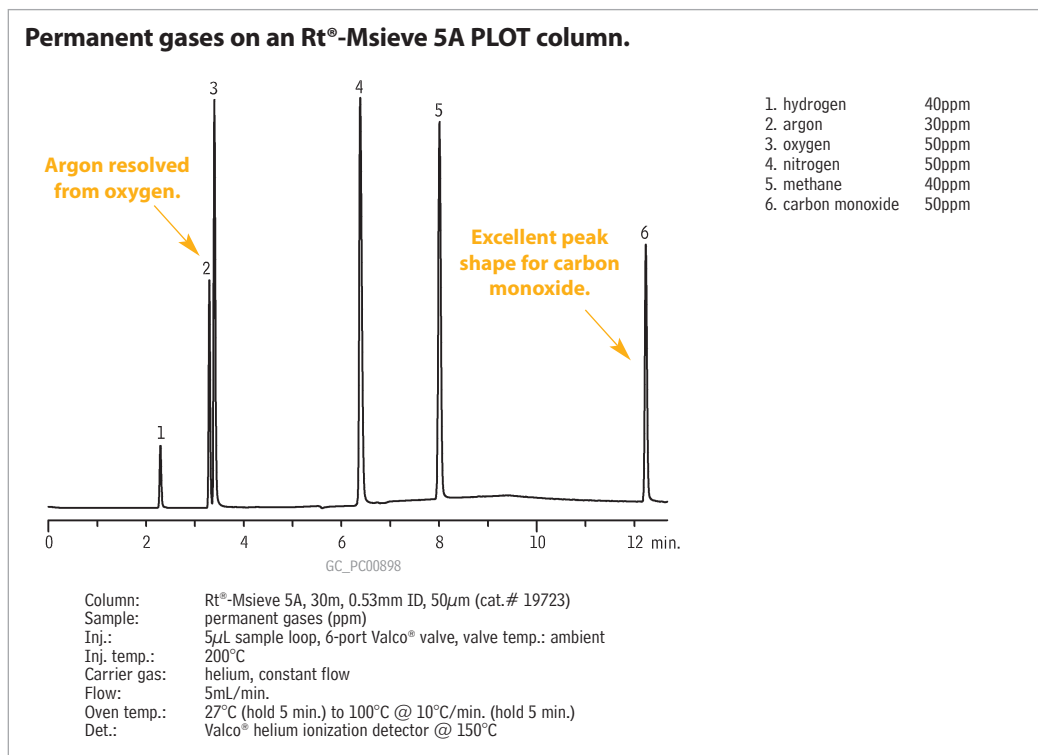
Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O₂ and other permanent gases, including CH₄, C₂H₆, and CO. Special coating and deactivation procedures ensure chromatographic efficiency and the integrity of the porous layer coating. Our deactivation technology also allows the CO 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. 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/O₂ and H₂/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.



did you know?

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O₂ and other permanent gases, including CH₄, C₂H₆, and CO.



i 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.

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 |

Metal PLOT Columns

MXT®-Msieve 5A (Siltek®-treated stainless steel PLOT)

| ID | df (µm) | temp. limits | 30-Meter |
|--------|---------|--------------|----------|
| 0.53mm | 50 | to 300°C | 79723 |

Restek Tubing Scorer for MXT® Columns

- Makes perfect cuts every time.
- Easy to use.
- Leaves column entrance perfectly round.

| Description | qty. | cat.# |
|--|------|-------|
| Restek Tubing Scorer for MXT Columns (0.25-0.53mm ID & 0.5-0.8mm OD) | ea. | 20523 |
| Replacement Scoring Wheel | ea. | 20522 |

Simple Solutions:
Perfect cuts every time!



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.



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.
- High retention for CO₂ simplifies gas analysis; CO₂ and methane separated from O₂/N₂/CO (Note: O₂/N₂/CO not separated at room temperature).
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 300°C.

| ID | df (μm) | temp. limits | 15-Meter | 30-Meter |
|--------|---------|--------------|----------|----------|
| 0.32mm | 10 | to 280/300°C | 19743 | 19744 |
| 0.53mm | 20 | to 280/300°C | 19741 | 19742 |

Rt®-QS-BOND Columns (fused silica PLOT)

(porous divinyl benzene homopolymer)

- Intermediate polarity PLOT column incorporating low 4-vinyl pyridine.
- 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 high 4-vinyl pyridine.
- 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)

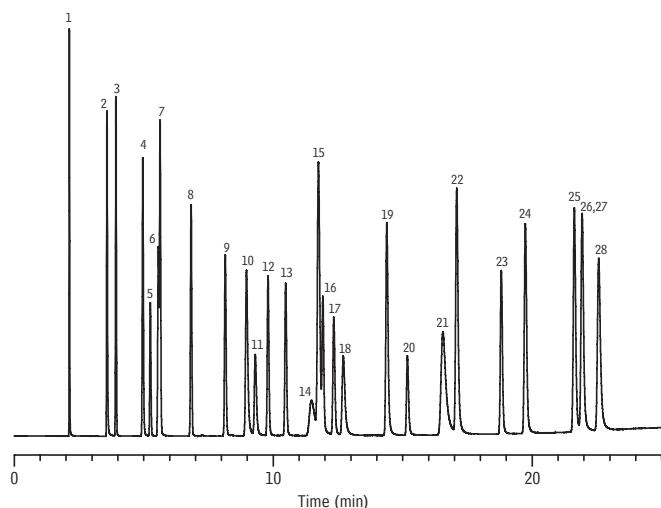
- Polar PLOT column, incorporating divinylbenzene ethylene glycol/dimethylacrylate.
- Use for the analysis of polar and nonpolar compounds.

| 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 |



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Solvent mixture on an Rt®-Q-BOND column.

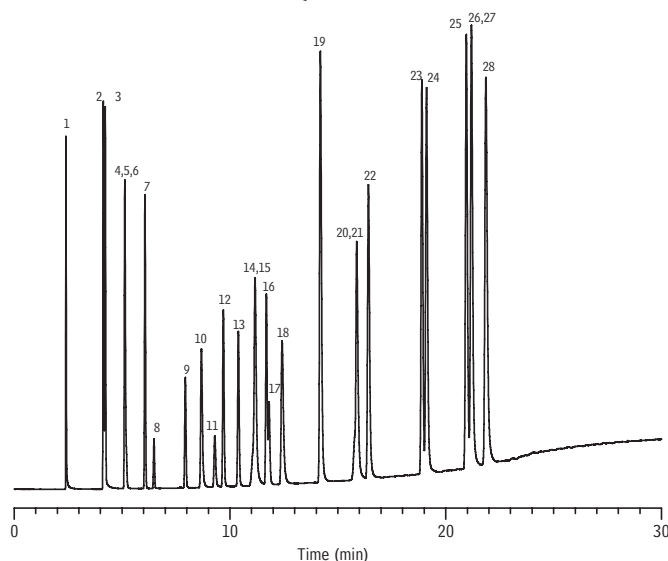


- | | |
|---------------------------------------|-------------------------|
| 1. methanol | 15. benzene |
| 2. ethanol | 16. 1,2-dimethoxyethane |
| 3. acetonitrile | 17. trichloroethylene |
| 4. acetone | 18. 1,4-dioxane |
| 5. dichloromethane | 19. pyridine |
| 6. 1,1-dichloroethene | 20. dimethylformamide |
| 7. nitromethane | 21. methylcyclohexane |
| 8. <i>trans</i> -1,2-dichloroethylene | 22. toluene |
| 9. <i>cis</i> -1,2-dichloroethylene | 23. 2-hexanone |
| 10. tetrahydrofuran | 24. chlorobenzene |
| 11. chloroform | 25. ethylbenzene |
| 12. ethyl acetate | 26. <i>m</i> -xylene |
| 13. 1,2-dichloroethane | 27. <i>p</i> -xylene |
| 14. 1,1,1-trichloroethane | 28. <i>o</i> -xylene |

Column: Rt®-Q-BOND, 30m, 0.53mm ID, 20µm (cat.# 19742)
 Sample: solvent mixture
 Inj.: 1.0µL, split (split vent flow 100mL/min.),
 4mm single gooseneck liner (cat.# 20798)
 Inj. temp.: 200°C
 Carrier gas: hydrogen, constant pressure, 4.2psi
 Linear velocity: 40cm/sec. @ 120°C
 Oven temp.: 120°C to 240°C @ 5°C/min. (hold 5.0 min.)
 Det.: FID @ 240°C

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Solvent mixture on an Rt®-QS-BOND column.

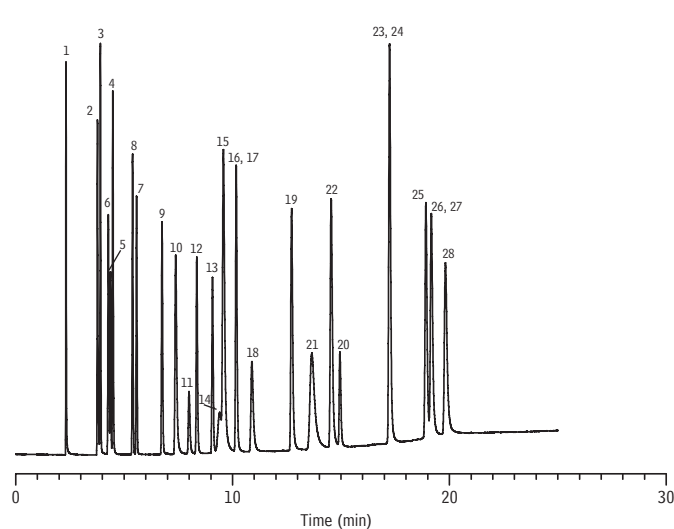


- | | |
|---------------------------------------|-------------------------|
| 1. methanol | 15. benzene |
| 2. ethanol | 16. 1,2-dimethoxyethane |
| 3. acetonitrile | 17. trichloroethylene |
| 4. acetone | 18. 1,4-dioxane |
| 5. dichloromethane | 19. pyridine |
| 6. 1,1-dichloroethene | 20. dimethylformamide |
| 7. nitromethane | 21. methylcyclohexane |
| 8. <i>trans</i> -1,2-dichloroethylene | 22. toluene |
| 9. <i>cis</i> -1,2-dichloroethylene | 23. 2-hexanone |
| 10. tetrahydrofuran | 24. chlorobenzene |
| 11. chloroform | 25. ethylbenzene |
| 12. ethyl acetate | 26. <i>m</i> -xylene |
| 13. 1,2-dichloroethane | 27. <i>p</i> -xylene |
| 14. 1,1,1-trichloroethane | 28. <i>o</i> -xylene |

Column: Rt®-QS-BOND, 30m, 0.53mm ID, 20µm (cat.# 19738)
 Sample: solvent mixture
 Inj.: 1.0µL, split (split vent flow 100mL/min.),
 4mm single gooseneck liner (cat.# 20798)
 Inj. temp.: 200°C
 Carrier gas: hydrogen, constant pressure, 4.2psi
 Linear velocity: 40cm/sec. @ 120°C
 Oven temp.: 120°C to 240°C @ 5°C/min. (hold 5.0 min.)
 Det.: FID @ 240°C

GC_PC01081

Solvent mixture on an Rt®-S-BOND column.



- | | |
|---------------------------------------|-------------------------|
| 1. methanol | 15. benzene |
| 2. ethanol | 16. 1,2-dimethoxyethane |
| 3. acetonitrile | 17. trichloroethylene |
| 4. acetone | 18. 1,4-dioxane |
| 5. dichloromethane | 19. pyridine |
| 6. 1,1-dichloroethene | 20. dimethylformamide |
| 7. nitromethane | 21. methylcyclohexane |
| 8. <i>trans</i> -1,2-dichloroethylene | 22. toluene |
| 9. <i>cis</i> -1,2-dichloroethylene | 23. 2-hexanone |
| 10. tetrahydrofuran | 24. chlorobenzene |
| 11. chloroform | 25. ethylbenzene |
| 12. ethyl acetate | 26. <i>m</i> -xylene |
| 13. 1,2-dichloroethane | 27. <i>p</i> -xylene |
| 14. 1,1,1-trichloroethane | 28. <i>o</i> -xylene |

Column: Rt®-S-BOND, 30m, 0.53mm ID, 20µm (cat.# 19746)
 Sample: solvent mixture
 Inj.: 1.0µL, split (split vent flow 100mL/min.),
 4mm single gooseneck liner (cat.# 20798)
 Inj. temp.: 200°C
 Carrier gas: hydrogen, constant pressure, 4.2psi
 Linear velocity: 40cm/sec. @ 120°C
 Oven temp.: 120°C to 220°C @ 5°C/min. (hold 5.0 min.)
 Det.: FID @ 220°C

GC_PC01080



Restek Capillary Column Installation Guide

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- I. **Brief Installation Procedure**
- II. **In-depth Installation Information**
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 - D. Confirming Installation Integrity
 - E. Conditioning
 - F. Test Mixtures
- III. **Operational Information**
 - A. Standby operation
 - B. Column removal and storage
 - C. Protection against dirty samples
 - D. Connecting fused silica tubing
 - E. Connecting stainless steel tubing
 - F. Column maintenance and rinsing
 - G. Injecting water and other solvents
- IV. **Column Troubleshooting & Return Procedure**
 - A. Pinpointing Performance Problems
 - B. Contacting Restek for Technical Service
 - C. Return Authorization Procedure

Why Read This Guide?

This guide helps chromatographers prevent costly mistakes that could potentially damage a Restek column. Section I describes a brief capillary column installation procedure. Section II provides in-depth installation information necessary to ensure the best performance from your column. The third section provides operational hints that will help extend column lifetime and the last section outlines warranty and return procedures.

Have Questions or Need Help Troubleshooting?

Whether your problem is straightforward or complex, contact our [technical service](#) chemists online, or call 800-356-1688, ext. 4, Monday through Friday, 8am-6pm EST.

Satisfaction Guaranteed! Our quality is the best and we back our claim! Please contact [Customer Service](#) or call 800-356-1688 (or one of our [distributors](#)) if any Restek product does not meet your expectations or is not better than or equivalent to a competitive product.



Restek Capillary Column Installation Guide

Section I: Brief Installation Procedure

The following procedure is a quick, easy, trouble-free sequence for installing a capillary column. For more in-depth installation information, refer to [Section II](#).

1. Cool all heated zones.
2. Replace spent oxygen and moisture traps.
3. Clean and/or deactivate injector and detector sleeves if necessary.
4. Replace critical injector and detector seals.
5. Replace septum.
6. Set make-up and detector gas flow rates.
7. Carefully inspect the column for damage or breakage.
8. Cut 10 centimeters from each end of the column.
 - use a sapphire scribe (cat.# 20115) or ceramic scoring wafer (cat.# 20116) to cut fused silica capillary columns.
 - use the serrated edge of a ceramic scoring wafer (cat.# 20116) or the edge of a sharp file to cut metal capillary columns.
9. Install a nut and ferrule on each end of the column.
10. Cut an additional 10 centimeters from each end of the column to remove ferrule fragments.
11. Mount the capillary column in the oven using a bracket that protects the column from becoming scratched or abraded.
12. Insert column the appropriate distance into the inlet as indicated in the instrument manual.
13. Set the approximate column flow rate by adjusting the head pressure to the value listed on the test chromatogram included with the column.
14. Set split vent, septa purge, and any other applicable inlet gases according to the instrument specifications.
15. Confirm the flow by immersing the column outlet in a vial of solvent (acetone or isopropyl alcohol).
16. Insert column the appropriate distance into the detector as indicated in the instrument manual.
17. Check for inlet and outlet leaks using a thermal conductivity leak detector (cat.#'s 21607, 20130, or 21609). Do not use soaps or liquid-based leak detectors or the column may be damaged.
18. Set injector and detector temperatures. Turn the detector on when the temperatures have equilibrated. Caution - do not exceed the phase's maximum operating temperature!
19. To set the proper dead time (linear velocity), inject methane (cat.# 20197) or a non-retained substance compatible with the detector being used.
20. Verify system integrity by checking the dead volume peak. It should not tail.
21. Condition the column at its maximum operating temperature to stabilize the baseline. (See the test chromatogram included with the column for the maximum

temperature.)

22. Set oven to appropriate temperature and inject methane (cat.# 20197) or an appropriate unretained substance, again to set the proper linear velocity.
23. Inject a duplicate of the original test mixture or your specific test mixture to confirm proper installation, system, and column performance.
24. Calibrate the instrument and inject samples.

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Restek Capillary Column Installation Guide

Section II: In-depth Installation Information

The following section provides in-depth information on instrument preparation procedures for installing and operating fused silica and stainless steel capillary columns.

I. Instrument preparation

- A. Gas purification
- B. Carrier gas selection
- C. Using hydrogen as a carrier gas
- D. Flow regulated/back pressure pneumatic systems
- E. Head pressure regulated pneumatic systems
- F. Injector maintenance
- G. Protection against dirty samples
- H. Replacing critical seals
- I. Changing septa
- J. Setting gas flow rates

II. Column Mounting and Installation

- A. Installation preparation
- B. Inlet installation
- C. Establishing flow
- D. Good operating practice
- E. Outlet installation
- F. Leak-checking techniques

III. Setting Optimum Flow Rates

IV. Confirming Installation Integrity

- A. Dead volume peak shape test
- B. Solvent peak shape test

V. Conditioning

VI. Test Mixtures

I. Instrument Preparation

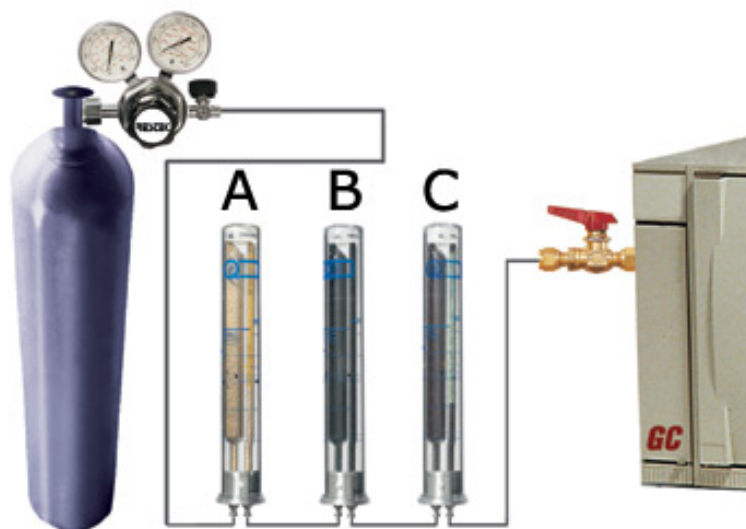
Gas Purification

Make sure the carrier gas is clean. The carrier gas **MUST** contain less than 1ppm of oxygen, moisture, or any other trace contaminants to prevent column degradation, decreased column lifetime, and increased stationary phase bleed. Contaminants such as trace hydrocarbons cause ghost peaks to appear during temperature programming and compromise the validity of analytical data. Make-up gas should also be contaminant-free or baseline fluctuations and excessive detector noise can occur. Detector gases, such as hydrogen and compressed air, should be free of water and hydrocarbons or excessive baseline noise can result.

We highly recommend installing a High Capacity Indicating Oxygen Trap on both the carrier and make-up gas lines. Because moisture reacts with most oxygen traps, we suggest installing a Moisture Trap in front of the oxygen trap. *(Install purifiers as closely as possible to the GC's bulkhead fitting, not system-wide. If purifiers are installed system-wide, a leaky fitting downstream of the trap could allow oxygen and moisture to*

enter the gas stream and degrade column performance.) The Moisture Trap can also be used on the FID air line or the ECD make-up gas line to eliminate noisy, rolling baselines when operating at high detector sensitivities. If hydrocarbon contamination is suspected, install a Hydrocarbon Trap between the moisture and oxygen traps. To prevent spontaneous breakage, coil the line leading to and from the purifiers to relieve strain and isolate instrument vibrations.

A note on equipment: Because oxygen, moisture, and elastomeric contaminants can migrate through rubber or elastomeric diaphragms and enter the carrier gas, all regulators should be equipped with stainless steel diaphragms.



Traps shown:

A. Moisture Trap:

Super-Clean™ Ultra-High Capacity Moisture Filter ([cat.# 22028](#))

B. Hydrocarbon Trap:

Super-Clean™ Ultra-High Capacity Hydrocarbon Filter ([cat.# 22030](#))

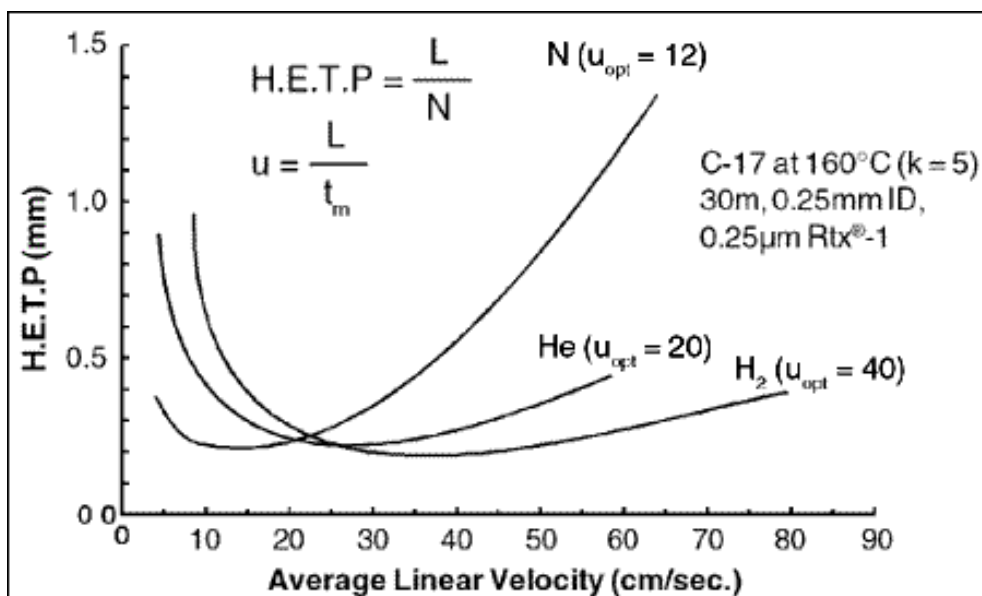
C. High Capacity Indicating Oxygen Trap:

Super-Clean™ Ultra-High Capacity Oxygen Filter ([cat.# 22029](#))

Carrier Gas Selection

A fast carrier gas that exhibits a flat van Deemter profile is essential in obtaining optimum capillary column performance. Because capillary columns average over 30 meters in length (compared to 2 meters for packed columns), a carrier gas that minimizes the effect of dead time is important. In addition, because capillary columns are head pressure controlled, not flow-controlled like most packed columns, the carrier gas flow decreases by 40 percent when programming from ambient to 300°C. Therefore, a carrier gas that retains high efficiency over a wide range of flow rates is essential for obtaining good resolution throughout a temperature-programmed analysis.

Figure A shows the van Deemter profile for hydrogen, helium, and nitrogen carrier gases. The curves were generated by plotting the Height Equivalent to a Theoretical Plate (H.E.T.P., the length of the column divided by the total number of theoretical plates) against the column's average linear velocity. The lowest point on the curve indicates the carrier gas velocity at which the highest column efficiency is reached.



Hydrogen is the fastest carrier gas (u_{opt} : 40cm/sec.) and exhibits the flattest van Deemter profile. Helium is the next best choice (u_{opt} : 20cm/sec.). The head pressures at optimum flow rates are similar for hydrogen and helium because hydrogen has half the viscosity and double the linear velocity of helium. Nitrogen's performance is inferior for capillary columns and is usually not recommended because of the slow optimum linear velocity (u_{opt} : 12cm/sec.) and steep van Deemter profile.

Figure B compares hydrogen to helium in an isothermal analysis using optimum linear velocities. The resolution is similar, but the analysis time is reduced by 50 percent when using hydrogen. However, helium does improve the separation of very low boiling or early eluting compounds since they allow more interaction with the stationary phase. Temperature programming usually provides similar analysis times between hydrogen and helium since the elution of most compounds strongly depends on the oven temperature. Therefore, the savings in analysis times are not as noticeable as when using isothermal oven conditions.

Figure C illustrates that hydrogen is only slightly faster than helium when both carrier gases are operated under the same temperature-programmed conditions. Also, note that helium improves the resolution of the early eluting compounds (peaks 1 & 2).

Exert Caution when using Hydrogen as a Carrier Gas

Hydrogen is explosive when concentrations exceed 4 percent in air and should only be used by individuals who have received proper training and understand the potential hazards. Proper safety precautions should be taken to prevent an explosion in the oven chamber. Some gas chromatographs are designed with spring loaded doors, perforated or corrugated metal oven chambers, and back pressure/flow controlled pneumatics which minimize the hazards when using hydrogen carrier gas. Additional precautions include:

- Frequently checking for leaks using a thermal conductivity leak detector (cat.# 22451).
- Minimizing the amount of carrier gas that could be expelled in the oven chamber if a leak were to occur by installing a needle valve, restrictor, or flow controller prior to the carrier inlet bulkhead fitting (only necessary for head pressure controlled systems).
- Purging an inert gas (N₂) into the oven chamber to displace oxygen and prevent an explosive atmosphere from forming.

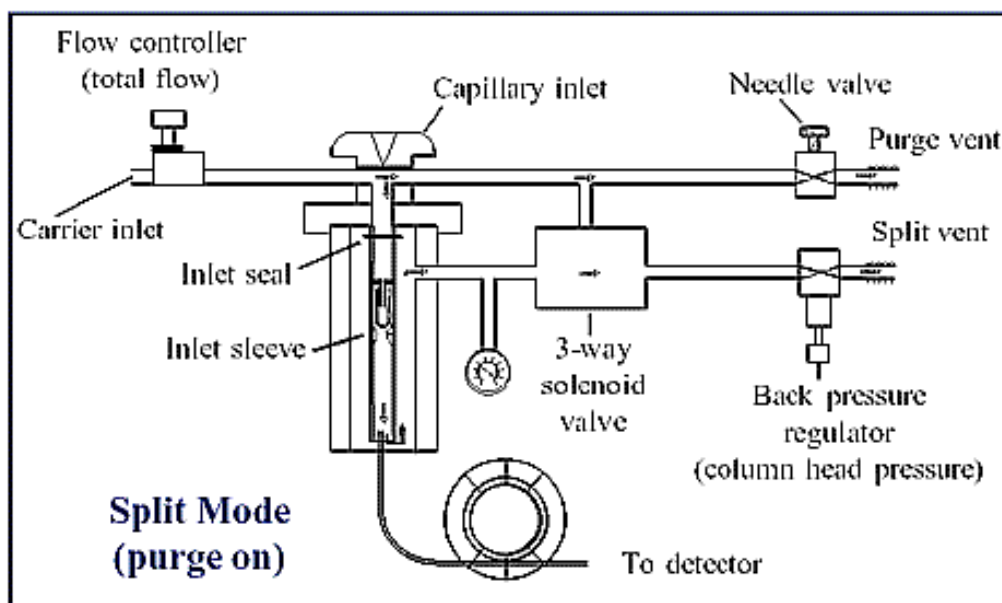
Hydrogen is expelled from both the split vent and septum purge when it is used as a carrier gas. Because of hydrogen's fast diffusivity, an explosion in a laboratory setting is highly unlikely. However, a spark from static electricity can ignite the hydrogen exiting from a septum purge or split vent which could cause a flame. Precautions to minimize

the problems with hydrogen exiting the split vent or septum purge include:

- Plumbing the exit lines to a hood or venting the escaping gas outside.
- Plumbing the lines to exit into a vial of water.
- Plumbing the exit lines to a position where analysts could not get burned if inadvertent ignition occurred.

Flow Regulated/Back Pressure Pneumatic Systems

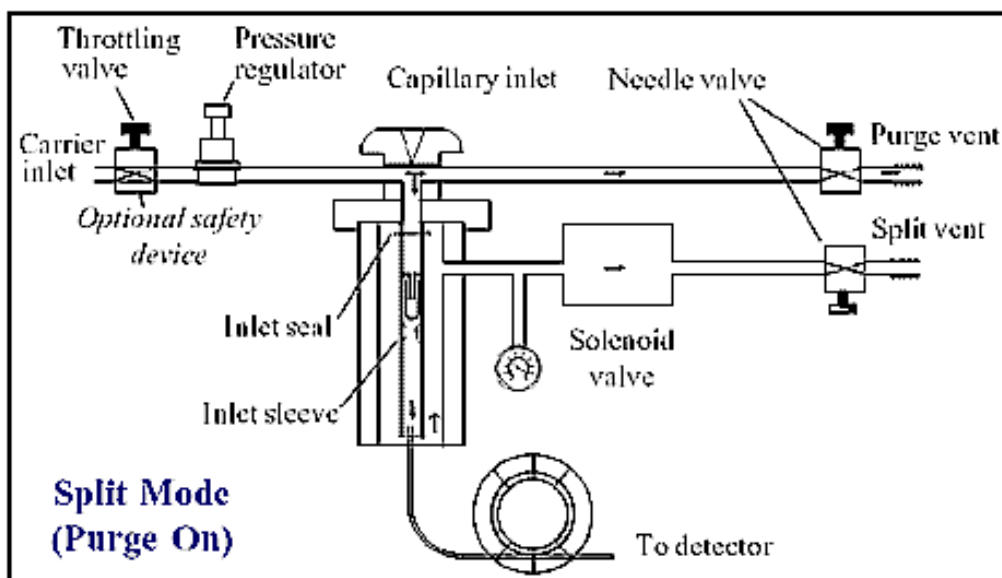
Figure D illustrates a flow regulated/back pressure system commonly used for split/splitless inlets (HP-5890, Varian 3300, 3500, & 3600 GCs). A flow controller positioned upstream of the injector controls the total amount of carrier gas that is expelled from the split vent, septum purge, and column (knob labeled "Total Flow" on HP 5890 GCs). The back pressure regulator (knob labeled "Column Head Pressure" on HP 5890 GCs) stops or reduces the flow from exiting the split vent until the desired column head pressure is reached. The flow controller provides the increase of pressure necessary to meet the requirements of the back pressure regulator. It is the back pressure regulator, located downstream of the split point, that actually controls the capillary column flow rate. One of the primary benefits of a flow controlled/back pressure regulated system is that adjustments to the capillary column flow rate (via head pressure changes) do not affect the amount of carrier gas exiting the splitter vent. Once the desired split vent flow rate is achieved, the flow controller setting should not have to be changed when installing different columns.



Flow regulated/back pressure systems prevent a drastic carrier gas loss that can happen if an inlet fitting or column leak occurs. Leaks are indicated by a failure to obtain the proper operating pressure with the capillary column. A common mistake is to increase the total system flow by turning the flow controller up when a proper head pressure cannot be obtained rather than checking for inlet leaks.

Head Pressure Regulated Pneumatic Systems

Figure E illustrates a head pressure regulated inlet system used in some split/splitless inlet systems (PE Autosystem, 8500, and Shimadzu 9A and 14A GCs). A single-stage pressure regulator is used to control the flow rate in the capillary column by increasing or decreasing the upstream inlet pressure. The split vent and septum purge flow rates are controlled by a needle valve or variable restrictor located downstream of the pressure regulator. Head pressure systems require adjustment of the needle valve controlling the septum purge or split vent every time a change is made in the column's head pressure.



We recommend placing a throttling valve (needle valve or restrictor) on the carrier gas inlet bulkhead fitting of pressure-regulated systems to prevent a catastrophic carrier gas loss should an inlet leak occur. If several GCs are attached to a common carrier gas source, a leak in one GC could drain the carrier gas from all other GCs, causing a loss of flow and subsequent damage to all capillary columns in the entire system. To prevent this from happening, limit the flow of carrier gas to each gas chromatograph (via a throttling valve) until it matches the flow requirements of the inlet system. This can be detected when the column's head pressure starts to decrease if the throttling valve is closed any further.

Injector Maintenance

Perform injector maintenance prior to installing a capillary column. Periodic maintenance is required after installation, depending on the number of injections and the cleanliness of the samples. Maintenance includes cleaning and deactivating inlet sleeves, replacing critical inlet seals, and replacing the septum. Review the instrument manual inlet diagram prior to disassembly.

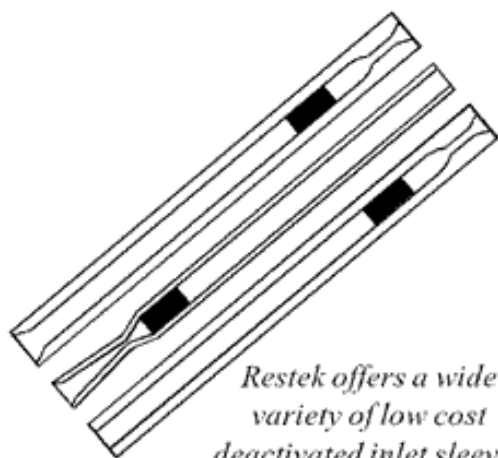
Cleaning and Deactivating Injector Sleeves

Don't install a new Restek column with a dirty injector sleeve! For optimum column performance, the inlet sleeve needs to be free of septum particles, sample residue, and ferrule fragments. Use deactivated inlet sleeves when analyzing samples with active functional groups or compounds prone to decomposition or adsorption onto untreated glass surfaces.

If the sleeve is deactivated and not excessively dirty, cleaning with organic solvents will not affect the integrity of the deactivation layer. First, use non-swelling organic solvents such as methanol or isopropyl alcohol to remove septum particles that adhere to the sleeve wall. Next, use solvents such as pentane, methylene chloride, or toluene to remove sample residue. Nylon tube brushes and pipe cleaners (cat.# 20108) are ideal for cleaning sleeves. Do not use laboratory detergents, acids, or bases to clean sleeves because they will remove the deactivation layer and require sleeve resilanization.

Sleeves that are very dirty or contain pyrolyzed residue can be difficult to clean.

Heating borosilicate or quartz sleeves overnight in a muffle furnace at 550°C will remove most contaminants. Etching with a 1:1:1 mixture of hydrofluoric acid, sulfuric acid, and deionized water for ten seconds is also very effective. However, heating to



Restek offers a wide variety of low cost deactivated inlet sleeves to fit most instruments.

550°C or using the acid-etch procedure will remove the deactivation layer and require sleeve resilanization. Caution - Exert extreme caution when using hydrofluoric acid. Hydrofluoric acid can cause severe burns and nerve damage if it is ingested, inhaled, or brought into contact with the skin. Only properly trained professionals equipped with the appropriate safety devices should attempt to handle strong acids.

Most new sleeves received from instrument manufacturers are not deactivated. Before optimum column performance can be achieved, sleeves must be deactivated. Restek has developed a unique, high temperature silanization procedure for sleeve deactivation that ensures a highly inert surface. These sleeves can be purchased from Restek at a cost below many instrument manufacturer's cost.

Refer to Restek's Chromatography Products Catalog to obtain the part number for your specific instrument. For more information on inlet sleeves, request a copy of Restek's bulletin Operating Hints for Split/Splitless Injectors or Guide to Direct/On-column Flash Vaporization Injection.

Protection Against Dirty Samples

Sleeve packing materials such as fused silica wool (cat.# 20790), glass wool (cat.# 20789), or fused silica beads (cat.# 20791) act as filters when analyzing samples containing high molecular weight residue or particulates. However, both wool and beads greatly increase the surface area that the sample contacts and can be a source of adsorption or breakdown. It is critical that the wool or beads be properly deactivated. If you plan to use wool, be careful inserting it into the sleeve because active sites can be created as the fibers break. We do not recommend using packings coated with stationary phases. (For more information on protection against dirty samples, request a copy of Restek's bulletin A Guide When Injecting Dirty Samples.) Alternative sleeve designs that minimize sample interaction with non-volatile residue are also available.

Replacing Critical Seals

Replace the critical seal prior to installing an inlet sleeve (see instrument manual for seal location). Most capillary injection ports use a rubber o-ring or graphite ferrule to seal the sleeve inside the injection port body. The seal must fit tightly around the sleeve to prevent the carrier gas from leaking around the outside of the sleeve. If your GC uses a ferrule as the inlet seal, always pre-swage the ferrule to fit the sleeve before tightening it in the inlet (especially Varian inlets).



Changing Septa

Always use a high quality, low bleed septa. We recommend replacing the septum frequently to prevent leaks and fragmentation. Otherwise, multiple injections and continuous exposure to a hot injection port will decompose the septum, causing particles to fall into the sleeve. Septum particles are a potential source of ghost peaks, loss of inertness, and carrier gas flow occlusion as shown in **Figure F**. It is best to install a new septum at the end of an analytical sequence so that it can condition in the injector and reduce the incidence of ghost peaks. Always use clean forceps when handling septa to avoid contamination.

Setting Detector and Make-up Gas Flow Rates

Confirm that the make-up gas, detector fuel, and oxidant flow rates are set according to the instrument's specifications (**Table I**, below). Make-up gas flow rates set too low will cause tailing solvent peaks, baseline disturbances, decreased sensitivity, and detector noise. Some instruments do not have leak-tight detector cavities and require flow rate verification before the column is installed into the detector. However, for GCs with leak-tight detector cavities, it is usually easier to check detector and make-up gas flow rates after the column is installed. We highly recommend using the Restek Flowmeter 6000 (cat.# 21622).

Table I Typical FID Flow Rates

| Instrument | H ₂ (ml/min.) | Make-up (ml/min.) | Air (ml/min.) |
|-----------------|--------------------------|-------------------|---------------|
| Hewlett-Packard | 30 | 20 | 400 |
| Varian | 30 | 20 | 300 |
| Shimadzu | 30-60 | 40 | 500 |
| PerkinElmer | 45 | -- | 450 |

II. Column Mounting and Installation



Do not remove the high-temperature string holding the fused silica capillary column inside the Restek cage. The high-temperature string is capable of withstanding more than 400°C and does not decompose during continuous operation at oven temperatures used in capillary chromatography.

When hanging the column on the oven support rod, be careful that fused silica tubing does not contact any metal parts. Stainless steel

columns can be placed directly on the oven support rod. If there is not an oven support rod, one can be made by inserting a temperature resistant pegboard hook into the corrugated oven wall or by hanging a 1/16-inch "S" hook from the oven ceiling. Be careful not to damage the oven thermocouple or interfere with the fan operation when installing homemade brackets.

Position the column so that it is midway between the injector and detector. This reduces thermal gradients and enhances retention time reproducibility. Uncoil one or two loops of tubing. When using fused silica columns, be careful not to scratch the column surface against the metal cross bars when removing loops. This abrasion of the polyimide coating could lead to spontaneous breakage.

Caution - When removing loops from 0.53mm ID columns, pull the tubing from the cage at the point with the widest gap between the metal crossbars. Avoid sharp bends that will break the tubing.

Choosing Ferrules



Graphite or Vespel®/graphite ferrules are used to seal the column to the injector and detector in capillary gas chromatography. Both ferrule types have advantages and disadvantages. Graphite ferrules are the easiest to use, and they are leak-free, universal

for most systems, and preferred by most beginning capillary chromatographers. Because graphite ferrules are soft, they easily conform to column outside diameters and different types of instrument fittings. However, they can flake or fragment upon removal, causing particles to lodge in the injector or detector sleeves, and they will not hold a seal under vacuum. Vespel®/graphite ferrules are hard and they must match the column and fitting dimensions closely to seal properly. In addition, because Vespel®/graphite ferrules can deform during initial heating, they need to be re-tightened or leakage will occur. Vespel®/graphite ferrules do not fragment, can be reused many times, and are preferred by mass spectroscopists since they do not contaminate the ion source with particles and maintain their seal under vacuum. In all cases, it is best to choose a ferrule that fits snugly or is slightly larger than the capillary tubing OD (see table below). This minimizes the need for excessive torque to properly seal the ferrule to the column.

| Nominal Tubing ID | Nominal Tubing OD | | | |
|----------------------|-------------------|-----------------|--------------|------------|
| | MXT | | Fused Silica | |
| 0.05mm | --- | --- | 0.363mm | +/-0.012mm |
| 0.10mm | 0.23mm | +/- 0.0254mm | 0.363mm | +/-0.012mm |
| 0.15mm | 0.41mm | +/- 0.0254mm | 0.363mm | +/-0.012mm |
| 0.18mm | 0.36mm | +/- 0.0254mm | 0.34mm | +/-0.01mm |
| 0.25mm | 0.41mm | +/- 0.0254mm | 0.37mm | +/-0.04mm |
| 0.28mm | 0.56mm | +/- 0.0254mm | --- | --- |
| 0.32mm | 0.41mm | +/- 0.0254mm | 0.45mm | +/-0.04mm |
| 0.53mm | 0.74mm | +/- 0.0254mm | 0.69mm | +/-0.05mm |
| 0.75mm | 0.93mm | +/- 0.0254mm | --- | --- |

Installation Preparation

Cut each column end squarely, approximately 10 centimeters from the end seals. To obtain a square cut with fused silica columns, place the column end against the forefinger and score the polyimide layer lightly and rapidly with a sapphire scribe (cat.# 20115) or a ceramic scoring wafer (cat.# 20116). Score only one side of the column. Point the column end down to prevent polyimide or fused silica shards from falling inside, and quickly flick the column just above the score.



Proper and improper fused silica cuts.

Cut metal capillary tubing by scoring the tubing wall (without cutting completely through) with the edge of a sharp file or ceramic scoring wafer. Wipe any filings off the tubing and bend it away from the score. Once the score opens, bend the tubing in the opposite direction (toward the score) until it snaps into two pieces. If the hole is not round or there is a burr on the tubing, try the procedure again. The flat side of a ceramic scoring wafer can be used to polish or round the column end into a smooth conical shape. We do not recommend using high speed wheels or grinders to cut the metal tubing since they may introduce metal filings into the tubing or ruin the polymer near the cut from the high temperatures created.



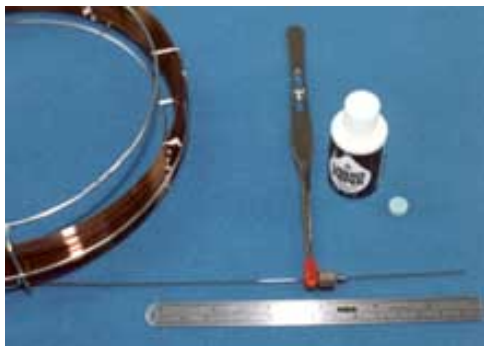
Proper and improper MXT® column cuts.

Next, install the nut and ferrule to the inlet in the manner described in the instrument manual. Use a pin vise and drill (cat.# 20103) to enlarge the ferrule ID if it does not slide easily onto the column. Prevent shards from falling into the column bore by pointing the column end down when installing the ferrule. Slide the connecting nut and ferrule approximately 20cm down the length of the column to make installation easier. Cut an additional 10cm from the column end after the nut and ferrule have been installed to remove any ferrule fragments that might have been forced into the column bore. Examine the quality of the cut with a small 10x pocket magnifier (cat.# 20124) and make sure that the cut is square. Jagged silica edges or exposed polyimide cause adsorption and tailing peaks, so it is very important that the column ends are cut uniformly. It may take several times, but once a square cut has been obtained, proceed with the installation. (Use an old column to practice making consistently square cuts.)

Inlet Installation

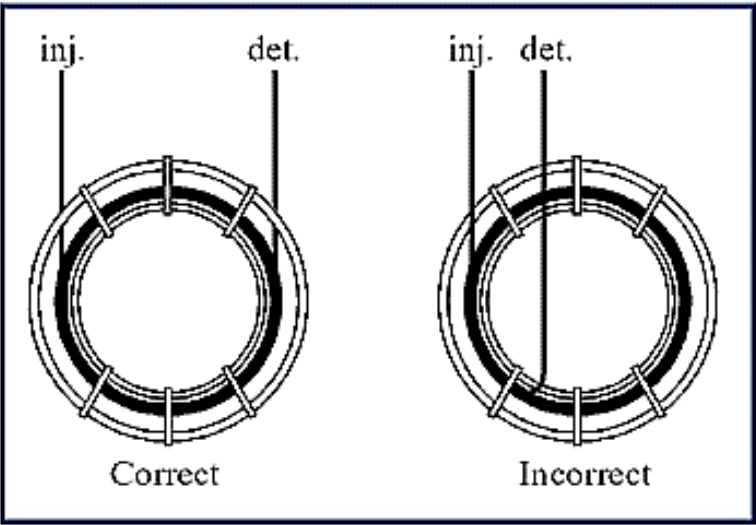
Consult the instrument manual to determine the correct insertion distance for the injector. It is important to install the column at the exact distance recommended by the injector manufacturer or poor peak symmetry and quantitation could occur. Lay the column end beside a ruler and position the nut and ferrule to the exact distance required for installation. Next, mark the insertion distance. This can be done one of three ways: with a pair of Slide-Lok Tweezers (cat.# 20101), with typewriter correction fluid, or by positioning a septum on the column to hold the nut and ferrule. If using a septum, slide it away from the nut after the fitting is tightened and leave it in the oven cavity while performing the analysis.

Gently insert the column end into the inlet fitting, making sure that the end is not crushed or scraped against the metal injection port fittings. While maintaining the correct distance, use a capillary wrench to tighten the nut approximately one-half turn past finger-tight until the column is held firmly. The ferrule is tight if the column cannot be pulled from the fitting while applying gentle pressure.



Various ways to mark the insertion distance

Make sure the fused silica tubing is not sharply bent when installing the column (**Figure G**). The tubing should gently bend from the cage to the fitting in angles greater than 90° or in diameters greater than 15cm. Sharp bends weaken the fused silica and eventually cause spontaneous breakage during use. If the tubing cannot be positioned to avoid sharp bends, then repeat the installation process and uncoil the appropriate amount of tubing from the cage.



Establishing Flow

Turn the carrier gas on and set the column head pressure to the values indicated in **Table II** *. These values represent approximate head pressures and flow rates. The exact optimum pressures and flow rates for a particular column will be set at a later time.

Table II Approximate Column Head Pressure (He or H₂ carrier gas)

| length (m) | 0.18mm ID | 0.25mm ID | 0.32mm ID | 0.53mm ID |
|--|-----------|-----------|-----------|-----------|
| 15 | — | 6psig | 3psig | 2psig |
| 20 | 14psig | — | — | — |
| 30 | — | 12psig | 8psig | 4psig |
| 40 | 30psig | — | — | — |
| 60 | — | 24psig | 16psig | 8psig |
| 105 | — | 40psig | 30psig | 14psig |
| Septum Purge Flow: between 2 and 5 cc/min. | | | | |

* If you are having difficulty establishing the appropriate column head pressure for back pressure regulated systems, then suspect septum or inlet ferrule leaks.

The split ratio is the amount of carrier gas exiting the split vent vs. the amount of carrier gas entering the capillary column. The split ratio should be adjusted so the sample amount reaching the column does not exceed the column's capacity. Typically, a split ratio of 50 to 1 is used. **Table III** lists common split vent flow rates found using hydrogen or helium carrier gases. Use the equation below to calculate the split ratio.

Split ratio = $\frac{\text{Split vent flow \& column flow}}{\text{Column flow rate (cm}^3\text{/min.)}}$

While the flow rate exiting the split vent is easy to measure with conventional bubble meters, the low flow rate exiting a capillary column can be difficult to measure. The following equation can be used to approximate the column flow rate.

Flow = $\frac{(\pi) (\text{column radius cm})^2 (\text{column length cm})}{\text{dead volume time (min.)}}$

where pi = 3.1459, column radius and length are in centimeters, and time is in minutes.

For example, a 30 meter x 0.53mm ID column operated at 20cm/sec. linear velocity with helium has a flow rate of 2.65cm³/min.

$$\text{Flow} = \frac{(3.14159) (.0265\text{cm})^2 (3000\text{cm})}{2.50\text{min.}} = 2.65\text{cm}^3/\text{min.}$$

Table III Typical Split Vent Flow Rates (50 to 1 split ratio)

| Carrier gas | 0.18mm ID | 0.25mm ID | 0.32mm ID | 0.53mm ID |
|-------------|-----------|-----------|------------|------------|
| helium | 15cc/min. | 35cc/min. | 80cc/min. | 125cc/min. |
| hydrogen | 30cc/min. | 70cc/min. | 160cc/min. | 250cc/min. |

Safety Tip: Always use a split vent trap when injecting hazardous or carcinogenic chemicals into a split/splitless inlet system.

Good Operating Practice

Operating a column without carrier gas flow causes irreparable damage to the stationary phase. Confirm flow by inserting the column outlet into a vial of solvent such as acetone or isopropyl alcohol prior to installing it into the detector. The appearance of bubbles at the column outlet confirms carrier gas flow. Allow the column to purge with carrier gas for fifteen minutes before installing the column outlet into the detector to remove any room air that may have diffused inside the column.

Outlet Installation

Install the nut and ferrule to the detector in the manner described in the instrument manual. Gently insert the column end into the outlet fitting making sure that it is not crushed or scraped against the metal detector parts. Regardless of the GC manufacturer, a higher degree of inertness and better peak symmetry results if the column end can be installed 1 to 3mm from the detector jet orifice. Be careful not to push the column beyond the jet orifice or the column end will burn in the flame. Some jets are too narrow to insert the column close to the jet orifice. If this is the case, pull the column end approximately 2mm away from the narrowed point to prevent flow occlusion or loss of inertness. While maintaining the correct insertion distance, use a capillary wrench to tighten the nut approximately one-half turn past finger-tight until the column is held firmly. The ferrule is tight when the column cannot be pulled from the fitting while applying gentle pressure.

Note — Be cautious when using stainless steel or aluminum-clad columns in gas chromatographs or GC/MS systems with electrically energized detector jets or orifices. These columns will conduct electricity and cause a short if the end of the column is installed too far into the energized detector. Always turn off the electrometer with Varian, PerkinElmer, and Shimadzu FIDs (since the detector is not grounded) when installing stainless steel or aluminum clad columns.

Leak-Checking Techniques

The best way to leak-check a capillary column system is to use a thermal conductivity leak detector (cat.#22451)*. These portable devices detect minute traces of helium or hydrogen carrier gas without contaminating the system. Leaks in mass spectrometers can easily be determined by monitoring for Mass 28 (N2) or 32 (O2).*

Never use liquid leak detectors that contain soaps or surfactants in capillary chromatography. Leaks draw these materials inside the system and contaminate the column, making high sensitivity operation difficult. In addition, liquid leak detectors can cause permanent damage to the capillary column by depolymerizing the silicone stationary phase.

Once the system is leak-free, set the injector and detector temperatures approximately 20°C above the final operating temperature of the analysis or at the column's maximum operating temperature. Then light or turn on the detector. Caution: Do NOT exceed the maximum operating temperature of the



column.

* Spraying argon gas and monitoring for Mass 39 is also effective for mass spectrometers.

III. Setting Optimum Flow Rates

The most accurate and reproducible way to set the capillary column flow is by injecting a non-retained substance (see table IV) to determine the linear velocity (dead volume time) and adjusting the head pressure until the linear velocity is at its optimum value. Measuring the flow rate at the column outlet is not recommended because it does not account for column-to-column variations. Relying on head-pressure readings is not recommended due to instrument and column variations. Exact flow rate values for a particular column can only be determined after the linear velocity is set at its optimum value.

Because most capillary columns are operated in a pressure (not flow) controlled mode, the temperature at which the linear velocity is set is critical. To obtain the optimum performance, linear velocity should always be set at the operating temperature for an isothermal analysis. For a temperature-programmed analysis, the column's linear velocity should be optimized at an oven temperature where a hard to separate peak pair elutes. If there are no critical peak pairs, raise the oven temperature to the temperature reached midway through the programmed run. Always document which non-retained compound was used and the temperature at which the linear velocity was set in order to easily reproduce the analysis.

To set dead time, inject 2.0µl of a non-retained substance that is compatible with the detector (**Table IV**). Accurately mark the injection starting time and peak elution time with an electronic integrator.

Table IV

| Detector Type | Recommended Dead Volume Compound |
|---------------|--|
| FID/TCD | CH ₄ |
| NPD | acetonitrile vapors |
| ECD | methylene chloride vapors or air |
| ELCD | dichlorodifluoromethane vapors |
| MS | O ₂ or N ₂ (air) |
| PID | ethylene or acetylene |

The compounds listed above may be slightly retained on thick film phases (1.0 to 7.0µm) giving erroneous dead volume times. However, they are reproducible for similar column types on subsequent analyses.

Adjust the column head pressure until the correct dead time is obtained for the appropriate column length and carrier gas (**Table V**). Once the dead volume time has been finalized, check the split vent and septa purge flow to make sure they did not change significantly. (Head pressure regulated capillary systems require adjustment of the split vent flow if the pressure changed significantly. Back pressure regulated capillary systems should not require adjustment.)

The values in **Table V** were obtained using the formula for average linear velocity (u). The optimum u is 40cm/sec. for hydrogen, 20cm/sec. for helium, and 12cm/sec. for nitrogen*. Insert the appropriate values in the equation below to obtain the required dead volume time for column lengths not listed.

$$\text{Dead volume time} = \frac{\text{Column length (cm)}}{u \text{ of carrier gas (cm/sec.)}}$$

Table V Dead Volume Times (for commonly used capillary columns)

| length (m) | hydrogen | helium |
|------------|---------------|-----------|
| 15 | 0.63 min./TCD | 1.25 min. |
| 30 | 1.25 min. | 2.5 min. |
| 60 | 2.5 min. | 5.0 min. |
| 105 | 4.38 min. | 8.75 min. |

* Nitrogen is not recommended as a carrier gas for most capillary columns because inadequate resolution and longer analysis times result.

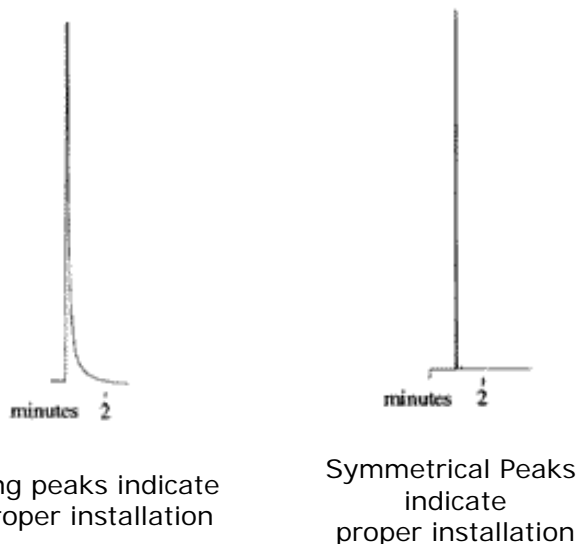
IV. Confirming Installation Integrity

We highly recommend using the dead volume peak shape test and the solvent peak shape test to confirm installation integrity.

Dead Volume Peak Shape Test

Examine the dead volume peak. A sharp, narrow peak that shows no sign of tailing indicates an unobstructed sample pathway and correct installation (**Figure H**). Tailing peaks indicate improper column installation, gross contamination of the splitter sleeve, a cracked splitter sleeve, improper sweeping of the column end by make-up gas, a crushed column end, or a column that has degraded. The cause of a tailing non-retained peak must be corrected before using the column analytically.

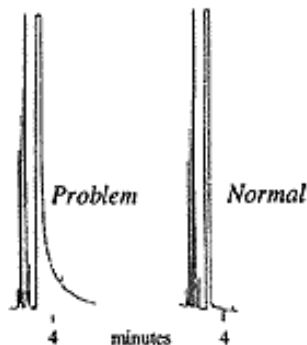
Figure H: Dead volume peak shape test



Solvent Peak Shape Test

The solvent peak shape test is an additional indicator of proper column installation in the inlet and outlet. Since compounds used to set the dead volume are usually gases at

The solvent peak shape is a good indicator of system integrity



room temperature (methane), they are not extremely sensitive indicators of system or installation problems. A 1 μ l injection of a liquid solvent, such as methylene chloride, expands to over 500 μ l of gas volume, making any potential installation or system problem readily apparent. A tailing solvent peak is a sensitive indicator of broken, undeactivated, or contaminated inlet sleeves. Tailing solvents also indicate problems with inadequate make-up gas or improper column insertion into the detector.

To perform the test, inject 1 μ l of a solvent in the split mode at 40°C isothermal and examine the peak shape (**Figure I**). The solvent peak should be symmetrical and show minimal tailing. If tailing appears, suspect an

installation or system problem. The cause of a tailing

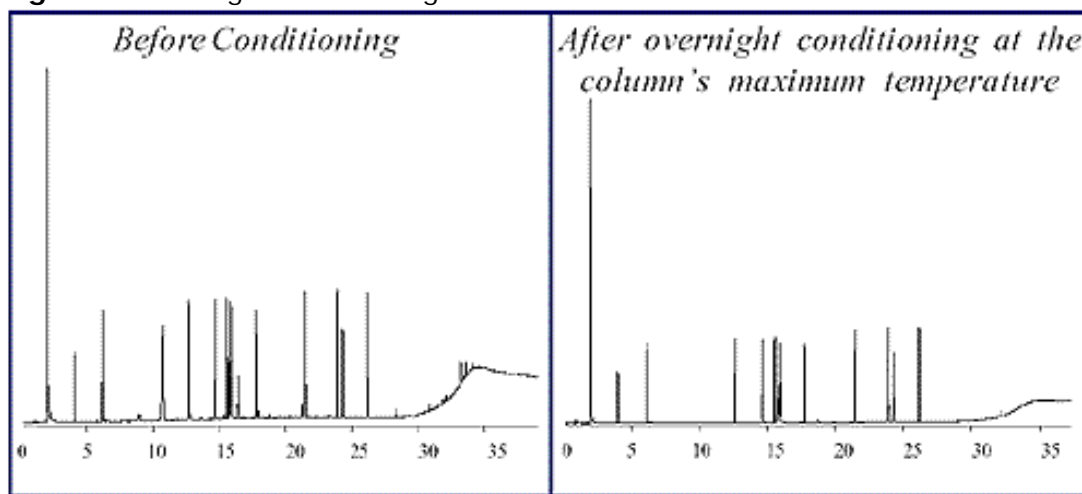
solvent peak must be corrected before using the column analytically.

V. Conditioning

Before conditioning a column at an elevated temperature, make sure there is proper flow, there are no leaks present, and there is an ample supply of oxygen-free carrier gas for the conditioning period. Conditioning at elevated temperatures without flow permanently damages or destroys the performance of the capillary column. Conditioning with an oxygen leak present causes the column to exhibit permanent high bleed and destroys its utility at high operating temperatures.

To condition the column, set the GC oven at 40°C, hold fifteen minutes, then program at 10°C/min. to the maximum operating temperature (see the test chromatogram included with the column). Alternatively, the column can be conditioned 25°C below the maximum operating temperature if it is going to be used at relatively low temperatures. Hold the column at this temperature for two hours or until the baseline stabilizes. Overnight conditioning is not necessary with Restek capillary columns operated at moderate detector sensitivities (approx. 8×10^{-11} AFS). Overnight conditioning is necessary when the column is going to be operated at high detector sensitivities ($< 4 \times 10^{-11}$ AFS) and at oven temperatures close to the maximum operating temperature (see **Figure J**). Extra conditioning may be required if operating the column at high sensitivity ($< 1 \times 10^{-11}$ AFS) or using thick films ($> 1\mu\text{m}$). The column should not be installed in very sensitive or hard-to-clean detectors such as ECDs, NPDs, FPDs, PIDs, ELCDs, or Mass Spectrometers during the initial conditioning period. This practice is particularly important with very thick film columns ($> 3\mu\text{m}$) which produce more stationary phase bleed. (Before conditioning thick film columns, cap the detector.) The Crossbond® procedure used by Restek produces columns with very low bleed levels. If your column is experiencing higher bleed than shown on the test chromatogram, contact us immediately at 800-356-1688 (ext. 4).

Figure J: Overnight conditioning reduces column bleed



VI. Test Mixtures

Restek tests every column with a stringent test mix to determine that the column and GC systems are performing correctly. It is good analytical practice to run the test mixture before analyzing samples to assess system problems or chemical incompatibilities that may be present. It is also good practice to inject the test mix weekly to monitor column performance and to indicate when maintenance procedures are needed. Refer to the "[Column Maintenance and Rinsing](#)" section in this guide.

Inject a column test mixture according to the test chromatogram conditions. Review the test chromatogram to determine peak identities for your specific column. Carefully compare Restek's test chromatogram and your analytical run, noting changes in peak shapes. In general, tailing hydrocarbon and Fatty Acid Methyl Ester (FAME) peaks indicate dead volume or contamination in the inlet or detector. Check the inlet and outlet sleeves for ferrule or septa fragments and reinstall the column. Excessively tailing solvent peaks and tailing or adsorbed peaks such as 2,3-butanediol, octanol, 2-

ethylhexanoic acid, or dicyclohexylamine indicate the need for cleaning and reactivating the split/splitless sleeve or that there is a problem with the make-up gas system. **Figure K** shows the Grob mix run on a relatively non-polar stationary phase.

SRI CTR1 Replacement Column for Fixed Gas analysis

May 2013

Separation of Oxygen, Nitrogen, Methane, CO and CO₂ has always been difficult since there is no single column material which is good for all these molecules at room temperature or above.

For example In the past, one column vendor (ALLTECH) sold a "column in a column" called a CTR1 which is shown at right.

This is a large bulky column consisting of an outer 1/4" OD column and an inner 1/8" OD column.

This column is no longer manufactured, or is not easily available, so SRI offers an equivalent or better column for the convenience of our customers.

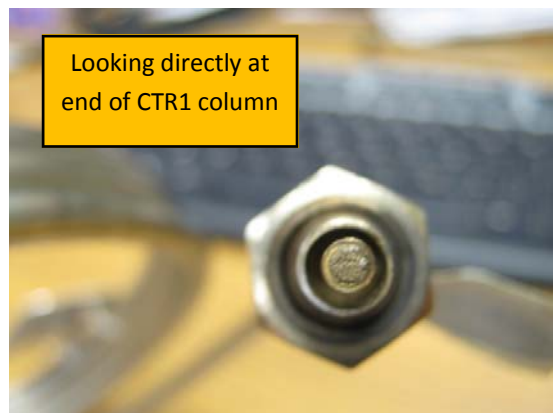
8600- PKC6 "Fixed Gas Column"

AUD\$880.00 April13 (price may change)

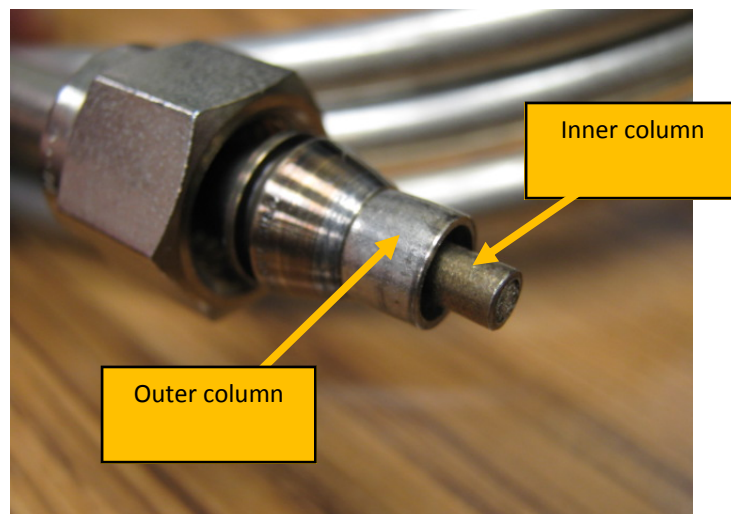
For a more robust method of separating these gas molecules as well as others like propane, propylene, butanes, pentane etc

Please see the MultipleGas#3 document on www.srigc.com/ . . . OR as Modified www.chromtech.net.au/pdf2/MGA#3-CT.pdf

. . . for a more Complex and UNIQUE Natural Gas / Sulfur compound separation see . . . <http://www.srigc.com/MG3+SulfurFeb2013.pdf>



Looking directly at end of CTR1 column



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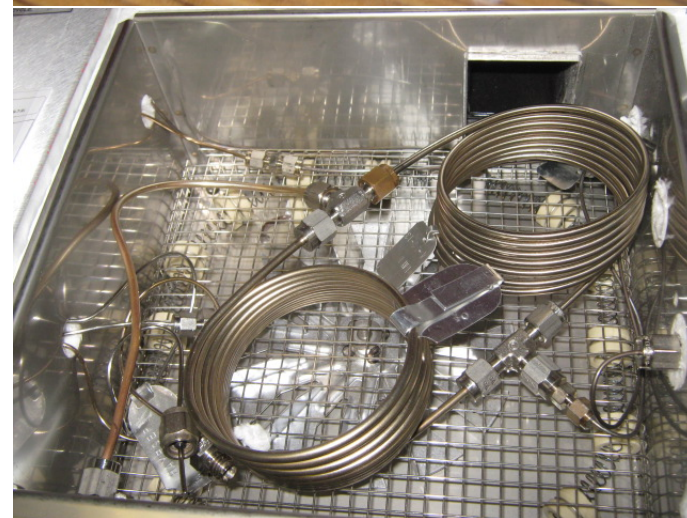
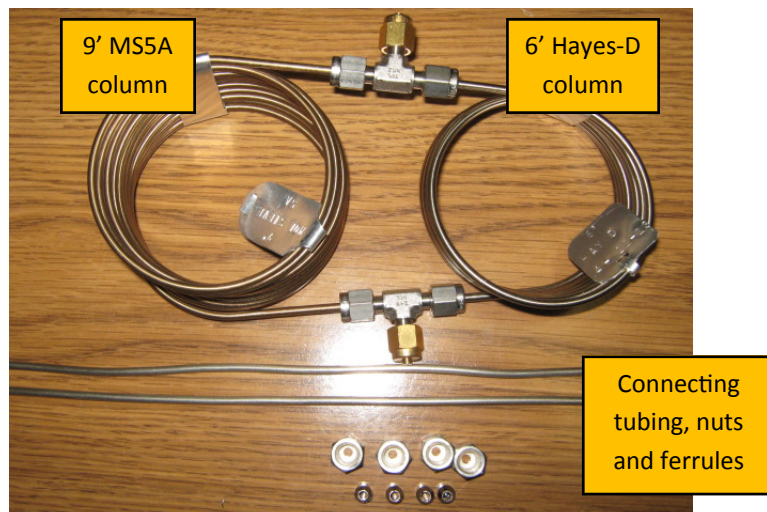
CTR1 Replacement Column for Fixed Gas analysis

May 2013

The SRI “ Fixed Gas Column” (FG) consists of two side by side columns rather than one column inside another. This arrangement is superior because the columns have different bake out temperatures and having them separable makes it easier to bake out the Molecular Sieve column (300C+)without damaging the lower temperature Hayesep-D (270C max) column.

The column is supplied with two 12” lengths of flexible 1/8”od nickel tubing to make connecting it easier and extra nuts and ferrules. We like the soft graphite ferrules for this application because they seal well and do not deteriorate at the 300C bake-out temperature. However metal ferrules or Vespel/Graphite can also be used.

The “ Fixed Gas Column” is shown installed in an SRI 8610C GC column oven AND there is still room for other columns.



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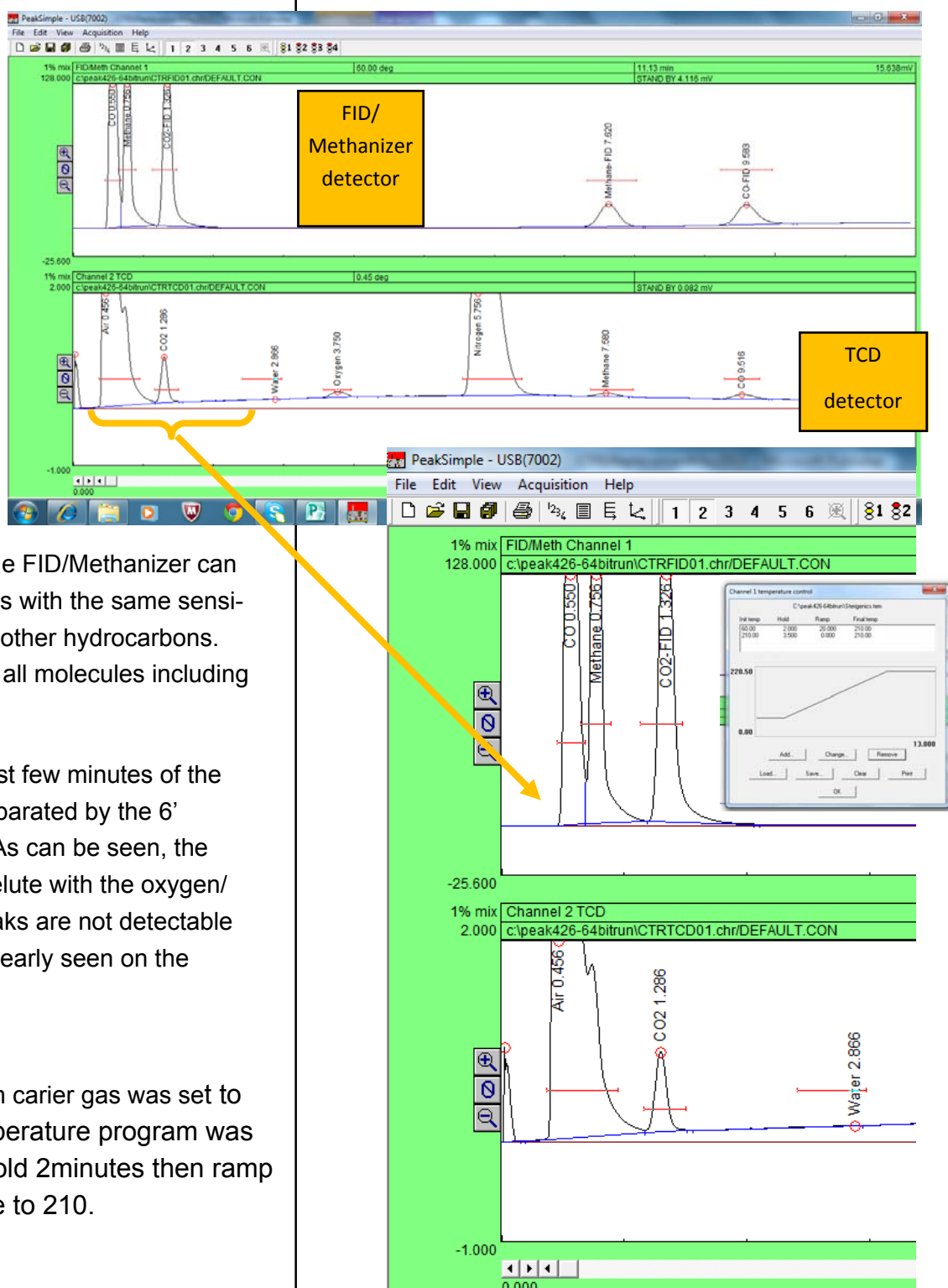
CTR1 Replacement Column for Fixed Gas analysis

May 2013

The FG column was installed in an SRI 8610C GC equipped with a TCD detector and FID/Methanizer (FIDM) detector. The two detectors were plumbed in series so some peaks are detected by both detectors. The methanizer part of the FID detector converts CO and CO₂ to methane so the FID/Methanizer can detect those molecules with the same sensitivity as methane and other hydrocarbons. The TCD responds to all molecules including water.

All the peaks in the first few minutes of the chromatogram are separated by the 6' Hayesep-D column. As can be seen, the CO and Methane co-elute with the oxygen/nitrogen, so these peaks are not detectable by the TCD, but are clearly seen on the FID.

In this case the helium carrier gas was set to 20 PSI and the temperature program was set to start @60C hold 2minutes then ramp at 20degrees/minute to 210.



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CTR1 Replacement Column for Fixed Gas analysis

May 2013

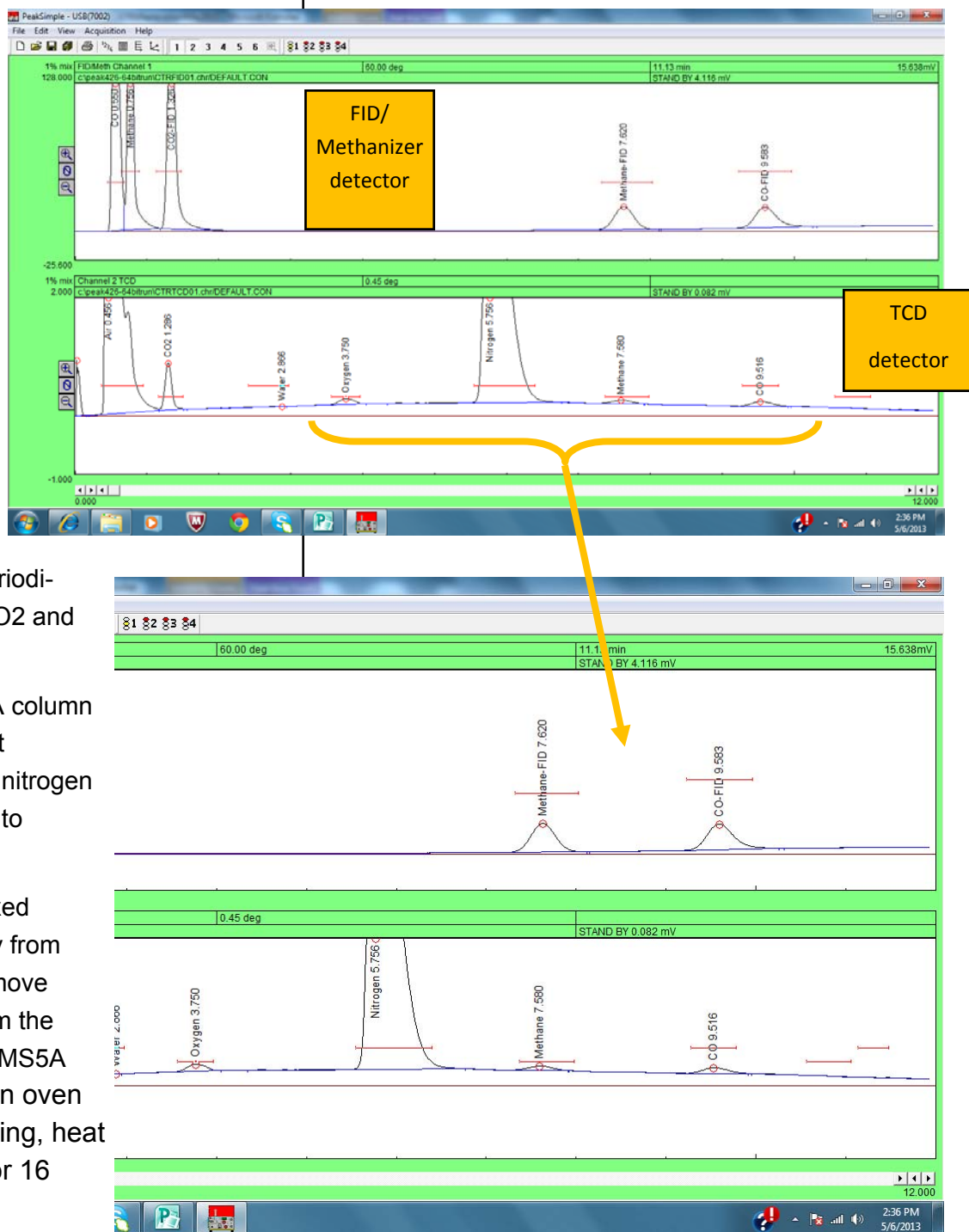
The peaks in the last minutes of the chromatogram are from the 9' Mole-Sieve 5A column.

This column separates oxygen from Nitrogen as well as methane and CO.

CO₂ however and water are permanently absorbed by this column which must be baked out periodically to remove the CO₂ and water.

You can tell the MS5A column needs to be baked out when the oxygen and nitrogen peaks start to blend into each other.

Remove the entire Fixed Gas column assembly from the oven and then remove the MS5A column from the assembly. Install the MS5A column in the column oven and with carrier flowing, heat the MS5A column for 16 hours at 300C.



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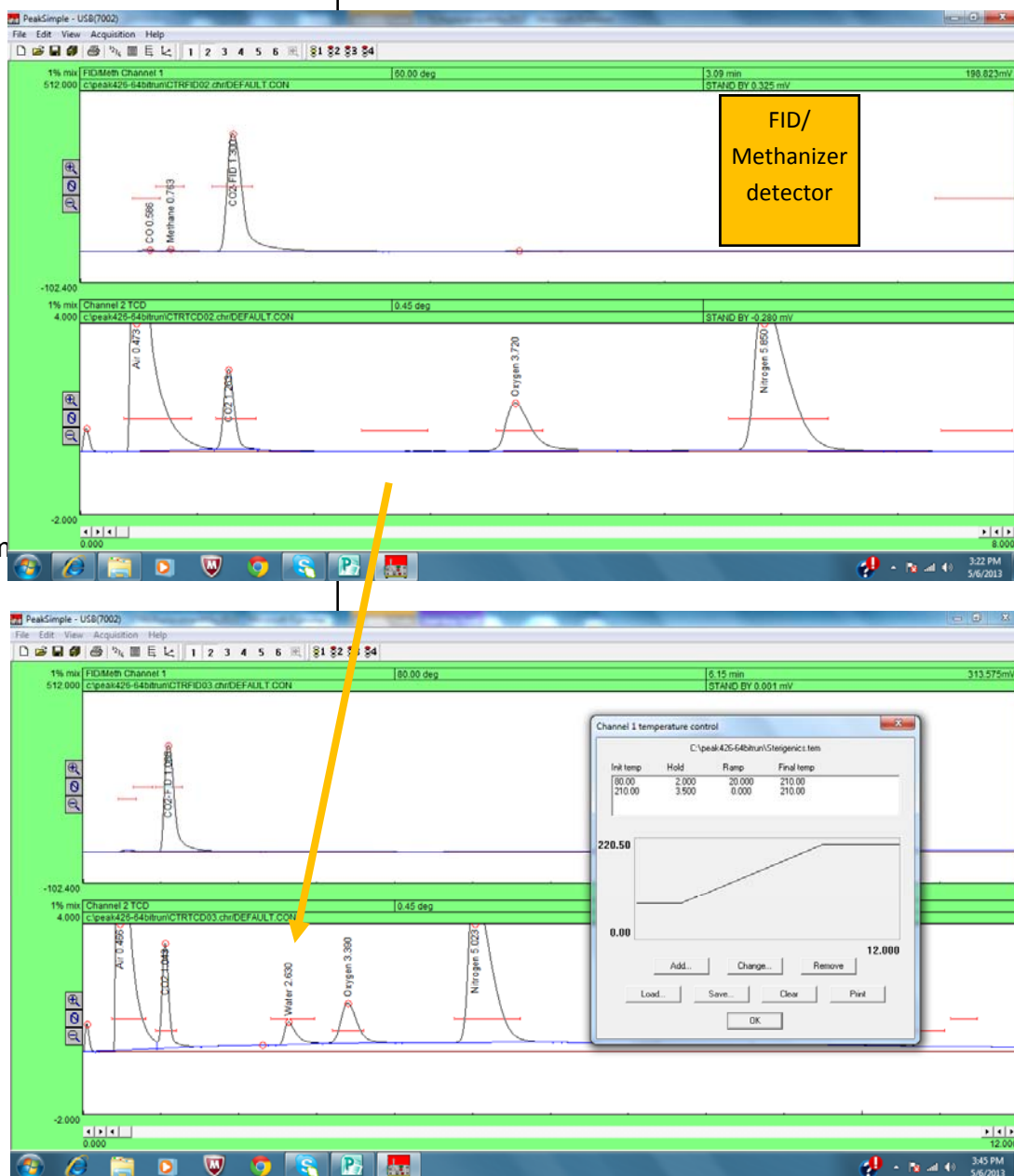
CTR1 Replacement Column for Fixed Gas analysis

May 2013

Shown at right is a chromatogram of 1ml exhaled breath using the 60C starting temperature.

Compare this chromatogram to the one below at a 80C starting temperature. The water peak in the top chromatogram co-elutes with the oxygen while at the 80C starting temperature, the lower chromatogram shows the water nicely separated from the oxygen.

There is less separation however between the CO2 and the air peak.



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CTR1 Replacement Column for Fixed Gas analysis

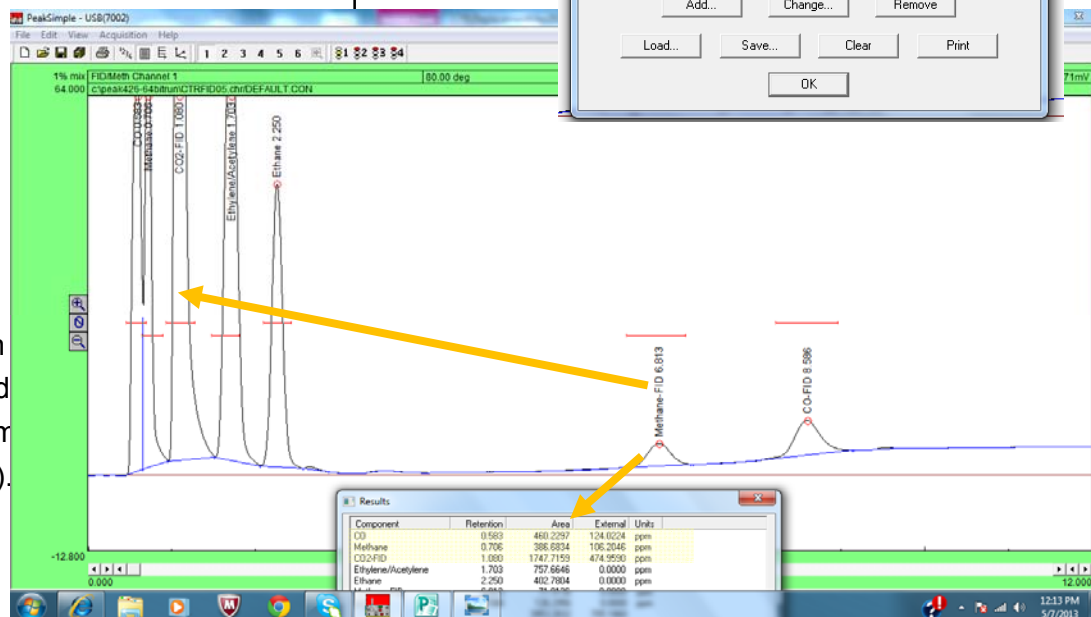
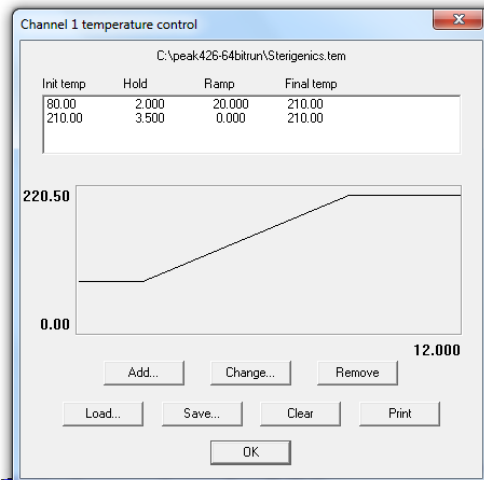
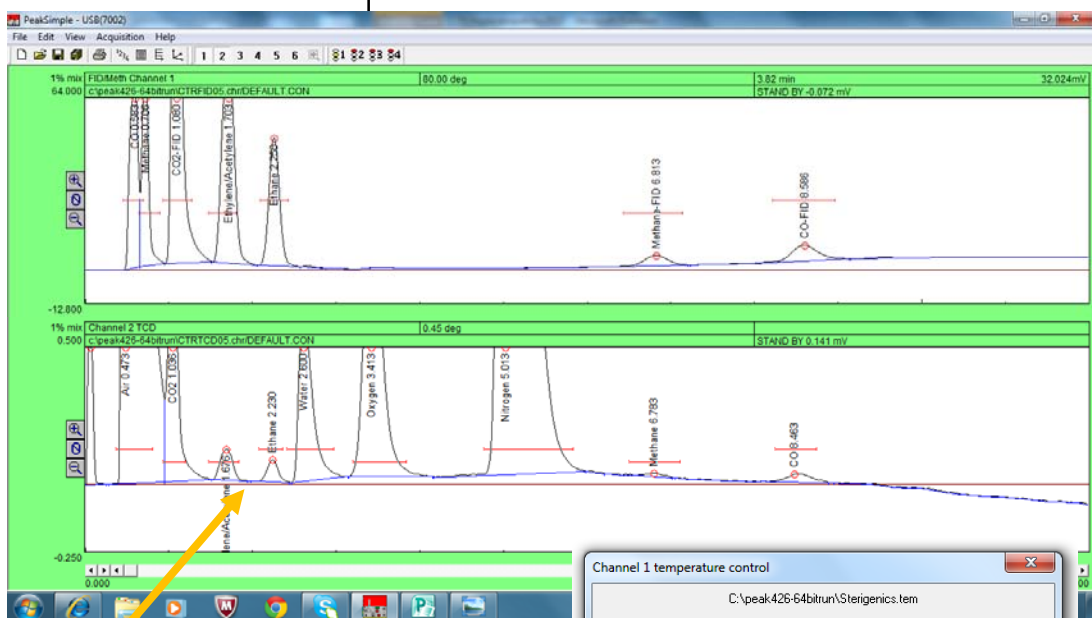
May 2013

Shown at right is a chromatogram of 1ml 1% gas mix including ethylene/acetylene and ethane using the 80C starting temperature oven program.

Between the TCD and FID/ Methanizer CO, CH₄, CO, Ethane, Ethylene/Acetylene, Water, Oxygen and Nitrogen are all resolved.

Ethylene and acetylene co-elute, but are separated from ethane and also water.

Note also that the split ratio between the columns is about 4:1 judging by the area counts of CO₂ (which elutes from the 6'Hayesep-D column and the methane and CO (which elute from the 9'MS5A column).



| Component | Retention | Area | External | Units |
|--------------------|-----------|-----------|----------|-------|
| CO | 0.583 | 460.2297 | 124.0224 | ppm |
| Methane | 0.706 | 385.5334 | 106.2046 | ppm |
| CO2/FID | 1.080 | 1747.7155 | 474.9550 | ppm |
| Ethylene/Acetylene | 1.703 | 757.6646 | 0.0000 | ppm |
| Ethane | 2.250 | 402.7884 | 0.0000 | ppm |



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CTR1 Replacement Column for Fixed Gas analysis

May 2013

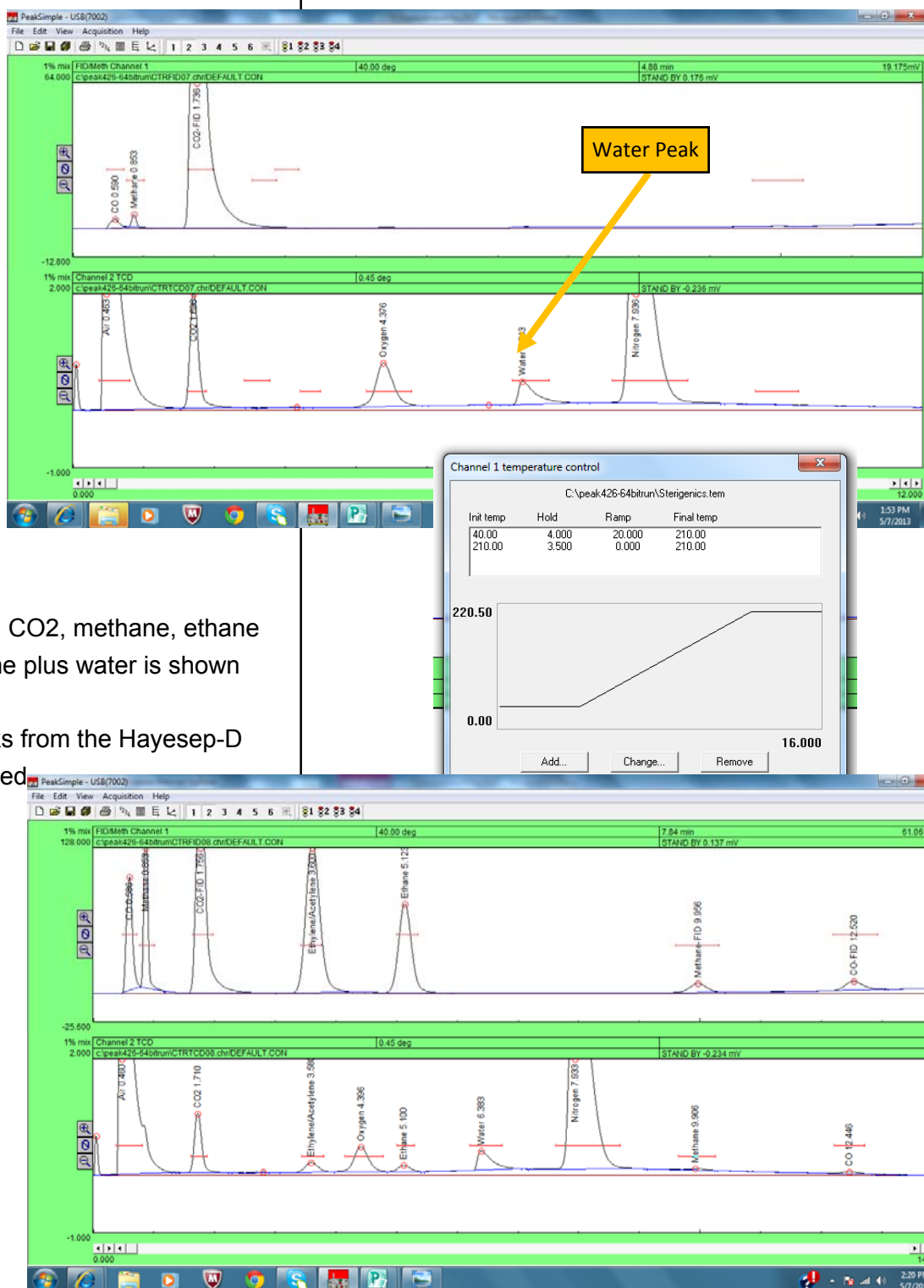
Shown at right is a chromatogram of exhaled breath starting at 40C.

You can see the water peak has shifted to the right and elutes between oxygen and nitrogen.

A mix of: O₂, N₂, CO, CO₂, methane, ethane and ethylene/acetylene plus water is shown starting at 40C.

You can see the peaks from the Hayesep-D column are interspersed with the peaks from the MS5A column.

You can experiment with different temperature programs to best suit your particular mix of gases.



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SELECTION GUIDE

Capillary GC Column Selection Guide

Restek offers fused silica or stainless steel capillary columns in more than 900 stock combinations of stationary phase, stationary phase film thickness, column ID, and column length. If you are not sure about how to choose the best combination for your application, column selection can be a frustrating, hit-or-miss decision. The information in this guide can help you choose the proper column for your particular need. Further, it can help you to determine whether a column you already are using is the best choice, or if you might improve resolution, speed of analysis, and/or analyte quantification by using a different column.

Parameters

- **Tubing Material**
- **Stationary Phase**
- **Stationary Phase Film Thickness**
- **Column Internal Diameter (ID)**
- **Column Length**



As always, your satisfaction with Restek chromatography columns is guaranteed. Please contact our **Technical Service Group** (or call 800-356-1688 or 814-353-1300, ext. 4), or your **Restek**



SELECTION GUIDE

Restek Capillary GC Column Selection Guide

Tubing Material

Siltek Tubing

In either fused silica or stainless steel format, Restek columns offer excellent inertness, consistent column-to-column performance and, when installed and operated according to recommendations, long column lifetimes.

Fused silica Rxi®, Rtx®, or Rt™ columns are your best choice for most applications. They offer the highest coating efficiencies, ensuring the best resolution of closely eluting

compounds. Also, many Restek fused silica columns can be ordered with an [Integra-Guard™ integral guard column](#).

Rxi® columns, in particular, provide unmatched performance and exceptionally reliable column-to-column consistency. In developing these columns, we focused on achieving unsurpassed inertness, and the lowest bleed and the highest reproducibility possible. To achieve these goals, we hired the world's best polymer chemists and built a new state-of-the-art research facility. We established rigorous controls on tubing dimensions and surface activity, and we treat this highly uniform tubing with a unique deactivation chemistry, producing a consistent, inert surface on which to apply a polymer. We reformulated our polymers, ensuring neutrality and fine tuning

selectivity for retention time locking.

The resulting exceptionally low-bleed columns are ideal for trace-level GC/MS analysis: with an Rxi® column, you can chromatograph sub-nanogram levels of active acidic or basic compounds on the same column — often under the same conditions.

To ensure reproducibility, we redeveloped our manufacturing process to maximize column-to-column consistency. Every Rxi® column is individually tested and proven to meet our stringent specifications for coating efficiency, selectivity, film thickness, inertness, and bleed. We guarantee every Rxi® column you receive will be the best column you have ever used.

Under harsh operating conditions, choose stainless steel MXT® columns:

- Rough handling (e.g., field instruments or process GC).
- Portable instruments / other small ovens requiring tightly coiled columns.
- High temperature chromatography.

When the potential for breakage is high, MXT® columns are your best choice — they present little risk of spontaneous breakage when used at high temperatures or when coiled into small diameters. While fused silica columns generally cannot be used above 360°C, because the polyimide outer coating becomes brittle over time at high temperatures, MXT® columns function well at temperatures exceeding 450°C. With an MXT® column, the only limitation to oven temperature is the operating limit of the stationary phase.

To prepare MXT® columns, we treat the internal surface of the stainless steel tubing with our exclusive Siltek® surface treatment, making the surface as inert as deactivated fused silica. The Siltek® layer permeates the surface, rather than simply coating it, making the layer

exceptionally flexible, so the tubing can be coiled to very small diameters. Coating efficiencies for MXT® columns are slightly lower than for fused silica columns, because the metal tubing has a larger surface area. We offer MXT® columns with a wide variety of stationary phases, in 0.18mm, 0.25mm, 0.32mm, and 0.53mm ID. The minimum coil diameter for 0.25mm ID or 0.53mm ID MXT® columns is 1.5 inches or 2.5 inches, respectively.

Restek Capillary GC Column Selection Guide

Stationary Phase

The stationary phase is the single most important consideration when you are choosing a column. The interactions between the analytes and the functional groups of the stationary phase contribute more to the overall results of the analysis than any other factor.

Table 1 summarizes the characteristics, chemical structures and, broadly, suggested uses for Restek general-purpose stationary phases. Change selectivity by choosing a stationary phase with a different percentage of substitution of a particular functional group (e.g., by switching from a 5% diphenyl/95% dimethyl polysiloxane stationary phase to a 20% diphenyl/80% dimethyl polysiloxane stationary phase) or by choosing a stationary phase with different functional groups (e.g., by switching from a diphenyl/dimethyl polysiloxane stationary phase to a polyethylene glycol stationary phase). Note that a stationary phase's selectivity for sample components follows the general chemical principle of "like prefers like": a nonpolar stationary phase, such as the Rxi®-1 methyl polysiloxane stationary phase, will preferentially retain and separate nonpolar compounds, such as straight-chain hydrocarbons, relative to polar compounds, such as alcohols. As methyl groups are replaced with more polar functionalities, such as phenyl or cyanopropyl groups, selectivity shifts toward more polar compounds. Polar phases, such as polyethylene glycol phases (e.g., Stabilwax®), are highly selective toward alcohols or other polar compounds.

Table 2 lists Restek special-purpose stationary phases. Columns with these phases are our first recommendations for the applications noted.

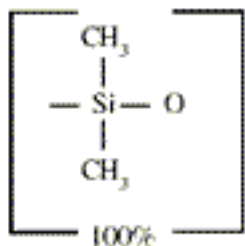
Table 3 lists stationary phases we recommend for environmental analyses by US EPA methods.

Table 4 lists retention indices for test compounds on the stationary phases characterized in Table 1. A retention index is a mathematical derivation indicating the elution position of a compound with respect to normal (straight chain) hydrocarbons. For example, a retention index of 650 for benzene on a particular stationary phase indicates benzene will elute mid-way between n-hexane (RI=600) and n-heptane (RI=700). The longer a particular compound is held by a stationary phase, the greater the retention index will be for that compound. Similarly, the greater the separation between two compounds, the greater the difference between their retention indices. To review retention indices for a wide variety of compounds on a range of Restek stationary phases, see the [retention index tables](#) in our on-line Expert Center.

Note that if you will be using a selective detector, background levels in your chromatograms can be high if the stationary phase contains elements the detector is designed to respond to. For example, avoid using a cyanopropyl (CN)-containing stationary phase with a nitrogen-phosphorus detector, or a fluorine-containing stationary phase with an electron capture detector.

Table 1 Stationary Phase Structures and Properties.

| Structure Diagram | Properties |
|-------------------|------------|
|-------------------|------------|



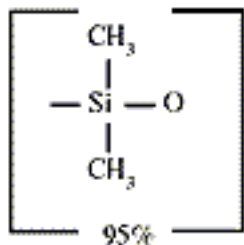
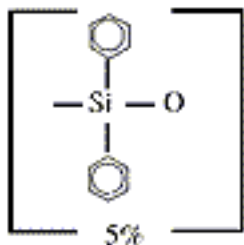
Rxi@-1ms/Rtx@-1MS

100% dimethyl polysiloxane

Stable to 360°C

Polarity: non-polar

Uses: solvents, petroleum products, pharmaceutical samples, waxes



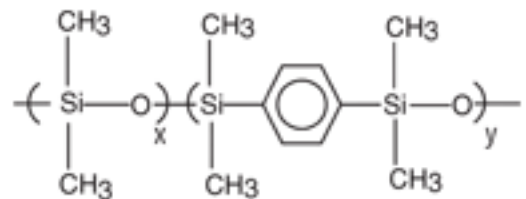
Rxi@-5ms/Rtx@-5/Rtx@-5MS

5% diphenyl - 95% dimethyl polysiloxane

Stable to 360°C

Polarity: slightly polar

Uses: flavors, environmental samples, aromatic hydrocarbons



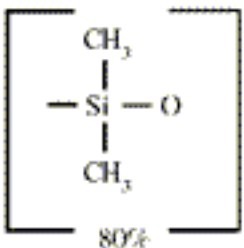
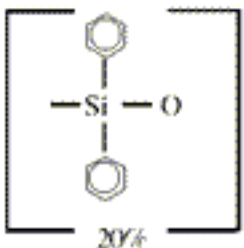
Rxi@-5Sil MS/Rtx@-5Sil MS

proprietary

Stable to 360°C

Polarity: slightly polar

Uses: flavors, environmental samples, pesticides, PCBs, aromatic hydrocarbons



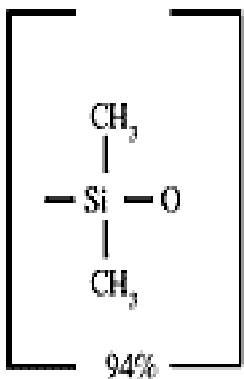
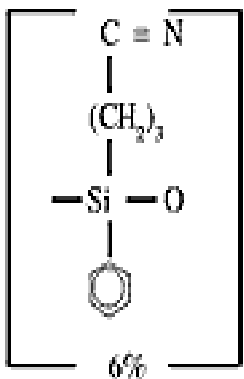
Rtx@-20

20% diphenyl - 80% dimethyl polysiloxane

Stable to 310°C

Polarity: slightly polar

Uses: volatile compounds, alcohols



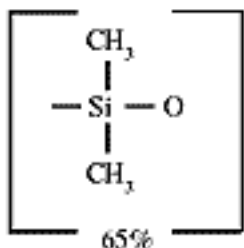
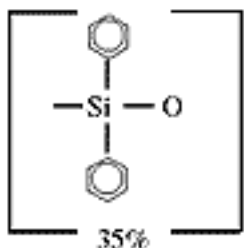
Rtx@-1301, Rtx@-624, Rtx@-G43

6% cyanopropylphenyl - 94% dimethyl polysiloxane

Stable to 280°C

Polarity: slightly polar

Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products



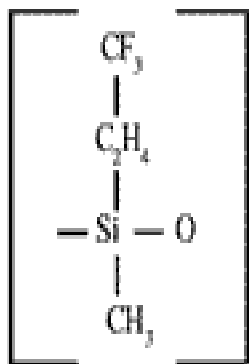
Rtx@-35

35% diphenyl - 65% dimethyl polysiloxane

Stable to 300°C

Polarity: intermediately polar

Uses: pesticides, Aroclor PCBs, amines, nitrogen-containing herbicides



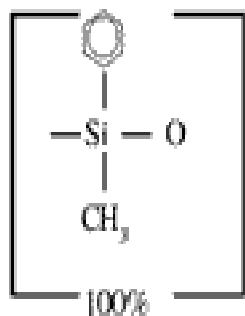
Rtx@-200

trifluoropropylmethyl polysiloxane

Stable to 360°C

Polarity: selective for lone pair electrons

Uses: environmental samples, solvents, Freon® gases, drugs, ketones, alcohols



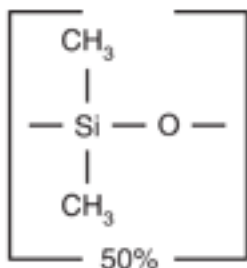
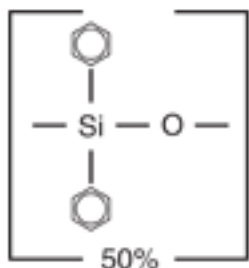
Rtx@-50

100% methylphenyl polysiloxane

Stable to 340°C

Polarity: intermediately polar

Uses: FAMES, carbohydrates



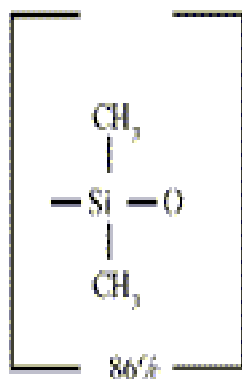
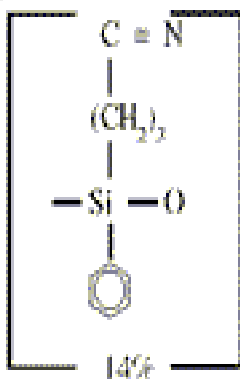
Rxi@-17

50% diphenyl - 50% dimethyl polysiloxane

Stable to 300°C

Polarity: intermediately polar

Uses: triglycerides, phthalate esters, steroids, phenols



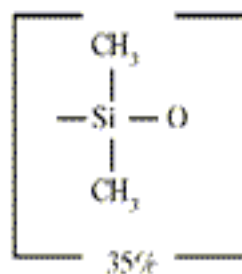
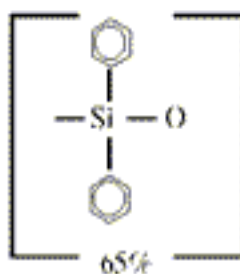
Rtx@-1701

14% cyanopropylphenyl - 86% dimethyl polysiloxane

Stable to 280°C

Polarity: intermediately polar

Uses: pesticides, Aroclor PCBs, alcohols, oxygenates



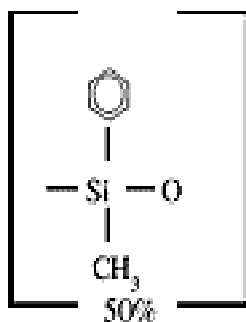
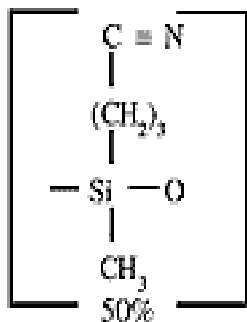
Rtx@-65TG

65% diphenyl - 35% dimethyl polysiloxane

Stable to 370°C

Polarity: intermediately polar

Uses: triglycerides, rosin acids, free fatty acids



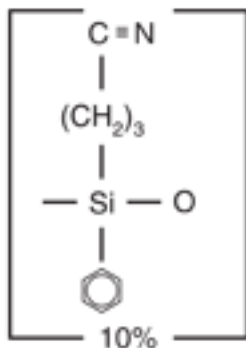
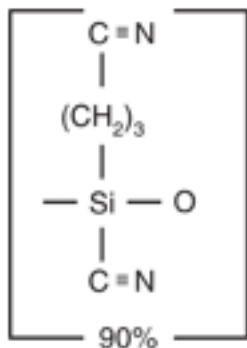
Rtx®-225

50% cyanopropylmethyl - 50% phenylmethyl polysiloxane

Stable to 260°C

Polarity: polar

Uses: FAMES, carbohydrates



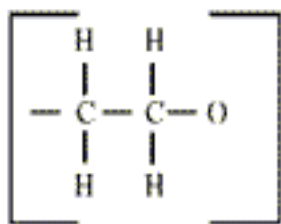
Rf™-2330

90% biscyanopropyl - 10% cyanopropylphenyl polysiloxane

Stable to 275°C

Polarity: very polar

Uses: *cis/trans* FAMES, dioxin isomers, rosin acids



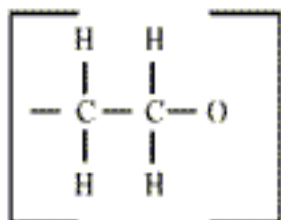
Stabilwax®

Carbowax® PEG

Stable to 250°C

Polarity: polar

Uses: FAMES, flavors, acids, amines, solvents, xylene isomers



Rtx®-Wax

Carbowax® PEG

Stable to 250°C

Polarity: polar

Uses: FAMES, solvents, BTEX aromatics, flavors

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Table 2 Restek special-purpose stationary phases.

| Application | Stationary Phase |
|---|-------------------------------|
| acids (underivatized) | Stabilwax®-DA |
| amines (underivatized); other basic compounds | Stabilwax®-DB |
| amines; other basic compounds | Rtx®-5 Amine Rtx®-35 Amine |

| | |
|--|--|
| blood alcohol; glycols | Rtx®-BAC1 Rtx®-BAC2 |
| chiral compounds | Rt™-βDEX Rt™-γDEX |
| detailed hydrocarbon analysis (ASTM/CGSB) | Rtx®-IPONA |
| dioxin and furan congeners | Rtx®-Dioxin Rtx®-Dioxin2 |
| fatty acid methyl esters (FAMEs) | FAMEWAX |
| flavor and fragrance components | Rtx®-1 F&F Rt™-CW20M F&F |
| nitroaromatic explosives e.g.: US EPA method 8095 | Rtx®-TNT Rtx®-TNT2 |
| organochlorine pesticides e.g.: US EPA methods 8081, 608, CLP Pesticides | Rtx®-CLPesticides Rtx®-CLPesticides2 Stx™-CLPesticides Stx™-CLPesticides2 |
| organophosphorus pesticides e.g.: US EPA method 8141A | Rtx®-OPPesticides Rtx®-OPPesticides2 |
| PCB congeners | Rtx®-PCB Stx™-500 |
| residual solvents in pharmaceuticals | Rtx®-G27 Rtx®-G43 |
| simulated distillation | MXT®-500 Sim Dist |
| simulated distillation: ASTM test method D2887 | Rtx®-2887 |
| volatile organic compounds e.g.: US EPA methods 502.2, 524.2, 601, 602, 624, 8010, 8020, 8260 | Rtx®-VGC Rtx®-VMS Rtx®-VRX Rtx®-Volatiles Rtx®-502.2 Rtx®-624 |

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Table 3 Stationary phases we recommend for environmental analyses.

For example chromatograms, click on the name of the stationary phase.

| US EPA Method | Stationary Phase |
|---|--|
| 502.2 (volatile organics) | Rtx®-502.2 |
| 504.1 (dibromoethane/dibromochloropropane) | Rtx®-CLPesticides Rtx®-CLPesticides2 |
| 506 (phthalate & adipate esters) | Rxi®-5Sil MS/Rtx®-5Sil MS Rxi®-1ms |
| 515/515.1 (chlorophenoxyacid herbicides) | Rtx®-440 Rtx®-50 Rtx®-CLPesticides Rtx®-CLPesticides2 |
| 524.2, Rev. IV (volatile organics) | Rtx®-VMS |
| 525.2 (semivolatile organics) | Rxi®-5ms |
| 526 (semivolatile organics) | Rxi®-5Sil MS/Rtx®-5Sil MS |
| 528 (phenols) | Rxi®-5Sil MS/Rtx®-5Sil MS |
| 551.1 (chlorinated disinfection byproducts) | Rtx®-5 Rtx®-200 Rtx®-1301 |

| | |
|--|--|
| 552.2 (haloacetic acids) | Rtx@-5 Rtx@-200 Rtx@-CLPesticides Rtx@-CLPesticides2 |
| 601 (volatile organics) | Rtx@-CLPesticides Rtx@-CLPesticides2 Stx™-CLPesticides Stx™-CLPesticides2 |
| 602 (volatile organics) | Rtx@-VMS Rtx@-VGC |
| 604 (phenols) | Rtx@-5 Rtx@-50 Rtx@-200 |
| 608 (organochlorine pesticides & PCBs) | Rtx@-CLPesticides Rtx@-CLPesticides2 Rtx@-PCB Stx™-500 (PCBs) |
| 610 (polynuclear aromatic hydrocarbons) | Rxi@-5ms Rxi@-5Sil MS/Rtx@-5Sil MS Rtx@-440 |
| 615 (chlorophenoxyacid herbicides) | Rtx@-35 Rtx@-5 |
| 619 (organonitrogen/organophosphorus pesticides) | Rtx@-CLPesticides Rtx@-CLPesticides2 Rtx@-50 Rtx@-200 |
| 624 (volatile organics) | Rtx@-VMS , Rtx@-VGC |
| 1671 (volatile organics) | Stabilwax® Stabilwax®-DB |
| 8010 (volatile organics) | Rtx@-VMS Rtx@-VGC |
| 8020 (volatile organics) | Rtx@-VMS Rtx@-VGC |
| 8021 (volatile organics) | Rtx@-VGC Rtx@-VRX |
| 8081/8081A (organochlorine pesticides) | Rtx@-CLPesticides Rtx@-CLPesticides2 Stx™-CLPesticides Stx™-CLPesticides2 Rtx@-440 Rtx@-XLB |
| 8095 (nitroaromatic explosives) | Rtx@-TNT Rtx@-TNT2 |
| 8100 (polynuclear aromatic hydrocarbons) | Rtx@-5 |
| 8140/8141/8141A (organophosphorus pesticides) | Rtx@-OPPesticides Rtx@-OPPesticides2 Rtx@-CLPesticides Rtx@-CLPesticides2 |
| 8151/8151A (organochlorine pesticides) | Rtx@-CLPesticides Rtx@-CLPesticides2 Rtx@-440 |
| 8240 (volatile organics) | Rtx@-VMS Rtx@-VGC |
| 8260/8260B (volatile organics) | Rtx@-VMS |
| 8270/8270D (semivolatile organics) | Rxi@-5Sil MS/Rtx@-5Sil MS Rxi@-5ms Rtx@-XLB |
| Appendix IX (semivolatile organics) | Rxi@-5Sil MS/Rtx@-5Sil MS |
| CLP (semivolatile organics) | Rtx@-5ms |

| | |
|--------------------------|--|
| TO-14/TO-15 (air toxins) | Rtx®-1 Rtx®-502.2 |
|--------------------------|--|

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Table 4 Retention indices for Restek general purpose stationary 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 |

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Stationary Phase Film Thickness

Stationary phase film thickness affects the retention and elution temperature for each compound in the sample. A thicker film retains compounds longer, increasing the length of time each compound spends in the column ([Table 1](#)). A thinner film retains compounds less, reducing the length of time each compound spends in the column. Very volatile compounds should be analyzed on a thick film column, to increase the time they spend in the column and allow them to separate. High molecular weight compounds must be analyzed on a thin film column, to reduce analysis time to a practical interval, and help minimize bleed at the higher temperatures required to elute such compounds.

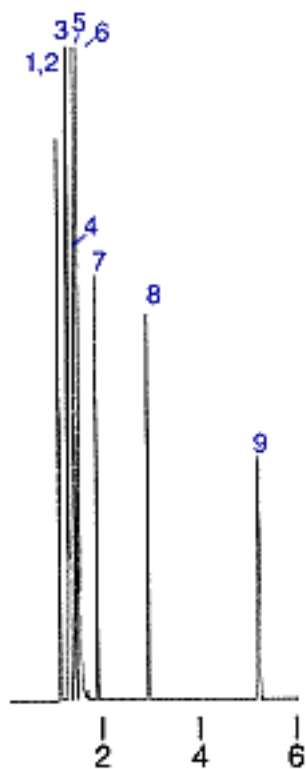
A comparative analysis of low boiling compounds on a 0.25 μ m, a 1.0 μ m, and a 5.0 μ m film of stationary phase, with all other variables held constant, shows the influence of film thickness ([Figure 1](#)). The 0.25 μ m film does not resolve butanol from benzene (peaks 1 & 2). The 1.0 μ m film provides about 80% resolution of this pair, but retention times are more than double those for the 0.25 μ m film. The 5.0 μ m film does not improve resolution between butanol and benzene, relative to the 1.0 μ m film, and retention times are increased by a factor of six relative to the 0.25 μ m film. So, for this particular sample, the 1.0 μ m phase film is best: resolution is suitable for quantifying the analytes, analysis time is acceptable, and a thicker film does not offer notable improvements. On the other hand, if we wanted to resolve very volatile C2 or C3

compounds, which would elute prior to peak 1, the 5.0 μ m film would be required.

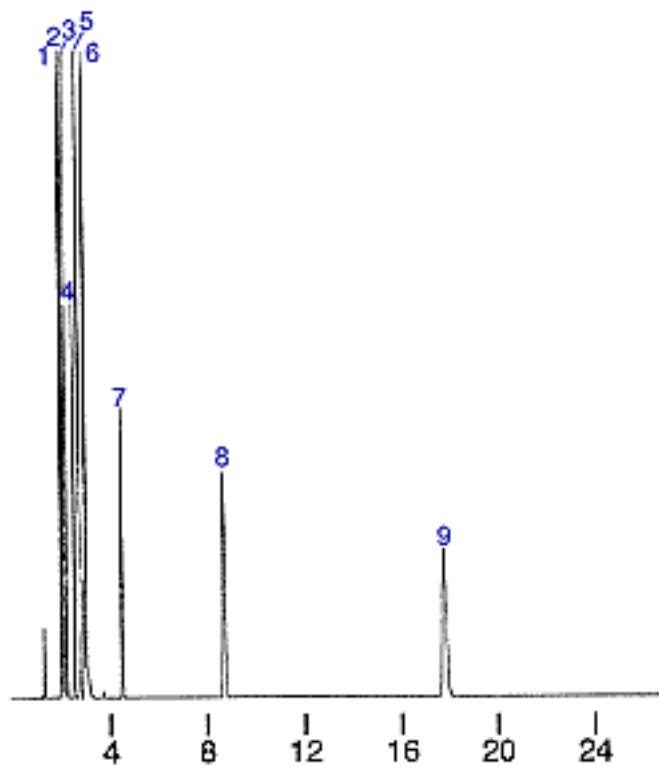
Both sample capacity and bleed increase as stationary phase film thickness is increased.

Changes in the column ID/stationary phase film thickness ratio, β , are an important consideration when you want to make a change in column internal diameter or in stationary phase film thickness. Analyte retention increases as column internal diameter is decreased, and analyte retention decreases as stationary phase film thickness is decreased. When other column parameters and analysis conditions are held constant, a column with a smaller β value will be more retentive for a given analyte. To assure similar retention and resolution when you increase the column ID, you also must increase the stationary phase film thickness. Similarly, if you wish to reduce the column ID, but keep retention and resolution similar, you also must reduce the stationary phase film thickness. **Table 2** lists β values for common combinations of column ID and stationary phase film thickness; where β values for different combinations are similar, elution patterns will be similar. To find β values for other column ID/stationary phase film combinations, use the **Beta Calculator**.

Figure 1 A sample containing low boiling components shows the differences in resolution among 0.25, 1.0, and 5.0 μ m columns. The 1.0 μ m column offers better resolution than the 0.25 μ m column, and the 5.0 μ m column does not offer any further improvements for compounds eluting after C6.

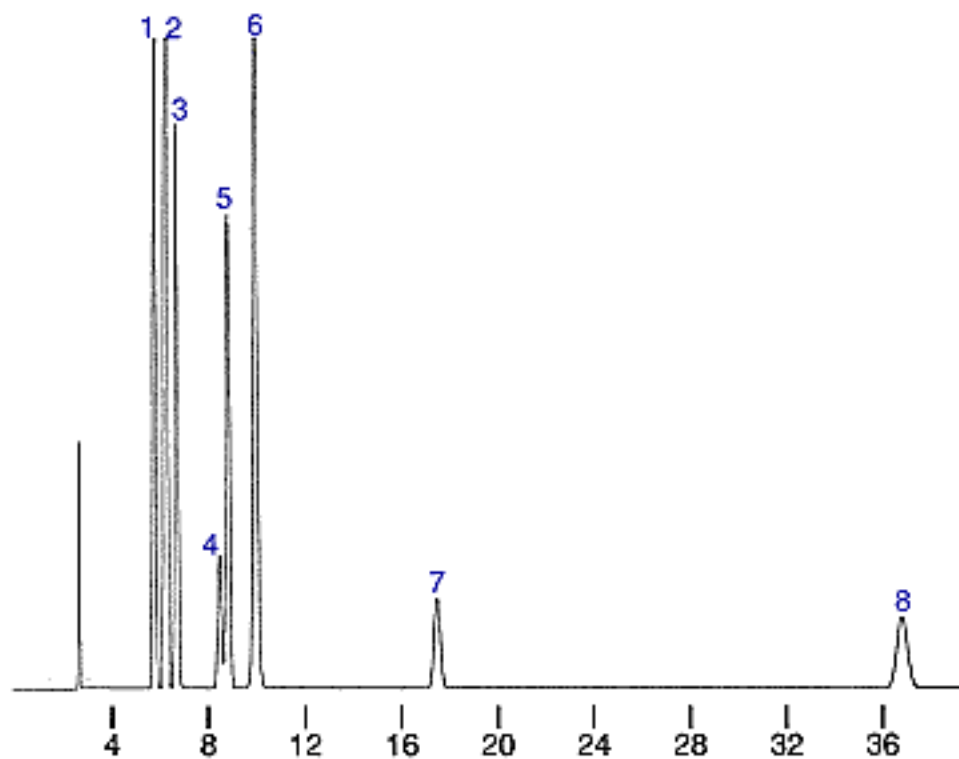


0.25µm, Rtx®-1



1.0µm, Rtx®-1

5.0µm, Rtx®-1



1. butanol
2. benzene
3. 2-pentanone
4. C7
5. 1-nitropropane
6. pyridine
7. C8
8. C9
9. C10

(Peak 9 elutes @ 117 minutes on the 5.0 μ m)

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Table 1 Characteristics of thick film and thin film stationary phases.

| Thick Films | Thin Films |
|--|--|
| higher sample capacity | lower sample capacity |
| less efficient | more efficient |
| longer retention times | shorter retention times |
| effectively retain lower molecular weight analytes | efficiently release higher molecular weight analytes |
| higher bleed | lower bleed |

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Table 2 Column ID: phase film ratio (β) value calculation for film thickness vs. column IDs

| phase film thickness (df) / β value | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Column ID | 0.10 μ m | 0.25 μ m | 0.50 μ m | 1.00 μ m | 1.50 μ m | 3.00 μ m | 5.00 μ m |
| 0.18mm | 450 | 180 | 90 | 45 | 30 | 15 | 9 |
| 0.25mm | 625 | 250 | 125 | 63 | 42 | 21 | 13 |
| 0.32mm | 800 | 320 | 160 | 80 | 53 | 27 | 16 |
| 0.53mm | 1325 | 530 | 265 | 128 | 88 | 43 | 27 |

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Restek Capillary GC Column Selection Guide

Column Internal Diameter (ID)

Your need for **resolution**, the **concentrations of analytes** you anticipate in your samples, and the **sample introduction and analyte detection** instrumentation you are using will influence your choice of column internal diameter.

When all other column parameters and analysis conditions are held constant, analyte retention increases, and resolution improves, as column internal diameter is decreased. Sample capacity increases as internal diameter is increased. Bleed also increases as column diameter is increased and film thickness is held constant, because there is more stationary phase in the column, however for most applications the difference in bleed will be insignificant.

Columns with an ID of 0.25mm or less offer the highest column efficiencies, and therefore the greatest resolution, but have limited sample capacities, relative to wider ID columns. If concentrations of analytes in your samples exceed the capacity of the column, the analysis will be characterized by peak distortion, poor resolution, and poor reproducibility. For many applications a 0.32mm ID column offers the best balance of resolution and sample capacity.

0.53mm ID columns are best for high flow situations, such as accommodating incoming samples

from a purge and trap unit. Alternatively, columns with an ID of 0.25mm or less are the best choice for GC/MS applications — they provide optimal performance with small flows of carrier gas, and thus can be connected directly to the vacuum source of a mass spectrometer, eliminating the complications associated with a jet separator.

Use **Table 1** to compare typical column characteristics according to column ID, then select the ID that best matches your needs.

Table 1 Characteristics of thick film and thin film stationary phases.

Select Column ID:

| Column Parameters | Values |
|--|--------|
| Typical Spitless Purge Time | |
| He split vent flow rate (50:1 split ratio) | |
| H2 split vent flow rate (50:1 split ratio) | |
| Column OD (Ferrule ID) | |
| Column Flow Rate (He @ 20cm/sec.) | |
| Column Flow Rate (H2 @ 40cm/sec.) | |
| Approximate Sample Capacity | |
| Typical Effective Plates/m (80% CE) | |

| | |
|---|---------------------------|
| Approximate column head pressure (He or H2 carrier gas) | |
| Column (m): | 6101215202530406075105150 |
| Head Pressure (psig): | |

Always optimize the column flow rate by using linear velocity.

Phase Ratio Calculations

Changes in the column ID/stationary phase film thickness ratio, beta, are an important consideration when you want to make a change in column internal diameter or in stationary phase film thickness. Analyte retention increases as column internal diameter is decreased, and analyte retention decreases as stationary phase film thickness is decreased. When other column parameters and analysis conditions are held constant, a column with a smaller beta value will be more retentive for a given analyte. To assure similar retention and resolution when you increase

the column ID, you also must increase the stationary phase film thickness. Similarly, if you wish to reduce the column ID, but keep retention and resolution similar, you also must reduce the stationary phase film thickness. **Table 2** lists beta values for common combinations of column ID and stationary phase film thickness; where beta values for different combinations are similar, elution patterns will be similar. To find beta values for other column ID/stationary phase film combinations, use the [Beta Calculator](#).

Table 2 Column ID: phase film ratio (beta) values for commonly used column dimensions.

| Column ID | phase film thickness (df) / beta value | | | | | | |
|-----------|--|--------|--------|--------|--------|--------|--------|
| | 0.10µm | 0.25µm | 0.50µm | 1.00µm | 1.50µm | 3.00µm | 5.00µm |
| 0.18mm | 450 | 180 | 90 | 45 | 30 | 15 | 9 |
| 0.25mm | 625 | 250 | 125 | 63 | 42 | 21 | 13 |
| 0.32mm | 800 | 320 | 160 | 80 | 53 | 27 | 16 |
| 0.53mm | 1325 | 530 | 265 | 128 | 88 | 43 | 27 |

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Column Length

Longer columns provide more resolving power, but increase analysis time and column purchase costs. As you consider whether the increase in resolution is worth the extra time and expense, remember that the benefit of using a longer column is much greater if you are performing a temperature programmed analysis than if you are performing an isothermal analysis. In an **isothermal analysis**, retention time varies directly with column length: if column length is doubled, analysis time will double as well. The increase in resolution will be only approximately 40%, however, because resolution is related to the square root of column length, as shown in the equation below. In a **temperature programmed analysis**, retention times are more dependent on temperature than on column length. As column length is increased, the increase in resolution will be the same as for an isothermal analysis, but there will be only a marginal increase in analysis time.

Length Effects

Length affects resolution and speed of analysis.

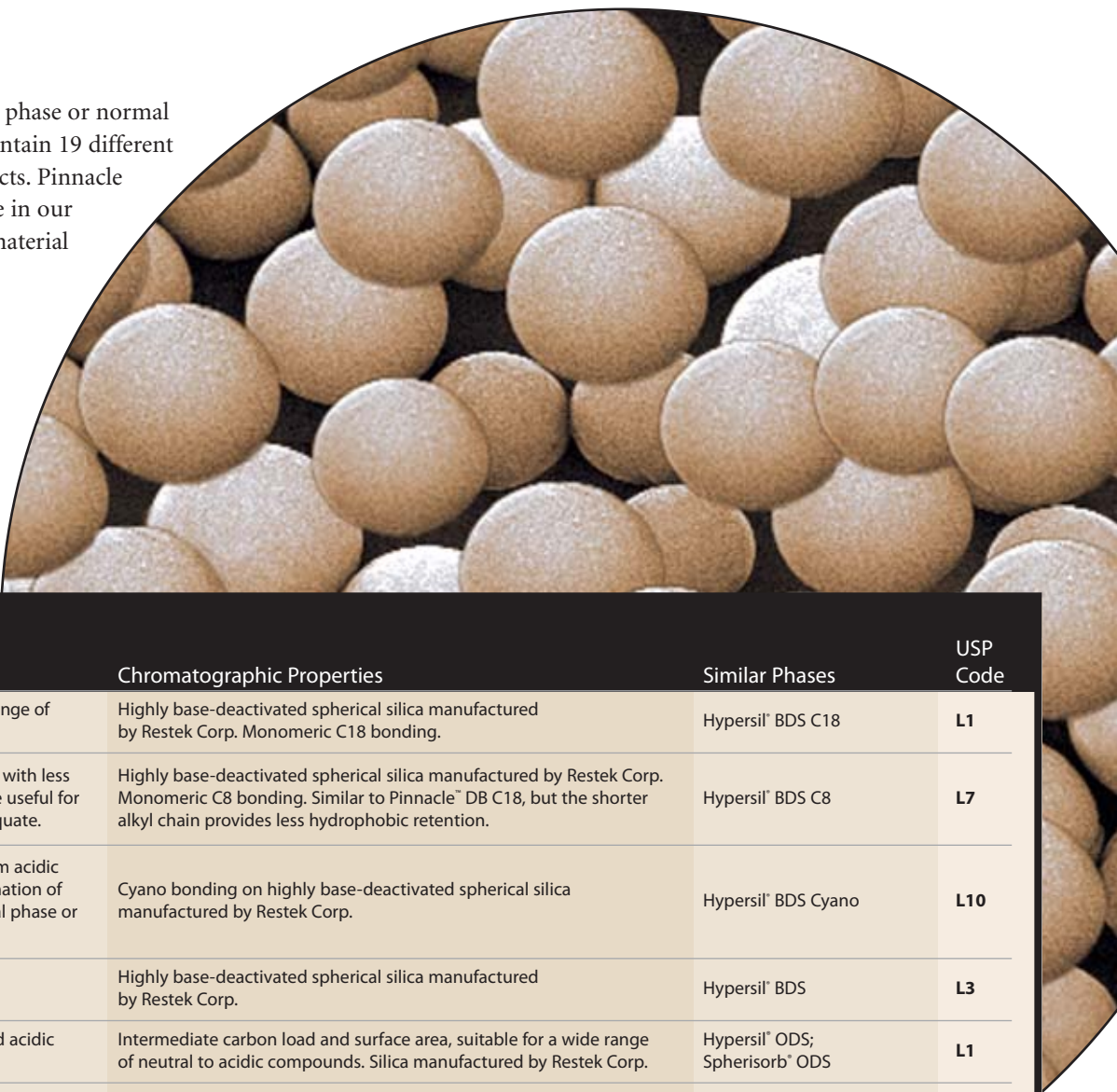
$$\text{Resolution} = \frac{1}{4} \sqrt{\frac{L}{h}} \times \frac{k}{k+1} \times \frac{\alpha-1}{\alpha}$$

L = length h = HETP k = capacity factor α = selectivity

HPLC Column Selection Guide



The uniform spherical shape of Restek silica allows optimal packing, for better reproducibility and lower back pressure, resulting in extended column life.



Restek Corporation manufactures a variety of columns for reversed phase or normal phase applications. The Allure™ and Ultra column product lines contain 19 different phases, and we continue to develop additional unique HPLC products. Pinnacle II™ and Pinnacle™ DB columns are based on silica we manufacture in our own laboratories, so you can be assured of their quality, from raw material synthesis through packing and testing.

We pack bonded phases into a wide range of column dimensions, including standard analytical columns in lengths of 30 to 250mm, internal diameters of 1.0 to 4.6mm, and particle sizes of 3 or 5µm. Preparative and semi-preparative columns are available, as well. These hundreds of column choices can make column selection overwhelming. The chart below, and the information on the back of the chart, are general guidelines to help simplify the column selection process.

| Restek HPLC Column | End Cap? | Pore Size (Å) | Carbon Load (%) | Applications | Chromatographic Properties | Similar Phases | USP Code |
|------------------------|----------|---------------|-----------------|---|---|---|----------|
| Pinnacle™ DB C18 | Y | 140 | 11 | Hydrophobic C18 phase suitable for a wide range of compounds, neutral through weakly basic. | Highly base-deactivated spherical silica manufactured by Restek Corp. Monomeric C18 bonding. | Hypersil® BDS C18 | L1 |
| 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. | Highly base-deactivated spherical silica manufactured by Restek Corp. Monomeric C8 bonding. Similar to Pinnacle™ DB C18, but the shorter alkyl chain provides less hydrophobic retention. | Hypersil® BDS C8 | L7 |
| Pinnacle™ DB Cyano | Y | 140 | 4 | Suitable for a wide range of compounds, from acidic through weakly basic. Also useful for confirmation of analyses on C18 or C8. Can be used in normal phase or reversed phase mode of separation. | Cyano bonding on highly base-deactivated spherical silica manufactured by Restek Corp. | Hypersil® BDS Cyano | L10 |
| Pinnacle™ DB Silica | NA | 140 | NA | Normal phase separations. | Highly base-deactivated spherical silica manufactured by Restek Corp. | Hypersil® BDS | L3 |
| Pinnacle II™ C18 | Y | 110 | 13 | Superior general purpose C18 for neutral and acidic analytes. | Intermediate carbon load and surface area, suitable for a wide range of neutral to acidic compounds. Silica manufactured by Restek Corp. | Hypersil® ODS; Spherisorb® ODS | L1 |
| Pinnacle II™ PAH | Y | 110 | P | Maximum resolution of polynuclear aromatic hydrocarbons. | Proprietary stationary phase; resolves 16 PAHs in US EPA Method 610. Silica manufactured by Restek Corp. | Unique | |
| Pinnacle II™ C8 | Y | 110 | 7 | Superior general purpose C8 for neutral and acidic analytes. | Provides shorter retention times for hydrophobic compounds than C18. Silica manufactured by Restek Corp. | Hypersil® C8 | L7 |
| Pinnacle II™ Cyano | Y | 110 | 4 | Superior general purpose cyano for weakly basic analytes. Can be used in normal phase or reversed phase mode of separation. | More rugged than bare silica for normal phase analyses. Silica manufactured by Restek Corp. | Hypersil® Cyano; Spherisorb® Cyano | L10 |
| Pinnacle II™ Phenyl | Y | 110 | 6 | Superior general purpose phenyl for neutral to weakly basic analytes. | Offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Silica manufactured by Restek Corp. | Hypersil® Phenyl; Spherisorb® Phenyl | L11 |
| Pinnacle II™ Amino | N | 110 | 2 | Excellent general purpose amino phase. Excellent choice for carbohydrate analysis. | Silica manufactured by Restek Corp. | Hypersil® Amino; Spherisorb® Amino | L8 |
| Pinnacle II™ Silica | NA | 110 | NA | Superior value phase for normal phase separation of polar analytes. | Lower retention than Ultra C18. Silica manufactured by Restek Corp. | Hypersil® Silica | L3 |
| Allure™ C18 | Y | 60 | 27 | Ideal for MS and light-scattering detection of neutral to slightly polar non-ionic solutes. Excellent for basic compounds, explosives, or steroids. | 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. Extensive deactivation. | Ultracarb® C18; Betamax® Neutral | L1 |
| Allure™ Aqueous C18 | N | 60 | P | Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds, water-soluble vitamins, organic acids. More retention than Ultra Aqueous columns. | Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases. | | L1 |
| Allure™ Basix | Y | 60 | 12 | Ideal for LC/MS of basic solutes. Excellent for basic pharmaceuticals or other amine-containing compounds. | Highly retentive phase for analytes containing amino functionality. | Betamax® Base; Maxsil® CN | L10 |
| Allure™ PFP Propyl | Y | 60 | 17 | Excellent for beta-blockers, halogenated compounds, nucleosides, nucleotides, pyridines, pyrimidines, or tricyclic antidepressants. Ideal for MS, ELSD, or NPD detection. | A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. | Discovery HS F5 | |
| Allure™ Organic Acids | N | 60 | P | Excellent resolution of challenging organic acids. | Single 30cm column performs equally to two C18 columns in series. (AOAC Method 986.13) | Unique | |
| Allure™ Silica | NA | 60 | NA | Highly retentive phase for polar analytes by normal phase separation. | High purity, very high surface area. | Maxsil® Si | L3 |
| Ultra C18 | Y | 100 | 20 | Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids. | Very retentive, high-purity packing material exhibits excellent peak shape for a wide range of compounds. Excellent first choice general purpose reversed phase column. | Discovery C18; Symmetry C18; Luna® C18; Zorbax® C18; Kromasil® C18; Lichrospher® RP-18; Inertsil® ODS-2; Develosil® C18 | L1 |
| 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, water-soluble vitamins, organic acids. | Highly retentive and selective for reversed phase separations of polar analytes. Extensively base deactivated. Compatible with highly aqueous (up to 100%) mobile phases. | ODS-AQ; Aquasil C18; Zorbax® SB-AQ | L1 |
| Ultra IBD | N | 100 | 12 | A polar group assists in deactivating surface silanols and contributes to unique selectivities for acids, bases, zwitterions, and polar compounds. | Intrinsically base-deactivated (IBD) phase, with a polar group embedded in the alkyl bonded phase. Provides unique selectivity while reducing or eliminating the need for mobile phase additives. | Symmetry Shield; Discovery ABZ & ABZ+; Prism®; HyPurity Advance | |
| Ultra C8 | Y | 100 | 12 | Excellent peak shape for a wide range of compounds. Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention. | Very retentive, high-purity, base-deactivated reversed phase packing. | Luna® C8; Symmetry C8; Kromasil® C8 | L7 |
| Ultra C4 | Y | 100 | 9 | Ideal for peptides, small proteins, hormones. | Exceptionally stable C4 packing, with high bonding coverage and silanol base-deactivation. Shorter retention than C18 or C8. | Supelcosil Butyl (C4); Delta-Pak® C4 | L26 |
| Ultra C1 | NA | 100 | 5 | Alternative selectivity to Ultra C18 or C8, especially for polar analytes. Shortest chain alkyl phase available for reversed phase separations. | Exceptionally stable C1 packing resists hydrolysis, even under acidic mobile phase conditions. Least retentive reversed phase hydrocarbon packing. | Spherisorb® C1 | L13 |
| Ultra Cyano | Y | 100 | 8 | Excellent for basic pharmaceuticals, steroids (normal or reversed phase conditions), or other basic compounds. | 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 separations. | Platinum® CN; Develosil® Cyano; Luna® CN | L10 |
| Ultra Phenyl | Y | 100 | 10 | Ideal for fatty acids, polynuclear aromatic hydrocarbons, purines and pyrimidines, polar aromatics. | High-purity, highly retentive, base-deactivated phase with alternate selectivity to hydrocarbon phases, especially for aromatic analytes. | Platinum® Phenyl; Supelcosil Phenyl | L11 |
| Ultra Amino | N | 100 | 2 | Superior general purpose amino phase. Ideal for carbohydrates. | 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® NH ₂ | L8 |
| Ultra PFP | Y | 100 | 7 | Ideal for taxol and precursors, halogenated compounds, amines, esters, or ketones. | A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogens or other basic analytes. | Fluophase® PFP; Fluosep-RP® Phenyl | L43 |
| Ultra Silica | NA | 100 | NA | Ideal for normal phase applications. | High purity, high surface area. | Unique | L3 |
| Ultra Carbamate | P | 100 | P | Rapid analysis of carbamates. | Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase. | Unique | |
| Ultra Quat | P | 100 | P | Proprietary phase for paraquat, diquat, and other quaternary amines. | High purity silica. Requires a reagent solution. | Unique | — |
| Viva™ Wide Pore C18 | Y | 300 | 6 | Proteins and other higher molecular weight compounds. | Silica manufactured by Restek Corp. | Symmetry® 300 C18; Jupiter® 300 C18; BioBasic® C18; Zorbax® 300 SB-C18 | |
| Viva™ Wide Pore Silica | NA | 300 | NA | Higher molecular weight compounds by normal phase mode. | Silica manufactured by Restek Corp. | Symmetry® 300 silica; Jupiter® 300 silica; Zorbax® 300 silica | |

P= proprietary
NA= not applicable
All columns: recommended pH range is 2.5–7.5; temp. limit 80°C.
Column lifetimes can be shortened by operating at pH and/or temperature extremes.

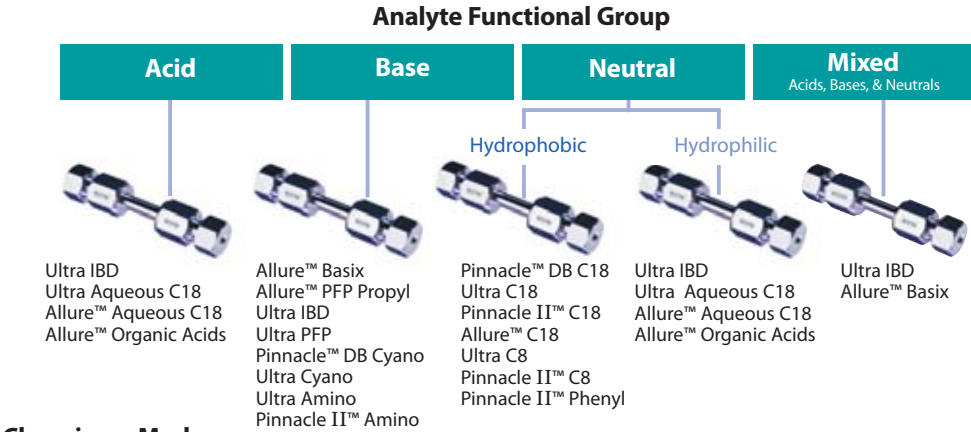
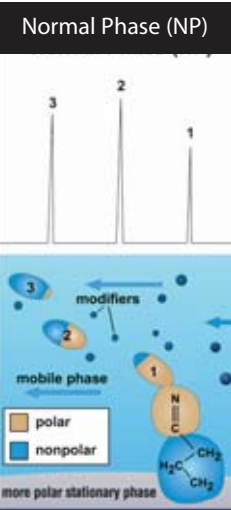
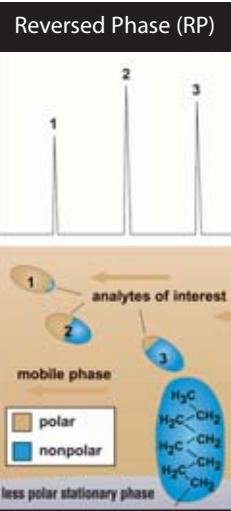
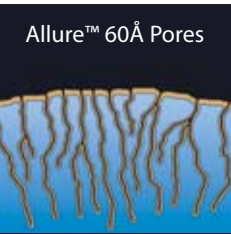
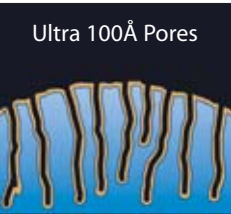
Call Restek Now for the Right Column for Your Tough Analysis 1-800-356-1688

Choosing a Stationary Phase

- Most critical decision in column selection.
- Based on analyte solubility and chemical differences among analytes.
- Analyte solubility dictates mode of separation:
 - Reversed phase - analytes soluble in water and/or polar organic solvent (e.g., acetonitrile, methanol). Mobile phase more polar than stationary phase.
 - Normal phase - analytes soluble in nonpolar solvent (e.g., hexane). Mobile phase less polar than stationary phase.

Pore Size

- Small molecules (<2000mw) generally analyzed on material with pore size ≤ 200Å (typical size: 60Å–180Å).
- Large molecules (>2000mw) generally analyzed on material with pore size ≥ 300Å.
- Surface area inversely related to pore size (the smaller the pores the larger the surface area).
- Stationary phase loading directly related to surface area (the larger the surface area the higher the stationary phase loading).



Choosing a Mode

| Sample Characteristics | | | |
|-----------------------------|-----------------------|-------------------------------|-------------------------|
| Sample soluble in: | Ionic Strength | Analytes primarily differ by: | Recommended Mode: |
| water and/or polar organics | nonionic | hydrophobicity/hydrophilicity | RP |
| | weakly ionic | hydrophobicity/hydrophilicity | RP with ion suppression |
| | nonionic/weakly ionic | size (> 2000MW) | SEC (GPC) |
| nonpolar organics | strongly ionic | hydrophobicity/hydrophilicity | RP-IP, IEX |
| | nonionic | hydrophobicity/hydrophilicity | NP |
| | weakly ionic | hydrophobicity/hydrophilicity | NP with ion suppression |
| | nonionic/weakly ionic | size (> 2000MW) | SEC (GPC) |

RP - reversed phase
SEC - size exclusion chromatography
GPC - gel filtration chromatography
RP-IP - reversed phase-ion pair ion exchange
NP - normal phase
GPC - gel permeation chromatography
IEX - ion exchange

Column Dimensions ID

- Theoretically, resolution and pressure are independent of ID, if the mobile phase flow rate is adjusted to maintain the same linear velocity.
- Smaller column ID can increase sensitivity if sample is limited.
- Smaller column ID can reduce / eliminate need for flow splitting in LC/MS.
- Column ID <3.2mm requires reducing extra column volume (tubing, injector, detector flow cell).

Length

- If all else is equal: shorter columns provide faster analyses and less backpressure; longer columns provide greater resolution
- Efficiency (N) is directly related to column length, but is a square root factor in resolution: therefore, a 4-fold increase in length is needed to double resolution

[R = 1/4 (α-1 / α) (√N) (k' / k'+1)]

α: selectivity k': capacity

Particle Size

- Analytical separations generally are on 5µm or smaller particles.
- Semi-preparative and preparative analyses generally are on 7µm or larger particles.
- Smaller particles provide greater efficiency (N) than larger particles (a 3µm particle provides ~50% greater efficiency than a 5µm particle).
- Smaller particles create higher backpressure.

Steps in Scouting a Method

1. Choose stationary phase based on chemistry of analytes.
2. Use a 150 x 4.6mm, 5µm column; determine appropriate mobile phase strength needed (2<k<5) by using a gradient test run.
3. If resolution is close to requirements, optimize column dimensions and conditions. If large gain in resolution is needed change mobile phase composition or stationary phase.

Optimum Flow Rate

| ID (mm) | 5µm Particles Flow Rate (mL/min.) | 3µm Particles 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 |

Trident™ Direct Guard Column System

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 the following 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. Use 4.0mm ID guard with 4.6 or 4.0mm ID analytical column, 2.1mm ID guard with 2.1 - 3.2mm ID analytical column.

Trident™ Direct Guard Column System

| Description | qty. | cat.# |
|---|-------|-------|
| 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 |

*The standard PEEK® tip in Trident™ Direct systems is compatible with Parker®, Upchurch®, Valco®, and other CPI-style fittings. To use Trident™ Direct systems with Waters®-style end fittings, the tip must be replaced with cat.# 25088.

Restek Trademarks: Allure, Pinnacle, Pinnacle II, Viva, Trident, Turning Visions into Reality, Restek logo.

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INNOVATIVE PRODUCTS

HPLC Column Selection Guide



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Restek Capillary Column Installation Guide

Section III: Operational Information

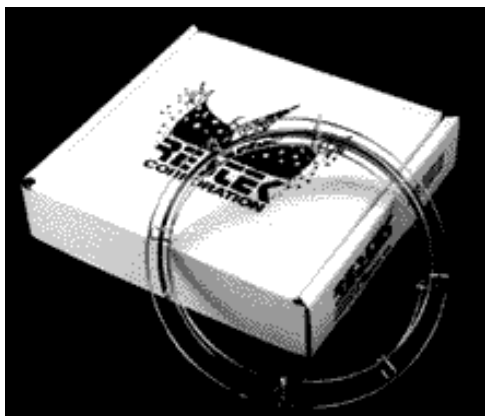
- A. Standby operation
 - B. Column removal and storage
 - C. Protection against dirty samples
 - D. Connecting fused silica tubing
 - E. Connecting stainless steel tubing
 - F. Column maintenance and rinsing
 - G. Injecting water and other solvents
-

A. Standby Operation

If the column is not going to be used for several days but the instrument must remain on standby, reduce the splitter vent flow rate to 10cc/min. (to conserve carrier gas) and maintain an oven temperature between 100°C and 150°C. Keeping the oven slightly hot minimizes septa bleed from accumulating at the head of the column and reduces the need for excessive conditioning when the column is used. Make sure there is a sufficient carrier gas supply when leaving the column in standby operation. If the column will be unused for three or more days, it is best to shut down all heated zones and leave the column in the GC with a low flow of carrier gas. Never leave the column in the GC without carrier gas flowing.

B. Column Removal and Storage

Remove the column from the GC. Make sure that there are no ferrule fragments in the injector or detector fittings. If a graphite ferrule sticks in the fitting, remove it by using a tapered needle file (cat.# 20106). Insert the file and spin it slightly until it is latched inside the ferrule. Then move the file slightly from side-to-side, while applying force, until the ferrule slips out of the fitting. If the ferrule does not come out in one piece, disassemble the fitting and inspect all parts to make sure that all fragments are removed.



Seal the column ends with a high temperature (2000°C) Microflame™ torch (cat.# 20125) immediately after removing the column from the GC. If a Microflame™ torch is not available, or when using stainless steel columns, insert the column ends into a septum to prevent phase oxidation during storage. Always store the column in the original box, away from sunlight or fluorescent lights, to avoid polymer damage. In particular, Stabilwax®, Rtx®-1301, and Rtx®-1701 columns (polyethylene glycol and cyanosilicone polymers) are especially susceptible to uv induced degradation and should be shielded from light.

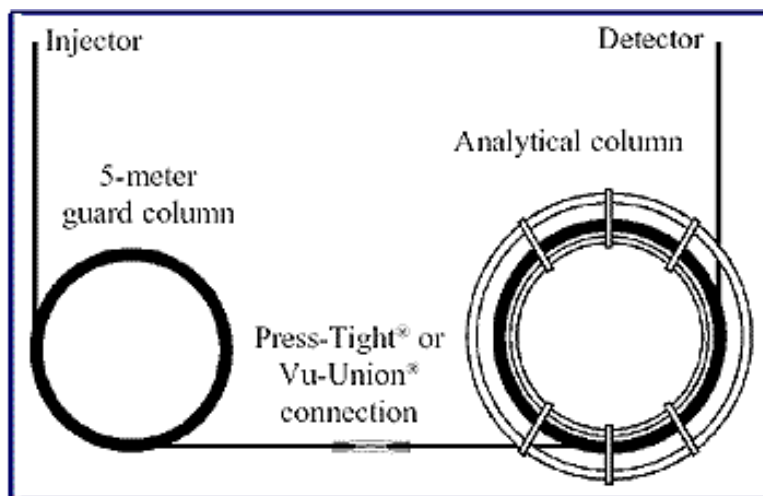
C. Protection Against Dirty Samples

Samples that contain non-volatile or high molecular weight residue can contaminate the stationary phase, decrease quantitative accuracy, and cause a loss of peak resolution after a limited number of injections. Packing the inlet sleeve and using a guard column are two specific precautions recommended to help increase the number of analyses performed before column and inlet sleeve maintenance is required.

The first precaution involves the use of an inlet sleeve packed with silanized fused silica or glass wool (cat.# 20790, 20789) or highly inert silica beads (cat.# 20791) to trap sample residue and prevent it from entering the capillary column. Insert a loosely packed 2cm wool plug approximately 1cm below the maximum penetration distance of the syringe needle. Too much packing material can detrimentally affect the performance of the column. Refer to the instrument manual for specific inlet packing instructions.

Stationary phase coated packings are not recommended since they tend to be adsorptive and can bleed stationary phase onto the column. This problem is particularly damaging if a methyl silicone inlet packing is used with a Carbowax® PEG-type capillary column.

The second precaution involves using a 5-meter deactivated, uncoated guard column at the analytical column inlet (**Figure L**). The guard column prolongs column life by trapping non-volatile contaminants before they enter the analytical column. Sample components travel at the same rate as the carrier gas on the uncoated guard column inlet, but slow down considerably when they reach the analytical column's stationary phase. Because the

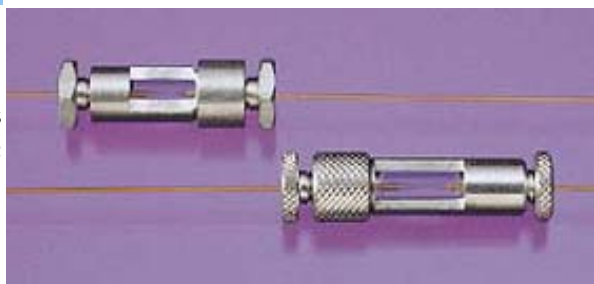


sample's rate of travel is faster through a guard column, the sample has a limited interaction time with residue and, therefore, is not as affected by its presence. Without a guard column, sample residue affects chromatographic performance more rapidly due to increased interaction times. A 5-meter guard column also allows contaminated segments to be removed without having to reconnect the column each time. Restek's Integra-Guard™ is a built-in guard column configuration that eliminates connectors. For more information on protection against dirty samples, request Restek's bulletin A Guide When Injecting Dirty Samples.

D. Connecting Fused Silica Tubing

Connectors are necessary to attach guard columns and restrictors, or to repair broken analytical columns. Both Press-Tight® connectors and Vu-Union® connectors are effective at making low dead volume, inert connections. Press-Tight® connectors are best for standard applications at temperatures below 325°C. Polyimide resin (cat.# 20445) can be used to strengthen and create permanent press-tight connections, preventing the possibility of premature separation. Vu-Union® connectors are appropriate for high temperature or high pressure applications, or when attaching an analytical column to a mass spectrometer transfer line. Call Restek's Technical Service at (800) 356-1688 (ext. 4) for more information on the use of these two connectors.



**Press-Tight® connectors****Vu-Union® connectors**
(vacuum/high pressure & capillary/microbore)**Connecting Columns with Press-Tight® Connectors**

1. Cut the column ends squarely.
2. Wipe the column ends with methanol to lubricate and clean.
3. Carefully insert the ends into the Press-Tight® Connector.
4. Visually inspect (see photo).
5. Leak-check using a thermal conductivity leak detector.

E. Connecting Stainless Steel Tubing

In order to connect MXT® columns, special connectors must be used. The MXT® Low Dead Volume connector (cat.# 20397, 20394) and MXT® Low Dead Volume "Y" connector (cat.# 20396, 20395) are Silcosteel®-treated and deactivated to make them inert to active compounds. They will not cause peak tailing or affect system inertness and can be used up to 400°C without degrading the deactivation layer. Stainless steel replacement ferrules are available to fit 0.28mm ID MXT columns (cat. # 20398) and 0.53mm ID MXT columns (cat. # 20399).

MXT® tubing can be connected to fused silica tubing by using a capillary Vu-Union® connector (cat.# 20418) provided the end of the MXT® column is properly burnished into a conical shape. The flat side of a ceramic scoring wafer can be used to polish or round the column end into a conical taper. An MXT® connector with a special ferrule (cat. # 20259) can also be used with a fused silica column. A fused silica Press-Tight® connector cannot be used with MXT® columns because without polyimide coating on the outside of the tubing, a leak-free connection cannot be obtained.

F. Column Maintenance and Rinsing

Maintenance is necessary if a column experiences high bleed (that cannot be decreased by overnight conditioning), adsorption of active components, peak tailing, or changes in relative retention times. Cutting two loops (approximately one meter) from the column inlet is often sufficient to restore a contaminated column. However, high molecular weight residue carried deep into the column bore can only be removed by solvent rinsing. To remove pyrolyzed contaminants that are not solvent-soluble, cut two loops from the column's inlet and one loop from the outlet. Closely examine the inlet end of the column to make sure that all contaminated tubing has been removed. Occasionally, it becomes necessary to remove more than two loops from a heavily contaminated column to restore it to acceptable performance. Solvent rinsing removes only soluble contaminants and may not always restore a bonded phase capillary column to its original performance. **Figure M** illustrates the performance of a column that has been successfully solvent-rinsed. Choose a series of polar and non-polar volatile solvents that will solubilize the suspected contamination. Only use solvents shown in **Table VII** to rinse Restek columns. If you are

using a solvent that is not listed, call Restek BEFORE rinsing to prevent permanent damage to your capillary column.

Figure M: Solvent rinsing removes soluble contaminants

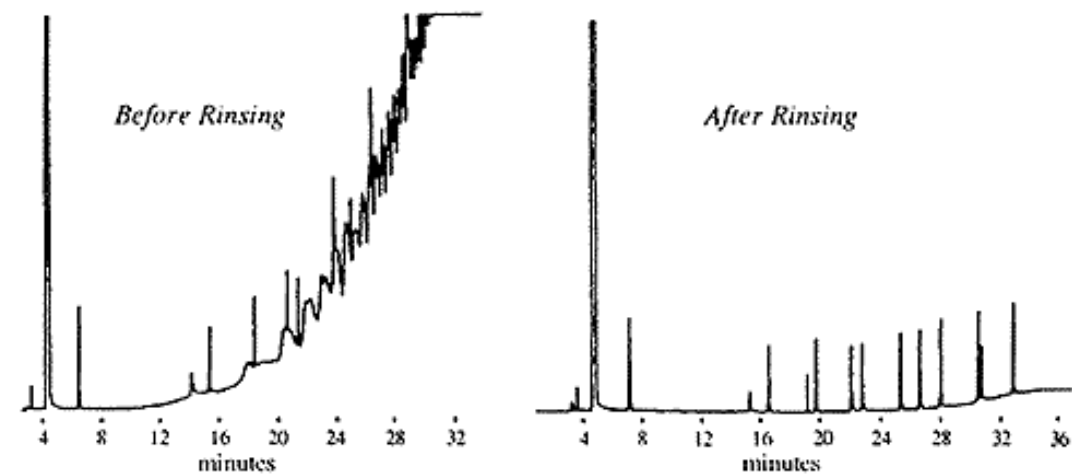


Table V Dead Volume Times (for commonly used capillary columns)

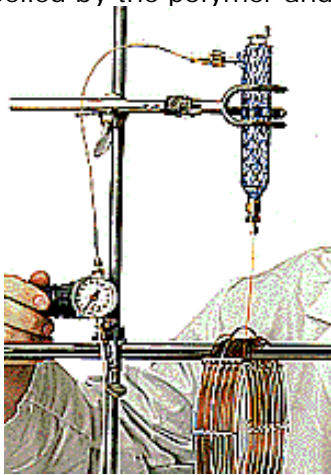
| Phase | Magic Mix | Water | Methanol | CH ₂ Cl ₂ | CHCl ₃ | Acetone | Toluene | Pentane |
|-------------------------|-----------|-------|----------|---------------------------------|-------------------|---------|---------|---------|
| MXT/Rtx-1 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx/XTI-5 & Rtx-5MS | OK | OK | OK | OK | OK | OK | OK | OK |
| Rtx-5 Amine | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-Volatiles | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-502.2 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-20 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-35 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-50,-56, & 65TG | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-1301 & 624 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-1701 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-200 | OK | OK | OK | OK | OK | OK | OK | OK |
| Rtx-225 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-BAC1 & BAC2 | OK | OK | OK | OK | OK | OK | OK | OK |
| MXT/Rtx-WAX & Stabilwax | Avoid | Avoid | OK | OK | OK | OK | OK | OK |
| Stabilwax DB | Avoid | Avoid | Avoid | OK | OK | OK | OK | OK |
| Stabilwax DA | Avoid | Avoid | OK | OK | OK | OK | OK | OK |

Magic Mix = 20% DI H₂O, 60% CH₃OH, 20% CH₂Cl₂

Do not rinse the following columns because they are either partially or not bonded: Rtx-2330, Rt-2330, Rt-2340, Rt-BDEX, Rt-γDEX, Rt-TCEP & Micropacked

Restek's chemists have found that a mixture of 60% methanol, 20% DI H₂O, and 20% methylene chloride (i.e. magic mix) is ideal for rinsing and cleaning most bonded stationary phases. (Do not use this mixture unless these solvents are recommended for rinsing.) The methylene chloride tends to swell the polymer which allows the methanol/DI H₂O to deeply penetrate into the swollen polymer lattice to remove polar contamination.

Without the addition of methylene chloride, polar solvents such as water or methanol are repelled by the polymer and do not clean deeply inside the polymer lattice.



Always rinse the column from the back (detector side) to the front (inlet side) to prevent contaminants lodged on the inlet side from being carried deeper inside the column bore (backflushing). Columns can be rinsed by either forcing solvent through the column under pressure or by pulling solvent through under vacuum. Restek offers a convenient Capillary Column Rinsing Kit (cat.# 20612, shown at left) to rinse columns. This kit contains a glass reservoir with a fritted disk to prevent particulates from damaging the capillary column. The amount of solvent used to rinse a column should equal approximately three to five times the column's internal volume. **Table VII** lists typical solvent volumes and pressures used to rinse each column ID.

Table VII Typical Solvent Volumes and Pressure Used for Rinsing

| Column ID | Solvent Volume | Reservoir Pressure |
|-----------|----------------|--------------------|
| 0.18mm | 10ml/TCD | 50psig |
| 0.25mm | 15ml | 40psig |
| 0.32mm | 25ml | 30psig |
| 0.53mm | 50ml | 15psig |

Use non-swelling solvents such as methanol or acetone to minimize swelling while solvent-rinsing thick film columns. Sometimes very thick films (>3µm) can swell shut and occlude the column flow while being solvent-rinsed. Do not try to remove the blockage by increasing the rinsing pressure. Attach both column ends to a vacuum system for 24 hours. The vacuum evaporates the solvent and opens the column bore.

After rinsing, allow the column to purge with a dry carrier gas for 4-6 hours to decrease polymer swelling after solvent exposure. If the column is installed in a GC and heated rapidly before the solvent swelling has diminished, extensive damage to the polymer occurs. After purging, install the column in the GC at 40°C and hold for 30 minutes. Then, program slowly (4°C/min.) to the column's maximum operating temperature and condition for two hours before using.

G. Injecting Water and Other Solvents

In general, injecting water and other solvents will not damage bonded or non-bonded phase capillary columns provided that the solvent is vaporized before it reaches the front of the column (i.e. when split, splitless, or direct injections are performed). However, if operating the capillary column in cold or heated on-column modes, some damage may occur. To reduce the risk of damage, avoid water and methanol with Stabilwax®, Stabilwax®-DB, Stabilwax®-DA, Rtx®-2330, and Rtx®-225 phases when using cold or heated on-column injection techniques. Alternatively, avoid damage from water and methanol by attaching a 5-meter Hydroguard™ guard column to the capillary column inlet. This allows the solvent to vaporize before reaching the capillary column. Injecting water, methanol, or other solvents will not damage the other phases Restek offers, regardless of the injection mode.



Restek Capillary Column Installation Guide

Section IV: Column Troubleshooting & Return Procedure

- A. Pinpointing Performance Problems
- B. Contacting Restek for Technical Service
- C. Return Authorization Procedure

Many problems associated with capillary chromatography are due to sample contamination or instrument variables. Our technical service chemists may suggest some troubleshooting procedures to isolate these variables. Preliminary troubleshooting efforts by you help us identify the cause of the problem faster and can save you valuable down time.

A. Please follow these steps to pinpoint performance problems:

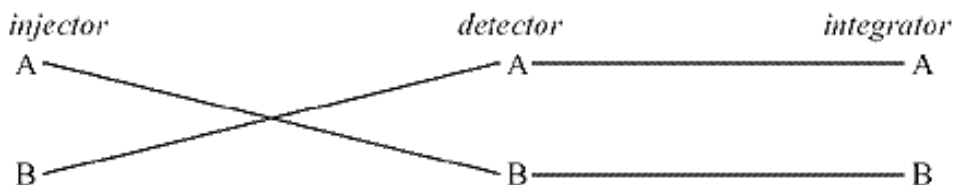
Isolate the Column From Instrument Variables:

The first step is to isolate the column from instrument variables. To do this, simply install a new column into the same GC without changing any GC related variables. We highly recommend keeping a spare column on hand at all times, but if you do not have a spare column, then install the questionable column in another GC that is working properly. If the problem does not seem to follow the column, (i.e. the new column does not work in the same GC, or the old column works fine in another GC), then we suggest performing routine maintenance on the injection port and detector as described in Section II of this installation guide. If the problem seems to follow the column, then it is time to perform routine maintenance on the column as described in Section III of this installation guide.

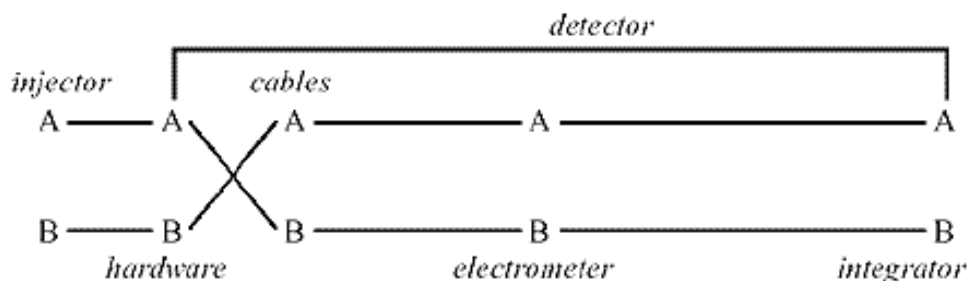
Begin Diagramming and Documenting

Document the procedures in chronological order listing times, dates, and important instrument parameters. Label all troubleshooting chromatograms. These steps help to inform anyone else that may be working on the system of the troubleshooting procedures that have been completed.

Start with a simple instrument diagram and try switching column A to detector B and vice versa. If the problem moves to detector B, then the problem is most likely occurring in the injector.



If the problem stays on Detector A when the column outlet is switched, then suspect a detector problem. Begin isolating detector problems by switching hardware, cables, electrometers, integrators, or any suspect part in the pathway. If the problem goes away from the A side, then that detector is most likely the cause and should be replaced.



B. If you are unable to pinpoint the problem:

Contact our [technical service group](#) at 800-356-1688 (ext. 4). Save all chromatograms and notes on any operating parameters.

Provide Restek's Technical Service Chemists with This Information:

1. The column's catalog and serial numbers.
2. Where and when the column was purchased and the invoice or purchase order number.
3. Instrument parameters:
 - a. instrument manufacturer and model number
 - b. injection mode
 - c. attenuation and range setting
 - d. oven temperature profile
 - e. injector and detector temperatures
 - f. detector type
4. Sample parameters:
 - a. sample size, list of sample components, and concentrations
 - b. description of the sample components that work and those that are problematic
 - c. derivatization agents, inorganics, or high molecular weight residue which may be present
 - d. number of injections made with the sample on this particular column and the length of time the column has been in service
5. Concise description of the problem:
 - a. observed symptoms
 - b. variables affecting the symptoms
 - c. steps taken to solve the problem
 - d. if the problem has been observed before

Before you call, obtain chromatograms generated when the column was working properly and chromatograms that illustrate the problem you are having.

C. Return Authorization Procedure:

Procedure for Returning Capillary GC Columns

If a phone call does not resolve the problem satisfactorily, we will evaluate the column in our lab to identify the problem source. Before returning the column, obtain an [RA#](#) (return authorization number) from a technical service chemist.

Important Note: If you purchased the column through a distributor, you must obtain return authorization through that distributor.

To send the column back, place it in its original box and tape. Send it prepaid to this address:

Restek Corporation
 110 Benner Circle
 Bellefonte, PA 16823-8812
 Attn: RA# _____

[*Note: information provided here is specific to Capillary GC Columns. Refer to the current Chromatography Products Guide for return authorization information on other types of products, or call Technical Service at 800-356-1688 (ext. 4).*]

After receiving the column, it is retested in our QA lab and rinsed if necessary. In most cases, the column evaluation is completed within three working days. A technical service chemist will call and discuss the results and give suggestions. If we determine the column is working satisfactorily or was contaminated and simply required solvent rinsing, it will be returned to your lab with our recommendations to help you avoid this problem in the future. If the column is defective, it will be replaced immediately with a new column. There is no charge for retesting or troubleshooting column problems.

When column problems are suspected and you need the product immediately, we can send you a new column, but we must invoice you for it. Credit is issued to your account if the returned column can be restocked or is found defective. If the problem was system-related or was caused by improper handling, the column will be returned to you and the replacement item invoice is due. We cannot restock damaged or used items.

A new High Temperature Carbowax Column stable up to 300°C for FAST-GC and GCxGC use.

Mario Galli (1), Stefano Galli (1)
1: MEGA s.r.l. - Capillary Columns Laboratory, Legnano (MI) - Italy

Contact for information and poster reprint: info@mega.mi.it

Introduction

Carbowax polar stationary phases are the most used in GC separations in conjunction with 5% phenyl apolar columns. For example PEG columns are very often used in Essential Oil, FAMES and Aromatic Compounds analyses. In recent years growth and development of techniques such as Fast-GC and GCxGC showed the need to have polar phases that can reach high temperatures. In fact, using Fast-GC systems with high temperature rates, the elution temperature of the compounds analyzed rises accordingly. In the same way, in the GCxGC, having a second dimension column such polar as a carbowax one that in the meantime allows to reach higher temperatures greatly expands the application possibilities of the technique.

For these reasons MEGA has developed a new Carbowax based column called MEGA-Wax HT, able to reach over 300°C and maintain the temperature of 300°C in isothermal mode.

The MEGA-Wax columns have a special deactivation treatment of the tubing surface that ensures a better coating of the phase. Beyond that a particular treatment on the PEG polymer is designed to allow the phase to reach high temperatures with a low bleeding and keeping the performances in time. The temperature range of this new column is extremely wide compared to other Carbowax columns, starting from 40°C reaching up to 300°C.

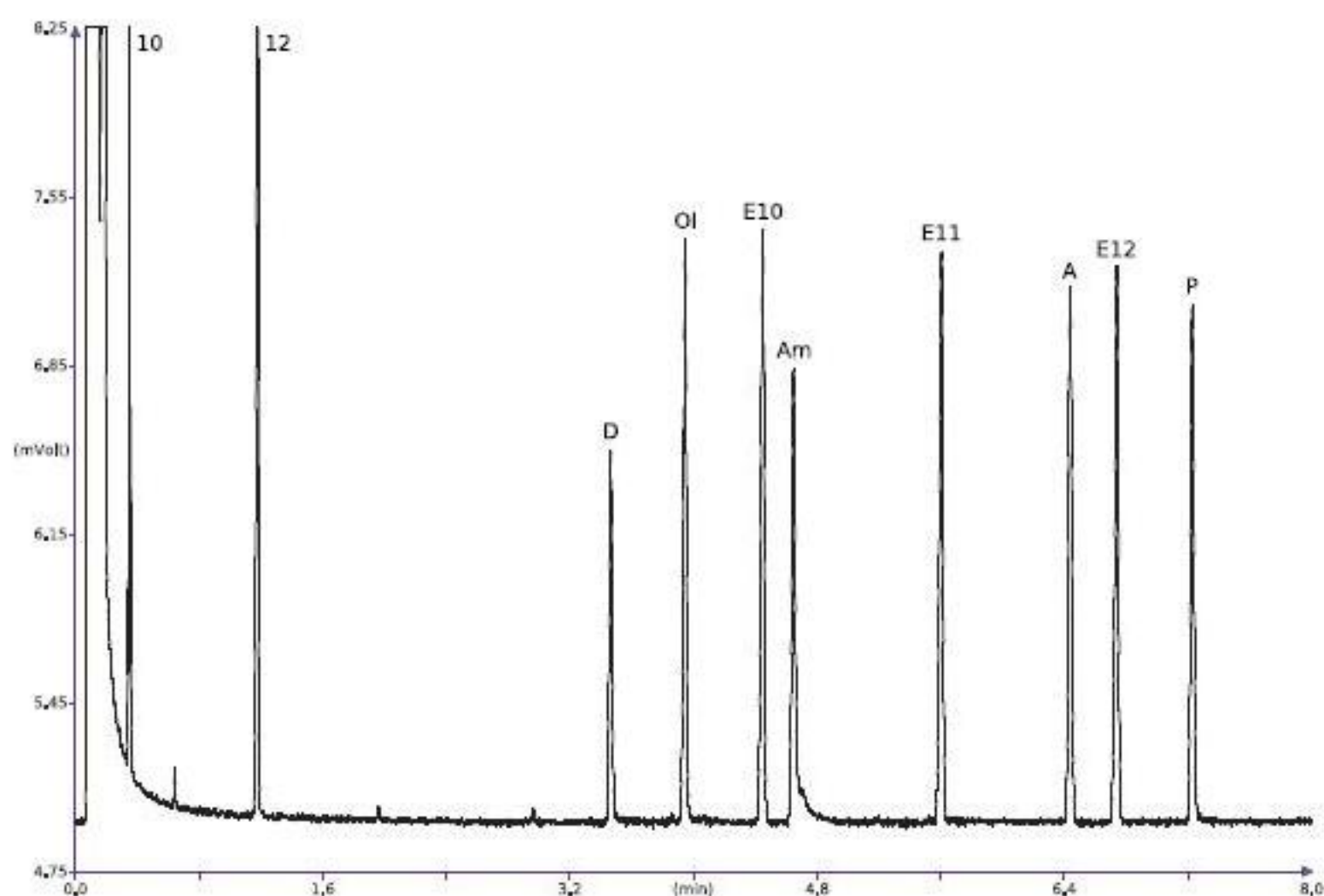


Figure 1. Grob Test (Test Mixture n. 2, Fluka Cat. # 86501) on a 0.10 mm ID x 4.5 m L (0.5 m incorporated retention gap) x 0.10 µm FT, MEGA-Wax HT Fast column. Conditions: 40°C to 200°C @ 15° C/min, Hydrogen carrier gas @ 150 kPa (constant pressure), SSL 250°C, FID 310°C. Identification: decane (10), dodecane (12), 2,3-butanediol (D), 1-octanol (Ol), methyl decanoate (E10), dicyclohexylamine (Am), methyl undecanoate (E11), methyl laurate (E12), 2,6-dimethylaniline, 2,6-dimethylphenol.

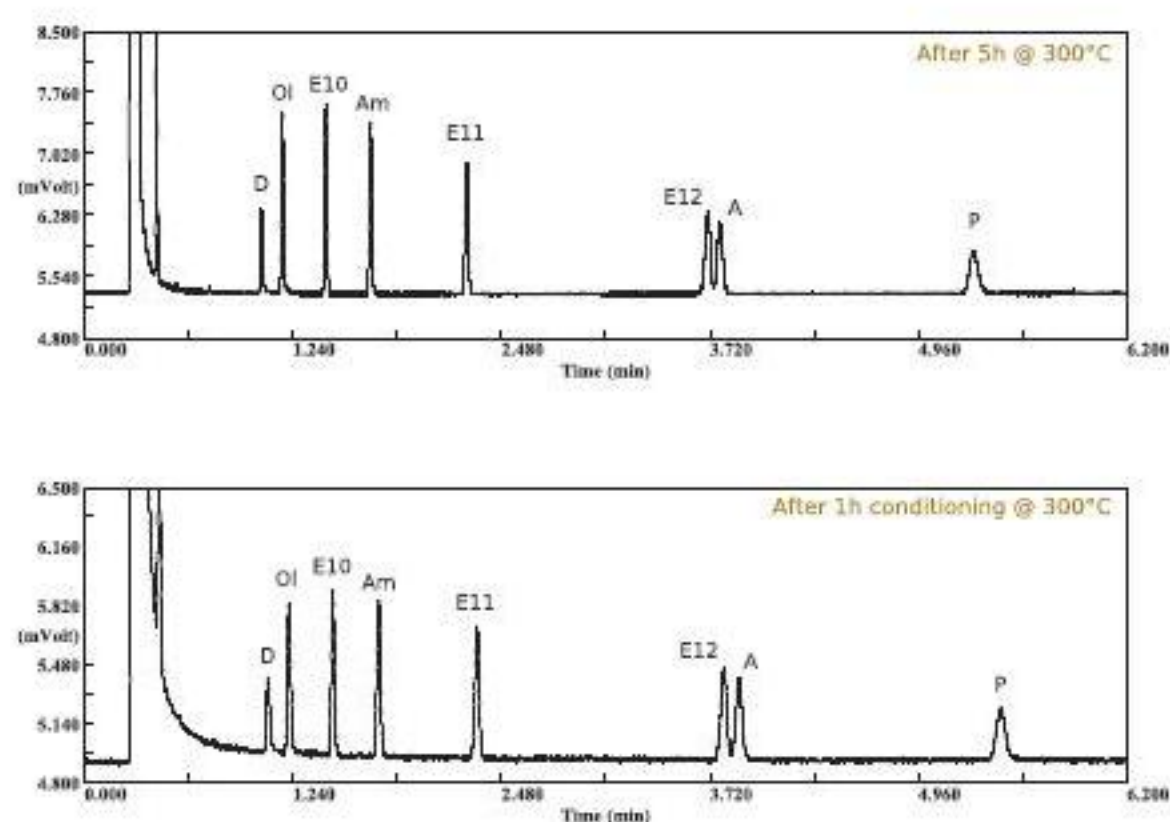


Figure 2.

Two isothermal runs to calculate the theoretical plates number (N) are here shown. All our narrow-bore Fast-GC 100µm ID columns have $N/m > 9000$, even for this new Carbowax stationary phase. The first value is obtained after one hour of initial column conditioning, while after keeping the column 5h @ 300°C a loss of less 5% than previous N value was noted, thus showing a very good resistance at high temperatures. The N values were calculated at 110°C in isothermal mode on a 0.10 mm ID x 8 m L x 0.10 µm FT, MEGA-Wax HT Fast.

A new High Temperature Carbowax Column stable up to 300°C for FAST-GC and GCxGC use.

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Experimental Results

1. BIODIESEL Analysis on MEGA-Wax HT.

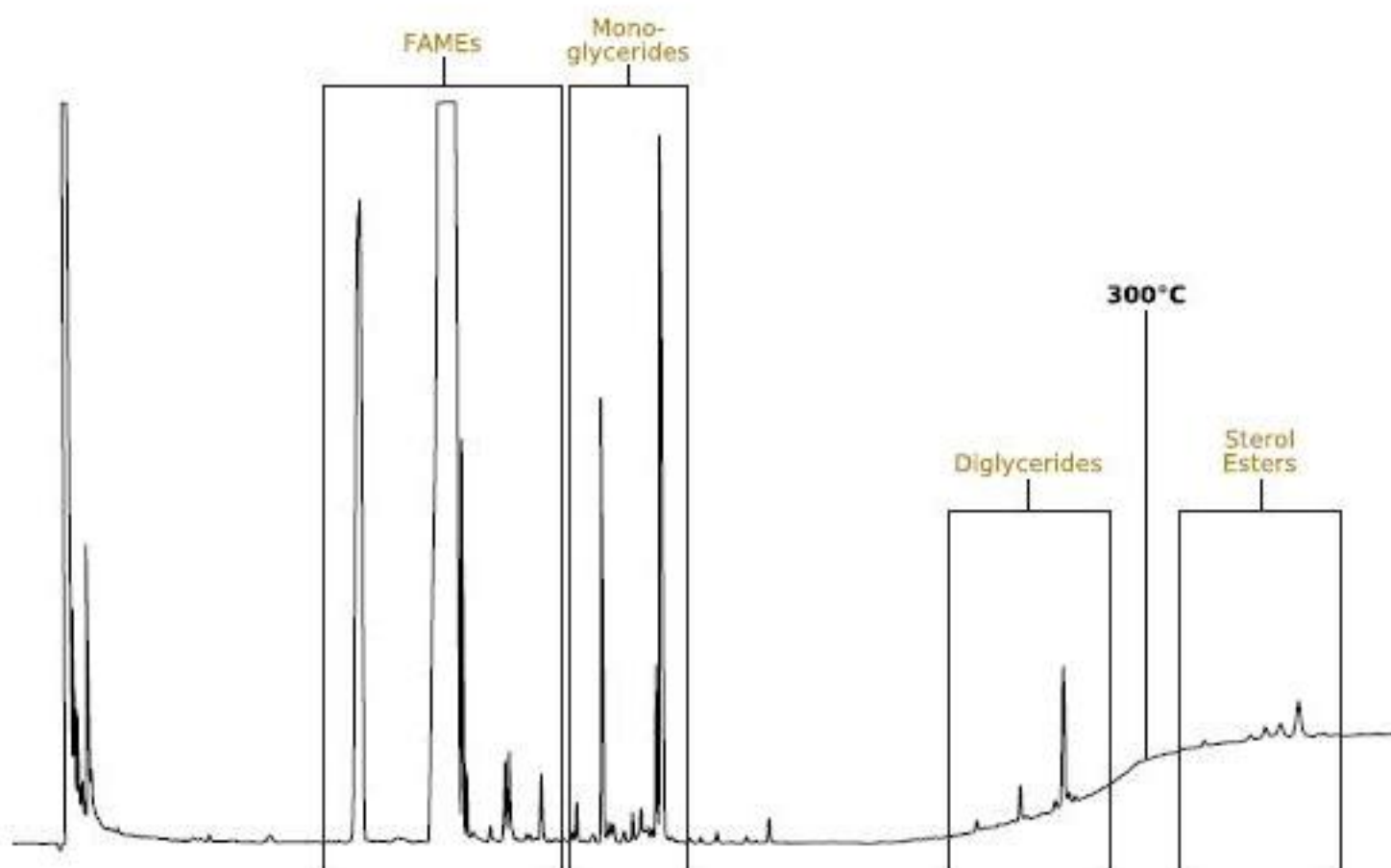


Figure 3. A real Biodiesel sample analysis is shown above. The Biodiesel sample was prepared according to the EN-14105 procedure. The column used is a 0.32 mm ID x 10 m L (1 m incorporated retention gap) x 0.05 µm FT, MEGA-Wax HT column. Conditions: 60°C to 300°C @ 10°C/min, Hydrogen carrier gas @ 35 kPa (constant pressure), On-Column Injection.

Biodiesel presents a significant challenge from the analytical point of view. There are many implemented methods regarding the GC Biodiesel analysis to determine free and total Glycerine, ester and linoleic acid methyl esters and Mono, Di and Tri-glycerides content. We injected a Biodiesel real sample on the new MEGA-Wax HT column. The results in Figure 3 show the possibility to extend the use of a polar Carbowax phase also for this kind of high temperature analysis. The MEGA-Wax HT works very well at high temperature, resolving sterol esters at 300°C in isothermal mode, while keeping an high polarity necessary to solve a typical FAMES separation that is made on a Carbowax column according to the EN-14103 method (see the Figure 4 below). The aim of this example is to demonstrate the possible use of the MEGA-Wax HT for high temperature Gas-Chromatography. The column could of course be applied to the GCxGC technique in order to have a second dimension column that allows to maintain an high orthogonality while reaching high temperatures needed for these applications.

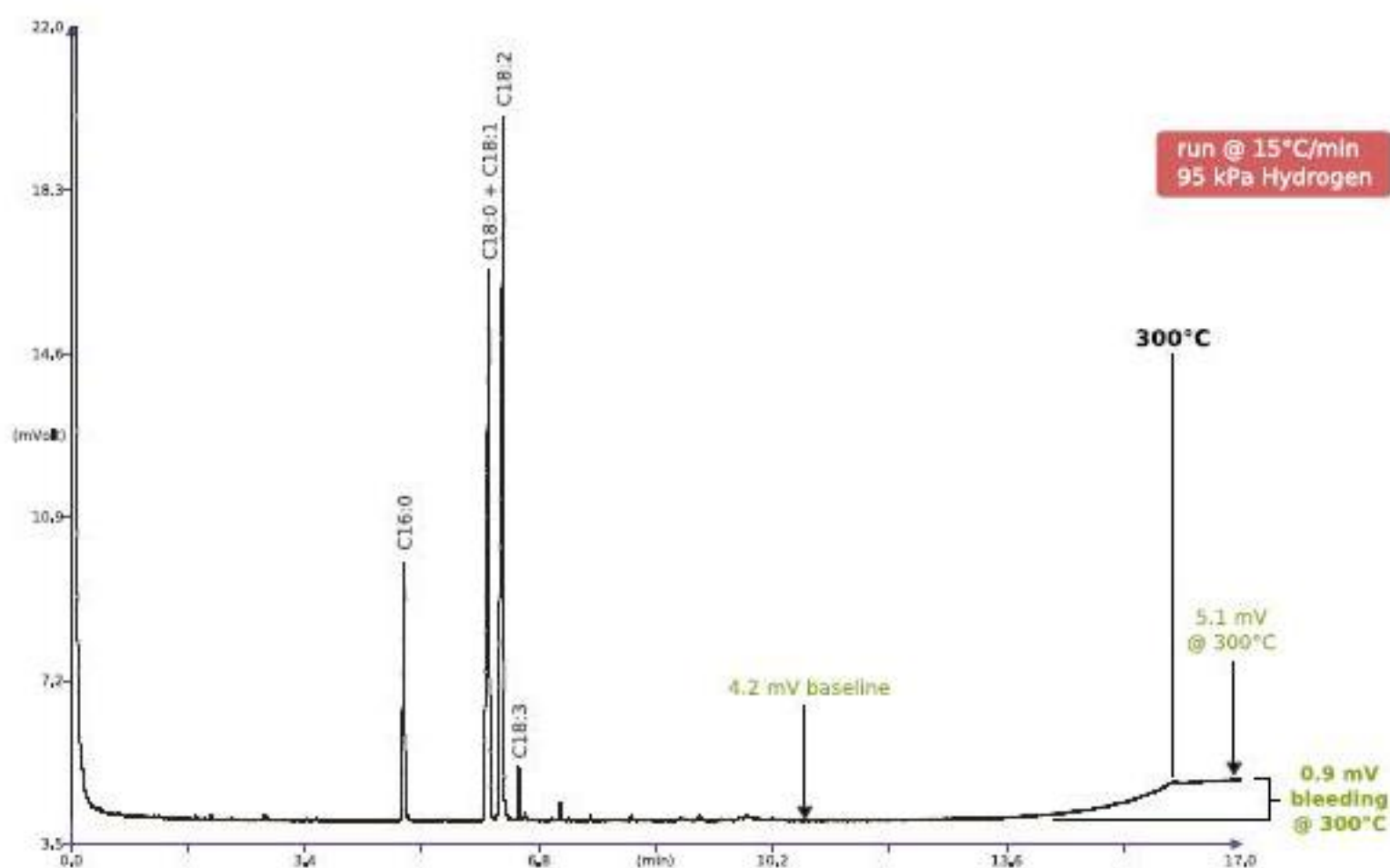


Figure 4. A FAST-GC separation example of Biodiesel FAMES performed on 0.10 mm ID x 2.5 m L (0.5 m incorporated retention gap) x 0.10 µm FT, MEGA-Wax HT Fast column. The extreme low bleeding is here also displayed; 0.9 mV bleeding only even under "aggressive" run conditions (15°C/min and 95 kPa Hydrogen constant pressure).

A new High Temperature Carbowax Column stable up to 300°C for FAST-GC and GCxGC use.

Mario Galli (1), Stefano Galli (1)
1: MEGA s.n.c. - Capillary Columns Laboratory, Legnano (MI) - Italy

Contact for information and poster reprint: info@mega.mi.it

2. POLYWAX 500 Analysis on MEGA-Wax HT.

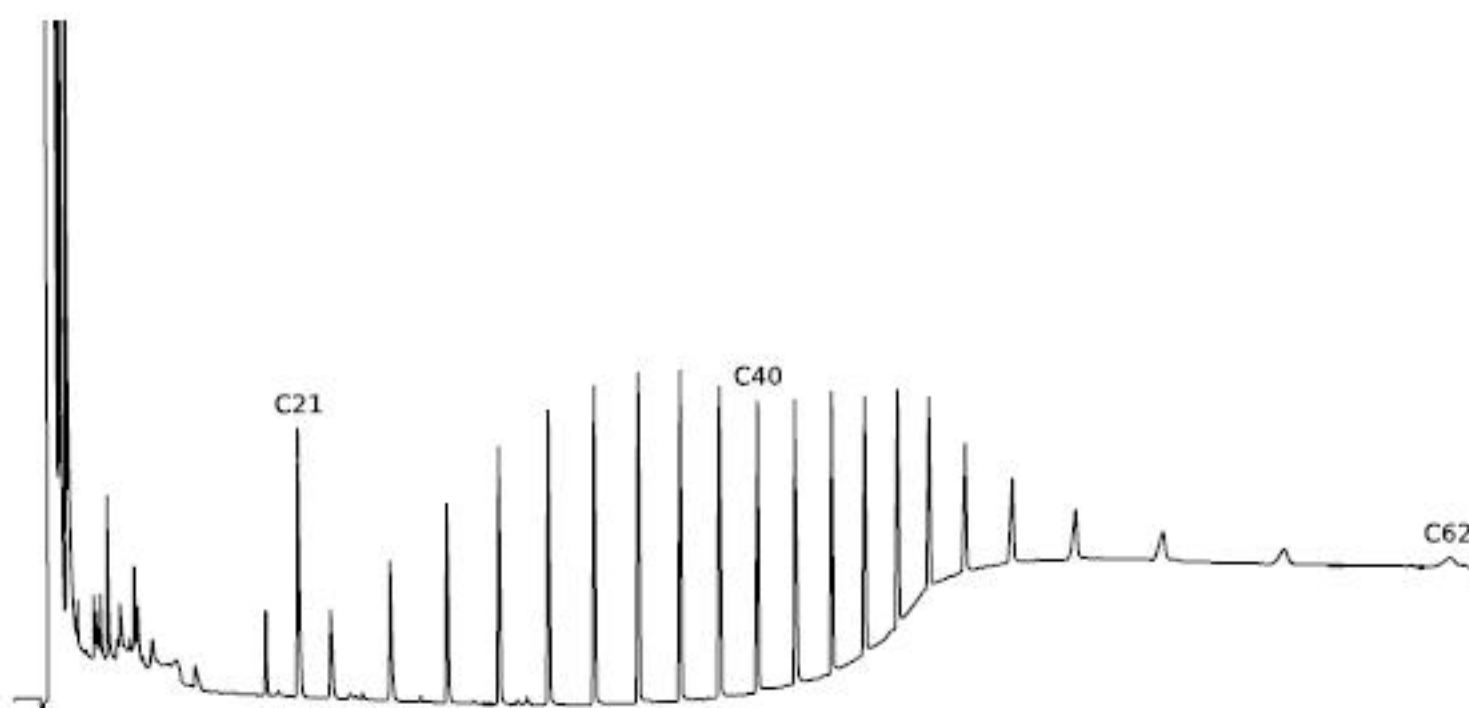


Figure 5. A Polywax 500 analysis on a 0.32 mm ID x 10 m L (1 m incorporated retention gap) x 0.05 µm FT, MEGA-Wax HT column. Another example of the use of the new Wax HT stationary phase for high temperature works. The sample introduction was made in On-Column mode.

Conclusions

The new MEGA-Wax column HT represents a novelty in the panorama of high polarity phases Carbowax. We think that the examples show the suitability of this new phase to meet the needs of having polar phases with an extended temperature range, especially to meet the modern needs of FAST-GC and GCxGC. At the present time in the Comprehensive 2DGC you are forced to find the best compromise between temperature limit of the column system and orthogonality between the two dimensions because of temperature limits given by more polar (and used) phases like Carbowax. We can move these limits a bit higher with the new Wax-HT column.

Furthermore, this column may be well used for conventional GC e.g. in combination with an apolar phase for a classic double-column configuration for MS systems. These systems, very often used in F&F labs for example, currently have big limitations because the usable temperature range of the apolar columns (like 5% phenyl phase) is reduced by the temperature limit of the normal Carbowax based phases.

We are still performing applications on this new stationary phase to find the maximum effective operating limits in temperature programmed mode with the best compromise of column lifetime. We are going on with the investigation on the possibility to use the Wax-HT for triglycerides analysis with the advantage to elute these heavy compounds below their decomposition temperature.

You can see other performances of the new MEGA-Wax HT columns on the "LC-GC Europe" (February 2010 Issue) magazine, GC Connections section. Here applications of MEGA-Wax HT are shown both on Fast-GC and GCxGC use for Essential Oil analysis. We wish to thank the authors of this paper for their work and their cooperation.

[Click here and read the LCGC article about the new MEGA-Wax HT column.](#)

Acknowledgments

We wish to thank Prof. Carlo Mariani (SSOG "Stazione Sperimentale per le industrie degli Oli e Grassi" - Via G. Colombo, 79 - 20133 Milano - Italy) for his knowledge support and for providing us the Biodiesel and sample standards.

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since
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general purpose
RETENTION
GAPs

PRESS-FT
connectors

GC Column Dimensions Available

| | | | | |
|---------------------|------------------------|----------------------------------|-------------------------------|-------------------------|
| Fast | ID | 0.05 mm | 0.10 mm | 0.15 mm |
| | Length | from 2 to 5 m | from 2 to 10 m | from 2.5 to 30 m |
| | Film Thickness* | 0.05 µm 0.10 µm | 0.05 µm 0.10 µm 0.20 µm | from 0.05 to 0.50 µm |
| Conventional | ID | 0.18 mm 0.20 mm | 0.25 mm | 0.32 mm |
| | Length | from 10 to 60 m | from 10 to 105 m | from 10 to 105 m |
| | Film Thickness* | from 0.05 µm to 1.20 µm | from 0.05 µm to 3.00 µm | from 0.05 to 5.00 µm |
| Wide-Bore | ID | 0.53 mm | | |
| | Length | from 10 to 105 m | | |
| | Film Thickness* | up to 5.00 µm | | |

Completely customize your product, selecting all combinations of sizes and also asking for out of catalog measures. We can develop ad-hoc solutions for your specific analytical problem without any additional cost.

All our stationary phases are available for Fast, Conventional, Wide-Bore and Multidimensional-GC.



*: the maximum film thickness depends on the stationary phase type

Column Cross - Reference (by phase)

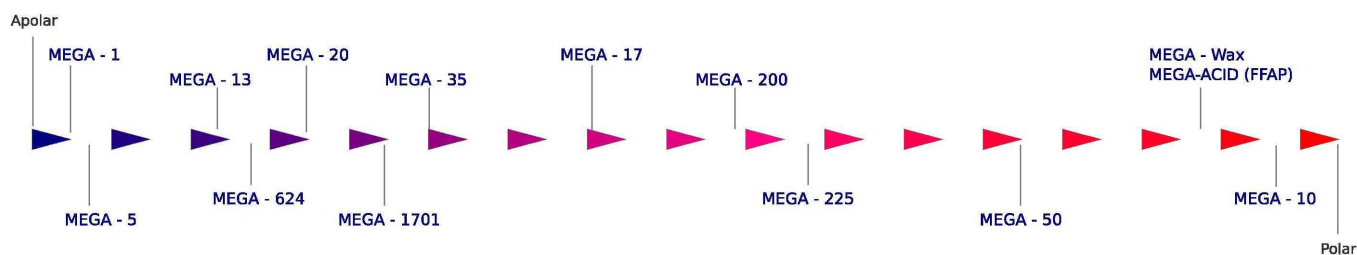
| MEGA | Phase Composition | Agilent (J&W) | Alltech | Phenomenex | Quadrex | Restek | SGE | Supelco | Varian |
|--------------------|---|----------------------------------|-------------------------|------------|-------------------|--------------------------|-----------------|------------------------------------|-----------------------------|
| MEGA - 1 | 100% Methyl Polysiloxane | DB-1 / HP-1 | AT-1 | ZB-1 | 007-1 | Rtx-1 | BP-1 | SPB-1 | CP Sil 5 CB |
| MEGA - 1 MS | 100% Methyl Polysiloxane (Low Bleeding) | DB-1 ms, HP-1 ms | AT-1 | ZB-1 ms | 007-1 | Rtx-1 ms | BPX-1 | SPB-1, Equity-1 | CP Sil 5 CB, Low Bleed / ms |
| MEGA - 1 HT | 100% Methyl Polysiloxane (High Temperature) | DB-1 ht | high temperature column | | | | | | |
| MEGA - 5 | 5% Phenyl, 95% Methyl Polysiloxane | DB-5 / HP-5 | AT-5 | ZB-5 | 007-5 | Rtx-5 | BP-5 | SPB-5 | CP Sil 8 CB |
| MEGA - 5 MS | 5% Phenyl, 95% Methyl Polysiloxane (Low Bleeding) | DB-5 ms, Ultra-2 HP-5 ms | AT-5 ms | ZB-5 ms | 007-5 ms | Rtx-5 ms | BPX-5 | SPB-5, Equity-5 | |
| MEGA - 5 HT | 5% Phenyl, 95% Methyl Polysiloxane (High Temperature) | DB-5 ht | high temperature column | | | | | | |
| MEGA - Wax | Polyethylenglycol (PEG) | DB-Wax, HP-Wax | AT-Wax | ZB-Wax | 007-CW | Rtx-Wax | BP-20 | OmegaWax | CP Wax 52 CB |
| MEGA - Wax MS | Polyethylenglycol (PEG) (Low Bleeding) | DB-Wax, HP-Wax | AT-Wax ms | ZB-Wax | 007-CW | Stabilwax | BP-20 | OmegaWax | CP Wax 52 CB |
| MEGA - Wax HT | Polyethylenglycol (PEG) (High Temperature) | high temperature unique column | | | | | | | |
| MEGA - 1701 | 7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane | DB-1701, HP-1701 | AT-1701 | ZB-1701 | 007-1701 | Rtx-1701 | BP-10 | SPB-1701 | CP Sil 19 CB, VF-1701 ms |
| MEGA - 35 | 35% Phenyl, 65% Methyl Polysiloxane | DB-35, HP-35 | AT-35 | ZB-35 | 007-11 | Rtx-35 | BPX-35, BPX-608 | SPB-35, SPB-608 | |
| MEGA - 35 MS | 35% Phenyl, 65% Methyl Polysiloxane (Low Bleeding) | DB-35 ms | | | | Rtx-35 Sil ms | | | |
| MEGA - 17 | 50% Phenyl, 50% Methyl Polysiloxane | DB-17, HP-17 | AT-50 | ZB-50 | 007-17 | Rtx-17 | BPX-50 | SPB-50 | CP Sil 24 CB, VF-17 ms |
| MEGA - 17 MS | 50% Phenyl, 50% Methyl Polysiloxane (Low Bleeding) | unique column | | | | | | | |
| MEGA - ACID (FFAP) | Polyethylenglycol (PEG) Acid Modified | DB-FFAP | AT-1000 | | 007-FFAP | Stabilwax-DA | BP-21 | SPB-1000, Nukol | CP Wax 58 CB |
| MEGA - 10 FAMES | 100% Cyanopropyl Polysiloxane | HP-88 | AT-Silar | | | Rtx-2330 | BPX-70 | SP-2330, SP-2560, SP-2331, SP-2380 | CP Sil 88 |
| MEGA - 225 | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane | DB-225, HP-225 | AT-225 | | 007-225 | Rtx-225 | BP-225 | | CP Sil 43 CB |
| MEGA - 225 MS | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane (Low Bleeding) | unique column | | | | | | | |
| MEGA - 624 | 6% Cyanopropylphenyl, 94% Methyl Polysiloxane | DB-624, DB-1301, HP-624, HP-1301 | AT-624 | ZB-624 | 007-624, 007-1301 | Rtx-624, Vocol, Rtx-1301 | BP-624 | SPB-1301, Vocol, SPB-624 | CP 1301, VF-624 ms |
| MEGA - 13 | 13% Phenyl, 87% Methyl Polysiloxane | | | | | | | | CP Sil 13 CB |

All trademarks mentioned in this document are registered.

| MEGA | Phase Composition | Agilent (J&W) | Alltech | Phenomenex | Quadrex | Restek | SGE | Supelco | Varian |
|--------------------|--|-------------------|---------|------------|---------|---------|-----|---------|-----------|
| MEGA - BASIC | Proprietary unique phase for basic compounds separation (Amines) | unique column | | | | | | | |
| MEGA - SOLVE 1 & 2 | Proprietary unique phases for complex solvents mixtures separation | unique columns | | | | | | | |
| MEGA - 50 | 50% Cyanopropyl, 50% Methyl Polysiloxane | DB-23 | | | | | | | |
| MEGA - 20 | 20% Phenyl, 80% Methyl Polysiloxane | | AT-20 | | 007-7 | Rtx-20 | | SPB-20 | |
| MEGA - 200 | Trifluoropropyl Methyl Polysiloxane | DB-200, DB-210 | AT-210 | | 007-210 | Rtx-200 | | SP-2401 | VF-200 ms |
| MEGA - DAI 1 & 2 | Proprietary unique phases developed for Direct Aqueous Injections | unique columns | | | | | | | |
| MEGA - LAP | Proprietary unique phase developed for Lipid Analysis | unique column | | | | | | | |
| MEGA - PLUS | Copolymer Polyethyleneglycol (PEG) + Methyl Polysiloxane | unique column | | | | | | | |
| MEGA - POF 1 & 2 | Proprietary phases for pesticides, herbicides and insecticides | new columns | | | | | | | |
| MEGA - VOC 1 & 2 | Proprietary phases for VOCs and Purge & Trap compounds analysis | new columns | | | | | | | |

Visit our website www.mega.mi.it to discover our complete range of stationary phases and custom products.

Phase Polarity Quick View



All trademarks mentioned in this document are registered.

Column Cross - Reference (by phase) —


(3)

Column Cross - Reference (by application)

| MEGA | Phase Composition | Temperature Max * | USP Classification | EPA Methods, Normatives | Applications |
|--------------------|---|----------------------|------------------------------|--|---|
| MEGA - 1 | 100% Methyl Polysiloxane | 350°C | G1, G2, G9, G38 | EPA 504.1, 505, 606, 8141 A | General purpose column. Solvent impurities, PCB congeners (Aroclor mixes), simulated distillation, drugs of abuse, gases, natural gases, essential oils, semivolatiles, pesticides. |
| MEGA - 1 MS | 100% Methyl Polysiloxane (Low Bleeding) | 350°C | G1, G2, G9, G38 | EPA 606 | General purpose column (see MEGA-1) for GC-MS use. |
| MEGA - 1 HT | 100% Methyl Polysiloxane (High Temperature) | 380°C | G2 | | General purpose column (see MEGA-1) for high temperature use. |
| MEGA - 5 | 5% Phenyl, 95% Methyl Polysiloxane | 350°C | G27, G36, G41 | EPA 611/8110, 604, 606, 607, 608/8081, 609, 612, 613, 615, 619, 622, 8015B, 8041, 8061A, 8082, 8091, 8121, 8141A | General purpose column. Solvent impurities, PCB congeners (Aroclor mixes), hydrocarbons, essential oils, semivolatiles, pesticides etc. |
| MEGA - 5 MS | 5% Phenyl, 95% Methyl Polysiloxane (Low Bleeding) | 350°C | G27, G36, G41 | EPA 513, 525, 552.2, 604, 606, 610, 613, 625, 1625, 1653, 8100, 8141A, 8270C, 8280A | General purpose column (see MEGA-5) for GC-MS use. |
| MEGA - 5 HT | 5% Phenyl, 95% Methyl Polysiloxane (High Temperature) | 380°C | G27, G36, G41 | | General purpose column (see MEGA-5) for high temperature use. |
| MEGA - Wax | Polyethyleneglycol (PEG) | 250°C | G14, G15, G16, G20, G39, G47 | EPA 602, 603, 619, 8121, USP 467 (OVIs) | General purpose column. FAMES, solvents, BTEX aromatics, flavour compounds, alcohols. Tune your WAX column polarity! Ask us for a custom PEG based column besides our well known standard MEGA-WAX. Contact us for more information! |
| MEGA - Wax MS | Polyethyleneglycol (PEG) (Low Bleeding) | 250°C | G14, G15, G16, G20, G39, G47 | EPA 602, 603, 619, USP 467 (OVIs) | General purpose column (see MEGA-WAX) for GC-MS use. |
| MEGA - Wax HT | Polyethyleneglycol (PEG) (High Temperature) | 300°C | | | General purpose column (see MEGA-WAX) for high temperature use. |
| MEGA - 1701 | 7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane | 280°C | G46 | EPA 513, 515.2, 552.2, 607, 619, 622, 8091, 8121, 8151A | General purpose column. Alcohols, oxygenates, PCB congeners (e.g. Aroclor mixes) etc. Ideal as confirmation column. |
| MEGA - 35 | 35% Phenyl, 65% Methyl Polysiloxane | 340°C | G28, G32, G42 | EPA 507, 508, 513, 551.1, 552.2, 607, 611, 615, 622, 8082, 8141A | General purpose column. Substituted polar compounds, phenols, PCBs, pesticides etc. Ideal as confirmation column. |
| MEGA - 35 MS | 35% Phenyl, 65% Methyl Polysiloxane (Low Bleeding) | 340°C | G28, G42 | | General purpose column (see MEGA-35) for GC-MS use. |
| MEGA - 17 | 50% Phenyl, 50% Methyl Polysiloxane | 340°C | G3, G17 | EPA 604, 608, 619, 8060, 8081 | General purpose column. Phthalate esters, rosin acids, herbicides, pharmaceuticals etc. Ideal as confirmation column. |
| MEGA - 17 MS | 50% Phenyl, 50% Methyl Polysiloxane (Low Bleeding) | 340°C | G3, G17 | | General purpose column (see MEGA-17) for GC-MS use. |
| MEGA - ACID (FFAP) | Polyethyleneglycol (PEG) Acid Modified | 250°C | G14, G15, G16, G25, G35, G39 | | General purpose column. Free acids, FAMES, solvents, BTEX aromatics, flavour compounds, alcohols, polar compounds. |
| MEGA - 10 FAMES | 100% Cyanopropyl Polysiloxane | 260°C | G5, G8, G48 | | High polarity column ideal for cis/trans FAMES and dioxins isomers. |
| MEGA - 225 | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane | 280°C | G7, G19 | | Mid to high polarity column for carbohydrate, sterols, flavour compounds. |
| MEGA - 225 MS | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane (Low Bleeding) | 280°C | G7, G19 | | Mid to high polarity column (see MEGA-225) for GC-MS use. |
| MEGA - 624 | 6% Cyanopropylphenyl, 94% Methyl Polysiloxane | 280°C | G43 | EPA 501.3, 502.1, 502.2, 503.1, 504.1, 524.2, 601, 602, 603, 624, 1624, 8010B, 8021B, 8030A, 8260B, USP 467 (OVIs) | General purpose column ideal for volatile organic pollutants. |

All trademarks mentioned in this document are registered.

*: the temperature range may change depending on stationary phase film thickness.

| MEGA | Phase Composition | Temperature Max * | USP Classification | EPA Methods, Normatives | Applications |
|------------------------------|--|-----------------------------|--|--|--|
| MEGA - 13 | 13% Phenyl, 87% Methyl Polysiloxane | 340°C | | EPA 601, 602, 624 | General purpose column for halocarbons and ideal as confirmation column. |
| MEGA - 20 | 20% Phenyl, 80% Methyl Polysiloxane | 340°C | G28, G32 | | General purpose column. Volatile compounds, flavour compounds, alcoholic beverages etc. ideal as confirmation column. |
| MEGA - 50 | 50% Cyanopropyl, 50% Methyl Polysiloxane | 260°C | G5 | | General purpose column. Carbohydrates, sterols, flavour compounds, FAMES and confirmation column. |
| MEGA - 200 | Trifluoropropyl Methyl Polysiloxane | 300°C | G6 | | General purpose column. Freon fluorocarbons, alcohols, ketones. Unique selectivity. |
| MEGA - SE54 | 5% Phenyl, 1% Vinyl 94% Methyl Polysiloxane | 350°C | G36 | | General purpose column (see MEGA-5). |
| MEGA - DEX Chiral Columns | MEGA-Dex DET Beta and Gamma MEGA-Dex DAC Beta and Gamma MEGA-Dex DMT Beta MEGA-Dex DMP Beta | 230°C |  | | Unique cyclodextrins based phases for chiral GC separations. Contact us to know our complete chiral columns range! We provide custom made MEGA-Dex stationary phases to solve your specific chiral analytical problem. |
| MEGA - ALC 1 & 2 | Proprietary phases | nd | | | Application-specific columns for Blood Alcohols testing; equivalent to DB-ALC 1 & 2 and Rtx-BAC 1 & 2. |
| MEGA - BASIC | Proprietary unique phase for basic compounds separation (Amines) | nd | | | Application-specific column for basic compounds analysis (Amines). |
| MEGA - DAI 1 & 2 | Proprietary unique phases developed for Direct Aqueous Injections | nd | | | Application-specific columns for Direct Aqueous Injections without sample preparation. |
| MEGA - LAP | Proprietary unique phase developed for Lipid Analysis | 370°C | | | Application-specific column for Lipids, Sterols and Triglycerides analysis. |
| MEGA - PLUS | Copolymer Polyethyleneglycol (PEG) + Methyl Polysiloxane | nd | | | General purpose. Tune the selectivity choosing between the uniques MEGA-PLUS 10 (10% PEG, 90% PDMS), MEGA-PLUS 25 (25% PEG, 75% PDMS), MEGA-PLUS 75 (75% PEG, 25% PDMS) or asking for a completely custom MEGA-PLUS column! |
| MEGA - POF 1 & 2 | New proprietary phases | nd | | | Application-specific columns developed for pesticides, herbicides and insecticides analysis. |
| MEGA - VOC 1 & 2 | New proprietary phases | nd | G43 (MEGA-VOC 1) | | Application-specific columns developed for Volatile Organic Compounds (OVIs), solvents and purgeable compounds analysis. |
| MEGA - SOLVE 1 & 2 | Proprietary unique phases for complex solvents mixtures separation | nd | | | Application-specific columns for complex solvents mixtures analysis. |
| MEGA - Biodiesel | Phases for Biodiesel Analysis | 370°C (UNI EN ISO 14105) | | UNI EN ISO 14105 (ASTM 6584), UNI EN ISO 14103 | Application-specific columns developed for Biodiesel analysis. MEGA-BIODIESEL 105 for triglycerides in biodiesel (UNI EN ISO 14105, ASTM 6584) stable up to 370°C and MEGA-BIODIESEL 103 for FAMES in biodiesel (UNI EN ISO 14103). |
| MEGA - PAH | Unique phase | 340°C | | EPA 610/8100 | Application-specific column for Polycyclic Aromatic Hydrocarbons. |
| MEGA - 1 PONA | 100% Methyl Polysiloxane optimized for Hydrocarbon Analysis | 350°C | | | Column optimized for DHA (Detailed Hydrocarbons Analysis); equivalent to DB-Petro, HP-Pona, Rtx-1 Pona, Petrocol. |
| MEGA - TNT 8095 | Unique phase | nd | | EPA 8095 | Application-specific column developed for Explosives analysis (nitroaromatics, nitramines, nitrate esters). |

All trademarks mentioned in this document are registered.

*: the temperature range may change depending on stationary phase film thickness.

Column Cross - Reference (by application) —

5



MEGA-Wax HT column, an unique PEG stationary phase able to reach up to **300°C** even in isothermal mode. Especially developed for FAST-GC and GCxGC use. The performances of this column have appeared on "LCGC - Europe" (February 2010 issue).



MEGA-5 MS Xil column, a new GC-MS stationary phase that assures **ultra-low bleeding** and unsurpassed inertness and efficiency for your GC-MS analysis. Contact us to receive the free e-brochure of the new MEGA-5 MS Xil.



MEGA-2D Single column, a revolutionary unique tubing column coated with **two in series different stationary phases** for GCxGC and MDGC applications. No connections are needed! Contact us to have more info about all MEGA Multidimensional-GC and GCxGC solutions.

Retention Gaps

Retention Gaps deactivated for any purpose:

- use with apolar solvents
- use with polar solvents
- general use

Any internal diameter size available:

0.05, 0.10, 0.15, 0.18, 0.20, 0.25, 0.32 and 0.53 mm ID.

Any length available also in pre-cut pieces individually packaged.

MEGA Retention Gaps have an exceptional inertness. Easy to handle and easy to install with our Press-Fit connectors.

Use Retention Gaps for focusing the sample components when introducing a large (liquid) sample directly onto the column and/or to protect the analytical column from contamination. Retention Gaps are also useful as connecting pipes to various parts of systems with complex configurations

Discover our **MEGA-GAP columns** line with integrated built-in Retention Gap. No connections needed! Visit our website or contact us for more information.

Press-Fit connectors

MEGA Press-Fit connectors allow you to simply connect different columns or Retention Gaps together in many ways. Press-Fit connectors are custom made to fit any tubing size and to ensure the minimal dead volume.



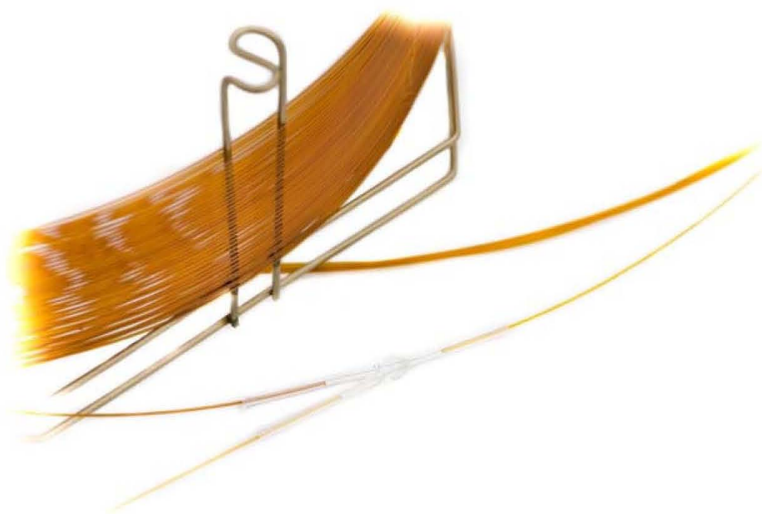
Press-Fit Union linear connectors: ideal to connect two columns or a Retention Gap to the analytical column.

Press-Fit "Y" three ways connectors: ideal to connect two analytical columns to a single injector port or split the exit of one column to a dual detector system. Many other configurations are possible using MEGA Press-Fit Y.



MEGA produces also personalized **Multiways Press-Fit** connectors for advanced analytical system configurations as Multidimensional-GC or other custom settings.

Visit our website to download our free guide "Press-Fit Connectors Tips" to discover how easy is to use our Press-Fit connectors.



- easy to handle

- easy to install

- a simple pressure
with your hands
to assure a
perfect
seal

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1980



MEGA[®]
CAPILLARY COLUMNS
LABORATORY



Fused Silica Capillary Columns → MEGA-WAX FAST



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MEGA-WAX FAST

Stationary Phase Specifications

| | |
|--------------------------|---|
| Composition | Polyethylenglycol (PEG) |
| Polarity | High polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -CW, AT TM -Wax, BP TM -20, CP TM -Wax 52 CB, DB TM -Wax, HP TM -Wax, OmegaWax TM , Rtx TM -Wax, ZB TM -Wax |
| USP Classification | G14, G15, G16, G20, G39, G47, USP 467 (OVIs) |
| EPA Methods / Normatives | EPA 602, 603, 619, 8121 |

Support/Download

- FAST-GC Guide (with application notes). Free download the Pdf File!



| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|---------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-WAX FAST | 0.05 mm | 0.05 µm | 5 m | 260 °C | F-WAX-005-005-5 | | |
| MEGA-WAX FAST | 0.05 mm | 0.10 µm | 5 m | 260 °C | F-WAX-005-010-5 | | |
| MEGA-WAX FAST | 0.10 mm | 0.10 µm | 10 m | 260 °C | F-WAX-010-010-10 | | |
| MEGA-WAX FAST | 0.10 mm | 0.20 µm | 10 m | 260 °C | F-WAX-010-020-10 | | |

You may also be interested in this/these product(s):

MEGA-WAX MS



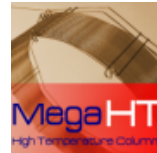
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MEGA-WAX



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MEGA-WAX HT



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Vendor Information

more categories

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conventional GC columns

STANDARD

GC-MS
columns

GC-MS COLUMNS

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DEDICATED
COLUMNS**

CUSTOM-DEDICATED

MEGA GAP
Incorporated Retention-Liquid
columns

MEGA-GAP (Incorporated Ret.-Liq)

dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

Mega HT
High Temperature Columns

HIGH TEMPERATURE COLUMNS

FAST-GC
columns

FAST-GC

mega^{2D}
columns

Fused Silica Capillary Columns → MEGA-1 FAST



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MEGA-1 FAST

Stationary Phase Characteristics

| | |
|---------------|---|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -1, AT TM -1, BP TM -1, CP Sil 5CB, DB TM -1, OV TM -1, HPT TM -1, Rtx TM -1, SPB TM -1, ZB TM -1 |

Support/Download

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| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|----------------|------|
| MEGA-1 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-1-005-005-5 | |
| MEGA-1 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-1-005-010-5 | |
| MEGA-1 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-1-010-010-10 | |
| MEGA-1 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-1-010-020-10 | |

Fused Silica Capillary Columns → MEGA-10 FAMEs FAST



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Image

MEGA-10 FAMEs FAST

Stationary Phase Characteristics

| | |
|--------------------|---|
| Composition | 100% Cyanopropyl Polysiloxane |
| Polarity | High polarity |
| Crossbond | Bonded |
| Equivalent to | AT TM -Silar, BPX TM -70, CP-Sil TM 88, HP TM -88, Rtx TM -2330, SPT TM -2330, SP TM -2331, SP TM -2560, SP TM -2380 |
| USP Classification | G5, G8, G48 |

Application Notes

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|--------------|-------------------|----------------|--------|-----------------|-----------------|------|
| MEGA-10 FAST | 0.15 mm | 0.15 µm | 15 m | 260 °C | F-10-015-015-15 | |
| MEGA-10 FAST | 0.20 mm | 0.20 µm | 30 m | 260 °C | F-10-020-020-30 | |

Fused Silica Capillary Columns → MEGA-101 FAST

MEGA-101 FAST



View Full-Size
Image

Stationary Phase Characteristics

| | |
|---------------|--|
| Composition | 100% Polydimethylsiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | DC TM -200, HP TM -101, SP TM -2100 |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|---------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-101 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-101-005-005-5 | | |
| MEGA-101 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-101-005-010-5 | | |
| MEGA-101 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-101-010-010-10 | | |
| MEGA-101 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-101-010-020-10 | | |

Fused Silica Capillary Columns → MEGA-13 FAST



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MEGA-13 FAST

Stationary Phase Characteristics

| | |
|--------------------------|-------------------------------------|
| Composition | 13% Phenyl, 87% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | Cp-Sil™ 13 CB |
| EPA Methods / Normatives | EPA 601, 602, 624 |

Support/Download

- [FAST-GC Guide \(with application notes\). Free download the Pdf File!](#)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|--------------|-------------------|----------------|--------|-----------------|-----------------|------|--|
| MEGA-13 FAST | 0.05 mm | 0.05 µm | 5 m | 340 °C | F-13-005-005-5 | | |
| MEGA-13 FAST | 0.05 mm | 0.10 µm | 5 m | 340 °C | F-13-005-010-5 | | |
| MEGA-13 FAST | 0.10 mm | 0.10 µm | 10 m | 340 °C | F-13-010-010-10 | | |
| MEGA-13 FAST | 0.10 mm | 0.20 µm | 10 m | 340 °C | F-13-010-020-10 | | |

Fused Silica Capillary Columns → MEGA-17 FAST



View Full-Size
Image

MEGA-17 FAST

Stationary Phase Characteristics

| | |
|--------------------------|--|
| Composition | 50% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Yes |
| Equivalent to | 007™-17, AT™-50, BPX™-50, CP Sil™ 24 CB, DB™-17, HPT™-17, Rtx™-17, SPB™-50, VFT™-17 ms, ZB™-50 |
| USP Classification | G3, G17 |
| EPA Methods / Normatives | EPA 604, 608, 619, 8060, 8081 |

Support/Download

- FAST-GC Guide (with application notes). Free download the Pdf File!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|--------------|-------------------|----------------|--------|-----------------|-----------------|------|
| MEGA-17 FAST | 0.05 mm | 0.05 µm | 5 m | 340 °C | F-17-005-005-5 | |
| MEGA-17 FAST | 0.05 mm | 0.10 µm | 5 m | 340 °C | F-17-005-010-5 | |
| MEGA-17 FAST | 0.10 mm | 0.10 µm | 10 m | 340 °C | F-17-010-010-10 | |
| MEGA-17 FAST | 0.10 mm | 0.20 µm | 10 m | 340 °C | F-17-010-020-10 | |

Fused Silica Capillary Columns → MEGA-1701 FAST

MEGA-1701 FAST



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Stationary Phase Characteristics

| | |
|--------------------------|--|
| Composition | 7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -1701, AT TM -1701, BPT TM -10, CP-Sil TM 19 CB, DB TM -1701, HPT TM -1701, OV TM -1701, Rtx TM -1701, SPB TM -1701, VF TM -1701 ms, ZB TM -1701 |
| USP Classification | G46 |
| EPA Methods / Normatives | EPA 513, 515.2, 552.2, 607, 619, 622, 8091, 8121, 8151A |

Support/Download

- [FAST-GC Guide \(with application notes\). Free download the Pdf File!](#)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|----------------|-------------------|----------------|--------|-----------------|-------------------|------|--|
| MEGA-1701 FAST | 0.05 mm | 0.05 µm | 5 m | 280 °C | F-1701-005-005-5 | | |
| MEGA-1701 FAST | 0.05 mm | 0.10 µm | 5 m | 280 °C | F-1701-005-010-5 | | |
| MEGA-1701 FAST | 0.10 mm | 0.10 µm | 10 m | 280 °C | F-1701-010-010-10 | | |
| MEGA-1701 FAST | 0.10 mm | 0.20 µm | 10 m | 280 °C | F-1701-010-020-10 | | |

Fused Silica Capillary Columns → MEGA-20 FAST



View Full-Size
Image

MEGA-20 FAST

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 20% Phenyl, 80% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -7, AT TM -20, Rtx TM -20, SPB TM -20 |
| USP Classification | G28, G32 |

Support/Download

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| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|--------------|-------------------|----------------|--------|-----------------|-----------------|------|
| MEGA-20 FAST | 0.05 mm | 0.05 µm | 5 m | 340 °C | F-20-005-005-5 | |
| MEGA-20 FAST | 0.05 mm | 0.10 µm | 5 m | 340 °C | F-20-005-010-5 | |
| MEGA-20 FAST | 0.10 mm | 0.10 µm | 10 m | 340 °C | F-20-010-010-10 | |
| MEGA-20 FAST | 0.10 mm | 0.20 µm | 10 m | 340 °C | F-20-010-020-10 | |

Fused Silica Capillary Columns → MEGA-200 FAST

MEGA-200 FAST



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Image](#)

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | Trifluoropropyl Methyl Polysiloxane |
| Polarity | High polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -210, AT TM -210, DB TM -200, DB TM -210, OV TM -202, OV TM -210, OV TM -215, Rtx TM -200, SP TM -2401, VF TM -200 ms |
| USP Classification | G6 |

Support/Download

- [FAST-GC Guide \(with application notes\). Free download the Pdf File!](#)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|---------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-200 FAST | 0.05 mm | 0.05 µm | 5 m | 300 °C | F-200-005-005-5 | |
| MEGA-200 FAST | 0.05 mm | 0.10 µm | 5 m | 300 °C | F-200-005-010-5 | |
| MEGA-200 FAST | 0.10 mm | 0.10 µm | 10 m | 300 °C | F-200-010-010-10 | |
| MEGA-200 FAST | 0.10 mm | 0.20 µm | 10 m | 300 °C | F-200-010-020-10 | |

Fused Silica Capillary Columns → MEGA-225 FAST

MEGA-225 FAST



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Stationary Phase Characteristics

| | |
|--------------------|---|
| Composition | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Bonded |
| Equivalent to | 007 TM -225, AT TM -225, BPT TM -225, CP-Sil TM 43 CB, DB TM -225, HPT TM -225, OV TM -225, Rtx TM -225 |
| USP Classification | G7, G19 |

Support/Download

- [FAST-GC Guide \(with application notes\). Free download the Pdf File!](#)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|---------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-225 FAST | 0.05 mm | 0.05 µm | 5 m | 280 °C | F-225-005-005-5 | |
| MEGA-225 FAST | 0.05 mm | 0.10 µm | 5 m | 280 °C | F-225-005-010-5 | |
| MEGA-225 FAST | 0.10 mm | 0.10 µm | 10 m | 280 °C | F-225-010-010-10 | |
| MEGA-225 FAST | 0.10 mm | 0.20 µm | 10 m | 280 °C | F-225-010-020-10 | |

Fused Silica Capillary Columns → MEGA-5 FAST



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Image

MEGA-5 FAST

Stationary Phase Characteristics

| | |
|--------------------------|--|
| Composition | 5% Phenyl, 95% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -5, AT TM -5, BPT TM -5, CP-Sil TM 8 CB, DB TM -5, HP TM -5 OV TM -5, Rtx TM -5, SE-52, SPB TM -5, ZB TM -5 |
| USP Classification | G27, G36, G41 |
| EPA Methods / Normatives | EPA 611/8110, 604, 606, 607, 608/8081, 609, 612, 613, 615, 619, 622, 8015B, 8041, 8061A, 8082, 8091, 8121, 8141A |

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- [FAST-GC Guide \(with application notes\). Free download the Pdf File!](#)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|----------------|------|--|
| MEGA-5 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-5-005-005-5 | | |
| MEGA-5 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-5-005-010-5 | | |
| MEGA-5 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-5-010-010-10 | | |
| MEGA-5 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-5-010-020-10 | | |

Fused Silica Capillary Columns → MEGA-50 FAST



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Image

MEGA-50 FAST

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 50% Cyanopropyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Bonded |
| Equivalent to | DB™-23 |
| USP Classification | G5 |

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- *FAST-GC Guide (with application notes). Free download the Pdf File!*

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | | |
|--------------|-------------------|----------------|--------|-----------------|-----------------|------|--|--|
| MEGA-50 FAST | 0.05 mm | 0.05 µm | 5 m | 260 °C | F-50-005-005-5 | | | |
| MEGA-50 FAST | 0.05 mm | 0.10 µm | 5 m | 260 °C | F-50-005-010-5 | | | |
| MEGA-50 FAST | 0.10 mm | 0.10 µm | 10 m | 260 °C | F-50-010-010-10 | | | |
| MEGA-50 FAST | 0.10 mm | 0.20 µm | 10 m | 260 °C | F-50-010-020-10 | | | |

Fused Silica Capillary Columns → MEGA-624 FAST



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MEGA-624 FAST

(Mega s.n.c.)

Stationary Phase Characteristics

| | |
|--------------------------|---|
| Composition | 6% Cyanopropylphenyl, 94% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -624, 007 TM -1301, AT TM -624, CPT TM -1301, DB TM -1301, DB TM -624, HPT TM -1301, HPT TM -624, Rtx TM -624, Rtx TM -1301, SPB TM -1301, SPB TM -624, VFT TM -624 ms, Vocol TM , ZB TM -624 |
| USP Classification | G43 |
| EPA Methods / Normatives | EPA 501.3, 502.1, 502.2, 503.1, 504.1, 524.2, 601, 602, 603, 624, 1624, 8010B, 8021B, 8030A, 8260B, USP 467 (OVIs) |

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| | | | | | | |
|---------------|---------|---------|------|------------------|--|--|
| MEGA-624 FAST | 0.05 mm | 0.10 µm | 5 m | F-624-005-010-5 | | |
| MEGA-624 FAST | 0.10 mm | 0.10 µm | 10 m | F-624-010-010-10 | | |
| MEGA-624 FAST | 0.10 mm | 0.20 µm | 10 m | F-624-010-020-10 | | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

CUSTOM
DEDICATED
COLUMNS

CUSTOM-DEDICATED

dex xeb
chiral columns

MEGA-DEX (CHIRAL
PHASES)

FAST-GC
columns

FAST-GC

GC-MS
columns

GC-MS COLUMNS

MEGA GAP
incorporated retention gap
columns

MEGA-GAP (Incorporated
Ret.-Gap)

Mega HT
High Temperature Columns

HIGH TEMPERATURE
COLUMNS

mega^{2D}
columns

Fused Silica Capillary Columns → MEGA-ACID (FFAP) FAST

MEGA-ACID (FFAP) FAST



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Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | Polyethylenglycol (PEG) Acid Modified |
| Polarity | High polarity |
| Crossbond | Bonded |
| Equivalent to | 007™-FFAP, AT™-1000, BPT™-21, CPT™-Wax 58 CB, DB™-FFAP, Nukol™, SPB™-1000, Stabilwax-DA™ |
| USP Classification | G14, G15, G16, G25, G35, G39 |

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| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|----------------|-------------------|----------------|--------|-----------------|-------------------|------|--|
| MEGA-ACID FAST | 0.05 mm | 0.05 µm | 5 m | 260 °C | F-ACID-005-005-5 | | |
| MEGA-ACID FAST | 0.05 mm | 0.10 µm | 5 m | 260 °C | F-ACID-005-010-5 | | |
| MEGA-ACID FAST | 0.10 mm | 0.10 µm | 10 m | 260 °C | F-ACID-010-010-10 | | |
| MEGA-ACID FAST | 0.10 mm | 0.20 µm | 10 m | 260 °C | F-ACID-010-020-10 | | |

Fused Silica Capillary Columns → MEGA-JXR FAST



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MEGA-JXR FAST

Stationary Phase Characteristics

| | |
|---------------|---------------------------------|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | / |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|---------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-JXR FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-JXR-005-005-5 | |
| MEGA-JXR FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-JXR-005-010-5 | |
| MEGA-JXR FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-JXR-010-010-10 | |
| MEGA-JXR FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-JXR-010-020-10 | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

**CUSTOM
DEDICATED
COLUMNS**

CUSTOM-DEDICATED

dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

FAST-GC

GC-MS
columns

GC-MS COLUMNS

MEGA GAP
incorporated methyl gap column

MEGA-GAP (Incorporated Ret.-Gap)

Mega HT
high temperature columns

HIGH TEMPERATURE COLUMNS

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Fused Silica Capillary Columns → MEGA-PLUS FAST

MEGA-PLUS FAST



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Stationary Phase Characteristics

| | |
|---------------|--|
| Composition | Copolymer Polyethyleneglycol (PEG) + Methyl Polisiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Yes |
| Equivalent to | unique column |

*Tune the selectivity of your MEGA-PLUS column choosing between the uniques **MEGA-PLUS 10** (10% PEG, 90% PDMS), **MEGA-PLUS 25** (25% PEG, 75% PDMS), **MEGA-PLUS 75** (75% PEG, 25% PDMS) or contact us to fully personalize your MEGA-PLUS composition!*

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- *FAST-GC Guide (with application notes). Free download the Pdf File!*

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|----------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-PLUS FAST | 0.05 mm | 0.05 µm | 5 m | 280 °C | F-PLUS-005-005-5 | |
| MEGA-PLUS FAST | 0.05 mm | 0.10 µm | 5 m | 280 °C | F-PLUS-005-010-5 | |
| MEGA-PLUS FAST | 0.10 mm | 0.10 µm | 10 m | 280 °C | F-PLUS-010-010-10 | |
| MEGA-PLUS FAST | 0.10 mm | 0.20 µm | 10 m | 280 °C | F-PLUS-010-020-10 | |

Fused Silica Capillary Columns → MEGA-PS255 FAST

MEGA-PS255 FAST



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Stationary Phase Characteristics

| | |
|---------------|-----------------------------------|
| Composition | 1% Vinyl, 99% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | / |

Applications

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-----------------|-------------------|----------------|--------|-----------------|--------------------|------|
| MEGA-PS255 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-PS255-005-005-5 | |
| MEGA-PS255 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-PS255-005-010-5 | |
| MEGA-PS255 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-PS255-010-010-10 | |
| MEGA-PS255 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-PS255-010-020-10 | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

**CUSTOM
DEDICATED
COLUMNS**

CUSTOM-DEDICATED

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chiral columns

MEGA-DEX (CHIRAL PHASES)

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Fused Silica Capillary Columns → MEGA-SE30 FAST



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MEGA-SE30 FAST

Stationary Phase Characteristics

| | |
|---------------|--------------------------|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | / |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|----------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-SE30 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-SE30-005-005-5 | |
| MEGA-SE30 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-SE30-005-010-5 | |
| MEGA-SE30 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-SE30-010-010-10 | |
| MEGA-SE30 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-SE30-010-020-10 | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

**CUSTOM
DEDICATED
COLUMNS**

CUSTOM-DEDICATED

dex web
chiral columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

FAST-GC

GC-MS
columns

MEGA GAP
non-porous fused silica columns

Mega HT
High Temperature Columns

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Fused Silica Capillary Columns → MEGA-SE54 FAST



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Image

MEGA-SE54 FAST

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 5% Phenyl, 1% Vinyl, 94% Methyl Polysiloxane |
| Polarity | Low polarity |
| Crossbond | Yes |
| Equivalent to | SE-54 |
| USP Classification | G6 |

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| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|----------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-SE54 FAST | 0.05 mm | 0.05 µm | 5 m | 350 °C | F-SE54-005-005-5 | |
| MEGA-SE54 FAST | 0.05 mm | 0.10 µm | 5 m | 350 °C | F-SE54-005-010-5 | |
| MEGA-SE54 FAST | 0.10 mm | 0.10 µm | 10 m | 350 °C | F-SE54-010-010-10 | |
| MEGA-SE54 FAST | 0.10 mm | 0.20 µm | 10 m | 350 °C | F-SE54-010-020-10 | |

Silica Capillary Columns GC-MS COLUMNS → MEGA-35 MS



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MEGA-35 MS

(Mega s.n.c.)

Every GC-MS MEGA column provides a **very low bleeding at high temperatures**. We offer the possibility to left void of stationary phase the end of the column, that is inserted into the transfer-line, in order to **avoid the contamination of the source**.

Other sizes and combinations of internal diameter, film thickness and length are available in addition to those standards listed below.

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 35% Phenyl, 65% Methyl Polysiloxane |
| Polarity | Mid to High |
| Crossbond | Yes |
| Equivalent to | DB™-35 ms, Rtx™-35 Sil ms |
| USP Classification | G28, G42 |

| Description | Q.ta | | | | | | |
|-------------|---------|---------|------|-------|------------------|--|--|
| MEGA-35 MS | 0.25 mm | 0.15 µm | 25 m | 340°C | MS-35-025-015-25 | | |
| MEGA-35 MS | 0.25 mm | 0.15 µm | 30 m | 340°C | MS-35-025-015-30 | | |
| MEGA-35 MS | 0.25 mm | 0.25 µm | 25 m | 340°C | MS-35-025-025-25 | | |
| MEGA-35 MS | 0.25 mm | 0.25 µm | 30 m | 340°C | MS-35-025-025-30 | | |

Fused Silica Capillary Columns → GC-MS COLUMNS → **MEGA-17 MS**

MEGA-17 MS

(Mega s.n.c.)



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Every GC-MS MEGA column provides a **very low bleeding at high temperatures**. We offer the possibility to left void of stationary phase the end of the column, that is inserted into the transfer-line, in order to **avoid the contamination of the source**.

Other sizes and combinations of internal diameter, film thickness and length are available in addition to those standards listed below.

Stationary Phase Characteristics

| | |
|--------------------|-------------------------------------|
| Composition | 50% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High |
| Crossbond | Yes |
| Equivalent to | unique column |
| USP Classification | G3, G17 |

| Description | | | | | | Q.ta |
|-------------|---------|---------|------|-------|------------------|------|
| MEGA-17 MS | 0.25 mm | 0.15 µm | 25 m | 340°C | MS-17-025-015-25 | |
| MEGA-17 MS | 0.25 mm | 0.25 µm | 25 m | 340°C | MS-17-025-025-25 | |
| MEGA-17 MS | 0.25 mm | 0.15 µm | 30 m | 340°C | MS-17-025-015-30 | |
| MEGA-17 MS | 0.25 mm | 0.25 µm | 30 m | 340°C | MS-17-025-025-30 | |

➔ MEGA-225 MS

MEGA-225 MS

(Mega s.n.c.)



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Every GC-MS MEGA column provides a **very low bleeding at high temperatures**. We offer the possibility to left void of stationary phase the end of the column, that is inserted into the transfer-line, in order to **avoid the contamination of the source**.

Other sizes and combinations of internal diameter, film thickness and length are available in addition to those standards listed below.

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Bonded |
| Equivalent to | unique column |
| USP Classification | G7, G19 |

| Description | | | | | | Q.ta | |
|-------------|---------|---------|------|------|-------------------|------|--|
| MEGA-225 MS | 0.25 mm | 0.25 µm | 25 m | n.d. | MS-225-025-025-25 | | |
| MEGA-225 MS | 0.25 mm | 0.15 µm | 25 m | n.d. | MS-225-025-015-25 | | |

→ MEGA-1 MS

MEGA-1 MS



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Every GC-MS MEGA column provides a **very low bleeding at high temperatures**. We offer the possibility to left void of stationary phase the end of the column, that is inserted into the transfer-line, in order to **avoid the contamination of the source**.

Other sizes and combinations of internal diameter, film thickness and length are available in addition to those standards listed below.

Stationary Phase Characteristics

| | |
|-------------------------|---|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -1, AT TM -1, CP Sil TM 5 CB, DB TM -1 ms, Equity TM -1, OV TM -1, HP TM -1 ms, Rtx TM -1 ms, SPB TM -1, ZB TM -1 ms |
| USP Classification | G1, G2, G9, G38 |
| EPA Methods, Normatives | EPA 606 |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|
| MEGA-1 MS | 0.25 mm | 0.15 µm | 15 m | 350 °C | MS-1-025-015-15 | |
| MEGA-1 MS | 0.25 mm | 0.15 µm | 25 m | 350 °C | MS-1-025-015-25 | |
| MEGA-1 MS | 0.25 mm | 0.15 µm | 30 m | 350 °C | MS-1-025-015-30 | |
| MEGA-1 MS | 0.25 mm | 0.15 µm | 50 m | 350 °C | MS-1-025-015-50 | |
| MEGA-1 MS | 0.25 mm | 0.15 µm | 60 m | 350 °C | MS-1-025-015-60 | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-----------------|--|--|
| MEGA-1 MS | 0.25 mm | 0.25 µm | 50 m | 350 °C | MS-1-025-025-50 | | |
| MEGA-1 MS | 0.25 mm | 0.25 µm | 60 m | 350 °C | MS-1-025-025-60 | | |
| MEGA-1 MS | 0.32 mm | 0.15 µm | 15 m | 350 °C | MS-1-032-015-15 | | |
| MEGA-1 MS | 0.32 mm | 0.15 µm | 25 m | 350 °C | MS-1-032-015-25 | | |
| MEGA-1 MS | 0.32 mm | 0.15 µm | 30 m | 350 °C | MS-1-032-015-30 | | |
| MEGA-1 MS | 0.32 mm | 0.15 µm | 50 m | 350 °C | MS-1-032-015-50 | | |
| MEGA-1 MS | 0.32 mm | 0.15 µm | 60 m | 350 °C | MS-1-032-015-60 | | |
| MEGA-1 MS | 0.32 mm | 0.25 µm | 15 m | 350 °C | MS-1-032-025-15 | | |
| MEGA-1 MS | 0.32 mm | 0.25 µm | 25 m | 350 °C | MS-1-032-025-25 | | |
| MEGA-1 MS | 0.32 mm | 0.25 µm | 30 m | 350 °C | MS-1-032-025-30 | | |
| MEGA-1 MS | 0.32 mm | 0.25 µm | 50 m | 350 °C | MS-1-032-025-50 | | |
| MEGA-1 MS | 0.32 mm | 0.25 µm | 60 m | 350 °C | MS-1-032-025-60 | | |

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MEGA-1 FAST



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MEGA-1



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Vendor Information

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Fused Silica Capillary Columns **MEGA-5 MS**

MEGA-5 MS



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Every GC-MS MEGA column provides a **very low bleeding at high temperatures**. We offer the possibility to left void of stationary phase the end of the column, that is inserted into the transfer-line, in order to **avoid the contamination of the source**.

Other sizes and combinations of internal diameter, film thickness and length are available in addition to those standards listed below.

Stationary Phase Characteristics

| | |
|--------------------------|---|
| Composition | 5% Phenyl, 95% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -5 ms, AT TM -5 ms, BPX TM -5, DB TM -5 ms, DB TM -Ultra 2, HP TM -5 ms, Rtx TM -5 ms, SPB TM -5, Equity TM -5 ms, ZB TM -5 ms |
| USP Classification | G27, G36, G41 |
| EPA Methods / Normatives | EPA 513, 525, 552.2, 604, 606, 610, 613, 625, 1625, 1653, 8100, 8141A, 8270C, 8280A |

MEGA®

CAPILLARY COLUMNS
LABORATORY

Gas Chromatography made in Italy

since
1980

| | | | | | | | |
|-----------|---------|---------|------|--------|-----------------|--|--|
| MEGA-5 MS | 0.25 mm | 0.15 µm | 30 m | 350 °C | MS-5-025-015-30 | | |
| MEGA-5 MS | 0.25 mm | 0.15 µm | 50 m | 350 °C | MS-5-025-015-50 | | |
| MEGA-5 MS | 0.25 mm | 0.15 µm | 60 m | 350 °C | MS-5-025-015-60 | | |
| MEGA-5 MS | 0.25 mm | 0.25 µm | 15 m | 350 °C | MS-5-025-025-15 | | |
| MEGA-5 MS | 0.25 mm | 0.25 µm | 25 m | 350 °C | MS-5-025-025-25 | | |
| MEGA-5 MS | 0.25 mm | 0.25 µm | 30 m | 350 °C | MS-5-025-025-30 | | |
| MEGA-5 MS | 0.25 mm | 0.25 µm | 50 m | 350 °C | MS-5-025-025-50 | | |
| MEGA-5 MS | 0.25 mm | 0.25 µm | 60 m | 350 °C | MS-5-025-025-60 | | |
| MEGA-5 MS | 0.32 mm | 0.15 µm | 15 m | 350 °C | MS-5-032-015-15 | | |
| MEGA-5 MS | 0.32 mm | 0.15 µm | 25 m | 350 °C | MS-5-032-015-25 | | |
| MEGA-5 MS | 0.32 mm | 0.15 µm | 30 m | 350 °C | MS-5-032-015-30 | | |
| MEGA-5 MS | 0.32 mm | 0.15 µm | 50 m | 350 °C | MS-5-032-015-50 | | |
| MEGA-5 MS | 0.32 mm | 0.15 µm | 60 m | 350 °C | MS-5-032-015-60 | | |
| MEGA-5 MS | 0.32 mm | 0.25 µm | 15 m | 350 °C | MS-5-032-025-15 | | |
| MEGA-5 MS | 0.32 mm | 0.25 µm | 25 m | 350 °C | MS-5-032-025-25 | | |
| MEGA-5 MS | 0.32 mm | 0.25 µm | 30 m | 350 °C | MS-5-032-025-30 | | |
| MEGA-5 MS | 0.32 mm | 0.25 µm | 50 m | 350 °C | MS-5-032-025-50 | | |
| MEGA-5 MS | 0.32 mm | 0.25 µm | 60 m | 350 °C | MS-5-032-025-60 | | |

→ MEGA-WAX MS

MEGA-WAX MS



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Image

Stationary Phase Specifications

| | |
|--------------------------|---|
| Composition | Polyethyleneglycol (PEG) |
| Polarity | High polarity |
| Crossbond | Yes |
| Equivalent to | 007TM-CW, ATTM-Wax ms, BPTM-20, CPTM-Wax 52 CB, DBTM-Wax, HPTM-Wax, OmegaWaxTM, StabilwaxTM, ZBTM-Wax |
| USP Classification | G14, G15, G16, G20, G39, G47, USP 467 (OVIs) |
| EPA Methods / Normatives | EPA 602, 603, 619 |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|--|
| MEGA-WAX MS | 0.25 mm | 0.15 µm | 15 m | 260 °C | MS-WAX-025-015-15 | | |
| MEGA-WAX MS | 0.25 mm | 0.15 µm | 25 m | 260 °C | MS-WAX-025-015-25 | | |
| MEGA-WAX MS | 0.25 mm | 0.15 µm | 30 m | 260 °C | MS-WAX-025-015-30 | | |
| MEGA-WAX MS | 0.25 mm | 0.15 µm | 50 m | 260 °C | MS-WAX-025-015-50 | | |
| MEGA-WAX MS | 0.25 mm | 0.15 µm | 60 m | 260 °C | MS-WAX-025-015-60 | | |
| MEGA-WAX MS | 0.25 mm | 0.25 µm | 15 m | 260 °C | MS-WAX-025-025-15 | | |
| MEGA-WAX MS | 0.25 mm | 0.25 µm | 25 m | 260 °C | MS-WAX-025-025-25 | | |

| | | | | | | | |
|-------------|---------|---------|------|--------|-------------------|--|--|
| MEGA-WAX MS | 0.25 mm | 0.25 µm | 30 m | 260 °C | MS-WAX-025-025-30 | | |
| MEGA-WAX MS | 0.25 mm | 0.25 µm | 50 m | 260 °C | MS-WAX-025-025-50 | | |
| MEGA-WAX MS | 0.25 mm | 0.25 µm | 60 m | 260 °C | MS-WAX-025-025-60 | | |
| MEGA-WAX MS | 0.32 mm | 0.15 µm | 15 m | 260 °C | MS-WAX-032-015-15 | | |
| MEGA-WAX MS | 0.32 mm | 0.15 µm | 25 m | 260 °C | MS-WAX-032-015-25 | | |
| MEGA-WAX MS | 0.32 mm | 0.15 µm | 30 m | 260 °C | MS-WAX-032-015-30 | | |
| MEGA-WAX MS | 0.32 mm | 0.15 µm | 50 m | 260 °C | MS-WAX-032-015-50 | | |
| MEGA-WAX MS | 0.32 mm | 0.15 µm | 60 m | 260 °C | MS-WAX-032-015-60 | | |
| MEGA-WAX MS | 0.32 mm | 0.25 µm | 15 m | 260 °C | MS-WAX-032-025-15 | | |
| MEGA-WAX MS | 0.32 mm | 0.25 µm | 25 m | 260 °C | MS-WAX-032-025-25 | | |
| MEGA-WAX MS | 0.32 mm | 0.25 µm | 30 m | 260 °C | MS-WAX-032-025-30 | | |
| MEGA-WAX MS | 0.32 mm | 0.25 µm | 50 m | 260 °C | MS-WAX-032-025-50 | | |
| MEGA-WAX MS | 0.32 mm | 0.25 µm | 60 m | 260 °C | MS-WAX-032-025-60 | | |

You may also be interested in this/these product(s):

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chiral columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

Fused Silica Capillary Columns → MEGA-DEX DAC-Beta



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MEGA-DEX DAC-Beta

Stationary Phase Characteristics

| | |
|-------------|---|
| Composition | Diacetyl tertbutylsilyl-BETA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |

Application Notes

Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

Support

Chiral Compounds Table (MEGA-DEX)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------------|-------------------|----------------|--------|-----------------|----------------------|------|
| MEGA-DEX DAC-Beta | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DAC-B-025-025-15 | |
| MEGA-DEX DAC-Beta | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DAC-B-025-015-25 | |
| MEGA-DEX DAC-Beta | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DAC-B-025-025-25 | |
| MEGA-DEX DAC-Beta | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DAC-B-025-015-15 | |

You may also be interested in this/these product(s):

MEGA-DEX DAC-Gamma



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MEGA-DEX DET-Beta



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MEGA-DEX DET-Gamma



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MEGA-DEX DMP-Beta



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chiral columns

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Mega HT
High Temperature Columns

HIGH TEMPERATURE COLUMNS

FAST-GC
columns

FAST-GC

mega^{2D}
columns

Fused Silica Capillary Columns → MEGA-DEX DAC-Gamma



View Full-Size
Image

MEGA-DEX DAC-Gamma

Stationary Phase Characteristics

| | |
|-------------|---|
| Composition | Diacetyl tertbutylsilyl-GAMMA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |

Application Notes

Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

Support

Chiral Compunds Table (MEGA-DEX)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|--------------------|-------------------|----------------|--------|-----------------|----------------------|------|--|
| MEGA-DEX DAC-Gamma | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DAC-G-025-015-15 | | |
| MEGA-DEX DAC-Gamma | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DAC-G-025-015-25 | | |
| MEGA-DEX DAC-Gamma | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DAC-G-025-025-15 | | |
| MEGA-DEX DAC-Gamma | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DAC-G-025-025-25 | | |

Fused Silica Capillary Columns → MEGA-DEX DET-Beta



View Full-Size

Image

MEGA-DEX DET-Beta

Stationary Phase Characteristics

| | |
|-------------|---|
| Composition | Diethyl tertbutylsilyl-BETA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |

Application Notes

Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

Support

Chiral Compunds Table (MEGA-DEX)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------------|-------------------|----------------|--------|-----------------|----------------------|------|
| MEGA-DEX DET-Beta | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DET-B-025-015-15 | |
| MEGA-DEX DET-Beta | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DET-B-025-015-25 | |
| MEGA-DEX DET-Beta | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DET-B-025-025-15 | |
| MEGA-DEX DET-Beta | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DET-B-025-025-25 | |

Fused Silica Capillary Columns → MEGA-DEX DET-Gamma



View Full-Size
Image

MEGA-DEX DET-Gamma

Stationary Phase Characteristics

| | |
|-------------|--|
| Composition | Diethyl tertbutylsilyl-GAMMA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |

Application Notes

Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

Support

Chiral Compunds Table (MEGA-DEX)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|--------------------|-------------------|----------------|--------|-----------------|----------------------|------|--|
| MEGA-DEX DET-Gamma | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DET-G-025-015-15 | | |
| MEGA-DEX DET-Gamma | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DET-G-025-015-25 | | |
| MEGA-DEX DET-Gamma | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DET-G-025-025-15 | | |
| MEGA-DEX DET-Gamma | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DET-G-025-025-25 | | |

Fused Silica Capillary Columns → MEGA-DEX DMP-Beta



MEGA-DEX DMP-Beta

Stationary Phase Characteristics

| | |
|-------------|------------------------------------|
| Composition | Dimethyl pentyl-BETA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |

Application Notes

Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

Support

Chiral Compunds Table (MEGA-DEX)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------------|-------------------|----------------|--------|-----------------|----------------------|------|
| MEGA-DEX DMP-Beta | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DMP-B-025-015-15 | |
| MEGA-DEX DMP-Beta | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DMP-B-025-015-25 | |
| MEGA-DEX DMP-Beta | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DMP-B-025-025-15 | |
| MEGA-DEX DMP-Beta | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DMP-B-025-025-25 | |

Fused Silica Capillary Columns → MEGA-DEX DMT-Beta



View Full-Size
Image

MEGA-DEX DMT-Beta

Stationary Phase Characteristics

| | |
|-------------|--|
| Composition | Dimethyl tertbutylsilyl-BETA-Cyclodextrine |
| Polarity | Chiral Stationary Phase |


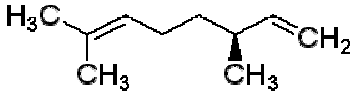
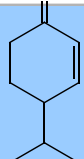
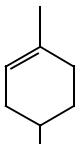
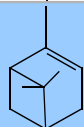
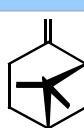

Application Notes

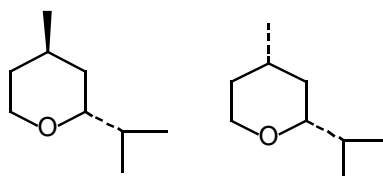
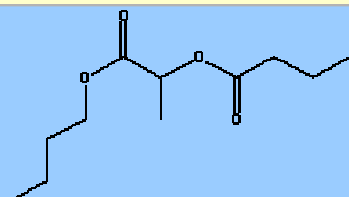
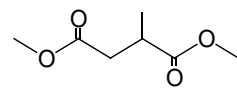
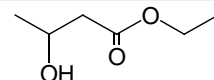
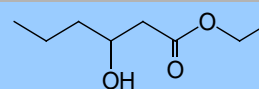
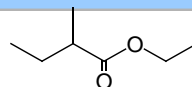
Camphor , Cineol , Delta Lactones , Isoborneol , Menthone-Isomenthone , Neomenthol-Isomenthol ,

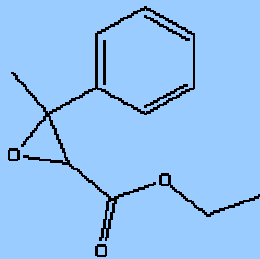
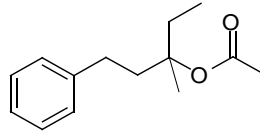
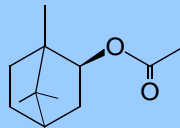
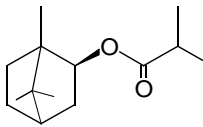
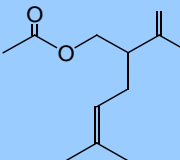
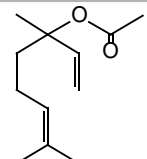
Support

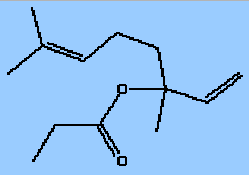
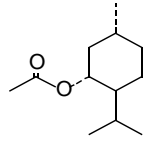
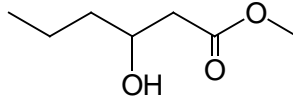
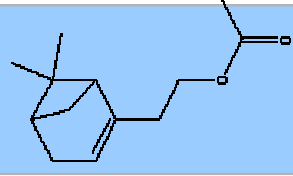
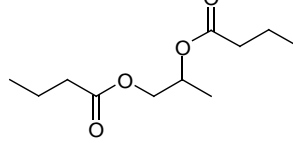
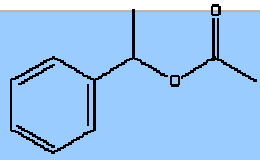
Chiral Compunds Table (MEGA-DEX)

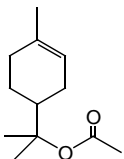
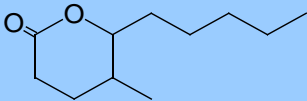
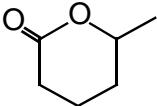
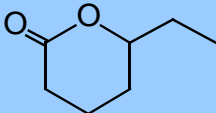
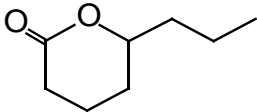
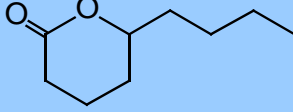
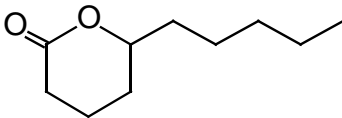
| Description | I.D. | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------------|---------|----------------|--------|-----------------|----------------------|------|--|
| MEGA-DEX DMT-Beta | 0.25 mm | 0.15 µm | 15 m | 230 °C | DEX-DMT-B-025-015-15 | | |
| MEGA-DEX DMT-Beta | 0.25 mm | 0.15 µm | 25 m | 230 °C | DEX-DMT-B-025-015-25 | | |
| MEGA-DEX DMT-Beta | 0.25 mm | 0.25 µm | 15 m | 230 °C | DEX-DMT-B-025-025-15 | | |
| MEGA-DEX DMT-Beta | 0.25 mm | 0.25 µm | 25 m | 230 °C | DEX-DMT-B-025-025-25 | | |

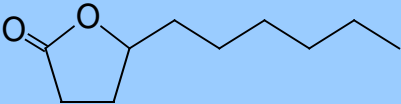
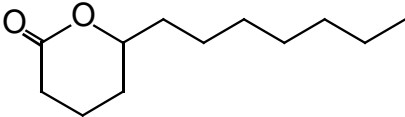
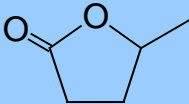
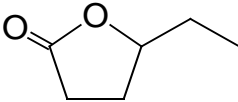
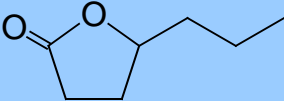
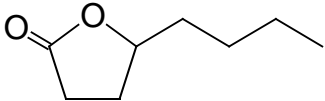
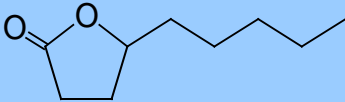
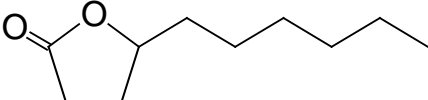
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|----------------|---|-------------------|-------------------|-------------------|-------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Camphene |  | 2,2 | 6,8 | / | 4,5 | |
| β-Citronellene |  | / | 1,2 | / | 1,8 | |
| β-Phellandrene |  | 3,8 | 6,1 | 0,9 | 3 | |
| Limonene |  | 5 | 7,4 | / | 3,7 | |
| α-Pinene |  | 2,9 | / | 1,2 | 3,5 | |
| β-Pinene |  | 3,4 | 3,6 | 1,1 | 1,4 | |
| Sabinene |  | 6,5 | 6,2 | / | 7,2 | |

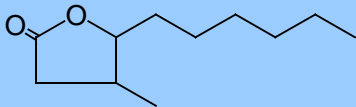
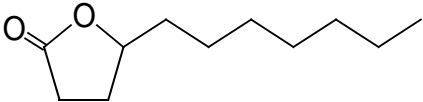
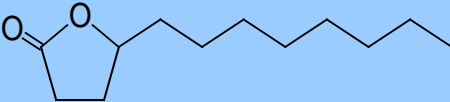
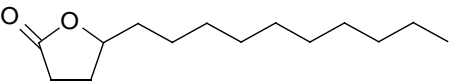
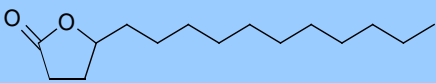
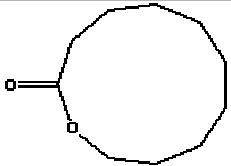
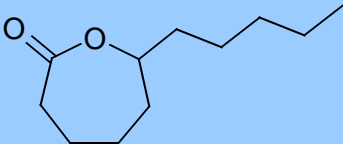
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|--------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| <i>Heterocycles</i> | | | | | | |
| Rose oxide |  | 4,2 | 2 | 1,6 | 2,1 | (2R4S) cis / (2S4R) cis |
| | | / | 1,9 | / | / | (2R4R) trans / (2S4S) trans |
| <i>Esters</i> | | | | | | |
| Butyl butyryl lactate |  | 1,6 | 1,7 | 2,2 | 1,4 | |
| Dimethyl methylsuccinate |  | 2,2 | 1,1 | 4 | 2 | |
| Ethyl 2-phenylbutyrate | / | 1 | 2,7 | 1 | 1,1 | |
| Ethyl 3-hydroxybutyrate |  | 3,2 | / | 6,1 | 1,8 | |
| Ethyl 3-hydroxyhexanoate |  | 3 | 1,5 | / | 3,7 | |
| Ethyl 2-methylbutyrate |  | 2,9 | 5,1 | 2,7 | 2,2 | |

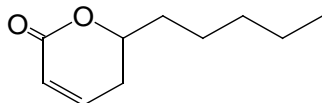
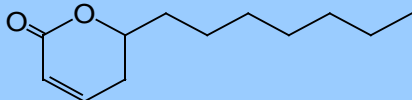
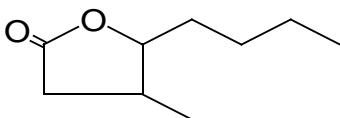
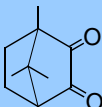
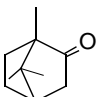
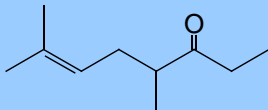
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---|---|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Ethyl 3-methyl-3-phenylglycidate |  | / | 2,5 | 1 | / | X / Y |
| | | 2 | 4,7 | / | 4,7 | Z / W |
| Phenylethyl methyl ethyl carbinol acetate |  | / | / | / | 1,1 | |
| Isobornyl acetate |  | / | 1,4 | / | 1,7 | |
| Isobornyl isobutyrate |  | 1 | 1,4 | / | 1,9 | |
| Lavandulyl acetate |  | 1,6 | 2,3 | / | 1,4 | |
| Linalyl acetate |  | 0,7 | 3,7 | 1,1 | / | |

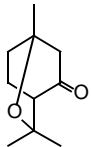
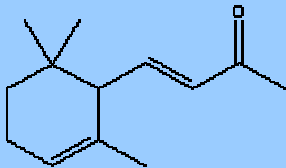
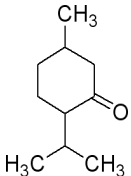
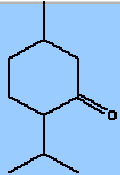
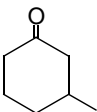
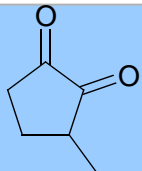
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|----------------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Linalyl propionate |  | / | 1,2 | / | 0,4 | |
| Menthyl acetate |  | 14 | 17 | 5,2 | 19,8 | |
| cis 2-Methyl-3.-hexenyl butyrate | / | 1,8 | 2,3 | 1 | 1 | |
| Methyl 3-hydroxyhexanoate |  | 5,7 | 6,8 | 3 | 7,8 | |
| Nopyl acetate |  | / | / | / | 1,7 | |
| Propyleneglycol butyrate |  | 2,3 | 1,4 | 1,2 | 5,3 | |
| Styrallyl acetate |  | 15,6 | 56,3 | 3 | 38,3 | |

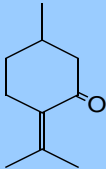
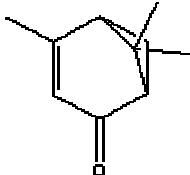
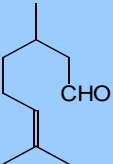
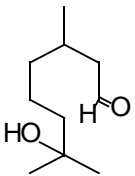
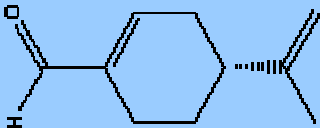
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|----------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| α -Terpinyl acetate |  | / | / | / | 1,1 | |
| Lactones | | | | | | |
| Aerangis lactone |  | 2,2 | 2,8 | 1 | 1,7 | |
| δ -Hexalactone |  | / | 1,5 | 6,6 | / | |
| δ -Heptalactone |  | 3,2 | 1,4 | 0,9 | 0,6 | |
| δ -Octalactone |  | 1,8 | 3,4 | 7,5 | 0,9 | |
| δ -Nonalactone |  | 1,5 | 1 | 4,4 | / | |
| δ -Decalactone |  | 1 | 1 | 4,1 | / | |

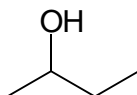
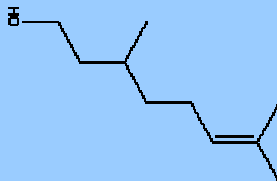
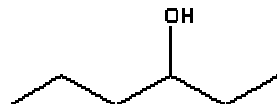
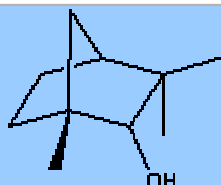
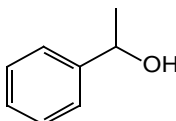
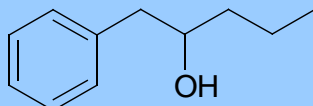
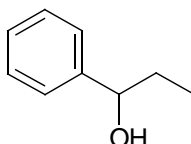
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|-------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| δ -Undecalactone |  | 1,4 | 1,2 | 3,8 | / | |
| δ -Dodecalactone |  | 1,1 | 1,1 | 3,5 | / | |
| γ -Pentalactone |  | 7,6 | 20,5 | 21,4 | 5,5 | |
| γ -Hexalactone |  | 6 | 13,6 | 15,7 | 3,4 | |
| γ -Heptalactone |  | 8,9 | 13,9 | 4,2 | 4,7 | |
| γ -Octalactone |  | 6,4 | 11,6 | 4,6 | 3,7 | |
| γ -Nonalactone |  | 5,7 | 9,8 | 3,9 | 3 | |
| γ -Decalactone |  | 4 | 7,2 | 3,7 | 2,2 | |

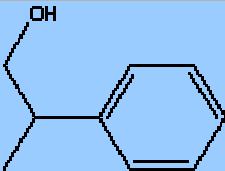
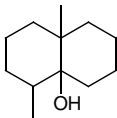
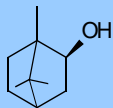
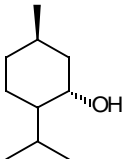
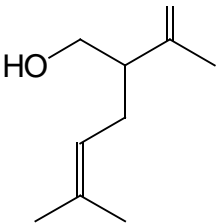
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---------------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| 3-Methyl- γ -decalactone |  | 6,4 | 8 | 4,5 | 5,1 | |
| γ -Undecalactone |  | 3,4 | 6,1 | 3,6 | 1,7 | |
| γ -Dodecalactone |  | 2,9 | 4,8 | 3,1 | 1,4 | |
| γ -Tetradecalactone |  | 2 | 3,2 | 2,4 | 1 | |
| γ -Pentadecalactone |  | 1,6 | 2,4 | 2,1 | 0,7 | |
| ϵ -Decalactone |  | 5 | 8 | 2,6 | 1,8 | |
| ϵ -Dodecalactone |  | 4,3 | 5,4 | 4 | 1,2 | |

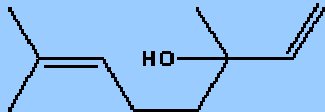
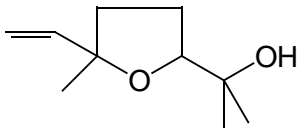
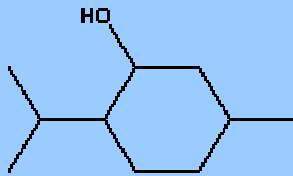
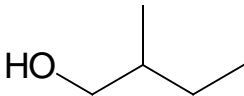
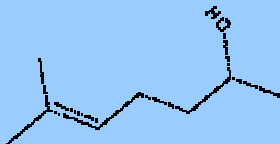
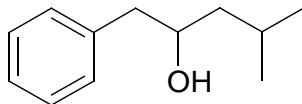
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|-----------------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Massoja decalactone |  | 1,2 | / | 5,7 | 0,7 | |
| Massoja dodecalactone |  | 1,2 | / | 5,2 | / | |
| Whiskey lactone |  | 11,2 | 11,2 | 5,1 | 5,2 | X / Y |
| | | 2,8 | 1,4 | 6,3 | / | Z / W |
| Ketones | | | | | | |
| Camphorquinone |  | 2,2 | 3,8 | 6,5 | / | |
| Camphor |  | 2,6 | 3,7 | 7,8 | / | |
| 3,6-dimethylocta-2-en-6-one |  | 1,7 | 5 | 2,4 | 3,2 | |

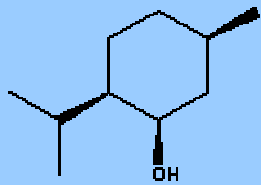
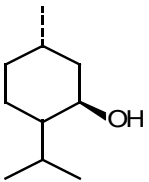
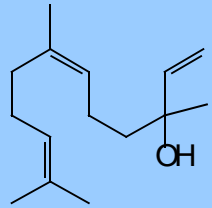
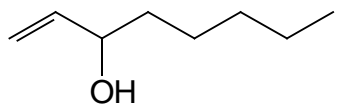
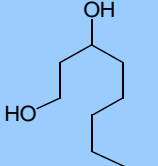
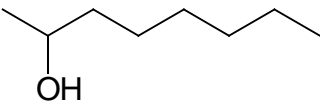
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---------------------------|---|-------------------|-------------------|-------------------|-------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| 1,8-Epoxy-p-menthan-3-one |  | 12,5 | 13,8 | 4,8 | 11,6 | |
| α-Ionone |  | 5,1 | 4,9 | 5,4 | 7,6 | |
| Isomenthone |  | 10,4 | / | 2,4 | / | |
| Menthone |  | 1,5 | 2,2 | 2,8 | / | |
| 3-Methylcyclohexanone |  | 1,7 | 5,3 | 1 | 1,3 | |
| 3-Oxocineole |  | 17 | 693.36.00 | 20,7 | 11 | |

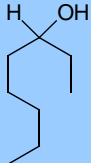
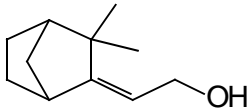
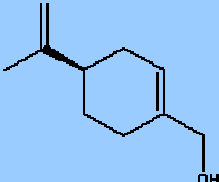
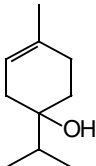
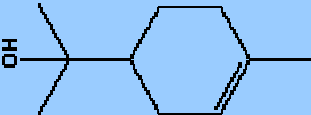
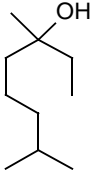
| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|--------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Piperitone | / | 6 | 8,8 | 2,8 | 5 | |
| Pulegone |  | 4,6 | 3,8 | / | 2,7 | |
| Verbenone |  | 2,9 | 3,5 | 1,8 | 1,1 | |
| Aldehydes | | | | | | |
| Citronellal |  | / | 1,1 | 3,1 | 1,3 | |
| Hydroxycitronellal |  | 1 | 1,1 | 2,9 | / | |
| Perillyl aldehyde |  | 6,4 | 8,2 | 1,9 | 4,1 | |

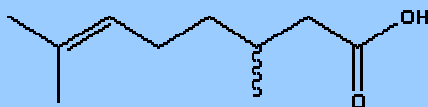
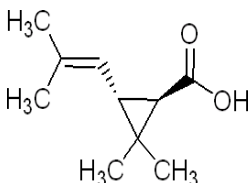
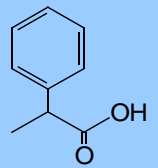
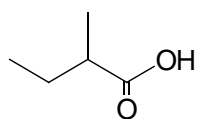
| COMPOUND | FORMULA | R (ERSOLUTION) | | | | CONFIG |
|---------------------|--|-------------------|-------------------|-------------------|-------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Alcohols | | | | | | |
| 2-Butanol |  | / | / | 2,2 | / | |
| Citronellol |  | 1,2 | 1,3 | 1,8 | / | |
| 3-Hexanol |  | / | / | 1,7 | 0,9 | |
| Fenchyl alcohol |  | 2,7 | 8,6 | 7 | 4,2 | |
| 1-Phenylethanol |  | 6 | 6,1 | 8 | 9 | |
| 1-Phenyl-2 pentanol |  | 4,1 | 1,1 | 3 | 3,3 | |
| 1-Phenil 1-propanol |  | 2 | 3,9 | 4,8 | 5,3 | |

| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| 2-Phenil-1-propanol |  | 3,2 | 3,1 | 7,6 | 2 | |
| Geosmin |  | 1,7 | 1,3 | 1 | 3,4 | |
| Isoborneol |  | 3,6 | 3,7 | 9,7 | 2,1 | |
| Isomenthol |  | 4,4 | 8,6 | 8,8 | 6,3 | |
| Isopinocampheol | / | 5,6 | 1,8 | 2 | / | |
| Lavandulol |  | 8,6 | 13,7 | / | 4,5 | S |
| | | | | | | R |

| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---------------------------|--|-------------------|-------------------|-------------------|-------------------|-----------------------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Linalool |  | 3,9 | 7,4 | 1,4 | 5,3 | |
| Linalool oxide |  | 9,6 | / | / | 13,9 | (+) trans / (-) trans |
| | | 4,8 | / | / | 9,6 | (+) cis / (-) cis |
| Menthol |  | 1,3 | 1,3 | 5 | 1,3 | |
| 2-Methylbutanol |  | 1,2 | 2,4 | 2,8 | 1,2 | |
| 6-Methyl-5hepten-2-ol |  | 6,3 | 6,7 | 1,5 | 8,2 | |
| 4-Methyl-1-phenylpentanol |  | 3,5 | 2,3 | 7 | 2,9 | |

| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|----------------|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Neoisomenthol |  | 11 | 17,4 | 4 | 10,1 | |
| Neomenthol |  | 6,9 | 6,4 | 4,6 | 3,1 | |
| Nerolidol |  | 2,2 | 4,3 | / | 2,2 | X cis / Y cis |
| | | 2,7 | 4,5 | / | 3,2 | Z trans / W trans |
| 1-Octen-3-ol |  | 1,4 | / | 1,4 | / | |
| 1,3-Octanediol |  | 1 | 1,2 | 2,7 | 1,6 | |
| 2-Octanol |  | 1 | 1 | / | / | |

| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|---------------------|--|-------------------------|-------------------------|-------------------------|-------------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| 3-Octanol |  | / | 1 | 1,5 | 0,4 | |
| Patchenol |  | / | / | / | 3,9 | |
| Perillyl alcohol |  | / | / | / | 3,5 | |
| Terpinen-4-ol |  | 2,4 | 1,7 | 22,8 | 4 | |
| α -Terpineol |  | 5,1 | 6,9 | 2,7 | 1,9 | |
| Tetrahydrolinalool |  | 4,2 | 7 | / | 6,6 | |

| COMPOUND | FORMULA | R (RESOLUTION) | | | | CONFIG |
|------------------------|--|-------------------|-------------------|-------------------|-------------------|--------|
| | | MEGA-DEX DMT β | MEGA-DEX DET β | MEGA-DEX DAC β | MEGA-DEX DMP β | |
| Acids | | | | | | |
| Citronellic acid |  | 1,7 | 1,1 | / | / | |
| Chrysanthemic acid |  | 8,4 | 7,5 | / | 11,2 | |
| 2-Phenylpropionic acid |  | / | 2 | 3,4 | 3,6 | |
| 2-Methylbutyric acid |  | 2,1 | 1,5 | 1 | 4,5 | |

Legend:

| | | | |
|--|--------------|--------------|------|
| MEGA-DEX DMT β = Dimethyl tertbutyldimethylisilyl-β-cyclodextrine | 0,25 mm i.d. | 0,15 μm f.t. | 25 m |
| MEGA-DEX DET β = Diethyl tertbutyldimethylisilyl-β-cyclodextrine | 0,25 mm i.d. | 0,15 μm f.t. | 25 m |
| MEGA-DEX DAC β = Diacetyl tertbutyldimethylisilyl-β-cyclodextrine | 0,25 mm i.d. | 0,25 μm f.t. | 25 m |
| MEGA-DEX DMP β = Dimethyl pentyl-β-cyclodextrine | 0,25 mm i.d. | 0,25 μm f.t. | 25 m |

Courtesy of Laboratory of Phytoanalysis, Dipartimento di Scienza e Tecnologia del farmaco, University of Torino (ITALY). Analyses were carried out on a Shimadzu QP 2010 S GC-MS system.

Fused Silica Capillary Columns → MEGA-1



View Full-Size
Image

MEGA-1

Stationary Phase Characteristics

| | |
|--------------------------|---|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -1, AT TM -1, BP TM -1, CP Sil 5 CB, DB TM -1, OV TM -1, HP TM -1, Rtx TM -1, SPB TM -1, ZB TM -1 |
| USP Classification | G1, G2, G9, G38 |
| EPA Methods / Normatives | EPA 504.1, 505, 606, 8141A |

Application Notes

Ketones, Drugs of Abuse 1, Drugs of Abuse 2, Phthalates (EPA Method 606), Natural Gas, Cyclic Hydrocarbons, Pesticides, Butter Triglycerides

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|----------------|------|
| MEGA-1 | 0.25 mm | 0.15 µm | 15 m | 350 °C | S-1-025-015-15 | |
| MEGA-1 | 0.25 mm | 0.15 µm | 25 m | 350 °C | S-1-025-015-25 | |
| MEGA-1 | 0.25 mm | 0.15 µm | 30 m | 350 °C | S-1-025-015-30 | |
| MEGA-1 | 0.25 mm | 0.15 µm | 50 m | 350 °C | S-1-025-015-50 | |
| MEGA-1 | 0.25 mm | 0.15 µm | 60 m | 350 °C | S-1-025-015-60 | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-1 | 0.25 mm | 0.25 µm | 15 m | 350 °C | S-1-025-025-15 | | |
| MEGA-1 | 0.25 mm | 0.25 µm | 25 m | 350 °C | S-1-025-025-25 | | |
| MEGA-1 | 0.25 mm | 0.25 µm | 30 m | 350 °C | S-1-025-025-30 | | |
| MEGA-1 | 0.25 mm | 0.25 µm | 50 m | 350 °C | S-1-025-025-50 | | |
| MEGA-1 | 0.25 mm | 0.25 µm | 60 m | 350 °C | S-1-025-025-60 | | |
| MEGA-1 | 0.25 mm | 0.45 µm | 15 m | 320 °C | S-1-025-045-15 | | |
| MEGA-1 | 0.25 mm | 0.45 µm | 25 m | 320 °C | S-1-025-045-25 | | |
| MEGA-1 | 0.25 mm | 0.45 µm | 30 m | 320 °C | S-1-025-045-30 | | |
| MEGA-1 | 0.25 mm | 0.45 µm | 50 m | 320 °C | S-1-025-045-50 | | |
| MEGA-1 | 0.25 mm | 0.45 µm | 60 m | 320 °C | S-1-025-045-60 | | |
| MEGA-1 | 0.25 mm | 1.00 µm | 15 m | 300 °C | S-1-025-100-15 | | |
| MEGA-1 | 0.25 mm | 1.00 µm | 25 m | 300 °C | S-1-025-100-25 | | |
| MEGA-1 | 0.25 mm | 1.00 µm | 30 m | 300 °C | S-1-025-100-30 | | |
| MEGA-1 | 0.25 mm | 1.00 µm | 50 m | 300 °C | S-1-025-100-50 | | |
| MEGA-1 | 0.25 mm | 1.00 µm | 60 m | 300 °C | S-1-025-100-60 | | |
| MEGA-1 | 0.25 mm | 1.50 µm | 15 m | 300 °C | S-1-025-150-15 | | |
| MEGA-1 | 0.25 mm | 1.50 µm | 25 m | 300 °C | S-1-025-150-25 | | |
| MEGA-1 | 0.25 mm | 1.50 µm | 30 m | 300 °C | S-1-025-150-30 | | |
| MEGA-1 | 0.25 mm | 1.50 µm | 50 m | 300 °C | S-1-025-150-50 | | |
| MEGA-1 | 0.25 mm | 1.50 µm | 60 m | 300 °C | S-1-025-150-60 | | |
| MEGA-1 | 0.32 mm | 0.15 µm | 15 m | 350 °C | S-1-032-015-15 | | |
| MEGA-1 | 0.32 mm | 0.15 µm | 25 m | 350 °C | S-1-032-015-25 | | |
| MEGA-1 | 0.32 mm | 0.15 µm | 30 m | 350 °C | S-1-032-015-30 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-1 | 0.32 mm | 0.15 µm | 50 m | 350 °C | S-1-032-015-50 | | |
| MEGA-1 | 0.32 mm | 0.15 µm | 60 m | 350 °C | S-1-032-015-60 | | |
| MEGA-1 | 0.32 mm | 0.25 µm | 15 m | 350 °C | S-1-032-025-15 | | |
| MEGA-1 | 0.32 mm | 0.25 µm | 25 m | 350 °C | S-1-032-025-25 | | |
| MEGA-1 | 0.32 mm | 0.25 µm | 30 m | 350 °C | S-1-032-025-30 | | |
| MEGA-1 | 0.32 mm | 0.25 µm | 50 m | 350 °C | S-1-032-025-50 | | |
| MEGA-1 | 0.32 mm | 0.25 µm | 60 m | 350 °C | S-1-032-025-60 | | |
| MEGA-1 | 0.32 mm | 0.32 µm | 15 m | 340 °C | S-1-032-032-15 | | |
| MEGA-1 | 0.32 mm | 0.32 µm | 25 m | 340 °C | S-1-032-032-25 | | |
| MEGA-1 | 0.32 mm | 0.32 µm | 30 m | 340 °C | S-1-032-032-30 | | |
| MEGA-1 | 0.32 mm | 0.32 µm | 50 m | 340 °C | S-1-032-032-50 | | |
| MEGA-1 | 0.32 mm | 0.32 µm | 60 m | 340 °C | S-1-032-032-60 | | |
| MEGA-1 | 0.32 mm | 0.45 µm | 15 m | 320 °C | S-1-032-045-15 | | |
| MEGA-1 | 0.32 mm | 0.45 µm | 25 m | 320 °C | S-1-032-045-25 | | |
| MEGA-1 | 0.32 mm | 0.45 µm | 30 m | 320 °C | S-1-032-045-30 | | |
| MEGA-1 | 0.32 mm | 0.45 µm | 50 m | 320 °C | S-1-032-045-50 | | |
| MEGA-1 | 0.32 mm | 0.45 µm | 60 m | 320 °C | S-1-032-045-60 | | |
| MEGA-1 | 0.32 mm | 1.00 µm | 15 m | 300 °C | S-1-032-100-15 | | |
| MEGA-1 | 0.32 mm | 1.00 µm | 25 m | 300 °C | S-1-032-100-25 | | |
| MEGA-1 | 0.32 mm | 1.00 µm | 30 m | 300 °C | S-1-032-100-30 | | |
| MEGA-1 | 0.32 mm | 1.00 µm | 50 m | 300 °C | S-1-032-100-50 | | |
| MEGA-1 | 0.32 mm | 1.00 µm | 60 m | 300 °C | S-1-032-100-60 | | |
| MEGA-1 | 0.32 mm | 1.50 µm | 15 m | 300 °C | S-1-032-150-15 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-1 | 0.32 mm | 1.50 µm | 25 m | 300 °C | S-1-032-150-25 | | |
| MEGA-1 | 0.32 mm | 1.50 µm | 30 m | 300 °C | S-1-032-150-30 | | |
| MEGA-1 | 0.32 mm | 1.50 µm | 50 m | 300 °C | S-1-032-150-50 | | |
| MEGA-1 | 0.32 mm | 1.50 µm | 60 m | 300 °C | S-1-032-150-60 | | |
| MEGA-1 | 0.32 mm | 3.00 µm | 15 m | 300 °C | S-1-032-300-15 | | |
| MEGA-1 | 0.32 mm | 3.00 µm | 25 m | 300 °C | S-1-032-300-25 | | |
| MEGA-1 | 0.32 mm | 3.00 µm | 30 m | 300 °C | S-1-032-300-30 | | |
| MEGA-1 | 0.32 mm | 3.00 µm | 50 m | 300 °C | S-1-032-300-50 | | |
| MEGA-1 | 0.32 mm | 3.00 µm | 60 m | 300 °C | S-1-032-300-60 | | |
| MEGA-1 | 0.32 mm | 5.00 µm | 15 m | 300 °C | S-1-032-500-15 | | |
| MEGA-1 | 0.32 mm | 5.00 µm | 25 m | 300 °C | S-1-032-500-25 | | |
| MEGA-1 | 0.32 mm | 5.00 µm | 30 m | 300 °C | S-1-032-500-30 | | |
| MEGA-1 | 0.32 mm | 5.00 µm | 50 m | 300 °C | S-1-032-500-50 | | |
| MEGA-1 | 0.32 mm | 5.00 µm | 60 m | 300 °C | S-1-032-500-60 | | |
| MEGA-1 | 0.53 mm | 0.15 µm | 15 m | 350 °C | S-1-053-015-15 | | |
| MEGA-1 | 0.53 mm | 0.15 µm | 25 m | 350 °C | S-1-053-015-25 | | |
| MEGA-1 | 0.53 mm | 0.15 µm | 30 m | 350 °C | S-1-053-015-30 | | |
| MEGA-1 | 0.53 mm | 0.15 µm | 50 m | 350 °C | S-1-053-015-50 | | |
| MEGA-1 | 0.53 mm | 0.15 µm | 60 m | 350 °C | S-1-053-015-60 | | |
| MEGA-1 | 0.53 mm | 0.25 µm | 15 m | 350 °C | S-1-053-025-15 | | |
| MEGA-1 | 0.53 mm | 0.25 µm | 25 m | 350 °C | S-1-053-025-25 | | |
| MEGA-1 | 0.53 mm | 0.25 µm | 30 m | 350 °C | S-1-053-025-30 | | |
| MEGA-1 | 0.53 mm | 0.25 µm | 50 m | 350 °C | S-1-053-025-50 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-1 | 0.53 mm | 0.25 µm | 60 m | 350 °C | S-1-053-025-60 | | |
| MEGA-1 | 0.53 mm | 0.45 µm | 15 m | 320 °C | S-1-053-045-15 | | |
| MEGA-1 | 0.53 mm | 0.45 µm | 25 m | 320 °C | S-1-053-045-25 | | |
| MEGA-1 | 0.53 mm | 0.45 µm | 30 m | 320 °C | S-1-053-045-30 | | |
| MEGA-1 | 0.53 mm | 0.45 µm | 50 m | 320 °C | S-1-053-045-50 | | |
| MEGA-1 | 0.53 mm | 0.45 µm | 60 m | 320 °C | S-1-053-045-60 | | |
| MEGA-1 | 0.53 mm | 1.00 µm | 15 m | 300 °C | S-1-053-100-15 | | |
| MEGA-1 | 0.53 mm | 1.00 µm | 25 m | 300 °C | S-1-053-100-25 | | |
| MEGA-1 | 0.53 mm | 1.00 µm | 30 m | 300 °C | S-1-053-100-30 | | |
| MEGA-1 | 0.53 mm | 1.00 µm | 50 m | 300 °C | S-1-053-100-50 | | |
| MEGA-1 | 0.53 mm | 1.00 µm | 60 m | 300 °C | S-1-053-100-60 | | |
| MEGA-1 | 0.53 mm | 1.50 µm | 15 m | 300 °C | S-1-053-150-15 | | |
| MEGA-1 | 0.53 mm | 1.50 µm | 25 m | 300 °C | S-1-053-150-25 | | |
| MEGA-1 | 0.53 mm | 1.50 µm | 30 m | 300 °C | S-1-053-150-30 | | |
| MEGA-1 | 0.53 mm | 1.50 µm | 50 m | 300 °C | S-1-053-150-50 | | |
| MEGA-1 | 0.53 mm | 1.50 µm | 60 m | 300 °C | S-1-053-150-60 | | |
| MEGA-1 | 0.53 mm | 3.00 µm | 15 m | 300 °C | S-1-053-300-15 | | |
| MEGA-1 | 0.53 mm | 3.00 µm | 25 m | 300 °C | S-1-053-300-25 | | |
| MEGA-1 | 0.53 mm | 3.00 µm | 30 m | 300 °C | S-1-053-300-30 | | |
| MEGA-1 | 0.53 mm | 3.00 µm | 50 m | 300 °C | S-1-053-300-50 | | |
| MEGA-1 | 0.53 mm | 3.00 µm | 60 m | 300 °C | S-1-053-300-60 | | |
| MEGA-1 | 0.53 mm | 5.00 µm | 15 m | 300 °C | S-1-053-500-15 | | |
| MEGA-1 | 0.53 mm | 5.00 µm | 25 m | 300 °C | S-1-053-500-25 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-1 | 0.53 mm | 5.00 µm | 30 m | 300 °C | S-1-053-500-30 | | |
| MEGA-1 | 0.53 mm | 5.00 µm | 50 m | 300 °C | S-1-053-500-50 | | |
| MEGA-1 | 0.53 mm | 5.00 µm | 60 m | 300 °C | S-1-053-500-60 | | |

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dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

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HIGH TEMPERATURE COLUMNS

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columns

FAST-GC

mega^{2D}
columns

MULTIDIMENSIONAL GC

Last Updated:

Fused Silica Capillary Columns → MEGA-17

MEGA-17



View Full-Size
Image

Stationary Phase Characteristics

| | |
|--------------------------|---|
| Composition | 50% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Yes |
| Equivalent to | 007TM-17, ATTM-50, BPXTM-50, CP SilTM 24 CB, DBTM-17, HPTTM-17, RtxTM-17, SPBTM-50, VFTTM-17 ms, ZBTM-50 |
| USP Classification | G3, G17 |
| EPA Methods / Normatives | EPA 604, 608, 619, 8060, 8081 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|
| MEGA-17 | 0.25 mm | 0.15 µm | 15 m | 340 °C | S-17-025-015-15 | |
| MEGA-17 | 0.25 mm | 0.15 µm | 25 m | 340 °C | S-17-025-015-25 | |
| MEGA-17 | 0.25 mm | 0.15 µm | 30 m | 340 °C | S-17-025-015-30 | |
| MEGA-17 | 0.25 mm | 0.15 µm | 50 m | 340 °C | S-17-025-015-50 | |
| MEGA-17 | 0.25 mm | 0.15 µm | 60 m | 340 °C | S-17-025-015-60 | |
| MEGA-17 | 0.25 mm | 0.25 µm | 15 m | 340 °C | S-17-025-025-15 | |
| MEGA-17 | 0.25 mm | 0.25 µm | 25 m | 340 °C | S-17-025-025-25 | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-17 | 0.25 mm | 0.25 µm | 30 m | 340 °C | S-17-025-025-30 | | |
| MEGA-17 | 0.25 mm | 0.25 µm | 50 m | 340 °C | S-17-025-025-50 | | |
| MEGA-17 | 0.25 mm | 0.25 µm | 60 m | 340 °C | S-17-025-025-60 | | |
| MEGA-17 | 0.25 mm | 0.45 µm | 15 m | 320 °C | S-17-025-045-15 | | |
| MEGA-17 | 0.25 mm | 0.45 µm | 25 m | 320 °C | S-17-025-045-25 | | |
| MEGA-17 | 0.25 mm | 0.45 µm | 30 m | 320 °C | S-17-025-045-30 | | |
| MEGA-17 | 0.25 mm | 0.45 µm | 50 m | 320 °C | S-17-025-045-50 | | |
| MEGA-17 | 0.25 mm | 0.45 µm | 60 m | 320 °C | S-17-025-045-60 | | |
| MEGA-17 | 0.25 mm | 1.00 µm | 15 m | 300 °C | S-17-025-100-15 | | |
| MEGA-17 | 0.25 mm | 1.00 µm | 25 m | 300 °C | S-17-025-100-25 | | |
| MEGA-17 | 0.25 mm | 1.00 µm | 30 m | 300 °C | S-17-025-100-30 | | |
| MEGA-17 | 0.25 mm | 1.00 µm | 50 m | 300 °C | S-17-025-100-50 | | |
| MEGA-17 | 0.25 mm | 1.00 µm | 60 m | 300 °C | S-17-025-100-60 | | |
| MEGA-17 | 0.32 mm | 0.15 µm | 15 m | 340 °C | S-17-032-015-15 | | |
| MEGA-17 | 0.32 mm | 0.15 µm | 25 m | 340 °C | S-17-032-015-25 | | |
| MEGA-17 | 0.32 mm | 0.15 µm | 30 m | 340 °C | S-17-032-015-30 | | |
| MEGA-17 | 0.32 mm | 0.15 µm | 50 m | 340 °C | S-17-032-015-50 | | |
| MEGA-17 | 0.32 mm | 0.15 µm | 60 m | 340 °C | S-17-032-015-60 | | |
| MEGA-17 | 0.32 mm | 0.25 µm | 15 m | 340 °C | S-17-032-025-15 | | |
| MEGA-17 | 0.32 mm | 0.25 µm | 25 m | 340 °C | S-17-032-025-25 | | |
| MEGA-17 | 0.32 mm | 0.25 µm | 30 m | 340 °C | S-17-032-025-30 | | |
| MEGA-17 | 0.32 mm | 0.25 µm | 50 m | 340 °C | S-17-032-025-50 | | |
| MEGA-17 | 0.32 mm | 0.25 µm | 60 m | 340 °C | S-17-032-025-60 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-17 | 0.32 mm | 0.32 µm | 15 m | 340 °C | S-17-032-032-15 | | |
| MEGA-17 | 0.32 mm | 0.32 µm | 25 m | 340 °C | S-17-032-032-25 | | |
| MEGA-17 | 0.32 mm | 0.32 µm | 30 m | 340 °C | S-17-032-032-30 | | |
| MEGA-17 | 0.32 mm | 0.32 µm | 50 m | 340 °C | S-17-032-032-50 | | |
| MEGA-17 | 0.32 mm | 0.32 µm | 60 m | 340 °C | S-17-032-032-60 | | |
| MEGA-17 | 0.32 mm | 0.45 µm | 15 m | 320 °C | S-17-032-045-15 | | |
| MEGA-17 | 0.32 mm | 0.45 µm | 25 m | 320 °C | S-17-032-045-25 | | |
| MEGA-17 | 0.32 mm | 0.45 µm | 30 m | 320 °C | S-17-032-045-30 | | |
| MEGA-17 | 0.32 mm | 0.45 µm | 50 m | 320 °C | S-17-032-045-50 | | |
| MEGA-17 | 0.32 mm | 0.45 µm | 60 m | 320 °C | S-17-032-045-60 | | |
| MEGA-17 | 0.32 mm | 1.00 µm | 15 m | 300 °C | S-17-032-100-15 | | |
| MEGA-17 | 0.32 mm | 1.00 µm | 25 m | 300 °C | S-17-032-100-25 | | |
| MEGA-17 | 0.32 mm | 1.00 µm | 30 m | 300 °C | S-17-032-100-30 | | |
| MEGA-17 | 0.32 mm | 1.00 µm | 50 m | 300 °C | S-17-032-100-50 | | |
| MEGA-17 | 0.32 mm | 1.00 µm | 60 m | 300 °C | S-17-032-100-60 | | |
| MEGA-17 | 0.53 mm | 0.15 µm | 15 m | 340 °C | S-17-053-015-15 | | |
| MEGA-17 | 0.53 mm | 0.15 µm | 25 m | 340 °C | S-17-053-015-25 | | |
| MEGA-17 | 0.53 mm | 0.15 µm | 30 m | 340 °C | S-17-053-015-30 | | |
| MEGA-17 | 0.53 mm | 0.15 µm | 50 m | 340 °C | S-17-053-015-50 | | |
| MEGA-17 | 0.53 mm | 0.15 µm | 60 m | 340 °C | S-17-053-015-60 | | |
| MEGA-17 | 0.53 mm | 0.25 µm | 15 m | 340 °C | S-17-053-025-15 | | |
| MEGA-17 | 0.53 mm | 0.25 µm | 25 m | 340 °C | S-17-053-025-25 | | |
| MEGA-17 | 0.53 mm | 0.25 µm | 30 m | 340 °C | S-17-053-025-30 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-17 | 0.53 mm | 0.25 µm | 50 m | 340 °C | S-17-053-025-50 | | |
| MEGA-17 | 0.53 mm | 0.25 µm | 60 m | 340 °C | S-17-053-025-60 | | |
| MEGA-17 | 0.53 mm | 0.45 µm | 15 m | 340 °C | S-17-053-045-15 | | |
| MEGA-17 | 0.53 mm | 0.45 µm | 25 m | 340 °C | S-17-053-045-25 | | |
| MEGA-17 | 0.53 mm | 0.45 µm | 30 m | 340 °C | S-17-053-045-30 | | |
| MEGA-17 | 0.53 mm | 0.45 µm | 50 m | 340 °C | S-17-053-045-50 | | |
| MEGA-17 | 0.53 mm | 0.45 µm | 60 m | 340 °C | S-17-053-045-60 | | |
| MEGA-17 | 0.53 mm | 1.00 µm | 15 m | 340 °C | S-17-053-100-15 | | |
| MEGA-17 | 0.53 mm | 1.00 µm | 25 m | 340 °C | S-17-053-100-25 | | |
| MEGA-17 | 0.53 mm | 1.00 µm | 30 m | 340 °C | S-17-053-100-30 | | |
| MEGA-17 | 0.53 mm | 1.00 µm | 50 m | 340 °C | S-17-053-100-50 | | |
| MEGA-17 | 0.53 mm | 1.00 µm | 60 m | 340 °C | S-17-053-100-60 | | |

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MEGA-1701

Stationary Phase Characteristics

| | |
|--------------------------|--|
| Composition | 7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -1701, AT TM -1701, BP TM -10, CP-Sil TM 19 CB, DB TM -1701, HP TM -1701, OV TM -1701, Rtx TM -1701, SPB TM -1701, VF TM -1701 ms, ZB TM -1701 |
| USP Classification | G46 |
| EPA Methods / Normatives | EPA 513, 515.2, 552.2, 607, 619, 622, 8091, 8121, 8151A |

Application Notes

Pesticides

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-1701 | 0.25 mm | 0.15 µm | 15 m | 280 °C | S-1701-025-015-15 | |
| MEGA-1701 | 0.25 mm | 0.15 µm | 25 m | 280 °C | S-1701-025-015-25 | |
| MEGA-1701 | 0.25 mm | 0.15 µm | 30 m | 280 °C | S-1701-025-015-30 | |
| MEGA-1701 | 0.25 mm | 0.15 µm | 50 m | 280 °C | S-1701-025-015-50 | |
| MEGA-1701 | 0.25 mm | 0.15 µm | 60 m | 280 °C | S-1701-025-015-60 | |
| MEGA-1701 | 0.25 mm | 0.25 µm | 15 m | 280 °C | S-1701-025-025-15 | |
| MEGA-1701 | 0.25 mm | 0.25 µm | 25 m | 280 °C | S-1701-025-025-25 | |
| MEGA-1701 | 0.25 mm | 0.25 µm | 30 m | 280 °C | S-1701-025-025-30 | |
| MEGA-1701 | 0.25 mm | 0.25 µm | 50 m | 280 °C | S-1701-025-025-50 | |
| MEGA-1701 | 0.25 mm | 0.25 µm | 60 m | 280 °C | S-1701-025-025-60 | |
| MEGA-1701 | 0.25 mm | 0.45 µm | 15 m | 280 °C | S-1701-025-045-15 | |
| MEGA-1701 | 0.25 mm | 0.45 µm | 25 m | 280 °C | S-1701-025-045-25 | |
| MEGA-1701 | 0.25 mm | 0.45 µm | 30 m | 280 °C | S-1701-025-045-30 | |
| MEGA-1701 | 0.25 mm | 0.45 µm | 50 m | 280 °C | S-1701-025-045-50 | |
| MEGA-1701 | 0.25 mm | 0.45 µm | 60 m | 280 °C | S-1701-025-045-60 | |
| MEGA-1701 | 0.25 mm | 1.00 µm | 15 m | 270 °C | S-1701-025-100-15 | |
| MEGA-1701 | 0.25 mm | 1.00 µm | 25 m | 270 °C | S-1701-025-100-25 | |
| MEGA-1701 | 0.25 mm | 1.00 µm | 30 m | 270 °C | S-1701-025-100-30 | |
| MEGA-1701 | 0.25 mm | 1.00 µm | 50 m | 270 °C | S-1701-025-100-50 | |
| MEGA-1701 | 0.25 mm | 1.00 µm | 60 m | 270 °C | S-1701-025-100-60 | |
| MEGA-1701 | 0.25 mm | 1.50 µm | 15 m | 270 °C | S-1701-025-150-15 | |
| MEGA-1701 | 0.25 mm | 1.50 µm | 25 m | 270 °C | S-1701-025-150-25 | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-1701 | 0.25 mm | 1.50 µm | 30 m | 270 °C | S-1701-025-150-30 | | |
| MEGA-1701 | 0.25 mm | 1.50 µm | 50 m | 270 °C | S-1701-025-150-50 | | |
| MEGA-1701 | 0.25 mm | 1.50 µm | 60 m | 270 °C | S-1701-025-150-60 | | |
| MEGA-1701 | 0.32 mm | 0.15 µm | 15 m | 280 °C | S-1701-032-015-15 | | |
| MEGA-1701 | 0.32 mm | 0.15 µm | 25 m | 280 °C | S-1701-032-015-25 | | |
| MEGA-1701 | 0.32 mm | 0.15 µm | 30 m | 280 °C | S-1701-032-015-30 | | |
| MEGA-1701 | 0.32 mm | 0.15 µm | 50 m | 280 °C | S-1701-032-015-50 | | |
| MEGA-1701 | 0.32 mm | 0.15 µm | 60 m | 280 °C | S-1701-032-015-60 | | |
| MEGA-1701 | 0.32 mm | 0.25 µm | 15 m | 280 °C | S-1701-032-025-15 | | |
| MEGA-1701 | 0.32 mm | 0.25 µm | 25 m | 280 °C | S-1701-032-025-25 | | |
| MEGA-1701 | 0.32 mm | 0.25 µm | 30 m | 280 °C | S-1701-032-025-30 | | |
| MEGA-1701 | 0.32 mm | 0.25 µm | 50 m | 280 °C | S-1701-032-025-50 | | |
| MEGA-1701 | 0.32 mm | 0.25 µm | 60 m | 280 °C | S-1701-032-025-60 | | |
| MEGA-1701 | 0.32 mm | 0.32 µm | 15 m | 280 °C | S-1701-032-032-15 | | |
| MEGA-1701 | 0.32 mm | 0.32 µm | 25 m | 280 °C | S-1701-032-032-25 | | |
| MEGA-1701 | 0.32 mm | 0.32 µm | 30 m | 280 °C | S-1701-032-032-30 | | |
| MEGA-1701 | 0.32 mm | 0.32 µm | 50 m | 280 °C | S-1701-032-032-50 | | |
| MEGA-1701 | 0.32 mm | 0.32 µm | 60 m | 280 °C | S-1701-032-032-60 | | |
| MEGA-1701 | 0.32 mm | 0.45 µm | 15 m | 280 °C | S-1701-032-045-15 | | |
| MEGA-1701 | 0.32 mm | 0.45 µm | 25 m | 280 °C | S-1701-032-045-25 | | |
| MEGA-1701 | 0.32 mm | 0.45 µm | 30 m | 280 °C | S-1701-032-045-30 | | |
| MEGA-1701 | 0.32 mm | 0.45 µm | 50 m | 280 °C | S-1701-032-045-50 | | |
| MEGA-1701 | 0.32 mm | 0.45 µm | 60 m | 280 °C | S-1701-032-045-60 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-1701 | 0.32 mm | 1.00 µm | 15 m | 270 °C | S-1701-032-100-15 | | |
| MEGA-1701 | 0.32 mm | 1.00 µm | 25 m | 270 °C | S-1701-032-100-25 | | |
| MEGA-1701 | 0.32 mm | 1.00 µm | 30 m | 270 °C | S-1701-032-100-30 | | |
| MEGA-1701 | 0.32 mm | 1.00 µm | 50 m | 270 °C | S-1701-032-100-50 | | |
| MEGA-1701 | 0.32 mm | 1.00 µm | 60 m | 270 °C | S-1701-032-100-60 | | |
| MEGA-1701 | 0.32 mm | 1.50 µm | 15 m | 270 °C | S-1701-032-150-15 | | |
| MEGA-1701 | 0.32 mm | 1.50 µm | 25 m | 270 °C | S-1701-032-150-25 | | |
| MEGA-1701 | 0.32 mm | 1.50 µm | 30 m | 270 °C | S-1701-032-150-30 | | |
| MEGA-1701 | 0.32 mm | 1.50 µm | 50 m | 270 °C | S-1701-032-150-50 | | |
| MEGA-1701 | 0.32 mm | 1.50 µm | 60 m | 270 °C | S-1701-032-150-60 | | |
| MEGA-1701 | 0.53 mm | 0.15 µm | 15 m | 280 °C | S-1701-053-015-15 | | |
| MEGA-1701 | 0.53 mm | 0.15 µm | 25 m | 280 °C | S-1701-053-015-25 | | |
| MEGA-1701 | 0.53 mm | 0.15 µm | 30 m | 280 °C | S-1701-053-015-30 | | |
| MEGA-1701 | 0.53 mm | 0.15 µm | 50 m | 280 °C | S-1701-053-015-50 | | |
| MEGA-1701 | 0.53 mm | 0.15 µm | 60 m | 280 °C | S-1701-053-015-60 | | |
| MEGA-1701 | 0.53 mm | 0.25 µm | 15 m | 280 °C | S-1701-053-025-15 | | |
| MEGA-1701 | 0.53 mm | 0.25 µm | 25 m | 280 °C | S-1701-053-025-25 | | |
| MEGA-1701 | 0.53 mm | 0.25 µm | 30 m | 280 °C | S-1701-053-025-30 | | |
| MEGA-1701 | 0.53 mm | 0.25 µm | 50 m | 280 °C | S-1701-053-025-50 | | |
| MEGA-1701 | 0.53 mm | 0.25 µm | 60 m | 280 °C | S-1701-053-025-60 | | |
| MEGA-1701 | 0.53 mm | 0.45 µm | 15 m | 280 °C | S-1701-053-045-15 | | |
| MEGA-1701 | 0.53 mm | 0.45 µm | 25 m | 280 °C | S-1701-053-045-25 | | |
| MEGA-1701 | 0.53 mm | 0.45 µm | 30 m | 280 °C | S-1701-053-045-30 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-1701 | 0.53 mm | 0.45 µm | 50 m | 280 °C | S-1701-053-045-50 | | |
| MEGA-1701 | 0.53 mm | 0.45 µm | 60 m | 280 °C | S-1701-053-045-60 | | |
| MEGA-1701 | 0.53 mm | 1.00 µm | 15 m | 270 °C | S-1701-053-100-15 | | |
| MEGA-1701 | 0.53 mm | 1.00 µm | 25 m | 270 °C | S-1701-053-100-25 | | |
| MEGA-1701 | 0.53 mm | 1.00 µm | 30 m | 270 °C | S-1701-053-100-30 | | |
| MEGA-1701 | 0.53 mm | 1.00 µm | 50 m | 270 °C | S-1701-053-100-50 | | |
| MEGA-1701 | 0.53 mm | 1.00 µm | 60 m | 270 °C | S-1701-053-100-60 | | |
| MEGA-1701 | 0.53 mm | 1.50 µm | 15 m | 270 °C | S-1701-053-150-15 | | |
| MEGA-1701 | 0.53 mm | 1.50 µm | 25 m | 270 °C | S-1701-053-150-25 | | |
| MEGA-1701 | 0.53 mm | 1.50 µm | 30 m | 270 °C | S-1701-053-150-30 | | |
| MEGA-1701 | 0.53 mm | 1.50 µm | 50 m | 270 °C | S-1701-053-150-50 | | |
| MEGA-1701 | 0.53 mm | 1.50 µm | 60 m | 270 °C | S-1701-053-150-60 | | |

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MEGA-1701 FAST



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Vendor Information

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MEGA-5



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Stationary Phase Characteristics

| | |
|--------------------------|---|
| Composition | 5% Phenyl, 95% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | 007 TM -5, AT TM -5, BP TM -5, CP-Sil TM 8 CB, DB TM -5, HP TM -5 OV TM -5, Rtx TM -5, SE-52, SPB TM -5, ZB TM -5 |
| USP Classification | G27, G36, G41 |
| EPA Methods / Normatives | EPA 611/8110, 604, 606, 607, 608/8081, 609, 612, 613, 615, 619, 622, 8015B, 8041, 8061A, 8082, 8091, 8121, 8141 |

Application Notes

Alkyl Naphtalens , Aloethers (EPA Method 611, 8110) , Anaesthetics , Pharmaceuticals , Halogenated Hydrocarbons (Metodo EPA 612), Organochlorinated Pesticides (Metodo EPA 608, 8081)

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| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|----------------|------|
| MEGA-5 | 0.25 mm | 0.15 µm | 15 m | 350 °C | S-5-025-015-15 | |
| MEGA-5 | 0.25 mm | 0.15 µm | 25 m | 350 °C | S-5-025-015-25 | |
| MEGA-5 | 0.25 mm | 0.15 µm | 30 m | 350 °C | S-5-025-015-30 | |
| MEGA-5 | 0.25 mm | 0.15 µm | 50 m | 350 °C | S-5-025-015-50 | |
| MEGA-5 | 0.25 mm | 0.15 µm | 60 m | 350 °C | S-5-025-015-60 | |
| MEGA-5 | 0.25 mm | 0.25 µm | 15 m | 350 °C | S-5-025-025-15 | |
| MEGA-5 | 0.25 mm | 0.25 µm | 25 m | 350 °C | S-5-025-025-25 | |
| MEGA-5 | 0.25 mm | 0.25 µm | 30 m | 350 °C | S-5-025-025-30 | |
| MEGA-5 | 0.25 mm | 0.25 µm | 50 m | 350 °C | S-5-025-025-50 | |
| MEGA-5 | 0.25 mm | 0.25 µm | 60 m | 350 °C | S-5-025-025-60 | |
| MEGA-5 | 0.25 mm | 0.45 µm | 15 m | 320 °C | S-5-025-045-15 | |
| MEGA-5 | 0.25 mm | 0.45 µm | 25 m | 320 °C | S-5-025-045-25 | |
| MEGA-5 | 0.25 mm | 0.45 µm | 30 m | 320 °C | S-5-025-045-30 | |
| MEGA-5 | 0.25 mm | 0.45 µm | 50 m | 320 °C | S-5-025-045-50 | |
| MEGA-5 | 0.25 mm | 0.45 µm | 60 m | 320 °C | S-5-025-045-60 | |
| MEGA-5 | 0.25 mm | 1.00 µm | 15 m | 300 °C | S-5-025-100-15 | |
| MEGA-5 | 0.25 mm | 1.00 µm | 25 m | 300 °C | S-5-025-100-25 | |
| MEGA-5 | 0.25 mm | 1.00 µm | 30 m | 300 °C | S-5-025-100-30 | |
| MEGA-5 | 0.25 mm | 1.00 µm | 50 m | 300 °C | S-5-025-100-50 | |
| MEGA-5 | 0.25 mm | 1.00 µm | 60 m | 300 °C | S-5-025-100-60 | |
| MEGA-5 | 0.25 mm | 1.50 µm | 15 m | 300 °C | S-5-025-150-15 | |
| MEGA-5 | 0.25 mm | 1.50 µm | 25 m | 300 °C | S-5-025-150-25 | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-5 | 0.25 mm | 1.50 µm | 30 m | 300 °C | S-5-025-150-30 | | |
| MEGA-5 | 0.25 mm | 1.50 µm | 50 m | 300 °C | S-5-025-150-50 | | |
| MEGA-5 | 0.25 mm | 1.50 µm | 60 m | 300 °C | S-5-025-150-60 | | |
| MEGA-5 | 0.32 mm | 0.15 µm | 15 m | 350 °C | S-5-032-015-15 | | |
| MEGA-5 | 0.32 mm | 0.15 µm | 25 m | 350 °C | S-5-032-015-25 | | |
| MEGA-5 | 0.32 mm | 0.15 µm | 30 m | 350 °C | S-5-032-015-30 | | |
| MEGA-5 | 0.32 mm | 0.15 µm | 50 m | 350 °C | S-5-032-015-50 | | |
| MEGA-5 | 0.32 mm | 0.15 µm | 60 m | 350 °C | S-5-032-015-60 | | |
| MEGA-5 | 0.32 mm | 0.25 µm | 15 m | 350 °C | S-5-032-025-15 | | |
| MEGA-5 | 0.32 mm | 0.25 µm | 25 m | 350 °C | S-5-032-025-25 | | |
| MEGA-5 | 0.32 mm | 0.25 µm | 30 m | 350 °C | S-5-032-025-30 | | |
| MEGA-5 | 0.32 mm | 0.25 µm | 50 m | 350 °C | S-5-032-025-50 | | |
| MEGA-5 | 0.32 mm | 0.25 µm | 60 m | 350 °C | S-5-032-025-60 | | |
| MEGA-5 | 0.32 mm | 0.32 µm | 15 m | 350 °C | S-5-032-032-15 | | |
| MEGA-5 | 0.32 mm | 0.32 µm | 25 m | 350 °C | S-5-032-032-25 | | |
| MEGA-5 | 0.32 mm | 0.32 µm | 30 m | 350 °C | S-5-032-032-30 | | |
| MEGA-5 | 0.32 mm | 0.32 µm | 50 m | 350 °C | S-5-032-032-50 | | |
| MEGA-5 | 0.32 mm | 0.32 µm | 60 m | 350 °C | S-5-032-032-60 | | |
| MEGA-5 | 0.32 mm | 0.45 µm | 15 m | 320 °C | S-5-032-045-15 | | |
| MEGA-5 | 0.32 mm | 0.45 µm | 25 m | 320 °C | S-5-032-045-25 | | |
| MEGA-5 | 0.32 mm | 0.45 µm | 30 m | 320 °C | S-5-032-045-30 | | |
| MEGA-5 | 0.32 mm | 0.45 µm | 50 m | 320 °C | S-5-032-045-50 | | |
| MEGA-5 | 0.32 mm | 0.45 µm | 60 m | 320 °C | S-5-032-045-60 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-5 | 0.32 mm | 1.00 µm | 15 m | 300 °C | S-5-032-100-15 | | |
| MEGA-5 | 0.32 mm | 1.00 µm | 25 m | 300 °C | S-5-032-100-25 | | |
| MEGA-5 | 0.32 mm | 1.00 µm | 30 m | 300 °C | S-5-032-100-30 | | |
| MEGA-5 | 0.32 mm | 1.00 µm | 50 m | 300 °C | S-5-032-100-50 | | |
| MEGA-5 | 0.32 mm | 1.00 µm | 60 m | 300 °C | S-5-032-100-60 | | |
| MEGA-5 | 0.32 mm | 1.50 µm | 15 m | 300 °C | S-5-032-150-15 | | |
| MEGA-5 | 0.32 mm | 1.50 µm | 25 m | 300 °C | S-5-032-150-25 | | |
| MEGA-5 | 0.32 mm | 1.50 µm | 30 m | 300 °C | S-5-032-150-30 | | |
| MEGA-5 | 0.32 mm | 1.50 µm | 50 m | 300 °C | S-5-032-150-50 | | |
| MEGA-5 | 0.32 mm | 1.50 µm | 60 m | 300 °C | S-5-032-150-60 | | |
| MEGA-5 | 0.32 mm | 3.00 µm | 15 m | 300 °C | S-5-032-300-15 | | |
| MEGA-5 | 0.32 mm | 3.00 µm | 25 m | 300 °C | S-5-032-300-25 | | |
| MEGA-5 | 0.32 mm | 3.00 µm | 30 m | 300 °C | S-5-032-300-30 | | |
| MEGA-5 | 0.32 mm | 3.00 µm | 50 m | 300 °C | S-5-032-300-50 | | |
| MEGA-5 | 0.32 mm | 3.00 µm | 60 m | 300 °C | S-5-032-300-60 | | |
| MEGA-5 | 0.32 mm | 5.00 µm | 15 m | 300 °C | S-5-032-500-15 | | |
| MEGA-5 | 0.32 mm | 5.00 µm | 25 m | 300 °C | S-5-032-500-25 | | |
| MEGA-5 | 0.32 mm | 5.00 µm | 30 m | 300 °C | S-5-032-500-30 | | |
| MEGA-5 | 0.32 mm | 5.00 µm | 50 m | 300 °C | S-5-032-500-50 | | |
| MEGA-5 | 0.32 mm | 5.00 µm | 60 m | 300 °C | S-5-032-500-60 | | |
| MEGA-5 | 0.53 mm | 0.15 µm | 15 m | 350 °C | S-5-053-015-15 | | |
| MEGA-5 | 0.53 mm | 0.15 µm | 25 m | 350 °C | S-5-053-015-25 | | |
| MEGA-5 | 0.53 mm | 0.15 µm | 30 m | 350 °C | S-5-053-015-30 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-5 | 0.53 mm | 0.15 µm | 50 m | 350 °C | S-5-053-015-50 | | |
| MEGA-5 | 0.53 mm | 0.15 µm | 60 m | 350 °C | S-5-053-015-60 | | |
| MEGA-5 | 0.53 mm | 0.25 µm | 15 m | 350 °C | S-5-053-025-15 | | |
| MEGA-5 | 0.53 mm | 0.25 µm | 25 m | 350 °C | S-5-053-025-25 | | |
| MEGA-5 | 0.53 mm | 0.25 µm | 30 m | 350 °C | S-5-053-025-30 | | |
| MEGA-5 | 0.53 mm | 0.25 µm | 50 m | 350 °C | S-5-053-025-50 | | |
| MEGA-5 | 0.53 mm | 0.25 µm | 60 m | 350 °C | S-5-053-025-60 | | |
| MEGA-5 | 0.53 mm | 0.45 µm | 15 m | 320 °C | S-5-053-045-15 | | |
| MEGA-5 | 0.53 mm | 0.45 µm | 25 m | 320 °C | S-5-053-045-25 | | |
| MEGA-5 | 0.53 mm | 0.45 µm | 30 m | 320 °C | S-5-053-045-30 | | |
| MEGA-5 | 0.53 mm | 0.45 µm | 50 m | 320 °C | S-5-053-045-50 | | |
| MEGA-5 | 0.53 mm | 0.45 µm | 60 m | 320 °C | S-5-053-045-60 | | |
| MEGA-5 | 0.53 mm | 1.00 µm | 15 m | 300 °C | S-5-053-100-15 | | |
| MEGA-5 | 0.53 mm | 1.00 µm | 25 m | 300 °C | S-5-053-100-25 | | |
| MEGA-5 | 0.53 mm | 1.00 µm | 30 m | 300 °C | S-5-053-100-30 | | |
| MEGA-5 | 0.53 mm | 1.00 µm | 50 m | 300 °C | S-5-053-100-50 | | |
| MEGA-5 | 0.53 mm | 1.00 µm | 60 m | 300 °C | S-5-053-100-60 | | |
| MEGA-5 | 0.53 mm | 1.50 µm | 15 m | 300 °C | S-5-053-150-15 | | |
| MEGA-5 | 0.53 mm | 1.50 µm | 25 m | 300 °C | S-5-053-150-25 | | |
| MEGA-5 | 0.53 mm | 1.50 µm | 30 m | 300 °C | S-5-053-150-30 | | |
| MEGA-5 | 0.53 mm | 1.50 µm | 50 m | 300 °C | S-5-053-150-50 | | |
| MEGA-5 | 0.53 mm | 1.50 µm | 60 m | 300 °C | S-5-053-150-60 | | |
| MEGA-5 | 0.53 mm | 3.00 µm | 15 m | 300 °C | S-5-053-300-15 | | |

| | | | | | | | |
|--------|---------|---------|------|--------|----------------|--|--|
| MEGA-5 | 0.53 mm | 3.00 µm | 25 m | 300 °C | S-5-053-300-25 | | |
| MEGA-5 | 0.53 mm | 3.00 µm | 30 m | 300 °C | S-5-053-300-30 | | |
| MEGA-5 | 0.53 mm | 3.00 µm | 50 m | 300 °C | S-5-053-300-50 | | |
| MEGA-5 | 0.53 mm | 3.00 µm | 60 m | 300 °C | S-5-053-300-60 | | |
| MEGA-5 | 0.53 mm | 5.00 µm | 15 m | 300 °C | S-5-053-500-15 | | |
| MEGA-5 | 0.53 mm | 5.00 µm | 25 m | 300 °C | S-5-053-500-25 | | |
| MEGA-5 | 0.53 mm | 5.00 µm | 30 m | 300 °C | S-5-053-500-30 | | |
| MEGA-5 | 0.53 mm | 5.00 µm | 50 m | 300 °C | S-5-053-500-50 | | |
| MEGA-5 | 0.53 mm | 5.00 µm | 60 m | 300 °C | S-5-053-500-60 | | |

You may also be interested in this/these product(s):

MEGA-5 FAST



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MEGA-5 MS



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MEGA-5 HT



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Vendor Information

Last Updated:

→ STANDARD → MEGA-SE54

MEGA-SE54



View Full-Size

Image

Stationary Phase Characteristics

| | |
|--------------------|---|
| Composition | 5% Phenyl, 1% Vinyl, 94% Methyl Polysiloxane |
| Polarity | Low polarity |
| Crossbond | Yes |
| Equivalent to | SE-54 |
| USP Classification | G6 |

Application Notes

AROCLOR , Sterols in Olive Oil

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-SE54 | 0.25 mm | 0.15 µm | 15 m | 350 °C | S-SE54-025-015-15 | |
| MEGA-SE54 | 0.25 mm | 0.15 µm | 25 m | 350 °C | S-SE54-025-015-25 | |
| MEGA-SE54 | 0.25 mm | 0.15 µm | 30 m | 350 °C | S-SE54-025-015-30 | |
| MEGA-SE54 | 0.25 mm | 0.15 µm | 50 m | 350 °C | S-SE54-025-015-50 | |
| MEGA-SE54 | 0.25 mm | 0.15 µm | 60 m | 350 °C | S-SE54-025-015-60 | |
| MEGA-SE54 | 0.25 mm | 0.25 µm | 15 m | 350 °C | S-SE54-025-025-15 | |
| MEGA-SE54 | 0.25 mm | 0.25 µm | 25 m | 350 °C | S-SE54-025-025-25 | |
| MEGA-SE54 | 0.25 mm | 0.25 µm | 30 m | 350 °C | S-SE54-025-025-30 | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE54 | 0.25 mm | 0.25 µm | 50 m | 350 °C | S-SE54-025-025-50 | | |
| MEGA-SE54 | 0.25 mm | 0.25 µm | 60 m | 350 °C | S-SE54-025-025-60 | | |
| MEGA-SE54 | 0.25 mm | 0.45 µm | 15 m | 320 °C | S-SE54-025-045-15 | | |
| MEGA-SE54 | 0.25 mm | 0.45 µm | 25 m | 320 °C | S-SE54-025-045-25 | | |
| MEGA-SE54 | 0.25 mm | 0.45 µm | 30 m | 320 °C | S-SE54-025-045-30 | | |
| MEGA-SE54 | 0.25 mm | 0.45 µm | 50 m | 320 °C | S-SE54-025-045-50 | | |
| MEGA-SE54 | 0.25 mm | 0.45 µm | 60 m | 320 °C | S-SE54-025-045-60 | | |
| MEGA-SE54 | 0.25 mm | 1.00 µm | 15 m | 300 °C | S-SE54-025-100-15 | | |
| MEGA-SE54 | 0.25 mm | 1.00 µm | 25 m | 300 °C | S-SE54-025-100-25 | | |
| MEGA-SE54 | 0.25 mm | 1.00 µm | 30 m | 300 °C | S-SE54-025-100-30 | | |
| MEGA-SE54 | 0.25 mm | 1.00 µm | 50 m | 300 °C | S-SE54-025-100-50 | | |
| MEGA-SE54 | 0.25 mm | 1.00 µm | 60 m | 300 °C | S-SE54-025-100-60 | | |
| MEGA-SE54 | 0.25 mm | 1.50 µm | 15 m | 300 °C | S-SE54-025-150-15 | | |
| MEGA-SE54 | 0.25 mm | 1.50 µm | 25 m | 300 °C | S-SE54-025-150-25 | | |
| MEGA-SE54 | 0.25 mm | 1.50 µm | 30 m | 300 °C | S-SE54-025-150-30 | | |
| MEGA-SE54 | 0.25 mm | 1.50 µm | 50 m | 300 °C | S-SE54-025-150-50 | | |
| MEGA-SE54 | 0.25 mm | 1.50 µm | 60 m | 300 °C | S-SE54-025-150-60 | | |
| MEGA-SE54 | 0.32 mm | 0.15 µm | 15 m | 350 °C | S-SE54-032-015-15 | | |
| MEGA-SE54 | 0.32 mm | 0.15 µm | 25 m | 350 °C | S-SE54-032-015-25 | | |
| MEGA-SE54 | 0.32 mm | 0.15 µm | 30 m | 350 °C | S-SE54-032-015-30 | | |
| MEGA-SE54 | 0.32 mm | 0.15 µm | 50 m | 350 °C | S-SE54-032-015-50 | | |
| MEGA-SE54 | 0.32 mm | 0.15 µm | 60 m | 350 °C | S-SE54-032-015-60 | | |
| MEGA-SE54 | 0.32 mm | 0.25 µm | 15 m | 350 °C | S-SE54-032-025-15 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE54 | 0.32 mm | 0.25 µm | 25 m | 350 °C | S-SE54-032-025-25 | | |
| MEGA-SE54 | 0.32 mm | 0.25 µm | 30 m | 350 °C | S-SE54-032-025-30 | | |
| MEGA-SE54 | 0.32 mm | 0.25 µm | 50 m | 350 °C | S-SE54-032-025-50 | | |
| MEGA-SE54 | 0.32 mm | 0.25 µm | 60 m | 350 °C | S-SE54-032-025-60 | | |
| MEGA-SE54 | 0.32 mm | 0.32 µm | 15 m | 340 °C | S-SE54-032-032-15 | | |
| MEGA-SE54 | 0.32 mm | 0.32 µm | 25 m | 340 °C | S-SE54-032-032-25 | | |
| MEGA-SE54 | 0.32 mm | 0.32 µm | 30 m | 340 °C | S-SE54-032-032-30 | | |
| MEGA-SE54 | 0.32 mm | 0.32 µm | 50 m | 340 °C | S-SE54-032-032-50 | | |
| MEGA-SE54 | 0.32 mm | 0.32 µm | 60 m | 340 °C | S-SE54-032-032-60 | | |
| MEGA-SE54 | 0.32 mm | 0.45 µm | 15 m | 320 °C | S-SE54-032-045-15 | | |
| MEGA-SE54 | 0.32 mm | 0.45 µm | 25 m | 320 °C | S-SE54-032-045-25 | | |
| MEGA-SE54 | 0.32 mm | 0.45 µm | 30 m | 320 °C | S-SE54-032-045-30 | | |
| MEGA-SE54 | 0.32 mm | 0.45 µm | 50 m | 320 °C | S-SE54-032-045-50 | | |
| MEGA-SE54 | 0.32 mm | 0.45 µm | 60 m | 320 °C | S-SE54-032-045-60 | | |
| MEGA-SE54 | 0.32 mm | 1.00 µm | 15 m | 300 °C | S-SE54-032-100-15 | | |
| MEGA-SE54 | 0.32 mm | 1.00 µm | 25 m | 300 °C | S-SE54-032-100-25 | | |
| MEGA-SE54 | 0.32 mm | 1.00 µm | 30 m | 300 °C | S-SE54-032-100-30 | | |
| MEGA-SE54 | 0.32 mm | 1.00 µm | 50 m | 300 °C | S-SE54-032-100-50 | | |
| MEGA-SE54 | 0.32 mm | 1.00 µm | 60 m | 300 °C | S-SE54-032-100-60 | | |
| MEGA-SE54 | 0.32 mm | 1.50 µm | 15 m | 300 °C | S-SE54-032-150-15 | | |
| MEGA-SE54 | 0.32 mm | 1.50 µm | 25 m | 300 °C | S-SE54-032-150-25 | | |
| MEGA-SE54 | 0.32 mm | 1.50 µm | 30 m | 300 °C | S-SE54-032-150-30 | | |
| MEGA-SE54 | 0.32 mm | 1.50 µm | 50 m | 300 °C | S-SE54-032-150-50 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE54 | 0.32 mm | 1.50 µm | 60 m | 300 °C | S-SE54-032-150-60 | | |
| MEGA-SE54 | 0.32 mm | 3.00 µm | 15 m | 300 °C | S-SE54-032-300-15 | | |
| MEGA-SE54 | 0.32 mm | 3.00 µm | 25 m | 300 °C | S-SE54-032-300-25 | | |
| MEGA-SE54 | 0.32 mm | 3.00 µm | 30 m | 300 °C | S-SE54-032-300-30 | | |
| MEGA-SE54 | 0.32 mm | 3.00 µm | 50 m | 300 °C | S-SE54-032-300-50 | | |
| MEGA-SE54 | 0.32 mm | 3.00 µm | 60 m | 300 °C | S-SE54-032-300-60 | | |
| MEGA-SE54 | 0.32 mm | 5.00 µm | 15 m | 300 °C | S-SE54-032-500-15 | | |
| MEGA-SE54 | 0.32 mm | 5.00 µm | 25 m | 300 °C | S-SE54-032-500-25 | | |
| MEGA-SE54 | 0.32 mm | 5.00 µm | 30 m | 300 °C | S-SE54-032-500-30 | | |
| MEGA-SE54 | 0.32 mm | 5.00 µm | 50 m | 300 °C | S-SE54-032-500-50 | | |
| MEGA-SE54 | 0.32 mm | 5.00 µm | 60 m | 300 °C | S-SE54-032-500-60 | | |
| MEGA-SE54 | 0.53 mm | 0.15 µm | 15 m | 350 °C | S-SE54-053-015-15 | | |
| MEGA-SE54 | 0.53 mm | 0.15 µm | 25 m | 350 °C | S-SE54-053-015-25 | | |
| MEGA-SE54 | 0.53 mm | 0.15 µm | 30 m | 350 °C | S-SE54-053-015-30 | | |
| MEGA-SE54 | 0.53 mm | 0.15 µm | 50 m | 350 °C | S-SE54-053-015-50 | | |
| MEGA-SE54 | 0.53 mm | 0.15 µm | 60 m | 350 °C | S-SE54-053-015-60 | | |
| MEGA-SE54 | 0.53 mm | 0.25 µm | 15 m | 350 °C | S-SE54-053-025-15 | | |
| MEGA-SE54 | 0.53 mm | 0.25 µm | 25 m | 350 °C | S-SE54-053-025-25 | | |
| MEGA-SE54 | 0.53 mm | 0.25 µm | 30 m | 350 °C | S-SE54-053-025-30 | | |
| MEGA-SE54 | 0.53 mm | 0.25 µm | 50 m | 350 °C | S-SE54-053-025-50 | | |
| MEGA-SE54 | 0.53 mm | 0.25 µm | 60 m | 350 °C | S-SE54-053-025-60 | | |
| MEGA-SE54 | 0.53 mm | 0.45 µm | 15 m | 320 °C | S-SE54-053-045-15 | | |
| MEGA-SE54 | 0.53 mm | 0.45 µm | 25 m | 320 °C | S-SE54-053-045-25 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE54 | 0.53 mm | 0.45 µm | 30 m | 320 °C | S-SE54-053-045-30 | | |
| MEGA-SE54 | 0.53 mm | 0.45 µm | 50 m | 320 °C | S-SE54-053-045-50 | | |
| MEGA-SE54 | 0.53 mm | 0.45 µm | 60 m | 320 °C | S-SE54-053-045-60 | | |
| MEGA-SE54 | 0.53 mm | 1.00 µm | 15 m | 300 °C | S-SE54-053-100-15 | | |
| MEGA-SE54 | 0.53 mm | 1.00 µm | 25 m | 300 °C | S-SE54-053-100-25 | | |
| MEGA-SE54 | 0.53 mm | 1.00 µm | 30 m | 300 °C | S-SE54-053-100-30 | | |
| MEGA-SE54 | 0.53 mm | 1.00 µm | 50 m | 300 °C | S-SE54-053-100-50 | | |
| MEGA-SE54 | 0.53 mm | 1.00 µm | 60 m | 300 °C | S-SE54-053-100-60 | | |
| MEGA-SE54 | 0.53 mm | 1.50 µm | 15 m | 300 °C | S-SE54-053-150-15 | | |
| MEGA-SE54 | 0.53 mm | 1.50 µm | 25 m | 300 °C | S-SE54-053-150-25 | | |
| MEGA-SE54 | 0.53 mm | 1.50 µm | 30 m | 300 °C | S-SE54-053-150-30 | | |
| MEGA-SE54 | 0.53 mm | 1.50 µm | 50 m | 300 °C | S-SE54-053-150-50 | | |
| MEGA-SE54 | 0.53 mm | 1.50 µm | 60 m | 300 °C | S-SE54-053-150-60 | | |
| MEGA-SE54 | 0.53 mm | 3.00 µm | 15 m | 300 °C | S-SE54-053-300-15 | | |
| MEGA-SE54 | 0.53 mm | 3.00 µm | 25 m | 300 °C | S-SE54-053-300-25 | | |
| MEGA-SE54 | 0.53 mm | 3.00 µm | 30 m | 300 °C | S-SE54-053-300-30 | | |
| MEGA-SE54 | 0.53 mm | 3.00 µm | 50 m | 300 °C | S-SE54-053-300-50 | | |
| MEGA-SE54 | 0.53 mm | 3.00 µm | 60 m | 300 °C | S-SE54-053-300-60 | | |
| MEGA-SE54 | 0.53 mm | 5.00 µm | 15 m | 300 °C | S-SE54-053-500-15 | | |
| MEGA-SE54 | 0.53 mm | 5.00 µm | 25 m | 300 °C | S-SE54-053-500-25 | | |
| MEGA-SE54 | 0.53 mm | 5.00 µm | 30 m | 300 °C | S-SE54-053-500-30 | | |
| MEGA-SE54 | 0.53 mm | 5.00 µm | 50 m | 300 °C | S-SE54-053-500-50 | | |
| MEGA-SE54 | 0.53 mm | 5.00 µm | 60 m | 300 °C | S-SE54-053-500-60 | | |

→ STANDARD → MEGA-WAX

MEGA-WAX



View Full-Size

Image

Stationary Phase Specifications

| | |
|--------------------------|--|
| Composition | Polyethyleneglycol (PEG) |
| Polarity | High polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -CW, AT TM -Wax, BPT TM -20, CPT TM -Wax 52 CB, DB TM -Wax, HPT TM -Wax, OmegaWax TM , Rtx TM -Wax, ZB TM -Wax |
| USP Classification | G14, G15, G16, G20, G39, G47, USP 467 (OVIs) |
| EPA Methods / Normatives | EPA 602, 603, 619, 8121 |

Application Notes

Aromatics (EPA Method 602) , Dimethylanilines , Fames , Fames C6-C24 , N-nitrosoamines , Triazines (EPA Method 619)

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-WAX | 0.25 mm | 0.15 µm | 15 m | 260 °C | S-WAX-025-015-15 | |
| MEGA-WAX | 0.25 mm | 0.15 µm | 25 m | 260 °C | S-WAX-025-015-25 | |
| MEGA-WAX | 0.25 mm | 0.15 µm | 30 m | 260 °C | S-WAX-025-015-30 | |
| MEGA-WAX | 0.25 mm | 0.15 µm | 50 m | 260 °C | S-WAX-025-015-50 | |
| MEGA-WAX | 0.25 mm | 0.15 µm | 60 m | 260 °C | S-WAX-025-015-60 | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-WAX | 0.25 mm | 0.25 µm | 15 m | 260 °C | S-WAX-025-025-15 | | |
| MEGA-WAX | 0.25 mm | 0.25 µm | 25 m | 260 °C | S-WAX-025-025-25 | | |
| MEGA-WAX | 0.25 mm | 0.25 µm | 30 m | 260 °C | S-WAX-025-025-30 | | |
| MEGA-WAX | 0.25 mm | 0.25 µm | 50 m | 260 °C | S-WAX-025-025-50 | | |
| MEGA-WAX | 0.25 mm | 0.25 µm | 60 m | 260 °C | S-WAX-025-025-60 | | |
| MEGA-WAX | 0.25 mm | 0.45 µm | 15 m | 260 °C | S-WAX-025-045-15 | | |
| MEGA-WAX | 0.25 mm | 0.45 µm | 25 m | 260 °C | S-WAX-025-045-25 | | |
| MEGA-WAX | 0.25 mm | 0.45 µm | 30 m | 260 °C | S-WAX-025-045-30 | | |
| MEGA-WAX | 0.25 mm | 0.45 µm | 50 m | 260 °C | S-WAX-025-045-50 | | |
| MEGA-WAX | 0.25 mm | 0.45 µm | 60 m | 260 °C | S-WAX-025-045-60 | | |
| MEGA-WAX | 0.25 mm | 1.00 µm | 15 m | 260 °C | S-WAX-025-100-15 | | |
| MEGA-WAX | 0.25 mm | 1.00 µm | 25 m | 260 °C | S-WAX-025-100-25 | | |
| MEGA-WAX | 0.25 mm | 1.00 µm | 30 m | 260 °C | S-WAX-025-100-30 | | |
| MEGA-WAX | 0.25 mm | 1.00 µm | 50 m | 260 °C | S-WAX-025-100-50 | | |
| MEGA-WAX | 0.25 mm | 1.00 µm | 60 m | 260 °C | S-WAX-025-100-60 | | |
| MEGA-WAX | 0.32 mm | 0.15 µm | 15 m | 260 °C | S-WAX-032-015-15 | | |
| MEGA-WAX | 0.32 mm | 0.15 µm | 25 m | 260 °C | S-WAX-032-015-25 | | |
| MEGA-WAX | 0.32 mm | 0.15 µm | 30 m | 260 °C | S-WAX-032-015-30 | | |
| MEGA-WAX | 0.32 mm | 0.15 µm | 50 m | 260 °C | S-WAX-032-015-50 | | |
| MEGA-WAX | 0.32 mm | 0.15 µm | 60 m | 260 °C | S-WAX-032-015-60 | | |
| MEGA-WAX | 0.32 mm | 0.25 µm | 15 m | 260 °C | S-WAX-032-025-15 | | |
| MEGA-WAX | 0.32 mm | 0.25 µm | 25 m | 260 °C | S-WAX-032-025-25 | | |
| MEGA-WAX | 0.32 mm | 0.25 µm | 30 m | 260 °C | S-WAX-032-025-30 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-WAX | 0.32 mm | 0.25 µm | 50 m | 260 °C | S-WAX-032-025-50 | | |
| MEGA-WAX | 0.32 mm | 0.25 µm | 60 m | 260 °C | S-WAX-032-025-60 | | |
| MEGA-WAX | 0.32 mm | 0.32 µm | 15 m | 260 °C | S-WAX-032-032-15 | | |
| MEGA-WAX | 0.32 mm | 0.32 µm | 25 m | 260 °C | S-WAX-032-032-25 | | |
| MEGA-WAX | 0.32 mm | 0.32 µm | 30 m | 260 °C | S-WAX-032-032-30 | | |
| MEGA-WAX | 0.32 mm | 0.32 µm | 50 m | 260 °C | S-WAX-032-032-50 | | |
| MEGA-WAX | 0.32 mm | 0.32 µm | 60 m | 260 °C | S-WAX-032-032-60 | | |
| MEGA-WAX | 0.32 mm | 0.45 µm | 15 m | 260 °C | S-WAX-032-045-15 | | |
| MEGA-WAX | 0.32 mm | 0.45 µm | 25 m | 260 °C | S-WAX-032-045-25 | | |
| MEGA-WAX | 0.32 mm | 0.45 µm | 30 m | 260 °C | S-WAX-032-045-30 | | |
| MEGA-WAX | 0.32 mm | 0.45 µm | 50 m | 260 °C | S-WAX-032-045-50 | | |
| MEGA-WAX | 0.32 mm | 0.45 µm | 60 m | 260 °C | S-WAX-032-045-60 | | |
| MEGA-WAX | 0.32 mm | 1.00 µm | 15 m | 260 °C | S-WAX-032-100-15 | | |
| MEGA-WAX | 0.32 mm | 1.00 µm | 25 m | 260 °C | S-WAX-032-100-25 | | |
| MEGA-WAX | 0.32 mm | 1.00 µm | 30 m | 260 °C | S-WAX-032-100-30 | | |
| MEGA-WAX | 0.32 mm | 1.00 µm | 50 m | 260 °C | S-WAX-032-100-50 | | |
| MEGA-WAX | 0.32 mm | 1.00 µm | 60 m | 260 °C | S-WAX-032-100-60 | | |
| MEGA-WAX | 0.53 mm | 0.15 µm | 15 m | 260 °C | S-WAX-053-015-15 | | |
| MEGA-WAX | 0.53 mm | 0.15 µm | 25 m | 260 °C | S-WAX-053-015-25 | | |
| MEGA-WAX | 0.53 mm | 0.15 µm | 30 m | 260 °C | S-WAX-053-015-30 | | |
| MEGA-WAX | 0.53 mm | 0.15 µm | 50 m | 260 °C | S-WAX-053-015-50 | | |
| MEGA-WAX | 0.53 mm | 0.15 µm | 60 m | 260 °C | S-WAX-053-015-60 | | |
| MEGA-WAX | 0.53 mm | 0.25 µm | 15 m | 260 °C | S-WAX-053-025-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-WAX | 0.53 mm | 0.25 µm | 25 m | 260 °C | S-WAX-053-025-25 | | |
| MEGA-WAX | 0.53 mm | 0.25 µm | 30 m | 260 °C | S-WAX-053-025-30 | | |
| MEGA-WAX | 0.53 mm | 0.25 µm | 50 m | 260 °C | S-WAX-053-025-50 | | |
| MEGA-WAX | 0.53 mm | 0.25 µm | 60 m | 260 °C | S-WAX-053-025-60 | | |
| MEGA-WAX | 0.53 mm | 0.45 µm | 15 m | 260 °C | S-WAX-053-045-15 | | |
| MEGA-WAX | 0.53 mm | 0.45 µm | 25 m | 260 °C | S-WAX-053-045-25 | | |
| MEGA-WAX | 0.53 mm | 0.45 µm | 30 m | 260 °C | S-WAX-053-045-30 | | |
| MEGA-WAX | 0.53 mm | 0.45 µm | 50 m | 260 °C | S-WAX-053-045-50 | | |
| MEGA-WAX | 0.53 mm | 0.45 µm | 60 m | 260 °C | S-WAX-053-045-60 | | |
| MEGA-WAX | 0.53 mm | 1.00 µm | 15 m | 260 °C | S-WAX-053-100-15 | | |
| MEGA-WAX | 0.53 mm | 1.00 µm | 25 m | 260 °C | S-WAX-053-100-25 | | |
| MEGA-WAX | 0.53 mm | 1.00 µm | 30 m | 260 °C | S-WAX-053-100-30 | | |
| MEGA-WAX | 0.53 mm | 1.00 µm | 50 m | 260 °C | S-WAX-053-100-50 | | |
| MEGA-WAX | 0.53 mm | 1.00 µm | 60 m | 260 °C | S-WAX-053-100-60 | | |

You may also be interested in this/these product(s):

MEGA-WAX FAST



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MEGA-WAX MS



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MEGA-WAX HT



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Vendor Information

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Fused Silica Capillary Columns → MEGA-10 FAMEs

MEGA-10 FAMEs



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Image

Stationary Phase Characteristics

| | |
|--------------------|---|
| Composition | 100% Cyanopropyl Polysiloxane |
| Polarity | High polarity |
| Crossbond | Bonded |
| Equivalent to | ATTM-Silar, BPXTM-70, CP-SilTM 88, HPTM-88, RtxTM-2330, SPTM-2330, SPTM-2331, SPTM-2560, SPTM-2380 |
| USP Classification | G5, G8, G48 |

Application Notes

FAMEs in Olive Oil, FAMEs Mix (cis-trans)

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|--|
| MEGA-10 | 0.25 mm | 0.25 µm | 15 m | 260 °C | C-10-025-025-15 | | |
| MEGA-10 | 0.25 mm | 0.25 µm | 25 m | 260 °C | C-10-025-025-25 | | |
| MEGA-10 | 0.25 mm | 0.25 µm | 30 m | 260 °C | C-10-025-025-30 | | |
| MEGA-10 | 0.25 mm | 0.25 µm | 50 m | 260 °C | C-10-025-025-50 | | |
| MEGA-10 | 0.25 mm | 0.25 µm | 60 m | 260 °C | C-10-025-025-60 | | |
| MEGA-10 | 0.32 mm | 0.25 µm | 15 m | 260 °C | C-10-032-025-15 | | |
| MEGA-10 | 0.32 mm | 0.25 µm | 25 m | 260 °C | C-10-032-025-25 | | |

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MEGA-10 FAMEs FAST



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Standard
conventional GC columns

CUSTOM
DEDICATED
COLUMNS

dex xeb
chiral columns

FAST-GC
columns

GC-MS
columns

MEGA GAP
Incorporated Rebeton Gap
column



Fused Silica Capillary Columns → MEGA-101

MEGA-101



View Full-Size
Image

Stationary Phase Characteristics

| | |
|---------------|--|
| Composition | 100% Polydimethylsiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | DC TM -200, HP TM -101, SP TM -2100 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-101 | 0.25 mm | 0.15 µm | 15 m | 350 °C | C-101-025-015-15 | | |
| MEGA-101 | 0.25 mm | 0.15 µm | 25 m | 350 °C | C-101-025-015-25 | | |
| MEGA-101 | 0.25 mm | 0.15 µm | 30 m | 350 °C | C-101-025-015-30 | | |
| MEGA-101 | 0.25 mm | 0.15 µm | 50 m | 350 °C | C-101-025-015-50 | | |
| MEGA-101 | 0.25 mm | 0.15 µm | 60 m | 350 °C | C-101-025-015-60 | | |
| MEGA-101 | 0.25 mm | 0.25 µm | 15 m | 340 °C | C-101-025-025-15 | | |
| MEGA-101 | 0.25 mm | 0.25 µm | 25 m | 340 °C | C-101-025-025-25 | | |
| MEGA-101 | 0.25 mm | 0.25 µm | 30 m | 340 °C | C-101-025-025-30 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-101 | 0.25 mm | 0.25 µm | 50 m | 340 °C | C-101-025-025-50 | | |
| MEGA-101 | 0.25 mm | 0.25 µm | 60 m | 340 °C | C-101-025-025-60 | | |
| MEGA-101 | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-101-025-045-15 | | |
| MEGA-101 | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-101-025-045-25 | | |
| MEGA-101 | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-101-025-045-30 | | |
| MEGA-101 | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-101-025-045-50 | | |
| MEGA-101 | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-101-025-045-60 | | |
| MEGA-101 | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-101-025-100-15 | | |
| MEGA-101 | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-101-025-100-25 | | |
| MEGA-101 | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-101-025-100-30 | | |
| MEGA-101 | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-101-025-100-50 | | |
| MEGA-101 | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-101-025-100-60 | | |
| MEGA-101 | 0.25 mm | 1.50 µm | 15 m | 300 °C | C-101-025-150-15 | | |
| MEGA-101 | 0.25 mm | 1.50 µm | 25 m | 300 °C | C-101-025-150-25 | | |
| MEGA-101 | 0.25 mm | 1.50 µm | 30 m | 300 °C | C-101-025-150-30 | | |
| MEGA-101 | 0.25 mm | 1.50 µm | 50 m | 300 °C | C-101-025-150-50 | | |
| MEGA-101 | 0.25 mm | 1.50 µm | 60 m | 300 °C | C-101-025-150-60 | | |
| MEGA-101 | 0.32 mm | 0.15 µm | 15 m | 350 °C | C-101-032-015-15 | | |
| MEGA-101 | 0.32 mm | 0.15 µm | 25 m | 350 °C | C-101-032-015-25 | | |
| MEGA-101 | 0.32 mm | 0.15 µm | 30 m | 350 °C | C-101-032-015-30 | | |
| MEGA-101 | 0.32 mm | 0.15 µm | 50 m | 350 °C | C-101-032-015-50 | | |
| MEGA-101 | 0.32 mm | 0.15 µm | 60 m | 350 °C | C-101-032-015-60 | | |
| MEGA-101 | 0.32 mm | 0.25 µm | 15 m | 350 °C | C-101-032-025-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-101 | 0.32 mm | 0.25 µm | 25 m | 350 °C | C-101-032-025-25 | | |
| MEGA-101 | 0.32 mm | 0.25 µm | 30 m | 350 °C | C-101-032-025-30 | | |
| MEGA-101 | 0.32 mm | 0.25 µm | 50 m | 350 °C | C-101-032-025-50 | | |
| MEGA-101 | 0.32 mm | 0.25 µm | 60 m | 350 °C | C-101-032-025-60 | | |
| MEGA-101 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-101-032-032-15 | | |
| MEGA-101 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-101-032-032-25 | | |
| MEGA-101 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-101-032-032-30 | | |
| MEGA-101 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-101-032-032-50 | | |
| MEGA-101 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-101-032-032-60 | | |
| MEGA-101 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-101-032-045-15 | | |
| MEGA-101 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-101-032-045-25 | | |
| MEGA-101 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-101-032-045-30 | | |
| MEGA-101 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-101-032-045-50 | | |
| MEGA-101 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-101-032-045-60 | | |
| MEGA-101 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-101-032-100-15 | | |
| MEGA-101 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-101-032-100-25 | | |
| MEGA-101 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-101-032-100-30 | | |
| MEGA-101 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-101-032-100-50 | | |
| MEGA-101 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-101-032-100-60 | | |
| MEGA-101 | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-101-032-150-15 | | |
| MEGA-101 | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-101-032-150-25 | | |
| MEGA-101 | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-101-032-150-30 | | |
| MEGA-101 | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-101-032-150-50 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-101 | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-101-032-150-60 | | |
| MEGA-101 | 0.53 mm | 0.15 µm | 15 m | 350 °C | C-101-053-015-15 | | |
| MEGA-101 | 0.53 mm | 0.15 µm | 25 m | 350 °C | C-101-053-015-25 | | |
| MEGA-101 | 0.53 mm | 0.15 µm | 30 m | 350 °C | C-101-053-015-30 | | |
| MEGA-101 | 0.53 mm | 0.15 µm | 50 m | 350 °C | C-101-053-015-50 | | |
| MEGA-101 | 0.53 mm | 0.15 µm | 60 m | 350 °C | C-101-053-015-60 | | |
| MEGA-101 | 0.53 mm | 0.25 µm | 15 m | 350 °C | C-101-053-025-15 | | |
| MEGA-101 | 0.53 mm | 0.25 µm | 25 m | 350 °C | C-101-053-025-25 | | |
| MEGA-101 | 0.53 mm | 0.25 µm | 30 m | 350 °C | C-101-053-025-30 | | |
| MEGA-101 | 0.53 mm | 0.25 µm | 50 m | 350 °C | C-101-053-025-50 | | |
| MEGA-101 | 0.53 mm | 0.25 µm | 60 m | 350 °C | C-101-053-025-60 | | |
| MEGA-101 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-101-053-045-15 | | |
| MEGA-101 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-101-053-045-25 | | |
| MEGA-101 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-101-053-045-30 | | |
| MEGA-101 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-101-053-045-50 | | |
| MEGA-101 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-101-053-045-60 | | |
| MEGA-101 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-101-053-100-15 | | |
| MEGA-101 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-101-053-100-25 | | |
| MEGA-101 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-101-053-100-30 | | |
| MEGA-101 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-101-053-100-50 | | |
| MEGA-101 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-101-053-100-60 | | |
| MEGA-101 | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-101-053-150-15 | | |
| MEGA-101 | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-101-053-150-25 | | |

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|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-101 | 0.53 mm | 1.50 µm | 30 m | 300 °C | C-101-053-150-30 | | |
| MEGA-101 | 0.53 mm | 1.50 µm | 50 m | 300 °C | C-101-053-150-50 | | |
| MEGA-101 | 0.53 mm | 1.50 µm | 60 m | 300 °C | C-101-053-150-60 | | |

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MEGA-101 FAST



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CUSTOM-DEDICATED



MEGA-DEX (CHIRAL PHASES)



FAST-GC



GC-MS COLUMNS



MEGA-GAP (Incorporated Ret.-Gap)



HIGH TEMPERATURE COLUMNS



MULTIDIMENSIONAL GC

Last Updated:

Fused Silica Capillary Columns → MEGA-13

MEGA-13



View Full-Size
Image

Stationary Phase Characteristics

| | |
|--------------------------|-------------------------------------|
| Composition | 13% Phenyl, 87% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | Cp-Sil™ 13 CB |
| EPA Methods / Normatives | EPA 601, 602, 624 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|--|
| MEGA-13 | 0.25 mm | 0.15 µm | 15 m | 340 °C | C-13-025-015-15 | | |
| MEGA-13 | 0.25 mm | 0.15 µm | 25 m | 340 °C | C-13-025-015-25 | | |
| MEGA-13 | 0.25 mm | 0.15 µm | 30 m | 340 °C | C-13-025-015-30 | | |
| MEGA-13 | 0.25 mm | 0.15 µm | 50 m | 340 °C | C-13-025-015-50 | | |
| MEGA-13 | 0.25 mm | 0.15 µm | 60 m | 340 °C | C-13-025-015-60 | | |
| MEGA-13 | 0.25 mm | 0.25 µm | 15 m | 340 °C | C-13-025-025-15 | | |
| MEGA-13 | 0.25 mm | 0.25 µm | 25 m | 340 °C | C-13-025-025-25 | | |
| MEGA-13 | 0.25 mm | 0.25 µm | 30 m | 340 °C | C-13-025-025-30 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-13 | 0.25 mm | 0.25 µm | 50 m | 340 °C | C-13-025-025-50 | | |
| MEGA-13 | 0.25 mm | 0.25 µm | 60 m | 340 °C | C-13-025-025-60 | | |
| MEGA-13 | 0.25 mm | 0.45 µm | 15 m | 340 °C | C-13-025-045-15 | | |
| MEGA-13 | 0.25 mm | 0.45 µm | 25 m | 340 °C | C-13-025-045-25 | | |
| MEGA-13 | 0.25 mm | 0.45 µm | 30 m | 340 °C | C-13-025-045-30 | | |
| MEGA-13 | 0.25 mm | 0.45 µm | 50 m | 340 °C | C-13-025-045-50 | | |
| MEGA-13 | 0.25 mm | 0.45 µm | 60 m | 340 °C | C-13-025-045-60 | | |
| MEGA-13 | 0.25 mm | 1.00 µm | 15 m | 340 °C | C-13-025-100-15 | | |
| MEGA-13 | 0.25 mm | 1.00 µm | 25 m | 340 °C | C-13-025-100-25 | | |
| MEGA-13 | 0.25 mm | 1.00 µm | 30 m | 340 °C | C-13-025-100-30 | | |
| MEGA-13 | 0.25 mm | 1.00 µm | 50 m | 340 °C | C-13-025-100-50 | | |
| MEGA-13 | 0.25 mm | 1.00 µm | 60 m | 340 °C | C-13-025-100-60 | | |
| MEGA-13 | 0.32 mm | 0.15 µm | 15 m | 340 °C | C-13-032-015-15 | | |
| MEGA-13 | 0.32 mm | 0.15 µm | 25 m | 340 °C | C-13-032-015-25 | | |
| MEGA-13 | 0.32 mm | 0.15 µm | 30 m | 340 °C | C-13-032-015-30 | | |
| MEGA-13 | 0.32 mm | 0.15 µm | 50 m | 340 °C | C-13-032-015-50 | | |
| MEGA-13 | 0.32 mm | 0.15 µm | 60 m | 340 °C | C-13-032-015-60 | | |
| MEGA-13 | 0.32 mm | 0.25 µm | 15 m | 340 °C | C-13-032-025-15 | | |
| MEGA-13 | 0.32 mm | 0.25 µm | 25 m | 340 °C | C-13-032-025-25 | | |
| MEGA-13 | 0.32 mm | 0.25 µm | 30 m | 340 °C | C-13-032-025-30 | | |
| MEGA-13 | 0.32 mm | 0.25 µm | 50 m | 340 °C | C-13-032-025-50 | | |
| MEGA-13 | 0.32 mm | 0.25 µm | 60 m | 340 °C | C-13-032-025-60 | | |
| MEGA-13 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-13-032-032-15 | | |

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|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-13 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-13-032-032-25 | | |
| MEGA-13 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-13-032-032-30 | | |
| MEGA-13 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-13-032-032-50 | | |
| MEGA-13 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-13-032-032-60 | | |
| MEGA-13 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-13-032-045-15 | | |
| MEGA-13 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-13-032-045-25 | | |
| MEGA-13 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-13-032-045-30 | | |
| MEGA-13 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-13-032-045-50 | | |
| MEGA-13 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-13-032-045-60 | | |
| MEGA-13 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-13-032-100-15 | | |
| MEGA-13 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-13-032-100-25 | | |
| MEGA-13 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-13-032-100-30 | | |
| MEGA-13 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-13-032-100-50 | | |
| MEGA-13 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-13-032-100-60 | | |
| MEGA-13 | 0.53 mm | 0.15 µm | 15 m | 340 °C | C-13-053-015-15 | | |
| MEGA-13 | 0.53 mm | 0.15 µm | 25 m | 340 °C | C-13-053-015-25 | | |
| MEGA-13 | 0.53 mm | 0.15 µm | 30 m | 340 °C | C-13-053-015-30 | | |
| MEGA-13 | 0.53 mm | 0.15 µm | 50 m | 340 °C | C-13-053-015-50 | | |
| MEGA-13 | 0.53 mm | 0.15 µm | 60 m | 340 °C | C-13-053-015-60 | | |
| MEGA-13 | 0.53 mm | 0.25 µm | 15 m | 340 °C | C-13-053-025-15 | | |
| MEGA-13 | 0.53 mm | 0.25 µm | 25 m | 340 °C | C-13-053-025-25 | | |
| MEGA-13 | 0.53 mm | 0.25 µm | 30 m | 340 °C | C-13-053-025-30 | | |
| MEGA-13 | 0.53 mm | 0.25 µm | 50 m | 340 °C | C-13-053-025-50 | | |

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|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-13 | 0.53 mm | 0.25 µm | 60 m | 340 °C | C-13-053-025-60 | | |
| MEGA-13 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-13-053-045-15 | | |
| MEGA-13 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-13-053-045-25 | | |
| MEGA-13 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-13-053-045-30 | | |
| MEGA-13 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-13-053-045-50 | | |
| MEGA-13 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-13-053-045-60 | | |
| MEGA-13 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-13-053-100-15 | | |
| MEGA-13 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-13-053-100-25 | | |
| MEGA-13 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-13-053-100-30 | | |
| MEGA-13 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-13-053-100-50 | | |
| MEGA-13 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-13-053-100-60 | | |

You may also be interested in this/these product(s):

MEGA-13 FAST



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MEGA-DEX (CHIRAL PHASES)



FAST-GC



GC-MS COLUMNS



MEGA-GAP (Incorporated Ret.-Gap)



HIGH TEMPERATURE COLUMNS



MULTIDIMENSIONAL GC

Fused Silica Capillary Columns → MEGA-20

MEGA-20



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Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 20% Phenyl, 80% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -7, AT TM -20, Rtx TM -20, SPB TM -20 |
| USP Classification | G28, G32 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|--|
| MEGA-20 | 0.25 mm | 0.15 µm | 15 m | 340 °C | C-20-025-015-15 | | |
| MEGA-20 | 0.25 mm | 0.15 µm | 25 m | 340 °C | C-20-025-015-25 | | |
| MEGA-20 | 0.25 mm | 0.15 µm | 30 m | 340 °C | C-20-025-015-30 | | |
| MEGA-20 | 0.25 mm | 0.15 µm | 50 m | 340 °C | C-20-025-015-50 | | |
| MEGA-20 | 0.25 mm | 0.15 µm | 60 m | 340 °C | C-20-025-015-60 | | |
| MEGA-20 | 0.25 mm | 0.25 µm | 15 m | 340 °C | C-20-025-025-15 | | |
| MEGA-20 | 0.25 mm | 0.25 µm | 25 m | 340 °C | C-20-025-025-25 | | |
| MEGA-20 | 0.25 mm | 0.25 µm | 30 m | 340 °C | C-20-025-025-30 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-20 | 0.25 mm | 0.25 µm | 50 m | 340 °C | C-20-025-025-50 | | |
| MEGA-20 | 0.25 mm | 0.25 µm | 60 m | 340 °C | C-20-025-025-60 | | |
| MEGA-20 | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-20-025-045-15 | | |
| MEGA-20 | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-20-025-045-25 | | |
| MEGA-20 | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-20-025-045-30 | | |
| MEGA-20 | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-20-025-045-50 | | |
| MEGA-20 | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-20-025-045-60 | | |
| MEGA-20 | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-20-025-100-15 | | |
| MEGA-20 | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-20-025-100-25 | | |
| MEGA-20 | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-20-025-100-30 | | |
| MEGA-20 | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-20-025-100-50 | | |
| MEGA-20 | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-20-025-100-60 | | |
| MEGA-20 | 0.32 mm | 0.15 µm | 15 m | 340 °C | C-20-032-015-15 | | |
| MEGA-20 | 0.32 mm | 0.15 µm | 25 m | 340 °C | C-20-032-015-25 | | |
| MEGA-20 | 0.32 mm | 0.15 µm | 30 m | 340 °C | C-20-032-015-30 | | |
| MEGA-20 | 0.32 mm | 0.15 µm | 50 m | 340 °C | C-20-032-015-50 | | |
| MEGA-20 | 0.32 mm | 0.15 µm | 60 m | 340 °C | C-20-032-015-60 | | |
| MEGA-20 | 0.32 mm | 0.25 µm | 15 m | 340 °C | C-20-032-025-15 | | |
| MEGA-20 | 0.32 mm | 0.25 µm | 25 m | 340 °C | C-20-032-025-25 | | |
| MEGA-20 | 0.32 mm | 0.25 µm | 30 m | 340 °C | C-20-032-025-30 | | |
| MEGA-20 | 0.32 mm | 0.25 µm | 50 m | 340 °C | C-20-032-025-50 | | |
| MEGA-20 | 0.32 mm | 0.25 µm | 60 m | 340 °C | C-20-032-025-60 | | |
| MEGA-20 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-20-032-032-15 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-20 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-20-032-032-25 | | |
| MEGA-20 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-20-032-032-30 | | |
| MEGA-20 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-20-032-032-50 | | |
| MEGA-20 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-20-032-032-60 | | |
| MEGA-20 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-20-032-045-15 | | |
| MEGA-20 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-20-032-045-25 | | |
| MEGA-20 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-20-032-045-30 | | |
| MEGA-20 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-20-032-045-50 | | |
| MEGA-20 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-20-032-045-60 | | |
| MEGA-20 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-20-032-100-15 | | |
| MEGA-20 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-20-032-100-25 | | |
| MEGA-20 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-20-032-100-30 | | |
| MEGA-20 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-20-032-100-50 | | |
| MEGA-20 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-20-032-100-60 | | |
| MEGA-20 | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-20-032-150-15 | | |
| MEGA-20 | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-20-032-150-25 | | |
| MEGA-20 | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-20-032-150-30 | | |
| MEGA-20 | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-20-032-150-50 | | |
| MEGA-20 | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-20-032-150-60 | | |
| MEGA-20 | 0.32 mm | 3.00 µm | 15 m | 300 °C | C-20-032-300-15 | | |
| MEGA-20 | 0.32 mm | 3.00 µm | 25 m | 300 °C | C-20-032-300-25 | | |
| MEGA-20 | 0.32 mm | 3.00 µm | 30 m | 300 °C | C-20-032-300-30 | | |
| MEGA-20 | 0.32 mm | 3.00 µm | 50 m | 300 °C | C-20-032-300-50 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-20 | 0.32 mm | 3.00 µm | 60 m | 300 °C | C-20-032-300-60 | | |
| MEGA-20 | 0.53 mm | 0.15 µm | 15 m | 340 °C | C-20-053-015-15 | | |
| MEGA-20 | 0.53 mm | 0.15 µm | 25 m | 340 °C | C-20-053-015-25 | | |
| MEGA-20 | 0.53 mm | 0.15 µm | 30 m | 340 °C | C-20-053-015-30 | | |
| MEGA-20 | 0.53 mm | 0.15 µm | 50 m | 340 °C | C-20-053-015-50 | | |
| MEGA-20 | 0.53 mm | 0.15 µm | 60 m | 340 °C | C-20-053-015-60 | | |
| MEGA-20 | 0.53 mm | 0.25 µm | 15 m | 340 °C | C-20-053-025-15 | | |
| MEGA-20 | 0.53 mm | 0.25 µm | 25 m | 340 °C | C-20-053-025-25 | | |
| MEGA-20 | 0.53 mm | 0.25 µm | 30 m | 340 °C | C-20-053-025-30 | | |
| MEGA-20 | 0.53 mm | 0.25 µm | 50 m | 340 °C | C-20-053-025-50 | | |
| MEGA-20 | 0.53 mm | 0.25 µm | 60 m | 340 °C | C-20-053-025-60 | | |
| MEGA-20 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-20-053-045-15 | | |
| MEGA-20 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-20-053-045-25 | | |
| MEGA-20 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-20-053-045-30 | | |
| MEGA-20 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-20-053-045-50 | | |
| MEGA-20 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-20-053-045-60 | | |
| MEGA-20 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-20-053-100-15 | | |
| MEGA-20 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-20-053-100-25 | | |
| MEGA-20 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-20-053-100-30 | | |
| MEGA-20 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-20-053-100-50 | | |
| MEGA-20 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-20-053-100-60 | | |
| MEGA-20 | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-20-053-150-15 | | |
| MEGA-20 | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-20-053-150-25 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-20 | 0.53 mm | 1.50 μm | 30 m | 300 °C | C-20-053-150-30 | | |
| MEGA-20 | 0.53 mm | 1.50 μm | 50 m | 300 °C | C-20-053-150-50 | | |
| MEGA-20 | 0.53 mm | 1.50 μm | 60 m | 300 °C | C-20-053-150-60 | | |
| MEGA-20 | 0.53 mm | 3.00 μm | 15 m | 300 °C | C-20-053-300-15 | | |
| MEGA-20 | 0.53 mm | 3.00 μm | 25 m | 300 °C | C-20-053-300-25 | | |
| MEGA-20 | 0.53 mm | 3.00 μm | 30 m | 300 °C | C-20-053-300-30 | | |
| MEGA-20 | 0.53 mm | 3.00 μm | 50 m | 300 °C | C-20-053-300-50 | | |
| MEGA-20 | 0.53 mm | 3.00 μm | 60 m | 300 °C | C-20-053-300-60 | | |

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FAST-GC



MULTIDIMENSIONAL GC

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Fused Silica Capillary Columns → MEGA-200

MEGA-200



View Full-Size
Image

Stationary Phase Characteristics

| | |
|--------------------|---|
| Composition | Trifluoropropyl Methyl Polysiloxane |
| Polarity | High polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -210, AT TM -210, DB TM -200, DB TM -210, OV TM -202, OV TM -210, OV TM -215, Rtx TM -200, SPT TM -2401, VF TM -200 ms |
| USP Classification | G6 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-200 | 0.25 mm | 0.15 µm | 15 m | 300 °C | C-200-025-015-15 | | |
| MEGA-200 | 0.25 mm | 0.15 µm | 25 m | 300 °C | C-200-025-015-25 | | |
| MEGA-200 | 0.25 mm | 0.15 µm | 30 m | 300 °C | C-200-025-015-30 | | |
| MEGA-200 | 0.25 mm | 0.15 µm | 50 m | 300 °C | C-200-025-015-50 | | |
| MEGA-200 | 0.25 mm | 0.15 µm | 60 m | 300 °C | C-200-025-015-60 | | |
| MEGA-200 | 0.25 mm | 0.25 µm | 15 m | 300 °C | C-200-025-025-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-200 | 0.25 mm | 0.25 µm | 25 m | 300 °C | C-200-025-025-25 | | |
| MEGA-200 | 0.25 mm | 0.25 µm | 30 m | 300 °C | C-200-025-025-30 | | |
| MEGA-200 | 0.25 mm | 0.25 µm | 50 m | 300 °C | C-200-025-025-50 | | |
| MEGA-200 | 0.25 mm | 0.25 µm | 60 m | 300 °C | C-200-025-025-60 | | |
| MEGA-200 | 0.25 mm | 0.45 µm | 15 m | 300 °C | C-200-025-045-15 | | |
| MEGA-200 | 0.25 mm | 0.45 µm | 25 m | 300 °C | C-200-025-045-25 | | |
| MEGA-200 | 0.25 mm | 0.45 µm | 30 m | 300 °C | C-200-025-045-30 | | |
| MEGA-200 | 0.25 mm | 0.45 µm | 50 m | 300 °C | C-200-025-045-50 | | |
| MEGA-200 | 0.25 mm | 0.45 µm | 60 m | 300 °C | C-200-025-045-60 | | |
| MEGA-200 | 0.25 mm | 1.00 µm | 15 m | 290 °C | C-200-025-100-15 | | |
| MEGA-200 | 0.25 mm | 1.00 µm | 25 m | 290 °C | C-200-025-100-25 | | |
| MEGA-200 | 0.25 mm | 1.00 µm | 30 m | 290 °C | C-200-025-100-30 | | |
| MEGA-200 | 0.25 mm | 1.00 µm | 50 m | 290 °C | C-200-025-100-50 | | |
| MEGA-200 | 0.25 mm | 1.00 µm | 60 m | 290 °C | C-200-025-100-60 | | |
| MEGA-200 | 0.32 mm | 0.15 µm | 15 m | 300 °C | C-200-032-015-15 | | |
| MEGA-200 | 0.32 mm | 0.15 µm | 25 m | 300 °C | C-200-032-015-25 | | |
| MEGA-200 | 0.32 mm | 0.15 µm | 30 m | 300 °C | C-200-032-015-30 | | |
| MEGA-200 | 0.32 mm | 0.15 µm | 50 m | 300 °C | C-200-032-015-50 | | |
| MEGA-200 | 0.32 mm | 0.15 µm | 60 m | 300 °C | C-200-032-015-60 | | |
| MEGA-200 | 0.32 mm | 0.25 µm | 15 m | 300 °C | C-200-032-025-15 | | |
| MEGA-200 | 0.32 mm | 0.25 µm | 25 m | 300 °C | C-200-032-025-25 | | |
| MEGA-200 | 0.32 mm | 0.25 µm | 30 m | 300 °C | C-200-032-025-30 | | |
| MEGA-200 | 0.32 mm | 0.25 µm | 50 m | 300 °C | C-200-032-025-50 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-200 | 0.32 mm | 0.25 µm | 60 m | 300 °C | C-200-032-025-60 | | |
| MEGA-200 | 0.32 mm | 0.32 µm | 15 m | 300 °C | C-200-032-032-15 | | |
| MEGA-200 | 0.32 mm | 0.32 µm | 25 m | 300 °C | C-200-032-032-25 | | |
| MEGA-200 | 0.32 mm | 0.32 µm | 30 m | 300 °C | C-200-032-032-30 | | |
| MEGA-200 | 0.32 mm | 0.32 µm | 50 m | 300 °C | C-200-032-032-50 | | |
| MEGA-200 | 0.32 mm | 0.32 µm | 60 m | 300 °C | C-200-032-032-60 | | |
| MEGA-200 | 0.32 mm | 0.45 µm | 15 m | 300 °C | C-200-032-045-15 | | |
| MEGA-200 | 0.32 mm | 0.45 µm | 25 m | 300 °C | C-200-032-045-25 | | |
| MEGA-200 | 0.32 mm | 0.45 µm | 30 m | 300 °C | C-200-032-045-30 | | |
| MEGA-200 | 0.32 mm | 0.45 µm | 50 m | 300 °C | C-200-032-045-50 | | |
| MEGA-200 | 0.32 mm | 0.45 µm | 60 m | 300 °C | C-200-032-045-60 | | |
| MEGA-200 | 0.32 mm | 1.00 µm | 15 m | 290 °C | C-200-032-100-15 | | |
| MEGA-200 | 0.32 mm | 1.00 µm | 25 m | 290 °C | C-200-032-100-25 | | |
| MEGA-200 | 0.32 mm | 1.00 µm | 30 m | 290 °C | C-200-032-100-30 | | |
| MEGA-200 | 0.32 mm | 1.00 µm | 50 m | 290 °C | C-200-032-100-50 | | |
| MEGA-200 | 0.32 mm | 1.00 µm | 60 m | 290 °C | C-200-032-100-60 | | |
| MEGA-200 | 0.32 mm | 1.50 µm | 15 m | 290 °C | C-200-032-150-15 | | |
| MEGA-200 | 0.32 mm | 1.50 µm | 25 m | 290 °C | C-200-032-150-25 | | |
| MEGA-200 | 0.32 mm | 1.50 µm | 30 m | 290 °C | C-200-032-150-30 | | |
| MEGA-200 | 0.32 mm | 1.50 µm | 50 m | 290 °C | C-200-032-150-50 | | |
| MEGA-200 | 0.32 mm | 1.50 µm | 60 m | 290 °C | C-200-032-150-60 | | |
| MEGA-200 | 0.53 mm | 0.15 µm | 15 m | 300 °C | C-200-053-015-15 | | |
| MEGA-200 | 0.53 mm | 0.15 µm | 25 m | 300 °C | C-200-053-015-25 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-200 | 0.53 mm | 0.15 µm | 30 m | 300 °C | C-200-053-015-30 | | |
| MEGA-200 | 0.53 mm | 0.15 µm | 50 m | 300 °C | C-200-053-015-50 | | |
| MEGA-200 | 0.53 mm | 0.15 µm | 60 m | 300 °C | C-200-053-015-60 | | |
| MEGA-200 | 0.53 mm | 0.25 µm | 15 m | 300 °C | C-200-053-025-15 | | |
| MEGA-200 | 0.53 mm | 0.25 µm | 25 m | 300 °C | C-200-053-025-25 | | |
| MEGA-200 | 0.53 mm | 0.25 µm | 30 m | 300 °C | C-200-053-025-30 | | |
| MEGA-200 | 0.53 mm | 0.25 µm | 50 m | 300 °C | C-200-053-025-50 | | |
| MEGA-200 | 0.53 mm | 0.25 µm | 60 m | 300 °C | C-200-053-025-60 | | |
| MEGA-200 | 0.53 mm | 0.45 µm | 15 m | 300 °C | C-200-053-045-15 | | |
| MEGA-200 | 0.53 mm | 0.45 µm | 25 m | 300 °C | C-200-053-045-25 | | |
| MEGA-200 | 0.53 mm | 0.45 µm | 30 m | 300 °C | C-200-053-045-30 | | |
| MEGA-200 | 0.53 mm | 0.45 µm | 50 m | 300 °C | C-200-053-045-50 | | |
| MEGA-200 | 0.53 mm | 0.45 µm | 60 m | 300 °C | C-200-053-045-60 | | |
| MEGA-200 | 0.53 mm | 1.00 µm | 15 m | 290 °C | C-200-053-100-15 | | |
| MEGA-200 | 0.53 mm | 1.00 µm | 25 m | 290 °C | C-200-053-100-25 | | |
| MEGA-200 | 0.53 mm | 1.00 µm | 30 m | 290 °C | C-200-053-100-30 | | |
| MEGA-200 | 0.53 mm | 1.00 µm | 50 m | 290 °C | C-200-053-100-50 | | |
| MEGA-200 | 0.53 mm | 1.00 µm | 60 m | 290 °C | C-200-053-100-60 | | |
| MEGA-200 | 0.53 mm | 1.50 µm | 15 m | 290 °C | C-200-053-150-15 | | |
| MEGA-200 | 0.53 mm | 1.50 µm | 25 m | 290 °C | C-200-053-150-25 | | |
| MEGA-200 | 0.53 mm | 1.50 µm | 30 m | 290 °C | C-200-053-150-30 | | |
| MEGA-200 | 0.53 mm | 1.50 µm | 50 m | 290 °C | C-200-053-150-50 | | |
| MEGA-200 | 0.53 mm | 1.50 µm | 60 m | 290 °C | C-200-053-150-60 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-200 | 0.53 mm | 3.00 µm | 15 m | 290 °C | C-200-053-300-15 | | |
| MEGA-200 | 0.53 mm | 3.00 µm | 25 m | 290 °C | C-200-053-300-25 | | |
| MEGA-200 | 0.53 mm | 3.00 µm | 30 m | 290 °C | C-200-053-300-30 | | |
| MEGA-200 | 0.53 mm | 3.00 µm | 50 m | 290 °C | C-200-053-300-50 | | |
| MEGA-200 | 0.53 mm | 3.00 µm | 60 m | 290 °C | C-200-053-300-60 | | |

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MEGA-GAP (Incorporated Ret.-Gap)



MEGA-DEX (CHIRAL PHASES)



HIGH TEMPERATURE COLUMNS



FAST-GC



MEGA-225



| | |
|--------------------|--|
| Composition | 25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Bonded |
| Equivalent to | 007™-225, AT™-225, BP™-225, CP-Sil™ 43 CB, DB™-225, HP™-225, OV™-225, Rtx™-225 |
| USP Classification | G7, G19 |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ty |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-225 | 0.25 mm | 0.15 µm | 15 m | 280 °C | C-225-025-015-15 | |
| MEGA-225 | 0.25 mm | 0.15 µm | 25 m | 280 °C | C-225-025-015-25 | |
| MEGA-225 | 0.25 mm | 0.15 µm | 30 m | 280 °C | C-225-025-015-30 | |
| MEGA-225 | 0.25 mm | 0.15 µm | 50 m | 280 °C | C-225-025-015-50 | |
| MEGA-225 | 0.25 mm | 0.15 µm | 60 m | 280 °C | C-225-025-015-60 | |
| MEGA-225 | 0.25 mm | 0.25 µm | 15 m | 280 °C | C-225-025-025-15 | |
| MEGA-225 | 0.25 mm | 0.25 µm | 25 m | 280 °C | C-225-025-025-25 | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-225 | 0.25 mm | 0.25 µm | 30 m | 280 °C | C-225-025-025-30 | | |
| MEGA-225 | 0.25 mm | 0.25 µm | 50 m | 280 °C | C-225-025-025-50 | | |
| MEGA-225 | 0.25 mm | 0.25 µm | 60 m | 280 °C | C-225-025-025-60 | | |
| MEGA-225 | 0.25 mm | 0.45 µm | 15 m | 280 °C | C-225-025-045-15 | | |
| MEGA-225 | 0.25 mm | 0.45 µm | 25 m | 280 °C | C-225-025-045-25 | | |
| MEGA-225 | 0.25 mm | 0.45 µm | 30 m | 280 °C | C-225-025-045-30 | | |
| MEGA-225 | 0.25 mm | 0.45 µm | 50 m | 280 °C | C-225-025-045-50 | | |
| MEGA-225 | 0.25 mm | 0.45 µm | 60 m | 280 °C | C-225-025-045-60 | | |
| MEGA-225 | 0.25 mm | 1.00 µm | 15 m | 270 °C | C-225-025-100-15 | | |
| MEGA-225 | 0.25 mm | 1.00 µm | 25 m | 270 °C | C-225-025-100-25 | | |
| MEGA-225 | 0.25 mm | 1.00 µm | 30 m | 270 °C | C-225-025-100-30 | | |
| MEGA-225 | 0.25 mm | 1.00 µm | 50 m | 270 °C | C-225-025-100-50 | | |
| MEGA-225 | 0.25 mm | 1.00 µm | 60 m | 270 °C | C-225-025-100-60 | | |
| MEGA-225 | 0.25 mm | 1.50 µm | 15 m | 270 °C | C-225-025-150-15 | | |
| MEGA-225 | 0.25 mm | 1.50 µm | 25 m | 270 °C | C-225-025-150-25 | | |
| MEGA-225 | 0.25 mm | 1.50 µm | 30 m | 270 °C | C-225-025-150-30 | | |
| MEGA-225 | 0.25 mm | 1.50 µm | 50 m | 270 °C | C-225-025-150-50 | | |
| MEGA-225 | 0.25 mm | 1.50 µm | 60 m | 270 °C | C-225-025-150-60 | | |
| MEGA-225 | 0.32 mm | 0.15 µm | 15 m | 280 °C | C-225-032-015-15 | | |
| MEGA-225 | 0.32 mm | 0.15 µm | 25 m | 280 °C | C-225-032-015-25 | | |
| MEGA-225 | 0.32 mm | 0.15 µm | 30 m | 280 °C | C-225-032-015-30 | | |
| MEGA-225 | 0.32 mm | 0.15 µm | 50 m | 280 °C | C-225-032-015-50 | | |
| MEGA-225 | 0.32 mm | 0.15 µm | 60 m | 280 °C | C-225-032-015-60 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-225 | 0.32 mm | 0.25 µm | 15 m | 280 °C | C-225-032-025-15 | | |
| MEGA-225 | 0.32 mm | 0.25 µm | 25 m | 280 °C | C-225-032-025-25 | | |
| MEGA-225 | 0.32 mm | 0.25 µm | 30 m | 280 °C | C-225-032-025-30 | | |
| MEGA-225 | 0.32 mm | 0.25 µm | 50 m | 280 °C | C-225-032-025-50 | | |
| MEGA-225 | 0.32 mm | 0.25 µm | 60 m | 280 °C | C-225-032-025-60 | | |
| MEGA-225 | 0.32 mm | 0.32 µm | 15 m | 280 °C | C-225-032-032-15 | | |
| MEGA-225 | 0.32 mm | 0.32 µm | 25 m | 280 °C | C-225-032-032-25 | | |
| MEGA-225 | 0.32 mm | 0.32 µm | 30 m | 280 °C | C-225-032-032-30 | | |
| MEGA-225 | 0.32 mm | 0.32 µm | 50 m | 280 °C | C-225-032-032-50 | | |
| MEGA-225 | 0.32 mm | 0.32 µm | 60 m | 280 °C | C-225-032-032-60 | | |
| MEGA-225 | 0.32 mm | 0.45 µm | 15 m | 280 °C | C-225-032-045-15 | | |
| MEGA-225 | 0.32 mm | 0.45 µm | 25 m | 280 °C | C-225-032-045-25 | | |
| MEGA-225 | 0.32 mm | 0.45 µm | 30 m | 280 °C | C-225-032-045-30 | | |
| MEGA-225 | 0.32 mm | 0.45 µm | 50 m | 280 °C | C-225-032-045-50 | | |
| MEGA-225 | 0.32 mm | 0.45 µm | 60 m | 280 °C | C-225-032-045-60 | | |
| MEGA-225 | 0.32 mm | 1.00 µm | 15 m | 270 °C | C-225-032-100-15 | | |
| MEGA-225 | 0.32 mm | 1.00 µm | 25 m | 270 °C | C-225-032-100-25 | | |
| MEGA-225 | 0.32 mm | 1.00 µm | 30 m | 270 °C | C-225-032-100-30 | | |
| MEGA-225 | 0.32 mm | 1.00 µm | 50 m | 270 °C | C-225-032-100-50 | | |
| MEGA-225 | 0.32 mm | 1.00 µm | 60 m | 270 °C | C-225-032-100-60 | | |
| MEGA-225 | 0.32 mm | 1.50 µm | 15 m | 270 °C | C-225-032-150-15 | | |
| MEGA-225 | 0.32 mm | 1.50 µm | 25 m | 270 °C | C-225-032-150-25 | | |
| MEGA-225 | 0.32 mm | 1.50 µm | 30 m | 270 °C | C-225-032-150-30 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-225 | 0.32 mm | 1.50 µm | 50 m | 270 °C | C-225-032-150-50 | | |
| MEGA-225 | 0.32 mm | 1.50 µm | 60 m | 270 °C | C-225-032-150-60 | | |
| MEGA-225 | 0.53 mm | 0.15 µm | 15 m | 280 °C | C-225-053-015-15 | | |
| MEGA-225 | 0.53 mm | 0.15 µm | 25 m | 280 °C | C-225-053-015-25 | | |
| MEGA-225 | 0.53 mm | 0.15 µm | 30 m | 280 °C | C-225-053-015-30 | | |
| MEGA-225 | 0.53 mm | 0.15 µm | 50 m | 280 °C | C-225-053-015-50 | | |
| MEGA-225 | 0.53 mm | 0.15 µm | 60 m | 280 °C | C-225-053-015-60 | | |
| MEGA-225 | 0.53 mm | 0.25 µm | 15 m | 280 °C | C-225-053-025-15 | | |
| MEGA-225 | 0.53 mm | 0.25 µm | 25 m | 280 °C | C-225-053-025-25 | | |
| MEGA-225 | 0.53 mm | 0.25 µm | 30 m | 280 °C | C-225-053-025-30 | | |
| MEGA-225 | 0.53 mm | 0.25 µm | 50 m | 280 °C | C-225-053-025-50 | | |
| MEGA-225 | 0.53 mm | 0.25 µm | 60 m | 280 °C | C-225-053-025-60 | | |
| MEGA-225 | 0.53 mm | 0.45 µm | 15 m | 280 °C | C-225-053-045-15 | | |
| MEGA-225 | 0.53 mm | 0.45 µm | 25 m | 280 °C | C-225-053-045-25 | | |
| MEGA-225 | 0.53 mm | 0.45 µm | 30 m | 280 °C | C-225-053-045-30 | | |
| MEGA-225 | 0.53 mm | 0.45 µm | 50 m | 280 °C | C-225-053-045-50 | | |
| MEGA-225 | 0.53 mm | 0.45 µm | 60 m | 280 °C | C-225-053-045-60 | | |
| MEGA-225 | 0.53 mm | 1.00 µm | 15 m | 270 °C | C-225-053-100-15 | | |
| MEGA-225 | 0.53 mm | 1.00 µm | 25 m | 270 °C | C-225-053-100-25 | | |
| MEGA-225 | 0.53 mm | 1.00 µm | 30 m | 270 °C | C-225-053-100-30 | | |
| MEGA-225 | 0.53 mm | 1.00 µm | 50 m | 270 °C | C-225-053-100-50 | | |
| MEGA-225 | 0.53 mm | 1.00 µm | 60 m | 270 °C | C-225-053-100-60 | | |
| MEGA-225 | 0.53 mm | 1.50 µm | 15 m | 270 °C | C-225-053-150-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-225 | 0.53 mm | 1.50 µm | 25 m | 270 °C | C-225-053-150-25 | | |
| MEGA-225 | 0.53 mm | 1.50 µm | 30 m | 270 °C | C-225-053-150-30 | | |
| MEGA-225 | 0.53 mm | 1.50 µm | 50 m | 270 °C | C-225-053-150-50 | | |
| MEGA-225 | 0.53 mm | 1.50 µm | 60 m | 270 °C | C-225-053-150-60 | | |

You may also be interested in this/these product(s):

MEGA-225 FAST



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Vendor Information

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Standard
conventional GC columns

STANDARD

GC-MS
columns

GC-MS COLUMNS

CUSTOM
DEDICATED
COLUMNS

CUSTOM-DEDICATED

MEGA GAP
incorporated retention gap
column

MEGA-GAP (Incorporated Ret.-Gap)

dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

Mega HT
High Temperature Columns

HIGH TEMPERATURE COLUMNS

FAST-GC
columns

FAST-GC

mega^{2D}
columns

MULTIDIMENSIONAL GC

Last Updated:

Fused Silica Capillary Columns → MEGA-50

MEGA-50



View Full-Size

Image

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | 50% Cyanopropyl, 50% Methyl Polysiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Bonded |
| Equivalent to | DB TM -23 |
| USP Classification | G5 |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-----------------|------|--|
| MEGA-50 | 0.25 mm | 0.25 µm | 15 m | 260 °C | C-50-025-025-15 | | |
| MEGA-50 | 0.25 mm | 0.25 µm | 25 m | 260 °C | C-50-025-025-25 | | |
| MEGA-50 | 0.25 mm | 0.25 µm | 30 m | 260 °C | C-50-025-025-30 | | |
| MEGA-50 | 0.25 mm | 0.25 µm | 50 m | 260 °C | C-50-025-025-50 | | |
| MEGA-50 | 0.25 mm | 0.25 µm | 60 m | 260 °C | C-50-025-025-60 | | |
| MEGA-50 | 0.32 mm | 0.25 µm | 15 m | 260 °C | C-50-032-025-15 | | |
| MEGA-50 | 0.32 mm | 0.25 µm | 25 m | 260 °C | C-50-032-025-25 | | |
| MEGA-50 | 0.32 mm | 0.25 µm | 30 m | 260 °C | C-50-032-025-30 | | |

| | | | | | | | |
|---------|---------|---------|------|--------|-----------------|--|--|
| MEGA-50 | 0.32 mm | 0.25 µm | 50 m | 260 °C | C-50-032-025-50 | | |
| MEGA-50 | 0.32 mm | 0.25 µm | 60 m | 260 °C | C-50-032-025-60 | | |
| MEGA-50 | 0.53 mm | 0.25 µm | 15 m | 260 °C | C-50-053-025-15 | | |
| MEGA-50 | 0.53 mm | 0.25 µm | 25 m | 260 °C | C-50-053-025-25 | | |
| MEGA-50 | 0.53 mm | 0.25 µm | 30 m | 260 °C | C-50-053-025-30 | | |
| MEGA-50 | 0.53 mm | 0.25 µm | 50 m | 260 °C | C-50-053-025-50 | | |
| MEGA-50 | 0.53 mm | 0.25 µm | 60 m | 260 °C | C-50-053-025-60 | | |

You may also be interested in this/these product(s):

MEGA-50 FAST



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Vendor Information

more categories

Standard
conventional GC columns

STANDARD

GC-MS

GC-MS COLUMNS

CUSTOM
DEDICATED
COLUMNS

CUSTOM-DEDICATED

MEGA GAP
Incorporated Retention Gap
column

MEGA-GAP (Incorporated Ret.-Gap)

dex xeb
chical columns

MEGA-DEX (CHIRAL PHASES)

Mega HT
High Temperature Columns

HIGH TEMPERATURE COLUMNS

FAST-GC
columns

FAST-GC



Fused Silica Capillary Columns → MEGA-624

MEGA-624



View Full-Size
Image

Stationary Phase Characteristics

| | |
|--------------------------|--|
| Composition | 6% Cyanopropylphenyl, 94% Methyl Polysiloxane |
| Polarity | Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | 007 TM -624, 007 TM -1301, AT TM -624, CP TM -1301, DB TM -1301, DB TM -624, HPT TM -1301, HPT TM -624, Rtx TM -624, Rtx TM -1301, SPB TM -1301, SPB TM -624, VFT TM -624 ms, Vocol TM , ZB TM -624 |
| USP Classification | G43 |
| EPA Methods / Normatives | EPA 501.3, 502.1, 502.2, 503.1, 504.1, 524.2, 601, 602, 603, 624, 1624, 8010B, 8021B, 8030A, 8260B, USP 467 (OVIs) |

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-624 | 0.25 mm | 0.15 µm | 15 m | 300 °C | C-624-025-015-15 | | |
| MEGA-624 | 0.25 mm | 0.15 µm | 25 m | 300 °C | C-624-025-015-25 | | |
| MEGA-624 | 0.25 mm | 0.15 µm | 30 m | 300 °C | C-624-025-015-30 | | |
| MEGA-624 | 0.25 mm | 0.15 µm | 50 m | 300 °C | C-624-025-015-50 | | |
| MEGA-624 | 0.25 mm | 0.15 µm | 60 m | 300 °C | C-624-025-015-60 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-624 | 0.25 mm | 0.25 µm | 15 m | 280 °C | C-624-025-025-15 | | |
| MEGA-624 | 0.25 mm | 0.25 µm | 25 m | 280 °C | C-624-025-025-25 | | |
| MEGA-624 | 0.25 mm | 0.25 µm | 30 m | 280 °C | C-624-025-025-30 | | |
| MEGA-624 | 0.25 mm | 0.25 µm | 50 m | 280 °C | C-624-025-025-50 | | |
| MEGA-624 | 0.25 mm | 0.25 µm | 60 m | 280 °C | C-624-025-025-60 | | |
| MEGA-624 | 0.25 mm | 0.45 µm | 15 m | 280 °C | C-624-025-045-15 | | |
| MEGA-624 | 0.25 mm | 0.45 µm | 25 m | 280 °C | C-624-025-045-25 | | |
| MEGA-624 | 0.25 mm | 0.45 µm | 30 m | 280 °C | C-624-025-045-30 | | |
| MEGA-624 | 0.25 mm | 0.45 µm | 50 m | 280 °C | C-624-025-045-50 | | |
| MEGA-624 | 0.25 mm | 0.45 µm | 60 m | 280 °C | C-624-025-045-60 | | |
| MEGA-624 | 0.25 mm | 1.00 µm | 15 m | 280 °C | C-624-025-100-15 | | |
| MEGA-624 | 0.25 mm | 1.00 µm | 25 m | 280 °C | C-624-025-100-25 | | |
| MEGA-624 | 0.25 mm | 1.00 µm | 30 m | 280 °C | C-624-025-100-30 | | |
| MEGA-624 | 0.25 mm | 1.00 µm | 50 m | 280 °C | C-624-025-100-50 | | |
| MEGA-624 | 0.25 mm | 1.00 µm | 60 m | 280 °C | C-624-025-100-60 | | |
| MEGA-624 | 0.25 mm | 1.50 µm | 15 m | 280 °C | C-624-025-150-15 | | |
| MEGA-624 | 0.25 mm | 1.50 µm | 25 m | 280 °C | C-624-025-150-25 | | |
| MEGA-624 | 0.25 mm | 1.50 µm | 30 m | 280 °C | C-624-025-150-30 | | |
| MEGA-624 | 0.25 mm | 1.50 µm | 50 m | 280 °C | C-624-025-150-50 | | |
| MEGA-624 | 0.25 mm | 1.50 µm | 60 m | 280 °C | C-624-025-150-60 | | |
| MEGA-624 | 0.32 mm | 0.15 µm | 15 m | 300 °C | C-624-032-015-15 | | |
| MEGA-624 | 0.32 mm | 0.15 µm | 25 m | 300 °C | C-624-032-015-25 | | |
| MEGA-624 | 0.32 mm | 0.15 µm | 30 m | 300 °C | C-624-032-015-30 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-624 | 0.32 mm | 0.15 µm | 50 m | 300 °C | C-624-032-015-50 | | |
| MEGA-624 | 0.32 mm | 0.15 µm | 60 m | 300 °C | C-624-032-015-60 | | |
| MEGA-624 | 0.32 mm | 0.25 µm | 15 m | 280 °C | C-624-032-025-15 | | |
| MEGA-624 | 0.32 mm | 0.25 µm | 25 m | 280 °C | C-624-032-025-25 | | |
| MEGA-624 | 0.32 mm | 0.25 µm | 30 m | 280 °C | C-624-032-025-30 | | |
| MEGA-624 | 0.32 mm | 0.25 µm | 50 m | 280 °C | C-624-032-025-50 | | |
| MEGA-624 | 0.32 mm | 0.25 µm | 60 m | 280 °C | C-624-032-025-60 | | |
| MEGA-624 | 0.32 mm | 0.32 µm | 15 m | 280 °C | C-624-032-032-15 | | |
| MEGA-624 | 0.32 mm | 0.32 µm | 25 m | 280 °C | C-624-032-032-25 | | |
| MEGA-624 | 0.32 mm | 0.32 µm | 30 m | 280 °C | C-624-032-032-30 | | |
| MEGA-624 | 0.32 mm | 0.32 µm | 50 m | 280 °C | C-624-032-032-50 | | |
| MEGA-624 | 0.32 mm | 0.32 µm | 60 m | 280 °C | C-624-032-032-60 | | |
| MEGA-624 | 0.32 mm | 0.45 µm | 15 m | 280 °C | C-624-032-045-15 | | |
| MEGA-624 | 0.32 mm | 0.45 µm | 25 m | 280 °C | C-624-032-045-25 | | |
| MEGA-624 | 0.32 mm | 0.45 µm | 30 m | 280 °C | C-624-032-045-30 | | |
| MEGA-624 | 0.32 mm | 0.45 µm | 50 m | 280 °C | C-624-032-045-50 | | |
| MEGA-624 | 0.32 mm | 0.45 µm | 60 m | 280 °C | C-624-032-045-60 | | |
| MEGA-624 | 0.32 mm | 1.00 µm | 15 m | 280 °C | C-624-032-100-15 | | |
| MEGA-624 | 0.32 mm | 1.00 µm | 25 m | 280 °C | C-624-032-100-25 | | |
| MEGA-624 | 0.32 mm | 1.00 µm | 30 m | 280 °C | C-624-032-100-30 | | |
| MEGA-624 | 0.32 mm | 1.00 µm | 50 m | 280 °C | C-624-032-100-50 | | |
| MEGA-624 | 0.32 mm | 1.00 µm | 60 m | 280 °C | C-624-032-100-60 | | |
| MEGA-624 | 0.32 mm | 1.50 µm | 15 m | 280 °C | C-624-032-150-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-624 | 0.32 mm | 1.50 µm | 25 m | 280 °C | C-624-032-150-25 | | |
| MEGA-624 | 0.32 mm | 1.50 µm | 30 m | 280 °C | C-624-032-150-30 | | |
| MEGA-624 | 0.32 mm | 1.50 µm | 50 m | 280 °C | C-624-032-150-50 | | |
| MEGA-624 | 0.32 mm | 1.50 µm | 60 m | 280 °C | C-624-032-150-60 | | |
| MEGA-624 | 0.32 mm | 3.00 µm | 15 m | 280 °C | C-624-032-300-15 | | |
| MEGA-624 | 0.32 mm | 3.00 µm | 25 m | 280 °C | C-624-032-300-25 | | |
| MEGA-624 | 0.32 mm | 3.00 µm | 30 m | 280 °C | C-624-032-300-30 | | |
| MEGA-624 | 0.32 mm | 3.00 µm | 50 m | 280 °C | C-624-032-300-50 | | |
| MEGA-624 | 0.32 mm | 3.00 µm | 60 m | 280 °C | C-624-032-300-60 | | |
| MEGA-624 | 0.53 mm | 0.15 µm | 15 m | 290 °C | C-624-053-015-15 | | |
| MEGA-624 | 0.53 mm | 0.15 µm | 25 m | 290 °C | C-624-053-015-25 | | |
| MEGA-624 | 0.53 mm | 0.15 µm | 30 m | 290 °C | C-624-053-015-30 | | |
| MEGA-624 | 0.53 mm | 0.15 µm | 50 m | 290 °C | C-624-053-015-50 | | |
| MEGA-624 | 0.53 mm | 0.15 µm | 60 m | 290 °C | C-624-053-015-60 | | |
| MEGA-624 | 0.53 mm | 0.25 µm | 15 m | 280 °C | C-624-053-025-15 | | |
| MEGA-624 | 0.53 mm | 0.25 µm | 25 m | 280 °C | C-624-053-025-25 | | |
| MEGA-624 | 0.53 mm | 0.25 µm | 30 m | 280 °C | C-624-053-025-30 | | |
| MEGA-624 | 0.53 mm | 0.25 µm | 50 m | 280 °C | C-624-053-025-50 | | |
| MEGA-624 | 0.53 mm | 0.25 µm | 60 m | 280 °C | C-624-053-025-60 | | |
| MEGA-624 | 0.53 mm | 0.45 µm | 15 m | 280 °C | C-624-053-045-15 | | |
| MEGA-624 | 0.53 mm | 0.45 µm | 25 m | 280 °C | C-624-053-045-25 | | |
| MEGA-624 | 0.53 mm | 0.45 µm | 30 m | 280 °C | C-624-053-045-30 | | |
| MEGA-624 | 0.53 mm | 0.45 µm | 50 m | 280 °C | C-624-053-045-50 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-624 | 0.53 mm | 0.45 μm | 60 m | 280 °C | C-624-053-045-60 | | |
| MEGA-624 | 0.53 mm | 1.00 μm | 15 m | 280 °C | C-624-053-100-15 | | |
| MEGA-624 | 0.53 mm | 1.00 μm | 25 m | 280 °C | C-624-053-100-25 | | |
| MEGA-624 | 0.53 mm | 1.00 μm | 30 m | 280 °C | C-624-053-100-30 | | |
| MEGA-624 | 0.53 mm | 1.00 μm | 50 m | 280 °C | C-624-053-100-50 | | |
| MEGA-624 | 0.53 mm | 1.00 μm | 60 m | 280 °C | C-624-053-100-60 | | |
| MEGA-624 | 0.53 mm | 1.50 μm | 15 m | 280 °C | C-624-053-150-15 | | |
| MEGA-624 | 0.53 mm | 1.50 μm | 25 m | 280 °C | C-624-053-150-25 | | |
| MEGA-624 | 0.53 mm | 1.50 μm | 30 m | 280 °C | C-624-053-150-30 | | |
| MEGA-624 | 0.53 mm | 1.50 μm | 50 m | 280 °C | C-624-053-150-50 | | |
| MEGA-624 | 0.53 mm | 1.50 μm | 60 m | 280 °C | C-624-053-150-60 | | |
| MEGA-624 | 0.53 mm | 3.00 μm | 15 m | 280 °C | C-624-053-300-15 | | |
| MEGA-624 | 0.53 mm | 3.00 μm | 25 m | 280 °C | C-624-053-300-25 | | |
| MEGA-624 | 0.53 mm | 3.00 μm | 30 m | 280 °C | C-624-053-300-30 | | |
| MEGA-624 | 0.53 mm | 3.00 μm | 50 m | 280 °C | C-624-053-300-50 | | |
| MEGA-624 | 0.53 mm | 3.00 μm | 60 m | 280 °C | C-624-053-300-60 | | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

CUSTOM
DEDICATED
COLUMNS

CUSTOM-DEDICATED

dex xeb
chical columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

FAST-GC

GC-MS

GC-MS COLUMNS

MEGA GAP
Incorporated Retention Gap
Columns

MEGA-GAP (Incorporated Ret.-Gap)



HIGH TEMPERATURE COLUMNS

mega^{2D}

MULTIDIMENSIONAL GC

Last Updated:

Fused Silica Capillary Columns → MEGA-ACID (FFAP)

MEGA-ACID (FFAP)



View Full-Size
Image

Stationary Phase Characteristics

| | |
|--------------------|--|
| Composition | Polyethyleneglycol (PEG) Acid Modified |
| Polarity | High polarity |
| Crossbond | Bonded |
| Equivalent to | 007™-FFAP, AT™-1000, BPT™-21, CPT™-Wax 58 CB, DB™-FFAP, Nukol™, SPB™-1000, Stabilwax- DA™ |
| USP Classification | G14, G15, G16, G25, G35, G39 |

Applications

Free Acids , Organics Acids , Amides , Aromes Mixture , Chemicals

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|
| MEGA-ACID | 0.25 mm | 0.15 µm | 15 m | 260 °C | C-ACID-025-015-15 | |
| MEGA-ACID | 0.25 mm | 0.15 µm | 25 m | 260 °C | C-ACID-025-015-25 | |
| MEGA-ACID | 0.25 mm | 0.15 µm | 30 m | 260 °C | C-ACID-025-015-30 | |
| MEGA-ACID | 0.25 mm | 0.15 µm | 50 m | 260 °C | C-ACID-025-015-50 | |
| MEGA-ACID | 0.25 mm | 0.15 µm | 60 m | 260 °C | C-ACID-025-015-60 | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-ACID | 0.25 mm | 0.25 µm | 15 m | 260 °C | C-ACID-025-025-15 | | |
| MEGA-ACID | 0.25 mm | 0.25 µm | 25 m | 260 °C | C-ACID-025-025-25 | | |
| MEGA-ACID | 0.25 mm | 0.25 µm | 30 m | 260 °C | C-ACID-025-025-30 | | |
| MEGA-ACID | 0.25 mm | 0.25 µm | 50 m | 260 °C | C-ACID-025-025-50 | | |
| MEGA-ACID | 0.25 mm | 0.25 µm | 60 m | 260 °C | C-ACID-025-025-60 | | |
| MEGA-ACID | 0.25 mm | 0.45 µm | 15 m | 260 °C | C-ACID-025-045-15 | | |
| MEGA-ACID | 0.25 mm | 0.45 µm | 25 m | 260 °C | C-ACID-025-045-25 | | |
| MEGA-ACID | 0.25 mm | 0.45 µm | 30 m | 260 °C | C-ACID-025-045-30 | | |
| MEGA-ACID | 0.25 mm | 0.45 µm | 50 m | 260 °C | C-ACID-025-045-50 | | |
| MEGA-ACID | 0.25 mm | 0.45 µm | 60 m | 260 °C | C-ACID-025-045-60 | | |
| MEGA-ACID | 0.25 mm | 1.00 µm | 15 m | 260 °C | C-ACID-025-100-15 | | |
| MEGA-ACID | 0.25 mm | 1.00 µm | 25 m | 260 °C | C-ACID-025-100-25 | | |
| MEGA-ACID | 0.25 mm | 1.00 µm | 30 m | 260 °C | C-ACID-025-100-30 | | |
| MEGA-ACID | 0.25 mm | 1.00 µm | 50 m | 260 °C | C-ACID-025-100-50 | | |
| MEGA-ACID | 0.25 mm | 1.00 µm | 60 m | 260 °C | C-ACID-025-100-60 | | |
| MEGA-ACID | 0.32 mm | 0.15 µm | 15 m | 260 °C | C-ACID-032-015-15 | | |
| MEGA-ACID | 0.32 mm | 0.15 µm | 25 m | 260 °C | C-ACID-032-015-25 | | |
| MEGA-ACID | 0.32 mm | 0.15 µm | 30 m | 260 °C | C-ACID-032-015-30 | | |
| MEGA-ACID | 0.32 mm | 0.15 µm | 50 m | 260 °C | C-ACID-032-015-50 | | |
| MEGA-ACID | 0.32 mm | 0.15 µm | 60 m | 260 °C | C-ACID-032-015-60 | | |
| MEGA-ACID | 0.32 mm | 0.25 µm | 15 m | 260 °C | C-ACID-032-025-15 | | |
| MEGA-ACID | 0.32 mm | 0.25 µm | 25 m | 260 °C | C-ACID-032-025-25 | | |
| MEGA-ACID | 0.32 mm | 0.25 µm | 30 m | 260 °C | C-ACID-032-025-30 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-ACID | 0.32 mm | 0.25 µm | 50 m | 260 °C | C-ACID-032-025-50 | | |
| MEGA-ACID | 0.32 mm | 0.25 µm | 60 m | 260 °C | C-ACID-032-025-60 | | |
| MEGA-ACID | 0.32 mm | 0.32 µm | 15 m | 260 °C | C-ACID-032-032-15 | | |
| MEGA-ACID | 0.32 mm | 0.32 µm | 25 m | 260 °C | C-ACID-032-032-25 | | |
| MEGA-ACID | 0.32 mm | 0.32 µm | 30 m | 260 °C | C-ACID-032-032-30 | | |
| MEGA-ACID | 0.32 mm | 0.32 µm | 50 m | 260 °C | C-ACID-032-032-50 | | |
| MEGA-ACID | 0.32 mm | 0.32 µm | 60 m | 260 °C | C-ACID-032-032-60 | | |
| MEGA-ACID | 0.32 mm | 0.45 µm | 15 m | 260 °C | C-ACID-032-045-15 | | |
| MEGA-ACID | 0.32 mm | 0.45 µm | 25 m | 260 °C | C-ACID-032-045-25 | | |
| MEGA-ACID | 0.32 mm | 0.45 µm | 30 m | 260 °C | C-ACID-032-045-30 | | |
| MEGA-ACID | 0.32 mm | 0.45 µm | 50 m | 260 °C | C-ACID-032-045-50 | | |
| MEGA-ACID | 0.32 mm | 0.45 µm | 60 m | 260 °C | C-ACID-032-045-60 | | |
| MEGA-ACID | 0.32 mm | 1.00 µm | 15 m | 260 °C | C-ACID-032-100-15 | | |
| MEGA-ACID | 0.32 mm | 1.00 µm | 25 m | 260 °C | C-ACID-032-100-25 | | |
| MEGA-ACID | 0.32 mm | 1.00 µm | 30 m | 260 °C | C-ACID-032-100-30 | | |
| MEGA-ACID | 0.32 mm | 1.00 µm | 50 m | 260 °C | C-ACID-032-100-50 | | |
| MEGA-ACID | 0.32 mm | 1.00 µm | 60 m | 260 °C | C-ACID-032-100-60 | | |
| MEGA-ACID | 0.53 mm | 0.15 µm | 15 m | 260 °C | C-ACID-053-015-15 | | |
| MEGA-ACID | 0.53 mm | 0.15 µm | 25 m | 260 °C | C-ACID-053-015-25 | | |
| MEGA-ACID | 0.53 mm | 0.15 µm | 30 m | 260 °C | C-ACID-053-015-30 | | |
| MEGA-ACID | 0.53 mm | 0.15 µm | 50 m | 260 °C | C-ACID-053-015-50 | | |
| MEGA-ACID | 0.53 mm | 0.15 µm | 60 m | 260 °C | C-ACID-053-015-60 | | |
| MEGA-ACID | 0.53 mm | 0.25 µm | 15 m | 260 °C | C-ACID-053-025-15 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-ACID | 0.53 mm | 0.25 µm | 25 m | 260 °C | C-ACID-053-025-25 | | |
| MEGA-ACID | 0.53 mm | 0.25 µm | 30 m | 260 °C | C-ACID-053-025-30 | | |
| MEGA-ACID | 0.53 mm | 0.25 µm | 50 m | 260 °C | C-ACID-053-025-50 | | |
| MEGA-ACID | 0.53 mm | 0.25 µm | 60 m | 260 °C | C-ACID-053-025-60 | | |
| MEGA-ACID | 0.53 mm | 0.45 µm | 15 m | 260 °C | C-ACID-053-045-15 | | |
| MEGA-ACID | 0.53 mm | 0.45 µm | 25 m | 260 °C | C-ACID-053-045-25 | | |
| MEGA-ACID | 0.53 mm | 0.45 µm | 30 m | 260 °C | C-ACID-053-045-30 | | |
| MEGA-ACID | 0.53 mm | 0.45 µm | 50 m | 260 °C | C-ACID-053-045-50 | | |
| MEGA-ACID | 0.53 mm | 0.45 µm | 60 m | 260 °C | C-ACID-053-045-60 | | |
| MEGA-ACID | 0.53 mm | 1.00 µm | 15 m | 260 °C | C-ACID-053-100-15 | | |
| MEGA-ACID | 0.53 mm | 1.00 µm | 25 m | 260 °C | C-ACID-053-100-25 | | |
| MEGA-ACID | 0.53 mm | 1.00 µm | 30 m | 260 °C | C-ACID-053-100-30 | | |
| MEGA-ACID | 0.53 mm | 1.00 µm | 50 m | 260 °C | C-ACID-053-100-50 | | |
| MEGA-ACID | 0.53 mm | 1.00 µm | 60 m | 260 °C | C-ACID-053-100-60 | | |

You may also be interested in this/these product(s):

MEGA-ACID (FFAP) FAST



Add to Cart

MEGA-WAX FAST



Add to Cart

MEGA-WAX



Add to Cart

Vendor Information

more categories

Fused Silica Capillary Columns → CUSTOM-DEDICATED → MEGA-ALC



[View Full-Size Image](#)

MEGA-ALC

(Mega s.n.c.)

Application-specific columns for Blood Alcohols testing (equivalent to DB-ALC 1 & 2 and Rtx BAC 1 & 2). Available also the MEGA-ALC 1 + 2 Kit; contact us to have more details.

Application Notes

Blood Alcohols (head space analysis)

| Description | | | | | Q.ta | |
|-------------|---------|---------|------|--------------------|------|--|
| MEGA-ALC 1 | 0.32 mm | 1.50 µm | 30 m | C-ALC-1-032-150-30 | | |
| MEGA-ALC 2 | 0.32 mm | 1.00 µm | 30 m | C-ALC-2-032-100-30 | | |



**CUSTOM
DEDICATED
COLUMNS**

MEGA-BASIC

Phase Characteristics

Equivalent to

unique column

Application Notes

Amines

Listed below you can see the column dimensions optimized for the analysis shown in the application note (you can download or open the application note in PDF format). You can completely customize a product simply by send us an e-mail or a fax (see [help with ordering](#) page) to **request your custom product for your specific analytical problem**.

| Description | Internal Diameter | Film Thickness | Length | Code # | Q.ta |
|-------------|-------------------|----------------|--------|--------------------|------|
| MEGA-BASIC | 0.32 mm | 0.25 µm | 25 m | C-BASIC-032-025-25 | |

Vendor Information

more categories

STANDARD

CUSTOM-DEDICATED

MEGA-DEX (CHIRAL PHASES)

FAST-GC



**CUSTOM
DEDICATED
COLUMNS**

View Full-Size
Image

(Mega s.n.c.)

The MEGA-BIODIESEL Columns warrant a very high stability of the stationary phase up to 370°C and over, thus to achieve absolute quality BIODIESEL analysis. Very low bleeding and perfect shape peaks are the principals characteristics of these columns.

unique columns

UNI EN ISO 14105 (ASTM 6584), UNI EN ISO 14103

EPA Methods / Normatives

BIODIESEL 1 (UNI EN ISO 14105, ASTM 6584) , BIODIESEL 2 (UNI EN ISO 14103:2003)

Listed below you can see the column dimensions optimized for the analysis shown in the application notes (you can download or open the application notes in PDF format). You can completely customize a product simply by send us an e-mail or a fax (see [contact us](#) page) to **request your custom product for your specific analytical problem.**

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------------|-------------------|----------------|--------|-----------------|---------------------------|------|
| MEGA-BIODIESEL105 | 0.32 mm | 0.10 µm | 15 m | 390°C | C-BIODIESEL105-032-010-15 | |
| MEGA-BIODIESEL103 | 0.32 mm | 0.25 µm | 30 m | n.d. | C-BIODIESEL103-032-025-30 | |
| MEGA-BIODIESEL110 | 0.32 mm | 1.00 µm | 30 m | n.d. | C-BIODIESEL110-032-100-30 | |

Fused Silica Capillary Columns → MEGA-DAI



[View Full-Size Image](#)

MEGA-DAI

(Mega s.n.c.)

Phase Characteristics

The stationary phases MEGA-DAI 1 & 2 (Direct Aqueous Injections), allow you to introduce aqueous samples directly into the column, avoiding sample preparation.

Equivalent to **unique** columns

Application Notes

Halogenated Aqueosus Compounds

Listed below you can see the column dimensions optimized for the analysis shown in the application note (you can download or open the application note in PDF format). You can completely customize a product simply by send us an e-mail or a fax (see [help with ordering page](#)) to **request your custom product for your specific analytical problem.**

| Description | Internal Diameter | Film Thickness | Length | Code # | Q.ta |
|-------------|-------------------|----------------|--------|------------------|------|
| MEGA-DAI | 0.32 mm | 5 µm | 30 m | C-DAI-032-500-30 | |

Vendor Information

more categories

Standard
conventional GC columns

STANDARD

CUSTOM
DEDICATED
COLUMNS

CUSTOM-DEDICATED

dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

FAST-GC



Fused Silica Capillary Columns → MEGA-JXR



View Full-Size
Image

MEGA-JXR

Stationary Phase Characteristics

| | |
|---------------|--------------------------|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | / |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|--|
| MEGA-JXR | 0.25 mm | 0.15 µm | 15 m | 350 °C | C-JXR-025-015-15 | | |
| MEGA-JXR | 0.25 mm | 0.15 µm | 25 m | 350 °C | C-JXR-025-015-25 | | |
| MEGA-JXR | 0.25 mm | 0.15 µm | 30 m | 350 °C | C-JXR-025-015-30 | | |
| MEGA-JXR | 0.25 mm | 0.15 µm | 50 m | 350 °C | C-JXR-025-015-50 | | |
| MEGA-JXR | 0.25 mm | 0.15 µm | 60 m | 350 °C | C-JXR-025-015-60 | | |
| MEGA-JXR | 0.25 mm | 0.25 µm | 15 m | 350 °C | C-JXR-025-025-15 | | |
| MEGA-JXR | 0.25 mm | 0.25 µm | 25 m | 350 °C | C-JXR-025-025-25 | | |
| MEGA-JXR | 0.25 mm | 0.25 µm | 30 m | 350 °C | C-JXR-025-025-30 | | |
| MEGA-JXR | 0.25 mm | 0.25 µm | 50 m | 350 °C | C-JXR-025-025-50 | | |
| MEGA-JXR | 0.25 mm | 0.25 µm | 60 m | 350 °C | C-JXR-025-025-60 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-JXR | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-JXR-025-045-15 | | |
| MEGA-JXR | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-JXR-025-045-25 | | |
| MEGA-JXR | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-JXR-025-045-30 | | |
| MEGA-JXR | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-JXR-025-045-50 | | |
| MEGA-JXR | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-JXR-025-045-60 | | |
| MEGA-JXR | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-JXR-025-100-15 | | |
| MEGA-JXR | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-JXR-025-100-25 | | |
| MEGA-JXR | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-JXR-025-100-30 | | |
| MEGA-JXR | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-JXR-025-100-50 | | |
| MEGA-JXR | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-JXR-025-100-60 | | |
| MEGA-JXR | 0.25 mm | 1.50 µm | 15 m | 300 °C | C-JXR-025-150-15 | | |
| MEGA-JXR | 0.25 mm | 1.50 µm | 25 m | 300 °C | C-JXR-025-150-25 | | |
| MEGA-JXR | 0.25 mm | 1.50 µm | 30 m | 300 °C | C-JXR-025-150-30 | | |
| MEGA-JXR | 0.25 mm | 1.50 µm | 50 m | 300 °C | C-JXR-025-150-50 | | |
| MEGA-JXR | 0.25 mm | 1.50 µm | 60 m | 300 °C | C-JXR-025-150-60 | | |
| MEGA-JXR | 0.32 mm | 0.15 µm | 15 m | 350 °C | C-JXR-032-015-15 | | |
| MEGA-JXR | 0.32 mm | 0.15 µm | 25 m | 350 °C | C-JXR-032-015-25 | | |
| MEGA-JXR | 0.32 mm | 0.15 µm | 30 m | 350 °C | C-JXR-032-015-30 | | |
| MEGA-JXR | 0.32 mm | 0.15 µm | 50 m | 350 °C | C-JXR-032-015-50 | | |
| MEGA-JXR | 0.32 mm | 0.15 µm | 60 m | 350 °C | C-JXR-032-015-60 | | |
| MEGA-JXR | 0.32 mm | 0.25 µm | 15 m | 350 °C | C-JXR-032-025-15 | | |
| MEGA-JXR | 0.32 mm | 0.25 µm | 25 m | 350 °C | C-JXR-032-025-25 | | |
| MEGA-JXR | 0.32 mm | 0.25 µm | 30 m | 350 °C | C-JXR-032-025-30 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-JXR | 0.32 mm | 0.25 µm | 50 m | 350 °C | C-JXR-032-025-50 | | |
| MEGA-JXR | 0.32 mm | 0.25 µm | 60 m | 350 °C | C-JXR-032-025-60 | | |
| MEGA-JXR | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-JXR-032-032-15 | | |
| MEGA-JXR | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-JXR-032-032-25 | | |
| MEGA-JXR | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-JXR-032-032-30 | | |
| MEGA-JXR | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-JXR-032-032-50 | | |
| MEGA-JXR | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-JXR-032-032-60 | | |
| MEGA-JXR | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-JXR-032-045-15 | | |
| MEGA-JXR | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-JXR-032-045-25 | | |
| MEGA-JXR | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-JXR-032-045-30 | | |
| MEGA-JXR | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-JXR-032-045-50 | | |
| MEGA-JXR | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-JXR-032-045-60 | | |
| MEGA-JXR | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-JXR-032-100-15 | | |
| MEGA-JXR | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-JXR-032-100-25 | | |
| MEGA-JXR | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-JXR-032-100-30 | | |
| MEGA-JXR | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-JXR-032-100-50 | | |
| MEGA-JXR | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-JXR-032-100-60 | | |
| MEGA-JXR | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-JXR-032-150-15 | | |
| MEGA-JXR | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-JXR-032-150-25 | | |
| MEGA-JXR | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-JXR-032-150-30 | | |
| MEGA-JXR | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-JXR-032-150-50 | | |
| MEGA-JXR | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-JXR-032-150-60 | | |
| MEGA-JXR | 0.32 mm | 3.00 µm | 15 m | 300 °C | C-JXR-032-300-15 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-JXR | 0.32 mm | 3.00 µm | 25 m | 300 °C | C-JXR-032-300-25 | | |
| MEGA-JXR | 0.32 mm | 3.00 µm | 30 m | 300 °C | C-JXR-032-300-30 | | |
| MEGA-JXR | 0.32 mm | 3.00 µm | 50 m | 300 °C | C-JXR-032-300-50 | | |
| MEGA-JXR | 0.32 mm | 3.00 µm | 60 m | 300 °C | C-JXR-032-300-60 | | |
| MEGA-JXR | 0.32 mm | 5.00 µm | 15 m | 300 °C | C-JXR-032-500-15 | | |
| MEGA-JXR | 0.32 mm | 5.00 µm | 25 m | 300 °C | C-JXR-032-500-25 | | |
| MEGA-JXR | 0.32 mm | 5.00 µm | 30 m | 300 °C | C-JXR-032-500-30 | | |
| MEGA-JXR | 0.32 mm | 5.00 µm | 50 m | 300 °C | C-JXR-032-500-50 | | |
| MEGA-JXR | 0.32 mm | 5.00 µm | 60 m | 300 °C | C-JXR-032-500-60 | | |
| MEGA-JXR | 0.53 mm | 0.15 µm | 15 m | 350 °C | C-JXR-053-015-15 | | |
| MEGA-JXR | 0.53 mm | 0.15 µm | 25 m | 350 °C | C-JXR-053-015-25 | | |
| MEGA-JXR | 0.53 mm | 0.15 µm | 30 m | 350 °C | C-JXR-053-015-30 | | |
| MEGA-JXR | 0.53 mm | 0.15 µm | 50 m | 350 °C | C-JXR-053-015-50 | | |
| MEGA-JXR | 0.53 mm | 0.15 µm | 60 m | 350 °C | C-JXR-053-015-60 | | |
| MEGA-JXR | 0.53 mm | 0.25 µm | 15 m | 350 °C | C-JXR-053-025-15 | | |
| MEGA-JXR | 0.53 mm | 0.25 µm | 25 m | 350 °C | C-JXR-053-025-25 | | |
| MEGA-JXR | 0.53 mm | 0.25 µm | 30 m | 350 °C | C-JXR-053-025-30 | | |
| MEGA-JXR | 0.53 mm | 0.25 µm | 50 m | 350 °C | C-JXR-053-025-50 | | |
| MEGA-JXR | 0.53 mm | 0.25 µm | 60 m | 350 °C | C-JXR-053-025-60 | | |
| MEGA-JXR | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-JXR-053-045-15 | | |
| MEGA-JXR | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-JXR-053-045-25 | | |
| MEGA-JXR | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-JXR-053-045-30 | | |
| MEGA-JXR | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-JXR-053-045-50 | | |

| | | | | | | | |
|----------|---------|---------|------|--------|------------------|--|--|
| MEGA-JXR | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-JXR-053-045-60 | | |
| MEGA-JXR | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-JXR-053-100-15 | | |
| MEGA-JXR | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-JXR-053-100-25 | | |
| MEGA-JXR | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-JXR-053-100-30 | | |
| MEGA-JXR | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-JXR-053-100-50 | | |
| MEGA-JXR | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-JXR-053-100-60 | | |
| MEGA-JXR | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-JXR-053-150-15 | | |
| MEGA-JXR | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-JXR-053-150-25 | | |
| MEGA-JXR | 0.53 mm | 1.50 µm | 30 m | 300 °C | C-JXR-053-150-30 | | |
| MEGA-JXR | 0.53 mm | 1.50 µm | 50 m | 300 °C | C-JXR-053-150-50 | | |
| MEGA-JXR | 0.53 mm | 1.50 µm | 60 m | 300 °C | C-JXR-053-150-60 | | |
| MEGA-JXR | 0.53 mm | 3.00 µm | 15 m | 300 °C | C-JXR-053-300-15 | | |
| MEGA-JXR | 0.53 mm | 3.00 µm | 25 m | 300 °C | C-JXR-053-300-25 | | |
| MEGA-JXR | 0.53 mm | 3.00 µm | 30 m | 300 °C | C-JXR-053-300-30 | | |
| MEGA-JXR | 0.53 mm | 3.00 µm | 50 m | 300 °C | C-JXR-053-300-50 | | |
| MEGA-JXR | 0.53 mm | 3.00 µm | 60 m | 300 °C | C-JXR-053-300-60 | | |
| MEGA-JXR | 0.53 mm | 5.00 µm | 15 m | 300 °C | C-JXR-053-500-15 | | |
| MEGA-JXR | 0.53 mm | 5.00 µm | 25 m | 300 °C | C-JXR-053-500-25 | | |
| MEGA-JXR | 0.53 mm | 5.00 µm | 30 m | 300 °C | C-JXR-053-500-30 | | |
| MEGA-JXR | 0.53 mm | 5.00 µm | 50 m | 300 °C | C-JXR-053-500-50 | | |
| MEGA-JXR | 0.53 mm | 5.00 µm | 60 m | 300 °C | C-JXR-053-500-60 | | |



**CUSTOM
DEDICATED
COLUMNS**

MEGA-LAP

Phase Characteristics

Equivalent to **unique** column

Sterols (TMS) Peanut Oil , Sterols (TMS) Sunflower Oil , Sterols (TMS) Mais Oil , Sterols (TMS) Soya Oil , Triglycerides Olive Oil , Triglycerides Hazelnut Oil

Here you can see the dimensions for the column optimized for the analysis shown in the application notes (you can open and download for free the applications in PDF format). You can completely customize a product simply by sending us an e-mail or a fax (see [help with ordering](#) page) to **request your specific product for your specific analytical problem**.

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|------------------|------|
| MEGA-LAP | 0.32 mm | 0.10 µm | 25 m | 370°C | C-LAP-032-010-25 | |

more categories

STANDARD

CUSTOM-DEDICATED

MEGA-DEX (CHIRAL PHASES)

FAST-GC

Fused Silica Capillary Columns → MEGA-PLUS

MEGA-PLUS



View Full-Size
Image

Stationary Phase Characteristics

| | |
|---------------|---|
| Composition | Copolymer Polyethyleneglycol (PEG) + Methyl Polisiloxane |
| Polarity | Mid to High polarity |
| Crossbond | Yes |
| Equivalent to | unique column |

Tune the selectivity of your MEGA-PLUS column choosing between the uniques **MEGA-PLUS 10** (10% PEG, 90% PDMS), **MEGA-PLUS 25** (25% PEG, 75% PDMS), **MEGA-PLUS 75** (75% PEG, 25% PDMS) or contact us to *fully personalize your MEGA-PLUS composition!*

0.15mm, 0.18mm, 0.20mm IDs also available! We offer the most complete range of sizes and stationary phases. Ask us for a completely custom solution to fully personalize your column for your particular analytical problem!

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|--|
| MEGA-PLUS | 0.25 mm | 0.15 µm | 15 m | 280 °C | C-PLUS-025-015-15 | | |
| MEGA-PLUS | 0.25 mm | 0.15 µm | 25 m | 280 °C | C-PLUS-025-015-25 | | |
| MEGA-PLUS | 0.25 mm | 0.15 µm | 30 m | 280 °C | C-PLUS-025-015-30 | | |
| MEGA-PLUS | 0.25 mm | 0.15 µm | 50 m | 280 °C | C-PLUS-025-015-50 | | |
| MEGA-PLUS | 0.25 mm | 0.15 µm | 60 m | 280 °C | C-PLUS-025-015-60 | | |
| MEGA-PLUS | 0.25 mm | 0.25 µm | 15 m | 280 °C | C-PLUS-025-025-15 | | |
| MEGA-PLUS | 0.25 mm | 0.25 µm | 25 m | 280 °C | C-PLUS-025-025-25 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-PLUS | 0.25 mm | 0.25 µm | 30 m | 280 °C | C-PLUS-025-025-30 | | |
| MEGA-PLUS | 0.25 mm | 0.25 µm | 50 m | 280 °C | C-PLUS-025-025-50 | | |
| MEGA-PLUS | 0.25 mm | 0.25 µm | 60 m | 280 °C | C-PLUS-025-025-60 | | |
| MEGA-PLUS | 0.25 mm | 0.45 µm | 15 m | 280 °C | C-PLUS-025-045-15 | | |
| MEGA-PLUS | 0.25 mm | 0.45 µm | 25 m | 280 °C | C-PLUS-025-045-25 | | |
| MEGA-PLUS | 0.25 mm | 0.45 µm | 30 m | 280 °C | C-PLUS-025-045-30 | | |
| MEGA-PLUS | 0.25 mm | 0.45 µm | 50 m | 280 °C | C-PLUS-025-045-50 | | |
| MEGA-PLUS | 0.25 mm | 0.45 µm | 60 m | 280 °C | C-PLUS-025-045-60 | | |
| MEGA-PLUS | 0.25 mm | 1.00 µm | 15 m | 280 °C | C-PLUS-025-100-15 | | |
| MEGA-PLUS | 0.25 mm | 1.00 µm | 25 m | 280 °C | C-PLUS-025-100-25 | | |
| MEGA-PLUS | 0.25 mm | 1.00 µm | 30 m | 280 °C | C-PLUS-025-100-30 | | |
| MEGA-PLUS | 0.25 mm | 1.00 µm | 50 m | 280 °C | C-PLUS-025-100-50 | | |
| MEGA-PLUS | 0.25 mm | 1.00 µm | 60 m | 280 °C | C-PLUS-025-100-60 | | |
| MEGA-PLUS | 0.32 mm | 0.15 µm | 15 m | 280 °C | C-PLUS-032-015-15 | | |
| MEGA-PLUS | 0.32 mm | 0.15 µm | 25 m | 280 °C | C-PLUS-032-015-25 | | |
| MEGA-PLUS | 0.32 mm | 0.15 µm | 30 m | 280 °C | C-PLUS-032-015-30 | | |
| MEGA-PLUS | 0.32 mm | 0.15 µm | 50 m | 280 °C | C-PLUS-032-015-50 | | |
| MEGA-PLUS | 0.32 mm | 0.15 µm | 60 m | 280 °C | C-PLUS-032-015-60 | | |
| MEGA-PLUS | 0.32 mm | 0.25 µm | 15 m | 280 °C | C-PLUS-032-025-15 | | |
| MEGA-PLUS | 0.32 mm | 0.25 µm | 25 m | 280 °C | C-PLUS-032-025-25 | | |
| MEGA-PLUS | 0.32 mm | 0.25 µm | 30 m | 280 °C | C-PLUS-032-025-30 | | |
| MEGA-PLUS | 0.32 mm | 0.25 µm | 50 m | 280 °C | C-PLUS-032-025-50 | | |
| MEGA-PLUS | 0.32 mm | 0.25 µm | 60 m | 280 °C | C-PLUS-032-025-60 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-PLUS | 0.32 mm | 0.32 µm | 15 m | 280 °C | C-PLUS-032-032-15 | | |
| MEGA-PLUS | 0.32 mm | 0.32 µm | 25 m | 280 °C | C-PLUS-032-032-25 | | |
| MEGA-PLUS | 0.32 mm | 0.32 µm | 30 m | 280 °C | C-PLUS-032-032-30 | | |
| MEGA-PLUS | 0.32 mm | 0.32 µm | 50 m | 280 °C | C-PLUS-032-032-50 | | |
| MEGA-PLUS | 0.32 mm | 0.32 µm | 60 m | 280 °C | C-PLUS-032-032-60 | | |
| MEGA-PLUS | 0.32 mm | 0.45 µm | 15 m | 280 °C | C-PLUS-032-045-15 | | |
| MEGA-PLUS | 0.32 mm | 0.45 µm | 25 m | 280 °C | C-PLUS-032-045-25 | | |
| MEGA-PLUS | 0.32 mm | 0.45 µm | 30 m | 280 °C | C-PLUS-032-045-30 | | |
| MEGA-PLUS | 0.32 mm | 0.45 µm | 50 m | 280 °C | C-PLUS-032-045-50 | | |
| MEGA-PLUS | 0.32 mm | 0.45 µm | 60 m | 280 °C | C-PLUS-032-045-60 | | |
| MEGA-PLUS | 0.32 mm | 1.00 µm | 15 m | 280 °C | C-PLUS-032-100-15 | | |
| MEGA-PLUS | 0.32 mm | 1.00 µm | 25 m | 280 °C | C-PLUS-032-100-25 | | |
| MEGA-PLUS | 0.32 mm | 1.00 µm | 30 m | 280 °C | C-PLUS-032-100-30 | | |
| MEGA-PLUS | 0.32 mm | 1.00 µm | 50 m | 280 °C | C-PLUS-032-100-50 | | |
| MEGA-PLUS | 0.32 mm | 1.00 µm | 60 m | 280 °C | C-PLUS-032-100-60 | | |
| MEGA-PLUS | 0.53 mm | 0.15 µm | 15 m | 280 °C | C-PLUS-053-015-15 | | |
| MEGA-PLUS | 0.53 mm | 0.15 µm | 25 m | 280 °C | C-PLUS-053-015-25 | | |
| MEGA-PLUS | 0.53 mm | 0.15 µm | 30 m | 280 °C | C-PLUS-053-015-30 | | |
| MEGA-PLUS | 0.53 mm | 0.15 µm | 50 m | 280 °C | C-PLUS-053-015-50 | | |
| MEGA-PLUS | 0.53 mm | 0.15 µm | 60 m | 280 °C | C-PLUS-053-015-60 | | |
| MEGA-PLUS | 0.53 mm | 0.25 µm | 15 m | 280 °C | C-PLUS-053-025-15 | | |
| MEGA-PLUS | 0.53 mm | 0.25 µm | 25 m | 280 °C | C-PLUS-053-025-25 | | |
| MEGA-PLUS | 0.53 mm | 0.25 µm | 30 m | 280 °C | C-PLUS-053-025-30 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-PLUS | 0.53 mm | 0.25 µm | 50 m | 280 °C | C-PLUS-053-025-50 | | |
| MEGA-PLUS | 0.53 mm | 0.25 µm | 60 m | 280 °C | C-PLUS-053-025-60 | | |
| MEGA-PLUS | 0.53 mm | 0.45 µm | 15 m | 280 °C | C-PLUS-053-045-15 | | |
| MEGA-PLUS | 0.53 mm | 0.45 µm | 25 m | 280 °C | C-PLUS-053-045-25 | | |
| MEGA-PLUS | 0.53 mm | 0.45 µm | 30 m | 280 °C | C-PLUS-053-045-30 | | |
| MEGA-PLUS | 0.53 mm | 0.45 µm | 50 m | 280 °C | C-PLUS-053-045-50 | | |
| MEGA-PLUS | 0.53 mm | 0.45 µm | 60 m | 280 °C | C-PLUS-053-045-60 | | |
| MEGA-PLUS | 0.53 mm | 1.00 µm | 15 m | 280 °C | C-PLUS-053-100-15 | | |
| MEGA-PLUS | 0.53 mm | 1.00 µm | 25 m | 280 °C | C-PLUS-053-100-25 | | |
| MEGA-PLUS | 0.53 mm | 1.00 µm | 30 m | 280 °C | C-PLUS-053-100-30 | | |
| MEGA-PLUS | 0.53 mm | 1.00 µm | 50 m | 280 °C | C-PLUS-053-100-50 | | |
| MEGA-PLUS | 0.53 mm | 1.00 µm | 60 m | 280 °C | C-PLUS-053-100-60 | | |

You may also be interested in this/these product(s):

MEGA-PLUS FAST



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COLUMNS

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dex xeb
chiral columns

MEGA-DEX (CHIRAL PHASES)

FAST-GC
columns

FAST-GC

Fused Silica Capillary Columns → CUSTOM-DEDICATED → MEGA-POF



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MEGA-POF

(Mega s.n.c.)

Caratteristiche Fase

Le fasi MEGA-POF 1 e 2 sono appositamente studiate per le analisi di miscele complesse di Pesticidi, Erbicidi ed Insetticidi.

Equivalenza Fasi

nuove colonne senza equivalenti

Applicazioni

Qui di seguito sono proposte le dimensioni ottimizzate per le analisi eseguite nelle applicazioni (visibili e scaricabili in formato PDF). Come per tutti i nostri prodotti **potete richiedere un prodotto completamente personalizzato**. Per fare questo inviateci un fax o una e-mail (vedi la pagina [Richiesta di Offerte/Ordini](#)) richiedendo la fattibilità e il preventivo per un prodotto non presente in catalogo.

Description

Q.ta

| | | | | | | | |
|------------|------------|---------|---------|------|-------------------|--|--|
| MEGA-POF 1 | MEGA-POF 1 | 0.32 mm | 0.25 µm | 25 m | C-POF1-032-025-25 | | |
|------------|------------|---------|---------|------|-------------------|--|--|

[View Full-Size Image](#)

Stationary Phase Characteristics

Applications

Alcoli

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS255 | 0.25 mm | 0.25 µm | 30 m | 350 °C | C-PS255-025-025-30 | | |
| MEGA-PS255 | 0.25 mm | 0.25 µm | 50 m | 350 °C | C-PS255-025-025-50 | | |
| MEGA-PS255 | 0.25 mm | 0.25 µm | 60 m | 350 °C | C-PS255-025-025-60 | | |
| MEGA-PS255 | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-PS255-025-045-15 | | |
| MEGA-PS255 | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-PS255-025-045-25 | | |
| MEGA-PS255 | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-PS255-025-045-30 | | |
| MEGA-PS255 | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-PS255-025-045-50 | | |
| MEGA-PS255 | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-PS255-025-045-60 | | |
| MEGA-PS255 | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-PS255-025-100-15 | | |
| MEGA-PS255 | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-PS255-025-100-25 | | |
| MEGA-PS255 | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-PS255-025-100-30 | | |
| MEGA-PS255 | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-PS255-025-100-50 | | |
| MEGA-PS255 | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-PS255-025-100-60 | | |
| MEGA-PS255 | 0.25 mm | 1.50 µm | 15 m | 300 °C | C-PS255-025-150-15 | | |
| MEGA-PS255 | 0.25 mm | 1.50 µm | 25 m | 300 °C | C-PS255-025-150-25 | | |
| MEGA-PS255 | 0.25 mm | 1.50 µm | 30 m | 300 °C | C-PS255-025-150-30 | | |
| MEGA-PS255 | 0.25 mm | 1.50 µm | 50 m | 300 °C | C-PS255-025-150-50 | | |
| MEGA-PS255 | 0.25 mm | 1.50 µm | 60 m | 300 °C | C-PS255-025-150-60 | | |
| MEGA-PS255 | 0.32 mm | 0.15 µm | 15 m | 350 °C | C-PS255-032-015-15 | | |
| MEGA-PS255 | 0.32 mm | 0.15 µm | 25 m | 350 °C | C-PS255-032-015-25 | | |
| MEGA-PS255 | 0.32 mm | 0.15 µm | 30 m | 350 °C | C-PS255-032-015-30 | | |
| MEGA-PS255 | 0.32 mm | 0.15 µm | 50 m | 350 °C | C-PS255-032-015-50 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS255 | 0.32 mm | 0.15 µm | 60 m | 350 °C | C-PS255-032-015-60 | | |
| MEGA-PS255 | 0.32 mm | 0.25 µm | 15 m | 350 °C | C-PS255-032-025-15 | | |
| MEGA-PS255 | 0.32 mm | 0.25 µm | 25 m | 350 °C | C-PS255-032-025-25 | | |
| MEGA-PS255 | 0.32 mm | 0.25 µm | 30 m | 350 °C | C-PS255-032-025-30 | | |
| MEGA-PS255 | 0.32 mm | 0.25 µm | 50 m | 350 °C | C-PS255-032-025-50 | | |
| MEGA-PS255 | 0.32 mm | 0.25 µm | 60 m | 350 °C | C-PS255-032-025-60 | | |
| MEGA-PS255 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-PS255-032-032-15 | | |
| MEGA-PS255 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-PS255-032-032-25 | | |
| MEGA-PS255 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-PS255-032-032-30 | | |
| MEGA-PS255 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-PS255-032-032-50 | | |
| MEGA-PS255 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-PS255-032-032-60 | | |
| MEGA-PS255 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-PS255-032-045-15 | | |
| MEGA-PS255 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-PS255-032-045-25 | | |
| MEGA-PS255 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-PS255-032-045-30 | | |
| MEGA-PS255 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-PS255-032-045-50 | | |
| MEGA-PS255 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-PS255-032-045-60 | | |
| MEGA-PS255 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-PS255-032-100-15 | | |
| MEGA-PS255 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-PS255-032-100-25 | | |
| MEGA-PS255 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-PS255-032-100-30 | | |
| MEGA-PS255 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-PS255-032-100-50 | | |
| MEGA-PS255 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-PS255-032-100-60 | | |
| MEGA-PS255 | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-PS255-032-150-15 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS255 | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-PS255-032-150-25 | | |
| MEGA-PS255 | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-PS255-032-150-30 | | |
| MEGA-PS255 | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-PS255-032-150-50 | | |
| MEGA-PS255 | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-PS255-032-150-60 | | |
| MEGA-PS255 | 0.32 mm | 3.00 µm | 15 m | 300 °C | C-PS255-032-300-15 | | |
| MEGA-PS255 | 0.32 mm | 3.00 µm | 25 m | 300 °C | C-PS255-032-300-25 | | |
| MEGA-PS255 | 0.32 mm | 3.00 µm | 30 m | 300 °C | C-PS255-032-300-30 | | |
| MEGA-PS255 | 0.32 mm | 3.00 µm | 50 m | 300 °C | C-PS255-032-300-50 | | |
| MEGA-PS255 | 0.32 mm | 3.00 µm | 60 m | 300 °C | C-PS255-032-300-60 | | |
| MEGA-PS255 | 0.32 mm | 5.00 µm | 15 m | 300 °C | C-PS255-032-500-15 | | |
| MEGA-PS255 | 0.32 mm | 5.00 µm | 25 m | 300 °C | C-PS255-032-500-25 | | |
| MEGA-PS255 | 0.32 mm | 5.00 µm | 30 m | 300 °C | C-PS255-032-500-30 | | |
| MEGA-PS255 | 0.32 mm | 5.00 µm | 50 m | 300 °C | C-PS255-032-500-50 | | |
| MEGA-PS255 | 0.32 mm | 5.00 µm | 60 m | 300 °C | C-PS255-032-500-60 | | |
| MEGA-PS255 | 0.53 mm | 0.15 µm | 15 m | 350 °C | C-PS255-053-015-15 | | |
| MEGA-PS255 | 0.53 mm | 0.15 µm | 25 m | 350 °C | C-PS255-053-015-25 | | |
| MEGA-PS255 | 0.53 mm | 0.15 µm | 30 m | 350 °C | C-PS255-053-015-30 | | |
| MEGA-PS255 | 0.53 mm | 0.15 µm | 50 m | 350 °C | C-PS255-053-015-50 | | |
| MEGA-PS255 | 0.53 mm | 0.15 µm | 60 m | 350 °C | C-PS255-053-015-60 | | |
| MEGA-PS255 | 0.53 mm | 0.25 µm | 15 m | 350 °C | C-PS255-053-025-15 | | |
| MEGA-PS255 | 0.53 mm | 0.25 µm | 25 m | 350 °C | C-PS255-053-025-25 | | |
| MEGA-PS255 | 0.53 mm | 0.25 µm | 30 m | 350 °C | C-PS255-053-025-30 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS255 | 0.53 mm | 0.25 µm | 50 m | 350 °C | C-PS255-053-025-50 | | |
| MEGA-PS255 | 0.53 mm | 0.25 µm | 60 m | 350 °C | C-PS255-053-025-60 | | |
| MEGA-PS255 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-PS255-053-045-15 | | |
| MEGA-PS255 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-PS255-053-045-25 | | |
| MEGA-PS255 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-PS255-053-045-30 | | |
| MEGA-PS255 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-PS255-053-045-50 | | |
| MEGA-PS255 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-PS255-053-045-60 | | |
| MEGA-PS255 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-PS255-053-100-15 | | |
| MEGA-PS255 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-PS255-053-100-25 | | |
| MEGA-PS255 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-PS255-053-100-30 | | |
| MEGA-PS255 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-PS255-053-100-50 | | |
| MEGA-PS255 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-PS255-053-100-60 | | |
| MEGA-PS255 | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-PS255-053-150-15 | | |
| MEGA-PS255 | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-PS255-053-150-25 | | |
| MEGA-PS255 | 0.53 mm | 1.50 µm | 30 m | 300 °C | C-PS255-053-150-30 | | |
| MEGA-PS255 | 0.53 mm | 1.50 µm | 50 m | 300 °C | C-PS255-053-150-50 | | |
| MEGA-PS255 | 0.53 mm | 1.50 µm | 60 m | 300 °C | C-PS255-053-150-60 | | |
| MEGA-PS255 | 0.53 mm | 3.00 µm | 15 m | 300 °C | C-PS255-053-300-15 | | |
| MEGA-PS255 | 0.53 mm | 3.00 µm | 25 m | 300 °C | C-PS255-053-300-25 | | |
| MEGA-PS255 | 0.53 mm | 3.00 µm | 30 m | 300 °C | C-PS255-053-300-30 | | |
| MEGA-PS255 | 0.53 mm | 3.00 µm | 50 m | 300 °C | C-PS255-053-300-50 | | |
| MEGA-PS255 | 0.53 mm | 3.00 µm | 60 m | 300 °C | C-PS255-053-300-60 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS255 | 0.53 mm | 5.00 µm | 15 m | 300 °C | C-PS255-053-500-15 | | |
| MEGA-PS255 | 0.53 mm | 5.00 µm | 25 m | 300 °C | C-PS255-053-500-25 | | |
| MEGA-PS255 | 0.53 mm | 5.00 µm | 30 m | 300 °C | C-PS255-053-500-30 | | |
| MEGA-PS255 | 0.53 mm | 5.00 µm | 50 m | 300 °C | C-PS255-053-500-50 | | |
| MEGA-PS255 | 0.53 mm | 5.00 µm | 60 m | 300 °C | C-PS255-053-500-60 | | |

You may also be interested in this/these product(s):

MEGA-PS255 FAST



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STANDARD



CUSTOM-DEDICATED



MEGA-DEX (CHIRAL PHASES)



FAST-GC



GC-MS COLUMNS



MEGA-GAP (Incorporated Ret.-
Gap)



HIGH TEMPERATURE COLUMNS



MULTIDIMENSIONAL GC

Last Updated:

Fused Silica Capillary Columns → MEGA-PS264

MEGA-PS264



View Full-Size
Image

Stationary Phase Characteristics

| | |
|---------------|--|
| Composition | 5.8% Phenyl, 0.2% Vinyl, 94% Methyl Polysiloxane |
| Polarity | Low-Intermediate polarity |
| Crossbond | Yes |
| Equivalent to | / |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta |
|-------------|-------------------|----------------|--------|-----------------|--------------------|------|
| MEGA-PS264 | 0.25 mm | 0.15 µm | 15 m | 350 °C | C-PS264-025-015-15 | |
| MEGA-PS264 | 0.25 mm | 0.15 µm | 25 m | 350 °C | C-PS264-025-015-25 | |
| MEGA-PS264 | 0.25 mm | 0.15 µm | 30 m | 350 °C | C-PS264-025-015-30 | |
| MEGA-PS264 | 0.25 mm | 0.15 µm | 50 m | 350 °C | C-PS264-025-015-50 | |
| MEGA-PS264 | 0.25 mm | 0.15 µm | 60 m | 350 °C | C-PS264-025-015-60 | |
| MEGA-PS264 | 0.25 mm | 0.25 µm | 15 m | 350 °C | C-PS264-025-025-15 | |
| MEGA-PS264 | 0.25 mm | 0.25 µm | 25 m | 350 °C | C-PS264-025-025-25 | |
| MEGA-PS264 | 0.25 mm | 0.25 µm | 30 m | 350 °C | C-PS264-025-025-30 | |
| MEGA-PS264 | 0.25 mm | 0.25 µm | 50 m | 350 °C | C-PS264-025-025-50 | |
| MEGA-PS264 | 0.25 mm | 0.25 µm | 60 m | 350 °C | C-PS264-025-025-60 | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS264 | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-PS264-025-045-15 | | |
| MEGA-PS264 | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-PS264-025-045-25 | | |
| MEGA-PS264 | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-PS264-025-045-30 | | |
| MEGA-PS264 | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-PS264-025-045-50 | | |
| MEGA-PS264 | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-PS264-025-045-60 | | |
| MEGA-PS264 | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-PS264-025-100-15 | | |
| MEGA-PS264 | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-PS264-025-100-25 | | |
| MEGA-PS264 | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-PS264-025-100-30 | | |
| MEGA-PS264 | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-PS264-025-100-50 | | |
| MEGA-PS264 | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-PS264-025-100-60 | | |
| MEGA-PS264 | 0.25 mm | 1.50 µm | 15 m | 300 °C | C-PS264-025-150-15 | | |
| MEGA-PS264 | 0.25 mm | 1.50 µm | 25 m | 300 °C | C-PS264-025-150-25 | | |
| MEGA-PS264 | 0.25 mm | 1.50 µm | 30 m | 300 °C | C-PS264-025-150-30 | | |
| MEGA-PS264 | 0.25 mm | 1.50 µm | 50 m | 300 °C | C-PS264-025-150-50 | | |
| MEGA-PS264 | 0.25 mm | 1.50 µm | 60 m | 300 °C | C-PS264-025-150-60 | | |
| MEGA-PS264 | 0.32 mm | 0.15 µm | 15 m | 350 °C | C-PS264-032-015-15 | | |
| MEGA-PS264 | 0.32 mm | 0.15 µm | 25 m | 350 °C | C-PS264-032-015-25 | | |
| MEGA-PS264 | 0.32 mm | 0.15 µm | 30 m | 350 °C | C-PS264-032-015-30 | | |
| MEGA-PS264 | 0.32 mm | 0.15 µm | 50 m | 350 °C | C-PS264-032-015-50 | | |
| MEGA-PS264 | 0.32 mm | 0.15 µm | 60 m | 350 °C | C-PS264-032-015-60 | | |
| MEGA-PS264 | 0.32 mm | 0.25 µm | 15 m | 350 °C | C-PS264-032-025-15 | | |
| MEGA-PS264 | 0.32 mm | 0.25 µm | 25 m | 350 °C | C-PS264-032-025-25 | | |
| MEGA-PS264 | 0.32 mm | 0.25 µm | 30 m | 350 °C | C-PS264-032-025-30 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS264 | 0.32 mm | 0.25 µm | 50 m | 350 °C | C-PS264-032-025-50 | | |
| MEGA-PS264 | 0.32 mm | 0.25 µm | 60 m | 350 °C | C-PS264-032-025-60 | | |
| MEGA-PS264 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-PS264-032-032-15 | | |
| MEGA-PS264 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-PS264-032-032-25 | | |
| MEGA-PS264 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-PS264-032-032-30 | | |
| MEGA-PS264 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-PS264-032-032-50 | | |
| MEGA-PS264 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-PS264-032-032-60 | | |
| MEGA-PS264 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-PS264-032-045-15 | | |
| MEGA-PS264 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-PS264-032-045-25 | | |
| MEGA-PS264 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-PS264-032-045-30 | | |
| MEGA-PS264 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-PS264-032-045-50 | | |
| MEGA-PS264 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-PS264-032-045-60 | | |
| MEGA-PS264 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-PS264-032-100-15 | | |
| MEGA-PS264 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-PS264-032-100-25 | | |
| MEGA-PS264 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-PS264-032-100-30 | | |
| MEGA-PS264 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-PS264-032-100-50 | | |
| MEGA-PS264 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-PS264-032-100-60 | | |
| MEGA-PS264 | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-PS264-032-150-15 | | |
| MEGA-PS264 | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-PS264-032-150-25 | | |
| MEGA-PS264 | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-PS264-032-150-30 | | |
| MEGA-PS264 | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-PS264-032-150-50 | | |
| MEGA-PS264 | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-PS264-032-150-60 | | |
| MEGA-PS264 | 0.32 mm | 3.00 µm | 15 m | 300 °C | C-PS264-032-300-15 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS264 | 0.32 mm | 3.00 µm | 25 m | 300 °C | C-PS264-032-300-25 | | |
| MEGA-PS264 | 0.32 mm | 3.00 µm | 30 m | 300 °C | C-PS264-032-300-30 | | |
| MEGA-PS264 | 0.32 mm | 3.00 µm | 50 m | 300 °C | C-PS264-032-300-50 | | |
| MEGA-PS264 | 0.32 mm | 3.00 µm | 60 m | 300 °C | C-PS264-032-300-60 | | |
| MEGA-PS264 | 0.32 mm | 5.00 µm | 15 m | 300 °C | C-PS264-032-500-15 | | |
| MEGA-PS264 | 0.32 mm | 5.00 µm | 25 m | 300 °C | C-PS264-032-500-25 | | |
| MEGA-PS264 | 0.32 mm | 5.00 µm | 30 m | 300 °C | C-PS264-032-500-30 | | |
| MEGA-PS264 | 0.32 mm | 5.00 µm | 50 m | 300 °C | C-PS264-032-500-50 | | |
| MEGA-PS264 | 0.32 mm | 5.00 µm | 60 m | 300 °C | C-PS264-032-500-60 | | |
| MEGA-PS264 | 0.53 mm | 0.15 µm | 15 m | 350 °C | C-PS264-053-015-15 | | |
| MEGA-PS264 | 0.53 mm | 0.15 µm | 25 m | 350 °C | C-PS264-053-015-25 | | |
| MEGA-PS264 | 0.53 mm | 0.15 µm | 30 m | 350 °C | C-PS264-053-015-30 | | |
| MEGA-PS264 | 0.53 mm | 0.15 µm | 50 m | 350 °C | C-PS264-053-015-50 | | |
| MEGA-PS264 | 0.53 mm | 0.15 µm | 60 m | 350 °C | C-PS264-053-015-60 | | |
| MEGA-PS264 | 0.53 mm | 0.25 µm | 15 m | 350 °C | C-PS264-053-025-15 | | |
| MEGA-PS264 | 0.53 mm | 0.25 µm | 25 m | 350 °C | C-PS264-053-025-25 | | |
| MEGA-PS264 | 0.53 mm | 0.25 µm | 30 m | 350 °C | C-PS264-053-025-30 | | |
| MEGA-PS264 | 0.53 mm | 0.25 µm | 50 m | 350 °C | C-PS264-053-025-50 | | |
| MEGA-PS264 | 0.53 mm | 0.25 µm | 60 m | 350 °C | C-PS264-053-025-60 | | |
| MEGA-PS264 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-PS264-053-045-15 | | |
| MEGA-PS264 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-PS264-053-045-25 | | |
| MEGA-PS264 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-PS264-053-045-30 | | |
| MEGA-PS264 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-PS264-053-045-50 | | |

| | | | | | | | |
|------------|---------|---------|------|--------|--------------------|--|--|
| MEGA-PS264 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-PS264-053-045-60 | | |
| MEGA-PS264 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-PS264-053-100-15 | | |
| MEGA-PS264 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-PS264-053-100-25 | | |
| MEGA-PS264 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-PS264-053-100-30 | | |
| MEGA-PS264 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-PS264-053-100-50 | | |
| MEGA-PS264 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-PS264-053-100-60 | | |
| MEGA-PS264 | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-PS264-053-150-15 | | |
| MEGA-PS264 | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-PS264-053-150-25 | | |
| MEGA-PS264 | 0.53 mm | 1.50 µm | 30 m | 300 °C | C-PS264-053-150-30 | | |
| MEGA-PS264 | 0.53 mm | 1.50 µm | 50 m | 300 °C | C-PS264-053-150-50 | | |
| MEGA-PS264 | 0.53 mm | 1.50 µm | 60 m | 300 °C | C-PS264-053-150-60 | | |
| MEGA-PS264 | 0.53 mm | 3.00 µm | 15 m | 300 °C | C-PS264-053-300-15 | | |
| MEGA-PS264 | 0.53 mm | 3.00 µm | 25 m | 300 °C | C-PS264-053-300-25 | | |
| MEGA-PS264 | 0.53 mm | 3.00 µm | 30 m | 300 °C | C-PS264-053-300-30 | | |
| MEGA-PS264 | 0.53 mm | 3.00 µm | 50 m | 300 °C | C-PS264-053-300-50 | | |
| MEGA-PS264 | 0.53 mm | 3.00 µm | 60 m | 300 °C | C-PS264-053-300-60 | | |
| MEGA-PS264 | 0.53 mm | 5.00 µm | 15 m | 300 °C | C-PS264-053-500-15 | | |
| MEGA-PS264 | 0.53 mm | 5.00 µm | 25 m | 300 °C | C-PS264-053-500-25 | | |
| MEGA-PS264 | 0.53 mm | 5.00 µm | 30 m | 300 °C | C-PS264-053-500-30 | | |
| MEGA-PS264 | 0.53 mm | 5.00 µm | 50 m | 300 °C | C-PS264-053-500-50 | | |
| MEGA-PS264 | 0.53 mm | 5.00 µm | 60 m | 300 °C | C-PS264-053-500-60 | | |

Fused Silica Capillary Columns → MEGA-SE30

MEGA-SE30



View Full-Size
Image

Stationary Phase Characteristics

| | |
|---------------|--------------------------|
| Composition | 100% Methyl Polysiloxane |
| Polarity | Apolar |
| Crossbond | Yes |
| Equivalent to | / |

| Description | Internal Diameter | Film Thickness | Length | Max Temperature | Code # | Q.ta | |
|-------------|-------------------|----------------|--------|-----------------|-------------------|------|--|
| MEGA-SE30 | 0.25 mm | 0.15 µm | 15 m | 350 °C | C-SE30-025-015-15 | | |
| MEGA-SE30 | 0.25 mm | 0.15 µm | 25 m | 350 °C | C-SE30-025-015-25 | | |
| MEGA-SE30 | 0.25 mm | 0.15 µm | 30 m | 350 °C | C-SE30-025-015-30 | | |
| MEGA-SE30 | 0.25 mm | 0.15 µm | 50 m | 350 °C | C-SE30-025-015-50 | | |
| MEGA-SE30 | 0.25 mm | 0.15 µm | 60 m | 350 °C | C-SE30-025-015-60 | | |
| MEGA-SE30 | 0.25 mm | 0.25 µm | 15 m | 350 °C | C-SE30-025-025-15 | | |
| MEGA-SE30 | 0.25 mm | 0.25 µm | 25 m | 350 °C | C-SE30-025-025-25 | | |
| MEGA-SE30 | 0.25 mm | 0.25 µm | 30 m | 350 °C | C-SE30-025-025-30 | | |
| MEGA-SE30 | 0.25 mm | 0.25 µm | 50 m | 350 °C | C-SE30-025-025-50 | | |
| MEGA-SE30 | 0.25 mm | 0.25 µm | 60 m | 350 °C | C-SE30-025-025-60 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE30 | 0.25 mm | 0.45 µm | 15 m | 320 °C | C-SE30-025-045-15 | | |
| MEGA-SE30 | 0.25 mm | 0.45 µm | 25 m | 320 °C | C-SE30-025-045-25 | | |
| MEGA-SE30 | 0.25 mm | 0.45 µm | 30 m | 320 °C | C-SE30-025-045-30 | | |
| MEGA-SE30 | 0.25 mm | 0.45 µm | 50 m | 320 °C | C-SE30-025-045-50 | | |
| MEGA-SE30 | 0.25 mm | 0.45 µm | 60 m | 320 °C | C-SE30-025-045-60 | | |
| MEGA-SE30 | 0.25 mm | 1.00 µm | 15 m | 300 °C | C-SE30-025-100-15 | | |
| MEGA-SE30 | 0.25 mm | 1.00 µm | 25 m | 300 °C | C-SE30-025-100-25 | | |
| MEGA-SE30 | 0.25 mm | 1.00 µm | 30 m | 300 °C | C-SE30-025-100-30 | | |
| MEGA-SE30 | 0.25 mm | 1.00 µm | 50 m | 300 °C | C-SE30-025-100-50 | | |
| MEGA-SE30 | 0.25 mm | 1.00 µm | 60 m | 300 °C | C-SE30-025-100-60 | | |
| MEGA-SE30 | 0.25 mm | 1.50 µm | 15 m | 300 °C | C-SE30-025-150-15 | | |
| MEGA-SE30 | 0.25 mm | 1.50 µm | 25 m | 300 °C | C-SE30-025-150-25 | | |
| MEGA-SE30 | 0.25 mm | 1.50 µm | 30 m | 300 °C | C-SE30-025-150-30 | | |
| MEGA-SE30 | 0.25 mm | 1.50 µm | 50 m | 300 °C | C-SE30-025-150-50 | | |
| MEGA-SE30 | 0.25 mm | 1.50 µm | 60 m | 300 °C | C-SE30-025-150-60 | | |
| MEGA-SE30 | 0.32 mm | 0.15 µm | 15 m | 350 °C | C-SE30-032-015-15 | | |
| MEGA-SE30 | 0.32 mm | 0.15 µm | 25 m | 350 °C | C-SE30-032-015-25 | | |
| MEGA-SE30 | 0.32 mm | 0.15 µm | 30 m | 350 °C | C-SE30-032-015-30 | | |
| MEGA-SE30 | 0.32 mm | 0.15 µm | 50 m | 350 °C | C-SE30-032-015-50 | | |
| MEGA-SE30 | 0.32 mm | 0.15 µm | 60 m | 350 °C | C-SE30-032-015-60 | | |
| MEGA-SE30 | 0.32 mm | 0.25 µm | 15 m | 350 °C | C-SE30-032-025-15 | | |
| MEGA-SE30 | 0.32 mm | 0.25 µm | 25 m | 350 °C | C-SE30-032-025-25 | | |
| MEGA-SE30 | 0.32 mm | 0.25 µm | 30 m | 350 °C | C-SE30-032-025-30 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE30 | 0.32 mm | 0.25 µm | 50 m | 350 °C | C-SE30-032-025-50 | | |
| MEGA-SE30 | 0.32 mm | 0.25 µm | 60 m | 350 °C | C-SE30-032-025-60 | | |
| MEGA-SE30 | 0.32 mm | 0.32 µm | 15 m | 340 °C | C-SE30-032-032-15 | | |
| MEGA-SE30 | 0.32 mm | 0.32 µm | 25 m | 340 °C | C-SE30-032-032-25 | | |
| MEGA-SE30 | 0.32 mm | 0.32 µm | 30 m | 340 °C | C-SE30-032-032-30 | | |
| MEGA-SE30 | 0.32 mm | 0.32 µm | 50 m | 340 °C | C-SE30-032-032-50 | | |
| MEGA-SE30 | 0.32 mm | 0.32 µm | 60 m | 340 °C | C-SE30-032-032-60 | | |
| MEGA-SE30 | 0.32 mm | 0.45 µm | 15 m | 320 °C | C-SE30-032-045-15 | | |
| MEGA-SE30 | 0.32 mm | 0.45 µm | 25 m | 320 °C | C-SE30-032-045-25 | | |
| MEGA-SE30 | 0.32 mm | 0.45 µm | 30 m | 320 °C | C-SE30-032-045-30 | | |
| MEGA-SE30 | 0.32 mm | 0.45 µm | 50 m | 320 °C | C-SE30-032-045-50 | | |
| MEGA-SE30 | 0.32 mm | 0.45 µm | 60 m | 320 °C | C-SE30-032-045-60 | | |
| MEGA-SE30 | 0.32 mm | 1.00 µm | 15 m | 300 °C | C-SE30-032-100-15 | | |
| MEGA-SE30 | 0.32 mm | 1.00 µm | 25 m | 300 °C | C-SE30-032-100-25 | | |
| MEGA-SE30 | 0.32 mm | 1.00 µm | 30 m | 300 °C | C-SE30-032-100-30 | | |
| MEGA-SE30 | 0.32 mm | 1.00 µm | 50 m | 300 °C | C-SE30-032-100-50 | | |
| MEGA-SE30 | 0.32 mm | 1.00 µm | 60 m | 300 °C | C-SE30-032-100-60 | | |
| MEGA-SE30 | 0.32 mm | 1.50 µm | 15 m | 300 °C | C-SE30-032-150-15 | | |
| MEGA-SE30 | 0.32 mm | 1.50 µm | 25 m | 300 °C | C-SE30-032-150-25 | | |
| MEGA-SE30 | 0.32 mm | 1.50 µm | 30 m | 300 °C | C-SE30-032-150-30 | | |
| MEGA-SE30 | 0.32 mm | 1.50 µm | 50 m | 300 °C | C-SE30-032-150-50 | | |
| MEGA-SE30 | 0.32 mm | 1.50 µm | 60 m | 300 °C | C-SE30-032-150-60 | | |
| MEGA-SE30 | 0.32 mm | 3.00 µm | 15 m | 300 °C | C-SE30-032-300-15 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE30 | 0.32 mm | 3.00 µm | 25 m | 300 °C | C-SE30-032-300-25 | | |
| MEGA-SE30 | 0.32 mm | 3.00 µm | 30 m | 300 °C | C-SE30-032-300-30 | | |
| MEGA-SE30 | 0.32 mm | 3.00 µm | 50 m | 300 °C | C-SE30-032-300-50 | | |
| MEGA-SE30 | 0.32 mm | 3.00 µm | 60 m | 300 °C | C-SE30-032-300-60 | | |
| MEGA-SE30 | 0.32 mm | 5.00 µm | 15 m | 300 °C | C-SE30-032-500-15 | | |
| MEGA-SE30 | 0.32 mm | 5.00 µm | 25 m | 300 °C | C-SE30-032-500-25 | | |
| MEGA-SE30 | 0.32 mm | 5.00 µm | 30 m | 300 °C | C-SE30-032-500-30 | | |
| MEGA-SE30 | 0.32 mm | 5.00 µm | 50 m | 300 °C | C-SE30-032-500-50 | | |
| MEGA-SE30 | 0.32 mm | 5.00 µm | 60 m | 300 °C | C-SE30-032-500-60 | | |
| MEGA-SE30 | 0.53 mm | 0.15 µm | 15 m | 350 °C | C-SE30-053-015-15 | | |
| MEGA-SE30 | 0.53 mm | 0.15 µm | 25 m | 350 °C | C-SE30-053-015-25 | | |
| MEGA-SE30 | 0.53 mm | 0.15 µm | 30 m | 350 °C | C-SE30-053-015-30 | | |
| MEGA-SE30 | 0.53 mm | 0.15 µm | 50 m | 350 °C | C-SE30-053-015-50 | | |
| MEGA-SE30 | 0.53 mm | 0.15 µm | 60 m | 350 °C | C-SE30-053-015-60 | | |
| MEGA-SE30 | 0.53 mm | 0.25 µm | 15 m | 350 °C | C-SE30-053-025-15 | | |
| MEGA-SE30 | 0.53 mm | 0.25 µm | 25 m | 350 °C | C-SE30-053-025-25 | | |
| MEGA-SE30 | 0.53 mm | 0.25 µm | 30 m | 350 °C | C-SE30-053-025-30 | | |
| MEGA-SE30 | 0.53 mm | 0.25 µm | 50 m | 350 °C | C-SE30-053-025-50 | | |
| MEGA-SE30 | 0.53 mm | 0.25 µm | 60 m | 350 °C | C-SE30-053-025-60 | | |
| MEGA-SE30 | 0.53 mm | 0.45 µm | 15 m | 320 °C | C-SE30-053-045-15 | | |
| MEGA-SE30 | 0.53 mm | 0.45 µm | 25 m | 320 °C | C-SE30-053-045-25 | | |
| MEGA-SE30 | 0.53 mm | 0.45 µm | 30 m | 320 °C | C-SE30-053-045-30 | | |
| MEGA-SE30 | 0.53 mm | 0.45 µm | 50 m | 320 °C | C-SE30-053-045-50 | | |

| | | | | | | | |
|-----------|---------|---------|------|--------|-------------------|--|--|
| MEGA-SE30 | 0.53 mm | 0.45 µm | 60 m | 320 °C | C-SE30-053-045-60 | | |
| MEGA-SE30 | 0.53 mm | 1.00 µm | 15 m | 300 °C | C-SE30-053-100-15 | | |
| MEGA-SE30 | 0.53 mm | 1.00 µm | 25 m | 300 °C | C-SE30-053-100-25 | | |
| MEGA-SE30 | 0.53 mm | 1.00 µm | 30 m | 300 °C | C-SE30-053-100-30 | | |
| MEGA-SE30 | 0.53 mm | 1.00 µm | 50 m | 300 °C | C-SE30-053-100-50 | | |
| MEGA-SE30 | 0.53 mm | 1.00 µm | 60 m | 300 °C | C-SE30-053-100-60 | | |
| MEGA-SE30 | 0.53 mm | 1.50 µm | 15 m | 300 °C | C-SE30-053-150-15 | | |
| MEGA-SE30 | 0.53 mm | 1.50 µm | 25 m | 300 °C | C-SE30-053-150-25 | | |
| MEGA-SE30 | 0.53 mm | 1.50 µm | 30 m | 300 °C | C-SE30-053-150-30 | | |
| MEGA-SE30 | 0.53 mm | 1.50 µm | 50 m | 300 °C | C-SE30-053-150-50 | | |
| MEGA-SE30 | 0.53 mm | 1.50 µm | 60 m | 300 °C | C-SE30-053-150-60 | | |
| MEGA-SE30 | 0.53 mm | 3.00 µm | 15 m | 300 °C | C-SE30-053-300-15 | | |
| MEGA-SE30 | 0.53 mm | 3.00 µm | 25 m | 300 °C | C-SE30-053-300-25 | | |
| MEGA-SE30 | 0.53 mm | 3.00 µm | 30 m | 300 °C | C-SE30-053-300-30 | | |
| MEGA-SE30 | 0.53 mm | 3.00 µm | 50 m | 300 °C | C-SE30-053-300-50 | | |
| MEGA-SE30 | 0.53 mm | 3.00 µm | 60 m | 300 °C | C-SE30-053-300-60 | | |
| MEGA-SE30 | 0.53 mm | 5.00 µm | 15 m | 300 °C | C-SE30-053-500-15 | | |
| MEGA-SE30 | 0.53 mm | 5.00 µm | 25 m | 300 °C | C-SE30-053-500-25 | | |
| MEGA-SE30 | 0.53 mm | 5.00 µm | 30 m | 300 °C | C-SE30-053-500-30 | | |
| MEGA-SE30 | 0.53 mm | 5.00 µm | 50 m | 300 °C | C-SE30-053-500-50 | | |
| MEGA-SE30 | 0.53 mm | 5.00 µm | 60 m | 300 °C | C-SE30-053-500-60 | | |

Fused Silica Capillary Columns → MEGA-SOLVE1

MEGA-SOLVE1



[View Full-Size Image](#)

Phase Characteristics

The MEGA-SOLVE are specific columns to separate very complex solvent mixtures.

Equivalent to **unique** column

Application Notes

[Solvents](#) , [Solvents List](#) ,

Here below you can see displayed the dimensions for the columns optimized for the analysis shown in the applications (you can download or open the applications in PDF format). But you can completely customize a product simply by [send us an e-mail](#) or a fax (see [help with ordering page](#)) to **request your specific product's dimensions for your specific analytical problem.**

| Description | Internal Diameter | Film Thickness | Length | Code # | Q.ta |
|-------------|-------------------|----------------|--------|---------------------|------|
| MEGA-SOLVE1 | 0.32 mm | 0.25 µm | 50 m | C-SOLVE1-032-025-50 | |



**CUSTOM
DEDICATED
COLUMNS**

MEGA-SOLVE2

The MEGA-SOLVE are specific columns to separate very complex solvent mixtures.

Equivalent to

unique column

Solvents , Solvents List ,

Here below you can see displayed the dimensions for the columns optimized for the analysis shown in the applications (you can download or open the applications in PDF format). But you can completely customize a product simply by **send us an e-mail** or a fax (see **help with ordering** page) to **request your specific product's dimensions for your specific analytical problem**.

| Description | Internal Diameter | Film Thickness | Length | Code # | Q.ta |
|-------------|-------------------|----------------|--------|---------------------|------|
| MEGA-SOLVE2 | 0.32 mm | 0.25 µm | 50 m | C-SOLVE2-032-025-50 | |

Fused Silica Capillary Columns → CUSTOM-DEDICATED → MEGA-TNT 8095



[View Full-Size Image](#)

MEGA-TNT 8095

(Mega s.n.c.)

Caratteristiche Fase

La fase MEGA-TNT 8095 é appositamente studiata per analisi di miscele di Esplosivi (metodo EPA 8095), composti Nitroaromatici, Nitroammine.

Equivalenza Fasi

colonna **senza equivalenti**

Applicazioni

Qui di seguito sono proposte le dimensioni ottimizzate per le analisi eseguite nelle applicazioni (visibili e scaricabili in formato PDF). Come per tutti i nostri prodotti **potete richiedere un prodotto completamente personalizzato**. Per fare questo inviateci un fax o una e-mail (vedi la pagina *Richiesta di Offerte/Ordini*) richiedendo la fattibilità e il preventivo per un prodotto non presente in catalogo.

MEGA-TNT 8095

pezzi

Quantity:



**CUSTOM
DEDICATED
COLUMNS**

MEGA-VOC

Caratteristiche Fase

Equivalenza Fasi

nuove colonne **senza equivalenti**

Qui di seguito sono proposte le dimensioni ottimizzate per le analisi eseguite nelle applicazioni (visibili e scaricabili in formato PDF). Come per tutti i nostri prodotti **potete richiedere un prodotto completamente personalizzato**. Per fare questo inviateci un fax o una e-mail (vedi la pagina **Richiesta di Offerte/Ordini**) richiedendo la fattibilità e il preventivo per un prodotto non presente in catalogo.

| Description | | | | | | Q.ta |
|-------------|------------|---------|---------|------|-------------------|------|
| MEGA-VOC 1 | MEGA-VOC 1 | 0.25 mm | 1.50 µm | 30 m | C-VOC1-025-150-30 | |

Retention GAPS → RETENTION-GAP DPTMDS



[View Full-Size Image](#)

RETENTION-GAP DPTMDS

Deactivation for General Purpose

Support

The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|-----------------|-------------------|--------|--------------------|------|--|
| RET. GAP DPTMDS | 0.25 mm | 1 m | RETG.DPTMDS.025.1 | | |
| RET. GAP DPTMDS | 0.25 mm | 10 m | RETG.DPTMDS.025.10 | | |
| RET. GAP DPTMDS | 0.25 mm | 2 m | RETG.DPTMDS.025.2 | | |
| RET. GAP DPTMDS | 0.25 mm | 20 m | RETG.DPTMDS.025.20 | | |
| RET. GAP DPTMDS | 0.25 mm | 5 m | RETG.DPTMDS.025.5 | | |
| RET. GAP DPTMDS | 0.25 mm | 50 m | RETG.DPTMDS.025.50 | | |
| RET. GAP DPTMDS | 0.32 mm | 1 m | RETG.DPTMDS.032.1 | | |

| | | | | | |
|-----------------|---------|------|--------------------|--|--|
| RET. GAP DPTMDS | 0.32 mm | 10 m | RETG.DPTMDS.032.10 | | |
| RET. GAP DPTMDS | 0.32 mm | 2 m | RETG.DPTMDS.032.2 | | |
| RET. GAP DPTMDS | 0.32 mm | 20 m | RETG.DPTMDS.032.20 | | |
| RET. GAP DPTMDS | 0.32 mm | 5 m | RETG.DPTMDS.032.5 | | |
| RET. GAP DPTMDS | 0.32 mm | 50 m | RETG.DPTMDS.032.50 | | |
| RET. GAP DPTMDS | 0.53 mm | 1 m | RETG.DPTMDS.053.1 | | |
| RET. GAP DPTMDS | 0.53 mm | 10 m | RETG.DPTMDS.053.10 | | |
| RET. GAP DPTMDS | 0.53 mm | 2 m | RETG.DPTMDS.053.2 | | |
| RET. GAP DPTMDS | 0.53 mm | 20 m | RETG.DPTMDS.053.20 | | |
| RET. GAP DPTMDS | 0.53 mm | 5 m | RETG.DPTMDS.053.5 | | |

You may also be interested in this/these product(s):

PRESS-FIT UNION



Retention GAPS → RETENTION-GAP HMDS



[View Full-Size Image](#)

RETENTION-GAP HMDS

Specific Deactivation for Apolar Solvents Injections

[Support](#)

The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|---------------|-------------------|--------|------------------|------|--|
| RET. GAP HMDS | 0.25 mm | 1 m | RETG.HMDS.025.1 | | |
| RET. GAP HMDS | 0.25 mm | 10 m | RETG.HMDS.025.10 | | |
| RET. GAP HMDS | 0.25 mm | 2 m | RETG.HMDS.025.2 | | |
| RET. GAP HMDS | 0.25 mm | 20 m | RETG.HMDS.025.20 | | |
| RET. GAP HMDS | 0.25 mm | 5 m | RETG.HMDS.025.5 | | |
| RET. GAP HMDS | 0.25 mm | 50 m | RETG.HMDS.025.50 | | |

| | | | | | |
|---------------|---------|------|------------------|--|--|
| RET. GAP HMDS | 0.32 mm | 1 m | RETG.HMDS.032.1 | | |
| RET. GAP HMDS | 0.32 mm | 10 m | RETG.HMDS.032.10 | | |
| RET. GAP HMDS | 0.32 mm | 2 m | RETG.HMDS.032.2 | | |
| RET. GAP HMDS | 0.32 mm | 20 m | RETG.HMDS.032.20 | | |
| RET. GAP HMDS | 0.32 mm | 5 m | RETG.HMDS.032.5 | | |
| RET. GAP HMDS | 0.32 mm | 50 m | RETG.HMDS.032.50 | | |
| RET. GAP HMDS | 0.53 mm | 1 m | RETG.HMDS.053.1 | | |
| RET. GAP HMDS | 0.53 mm | 10 m | RETG.HMDS.053.10 | | |
| RET. GAP HMDS | 0.53 mm | 2 m | RETG.HMDS.053.2 | | |
| RET. GAP HMDS | 0.53 mm | 20 m | RETG.HMDS.053.20 | | |
| RET. GAP HMDS | 0.53 mm | 5 m | RETG.HMDS.053.5 | | |

You may also be interested in this/these product(s):

PRESS-FIT UNION



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PRESS-FIT "Y" 3 Ways



Retention GAPS → RETENTION-GAP CARBOWAX



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RETENTION-GAP CARBOWAX

Specific deactivation for Polar Solvents Injections

[Support](#)

The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|-------------------|-------------------|--------|-----------------|------|--|
| RET. GAP CARBOWAX | 0.25 mm | 1 m | RETG.WAX.025.1 | | |
| RET. GAP CARBOWAX | 0.25 mm | 10 m | RETG.WAX.025.10 | | |
| RET. GAP CARBOWAX | 0.25 mm | 2 m | RETG.WAX.025.2 | | |
| RET. GAP CARBOWAX | 0.25 mm | 20 m | RETG.WAX.025.20 | | |
| RET. GAP CARBOWAX | 0.25 mm | 5 m | RETG.WAX.025.5 | | |
| RET. GAP CARBOWAX | 0.25 mm | 50 m | RETG.WAX.025.50 | | |
| RET. GAP CARBOWAX | 0.32 mm | 1 m | RETG.WAX.032.1 | | |

| | | | | | |
|-------------------|---------|------|-----------------|--|--|
| RET. GAP CARBOWAX | 0.32 mm | 10 m | RETG.WAX.032.10 | | |
| RET. GAP CARBOWAX | 0.32 mm | 2 m | RETG.WAX.032.2 | | |
| RET. GAP CARBOWAX | 0.32 mm | 20 m | RETG.WAX.032.20 | | |
| RET. GAP CARBOWAX | 0.32 mm | 5 m | RETG.WAX.032.5 | | |
| RET. GAP CARBOWAX | 0.32 mm | 50 m | RETG.WAX.032.50 | | |
| RET. GAP CARBOWAX | 0.53 mm | 1 m | RETG.WAX.053.1 | | |
| RET. GAP CARBOWAX | 0.53 mm | 10 m | RETG.WAX.053.10 | | |
| RET. GAP CARBOWAX | 0.53 mm | 2 m | RETG.WAX.053.2 | | |
| RET. GAP CARBOWAX | 0.53 mm | 20 m | RETG.WAX.053.20 | | |
| RET. GAP CARBOWAX | 0.53 mm | 5 m | RETG.WAX.053.5 | | |

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Retention GAPS → RETENTION-GAP DPTMDS



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RETENTION-GAP DPTMDS

Deactivation for General Purpose

Support

The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|-----------------|-------------------|--------|--------------------|------|--|
| RET. GAP DPTMDS | 0.25 mm | 1 m | RETG.DPTMDS.025.1 | | |
| RET. GAP DPTMDS | 0.25 mm | 10 m | RETG.DPTMDS.025.10 | | |
| RET. GAP DPTMDS | 0.25 mm | 2 m | RETG.DPTMDS.025.2 | | |
| RET. GAP DPTMDS | 0.25 mm | 20 m | RETG.DPTMDS.025.20 | | |
| RET. GAP DPTMDS | 0.25 mm | 5 m | RETG.DPTMDS.025.5 | | |
| RET. GAP DPTMDS | 0.25 mm | 50 m | RETG.DPTMDS.025.50 | | |
| RET. GAP DPTMDS | 0.32 mm | 1 m | RETG.DPTMDS.032.1 | | |

| | | | | | |
|-----------------|---------|------|--------------------|--|--|
| RET. GAP DPTMDS | 0.32 mm | 10 m | RETG.DPTMDS.032.10 | | |
| RET. GAP DPTMDS | 0.32 mm | 2 m | RETG.DPTMDS.032.2 | | |
| RET. GAP DPTMDS | 0.32 mm | 20 m | RETG.DPTMDS.032.20 | | |
| RET. GAP DPTMDS | 0.32 mm | 5 m | RETG.DPTMDS.032.5 | | |
| RET. GAP DPTMDS | 0.32 mm | 50 m | RETG.DPTMDS.032.50 | | |
| RET. GAP DPTMDS | 0.53 mm | 1 m | RETG.DPTMDS.053.1 | | |
| RET. GAP DPTMDS | 0.53 mm | 10 m | RETG.DPTMDS.053.10 | | |
| RET. GAP DPTMDS | 0.53 mm | 2 m | RETG.DPTMDS.053.2 | | |
| RET. GAP DPTMDS | 0.53 mm | 20 m | RETG.DPTMDS.053.20 | | |
| RET. GAP DPTMDS | 0.53 mm | 5 m | RETG.DPTMDS.053.5 | | |

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Retention GAPS → RETENTION-GAP HMDS



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RETENTION-GAP HMDS

Specific Deactivation for Apolar Solvents Injections

[Support](#)

The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|---------------|-------------------|--------|------------------|------|--|
| RET. GAP HMDS | 0.25 mm | 1 m | RETG.HMDS.025.1 | | |
| RET. GAP HMDS | 0.25 mm | 10 m | RETG.HMDS.025.10 | | |
| RET. GAP HMDS | 0.25 mm | 2 m | RETG.HMDS.025.2 | | |
| RET. GAP HMDS | 0.25 mm | 20 m | RETG.HMDS.025.20 | | |
| RET. GAP HMDS | 0.25 mm | 5 m | RETG.HMDS.025.5 | | |
| RET. GAP HMDS | 0.25 mm | 50 m | RETG.HMDS.025.50 | | |

| | | | | | |
|---------------|---------|------|------------------|--|--|
| RET. GAP HMDS | 0.32 mm | 1 m | RETG.HMDS.032.1 | | |
| RET. GAP HMDS | 0.32 mm | 10 m | RETG.HMDS.032.10 | | |
| RET. GAP HMDS | 0.32 mm | 2 m | RETG.HMDS.032.2 | | |
| RET. GAP HMDS | 0.32 mm | 20 m | RETG.HMDS.032.20 | | |
| RET. GAP HMDS | 0.32 mm | 5 m | RETG.HMDS.032.5 | | |
| RET. GAP HMDS | 0.32 mm | 50 m | RETG.HMDS.032.50 | | |
| RET. GAP HMDS | 0.53 mm | 1 m | RETG.HMDS.053.1 | | |
| RET. GAP HMDS | 0.53 mm | 10 m | RETG.HMDS.053.10 | | |
| RET. GAP HMDS | 0.53 mm | 2 m | RETG.HMDS.053.2 | | |
| RET. GAP HMDS | 0.53 mm | 20 m | RETG.HMDS.053.20 | | |
| RET. GAP HMDS | 0.53 mm | 5 m | RETG.HMDS.053.5 | | |

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The Retention Gap Effects - Guide to Use of Retention Gaps (PDF File)

| Description | Internal Diameter | Length | Code # | Q.ta | |
|-------------------|-------------------|--------|-----------------|------|--|
| RET. GAP CARBOWAX | 0.25 mm | 1 m | RETG.WAX.025.1 | | |
| RET. GAP CARBOWAX | 0.25 mm | 10 m | RETG.WAX.025.10 | | |
| RET. GAP CARBOWAX | 0.25 mm | 2 m | RETG.WAX.025.2 | | |
| RET. GAP CARBOWAX | 0.25 mm | 20 m | RETG.WAX.025.20 | | |
| RET. GAP CARBOWAX | 0.25 mm | 5 m | RETG.WAX.025.5 | | |
| RET. GAP CARBOWAX | 0.25 mm | 50 m | RETG.WAX.025.50 | | |
| RET. GAP CARBOWAX | 0.32 mm | 1 m | RETG.WAX.032.1 | | |

| | | | | | |
|-------------------|---------|------|-----------------|--|--|
| RET. GAP CARBOWAX | 0.32 mm | 10 m | RETG.WAX.032.10 | | |
| RET. GAP CARBOWAX | 0.32 mm | 2 m | RETG.WAX.032.2 | | |
| RET. GAP CARBOWAX | 0.32 mm | 20 m | RETG.WAX.032.20 | | |
| RET. GAP CARBOWAX | 0.32 mm | 5 m | RETG.WAX.032.5 | | |
| RET. GAP CARBOWAX | 0.32 mm | 50 m | RETG.WAX.032.50 | | |
| RET. GAP CARBOWAX | 0.53 mm | 1 m | RETG.WAX.053.1 | | |
| RET. GAP CARBOWAX | 0.53 mm | 10 m | RETG.WAX.053.10 | | |
| RET. GAP CARBOWAX | 0.53 mm | 2 m | RETG.WAX.053.2 | | |
| RET. GAP CARBOWAX | 0.53 mm | 20 m | RETG.WAX.053.20 | | |
| RET. GAP CARBOWAX | 0.53 mm | 5 m | RETG.WAX.053.5 | | |

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