

GC Columns

Fused Silica Capillary Columns

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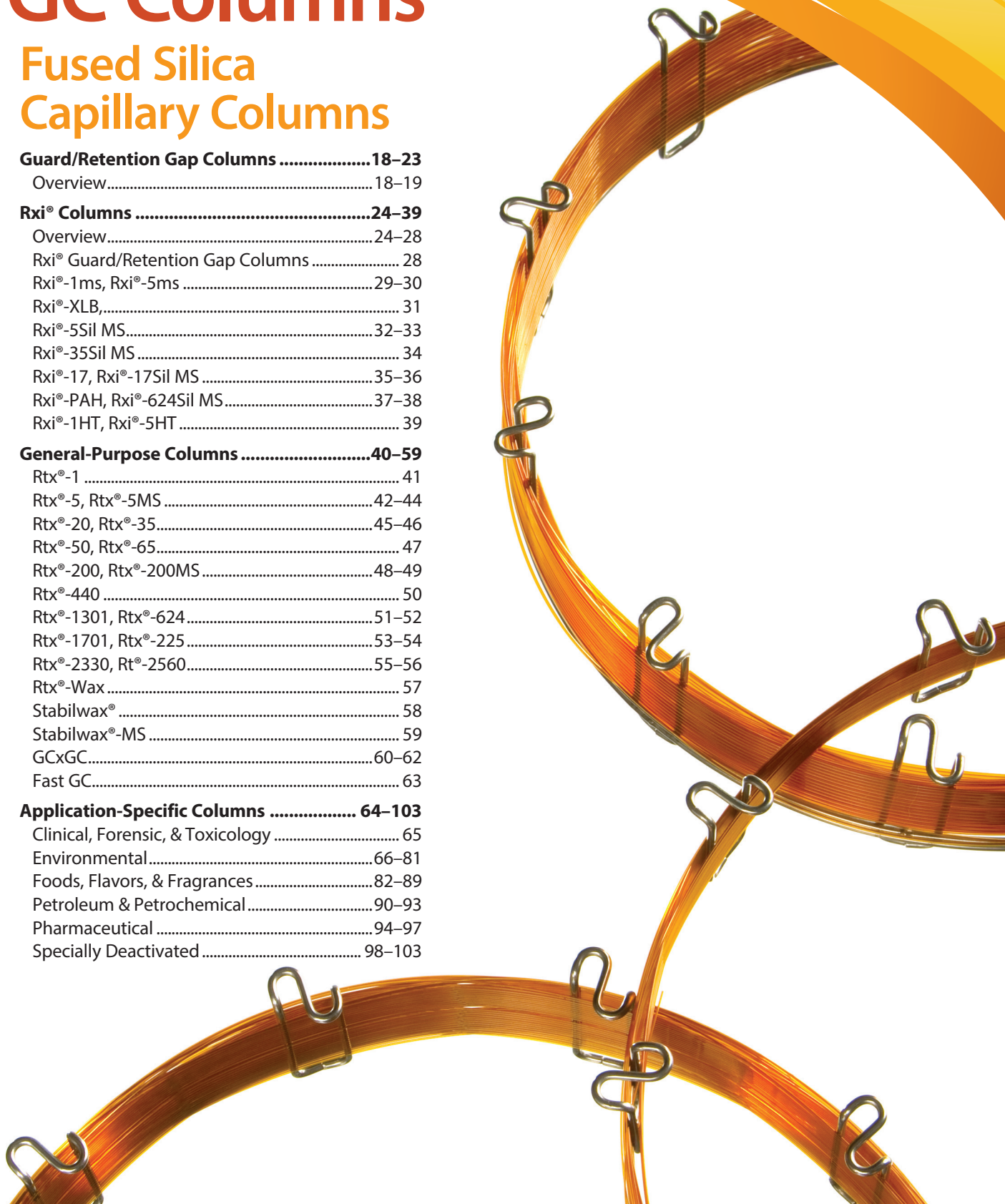
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Rxi® Guard/Retention Gap Columns (fused silica)

- 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 cat.#	5-Meter/6-pk. cat.#	10-Meter cat.#	10-Meter/6-pk. cat.#
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

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 cat.#	5-Meter cat.#	5-Meter/6-pk. cat.#
0.025 mm	0.363 ± 0.012 mm	10097		
0.05 mm	0.363 ± 0.012 mm	10098		
0.075 mm	0.363 ± 0.012 mm	10099		
0.10 mm	0.363 ± 0.012 mm	10100	10041	
0.15 mm	0.363 ± 0.012 mm	10101	10042	
0.18 mm	0.37 ± 0.04 mm	10102	10046	10046-600
0.25 mm	0.37 ± 0.04 mm		10043	10043-600
0.32 mm	0.45 ± 0.04 mm		10044	10044-600
0.53 mm	0.69 ± 0.05 mm		10045	10045-600

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

*30- and 60-meter lengths are banded in 5-meter sections.

†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

Polar-Deactivated Guard/Retention Gap Columns (fused silica)

(polar polyethylene glycol deactivation)

- 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 cat.#	10-Meter cat.#	30-Meter* cat.#
0.25 mm	0.37 ± 0.04 mm	10065	10068	10014
0.32 mm	0.45 ± 0.04 mm	10066	10069	
0.53 mm	0.69 ± 0.05 mm	10067	10070	10034

*30-meter lengths are banded in 5-meter sections.

it's a fact

To eliminate connections, use an Integra-Guard® column. (See **page 23**.)

**it's a fact**

Use guard columns to:

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

Certificates of analysis for 5 m and 10 m Restek® guard columns are now provided electronically. To view and download your 5 m or 10 m guard column certificate, simply visit www.restek.com/documentation then enter your catalog # and serial #.

Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8



did you know?

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

also available

Metal MXT® Guard/Retention Gap Columns

Rugged, flexible, Siltek®-treated stainless steel tubing for use with MXT® columns; inertness comparable to fused silica tubing.

See **page 106**.



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 cat.#	5-Meter/6-pk. cat.#
0.25 mm	0.37 ± 0.04 mm	10000	10000-600
0.32 mm	0.45 ± 0.04 mm	10001	10001-600
0.53 mm	0.69 ± 0.05 mm	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-and-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—Hydroguard® deactivated tubing. 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 surface beneath. Use Hydroguard® tubing for connecting GCs to these devices:

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

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

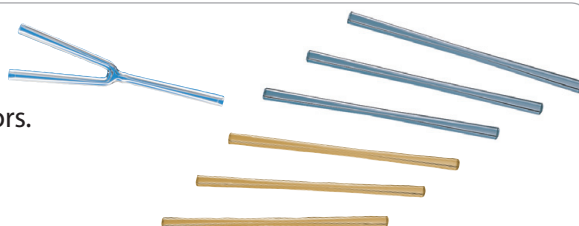
*30- and 60-meter lengths are banded in 5-meter sections.

†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

also available

Press-Tight connectors.

See **pages 227–228**.



Innovative Integra-Guard® Columns

Get the protection without the connection!

- 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 a guard column and an 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 here. 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.#
Rtx-1		
30 m, 0.25 mm ID, 0.25 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10123-124
30 m, 0.53 mm ID, 1.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10155-126
30 m, 0.53 mm ID, 5.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10179-126
Rtx-5		
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10223-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/10 m Integra-Guard Column	ea.	10223-127
30 m, 0.25 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10253-124
30 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10224-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10254-125
30 m, 0.53 mm ID, 5.00 µm Rtx-5/Rtx-G27 w/5 m Integra-Guard Column	ea.	10279-126
60 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10227-125
Rtx-5MS		
15 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12620-124
15 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12635-127
30 m, 0.25 mm ID, 0.10 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12608-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12623-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12623-127
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12638-124
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12638-127
30 m, 0.32 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12624-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12654-125
Rxi-5Sil MS		
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125
Rtx-624		
30 m, 0.25 mm ID, 1.40 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10968-124
30 m, 0.32 mm ID, 1.80 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10970-125
30 m, 0.53 mm ID, 3.00 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10971-126
Rtx-1301		
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126
Rtx-1701		
30 m, 0.25 mm ID, 0.25 µm Rtx-1701 w/5 m Integra-Guard Column	ea.	12023-124
Stabilwax		
30 m, 0.25 mm ID, 0.25 µm Stabilwax w/5 m Integra-Guard Column	ea.	10623-124
30 m, 0.32 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10654-125
30 m, 0.53 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10655-126

Integra-Guard® columns are available for all phases listed for columns with 0.25, 0.32, or 0.53 mm ID.

If you don't see what you need here, contact Customer Service.

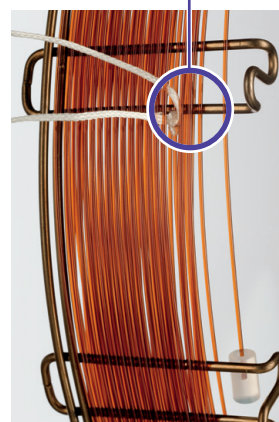
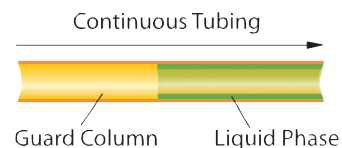
Restek innovation!

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

similar guards

DuraGuard, EZ-Guard, Guardian

Integra-Guard® Built-In Guard Column



String indicates where the analytical column begins.



Tag indicates guard column end.

High-Performance Rxi® GC Columns

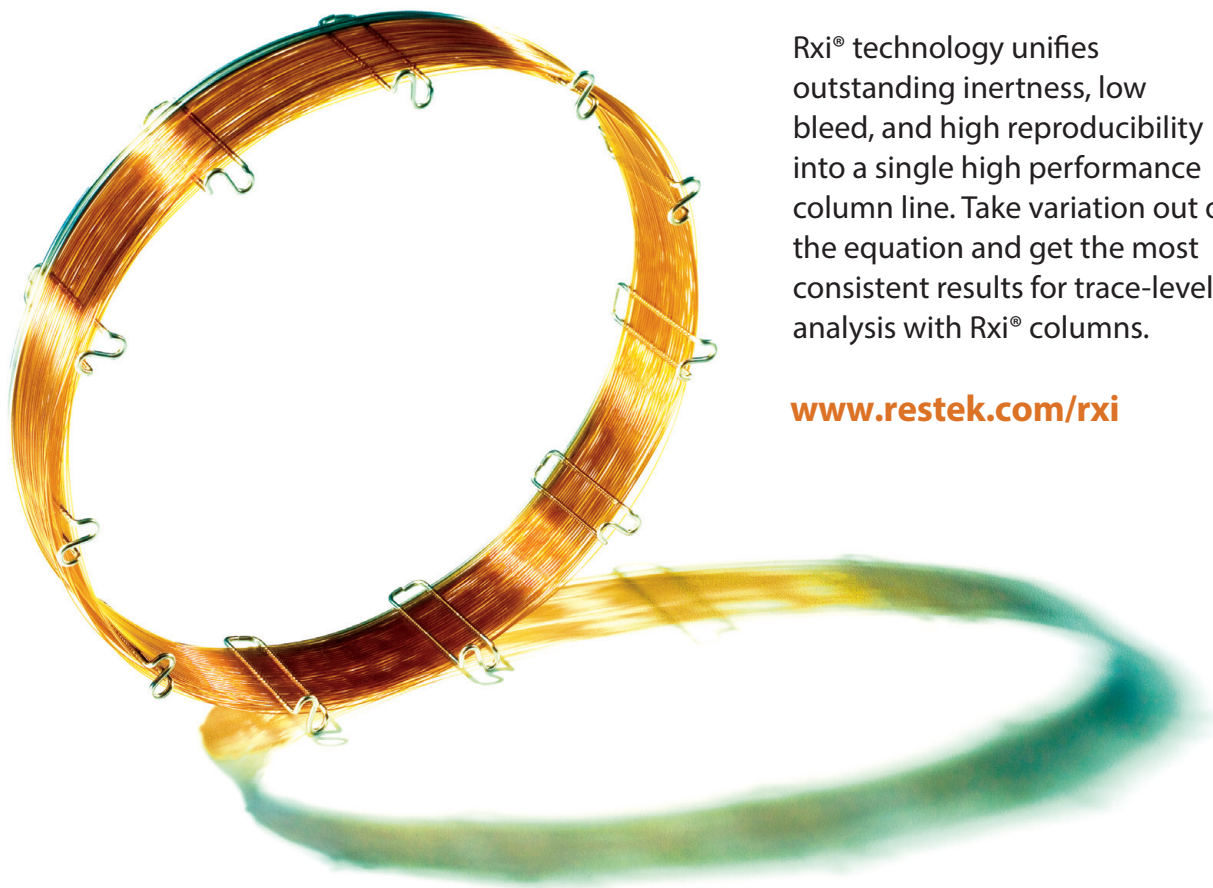
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Lower Detection Limits with Groundbreaking Rxi® Column Technology

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.

www.restek.com/rxi



Lower Detection Limits with Groundbreaking 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 these benefits:

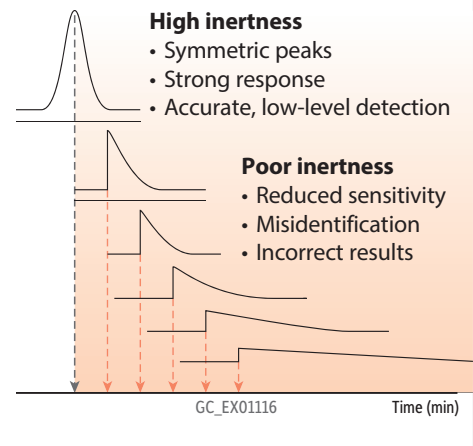
- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

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.



free literature

Rxi® GC Columns

To learn more, download your free copy from

www.restek.com

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How did we Create the Rxi® Column Family?

We've optimized phase chemistry, column deactivation, and our manufacturing process to ensure exceptional performance.

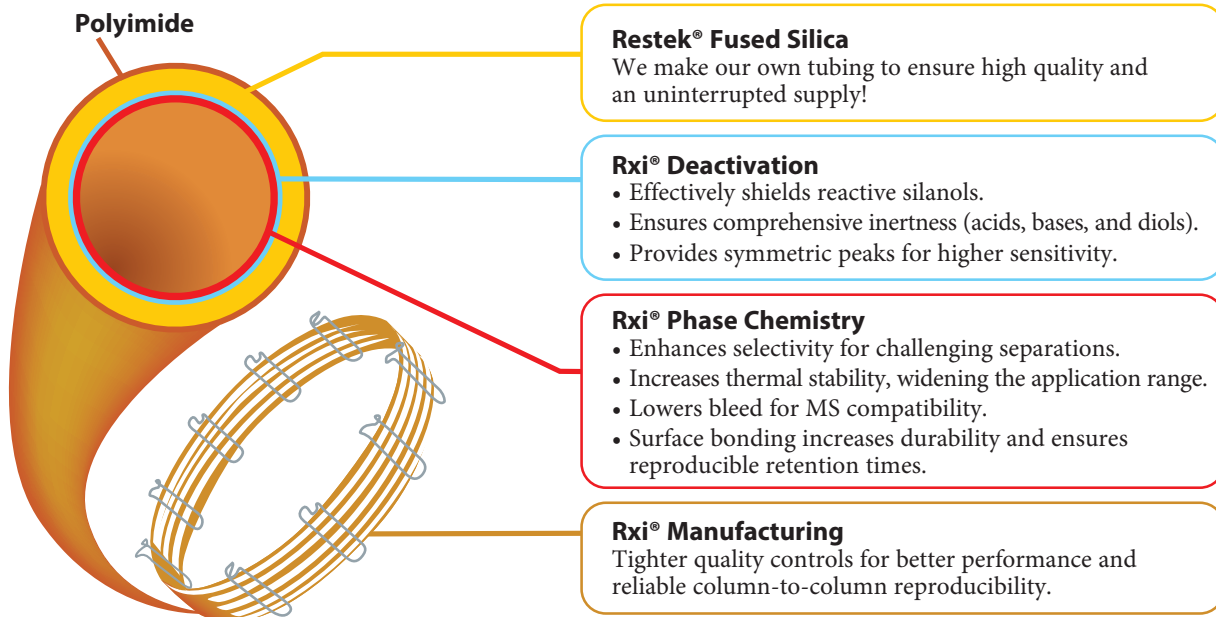
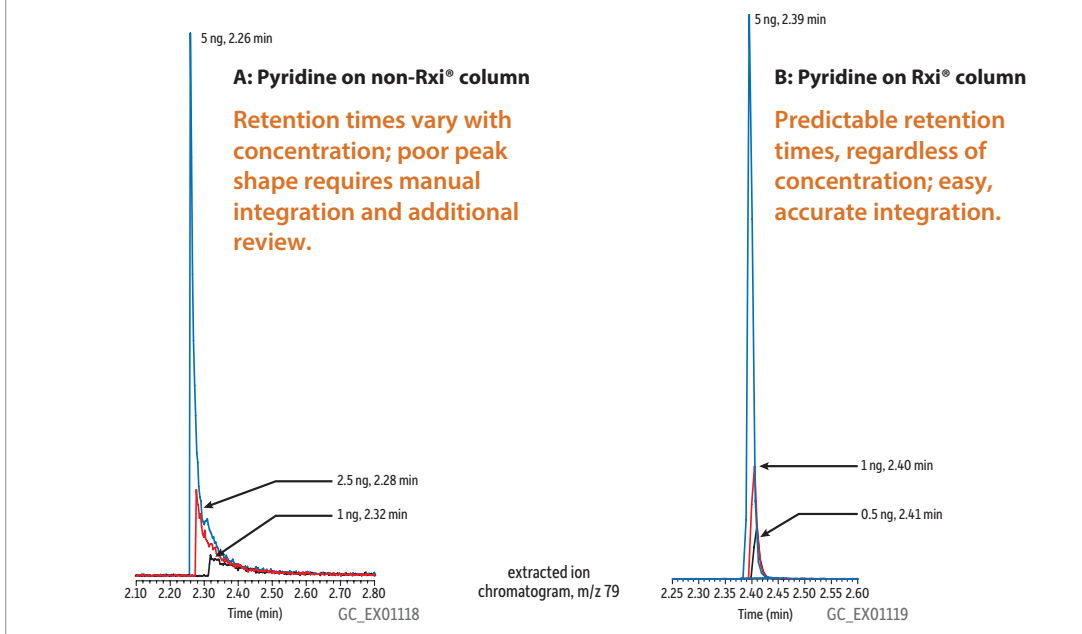


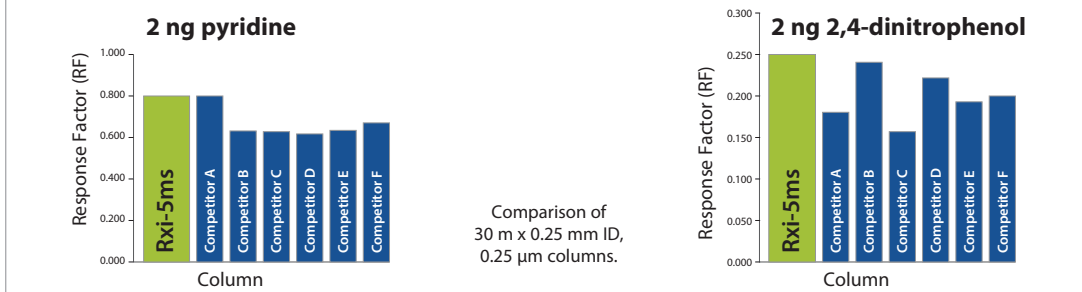
Figure 2: Compared to conventional GC columns, Rxi® columns show excellent inertness and produce good peak shape and reproducible retention for challenging compounds.



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).

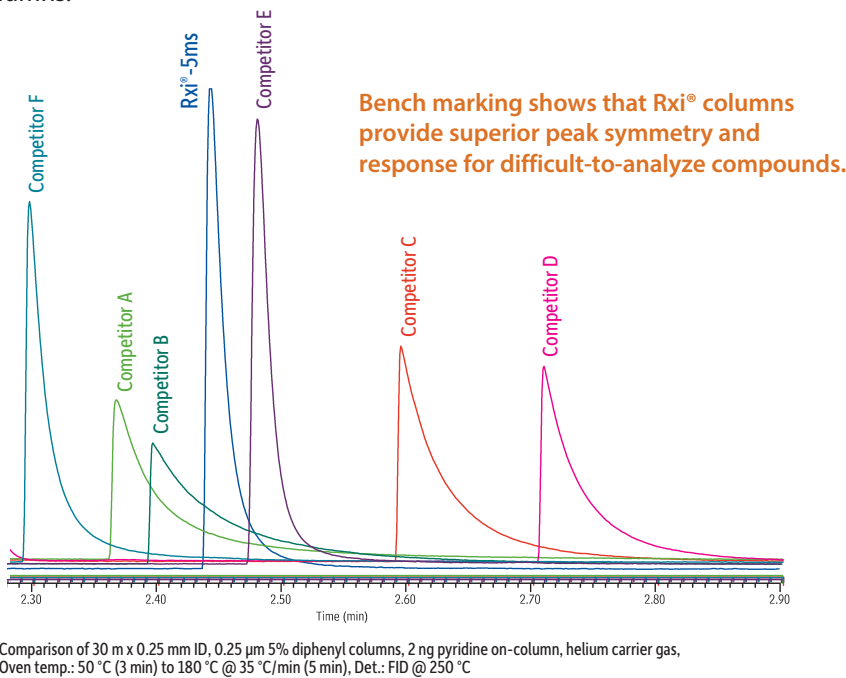
Figure 3: An Rxi® column gives the best overall performance for both basic and acidic compounds.



What are “Sil” Rxi® Columns?

By combining arylene chemistry with Rxi® technology, Restek has developed a subgroup of Rxi® columns with exceptional thermal stability. These columns are produced by incorporating phenylene groups into the polysiloxane backbone, forming silarylene copolymers. As a result of this modification, these columns, which are distinguished by a “Sil” naming convention, have greater thermal stability than their conventional counterparts. Four Sil columns are currently available: Rxi®-5Sil MS, Rxi®-624Sil MS, Rxi®-35Sil MS, and Rxi®-17Sil MS; these columns have the same polarity as their conventional counterparts, but differ in selectivity. Higher thermal stability results in lower bleed, which can make these columns useful for MS applications or when increased sensitivity is required.

Figure 4: Peak shape comparison of a basic compound on various brands of GC columns.



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?

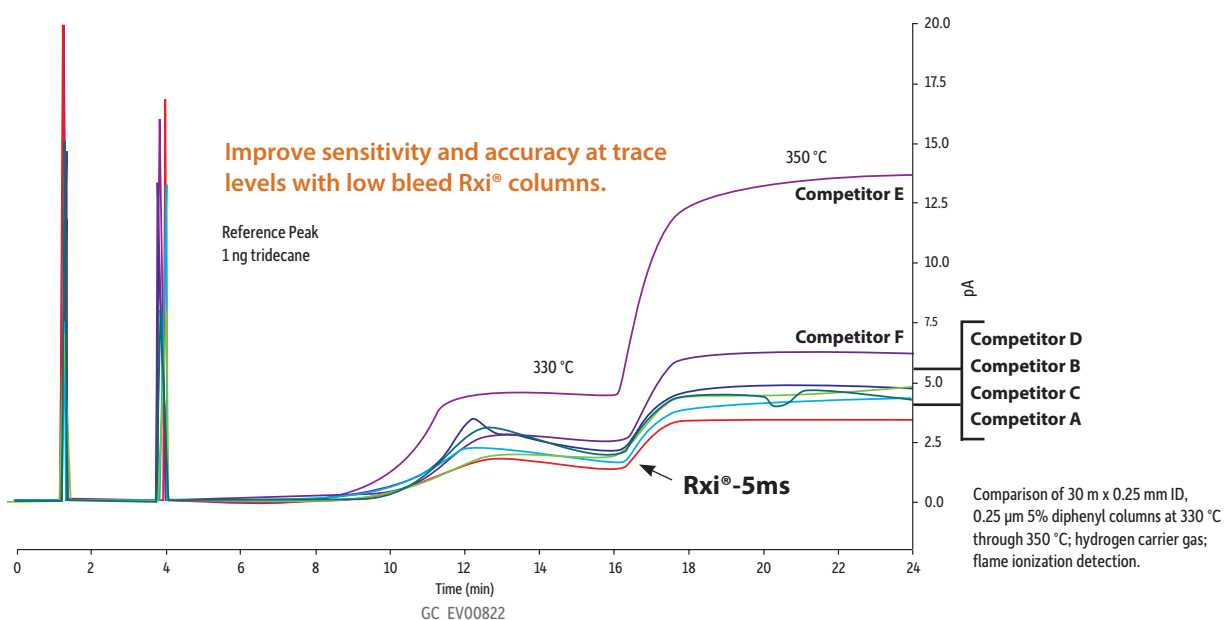
Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.

Lowest Bleed

Rxi® columns are more stable at high temperatures than other manufacturers' columns, 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 the following:

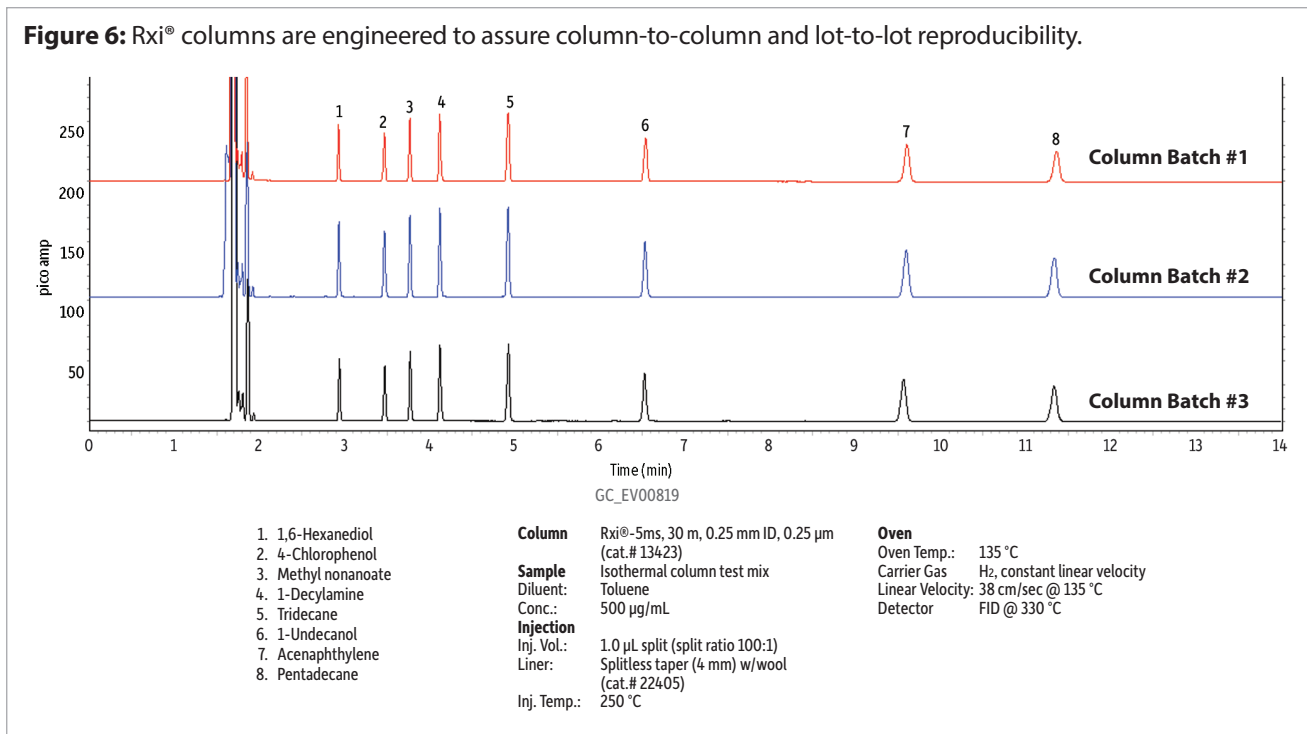
- Increased sensitivity, for lower detection limits and better matches to mass spectral libraries.
- Faster system stabilization.
- Reduced detector contamination results in less downtime for maintenance.

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).



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 cat.#	5-Meter/6-pk. cat.#	10-Meter cat.#	10-Meter/6-pk. cat.#
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

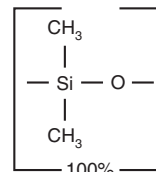
Rxi®-1ms Columns (fused silica)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for arson accelerants, 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.
- Equivalent to USP G1, G2, and G38 phases.

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

ID	df	temp. limits	10-Meter cat.#	12-Meter cat.#	20-Meter cat.#	25-Meter cat.#	50-Meter cat.#
0.15 mm	0.15 µm	-60 to 330/350 °C	43800		43801		
	2.0 µm	-60 to 330/350 °C			43802		
0.18 mm	0.18 µm	-60 to 330/350 °C			13302		
	0.36 µm	-60 to 330/350 °C			13311		
0.20 mm	0.33 µm	-60 to 330/350 °C		13397		13398	13399

Rxi®-1ms Structure

Similar to: (100%-methyl)-polysiloxane

similar phases

HP-1ms, HP-1msUI, DB-1ms, DB-1msUI, Ultra-1, VF-1ms, ZB-1, ZB-1ms

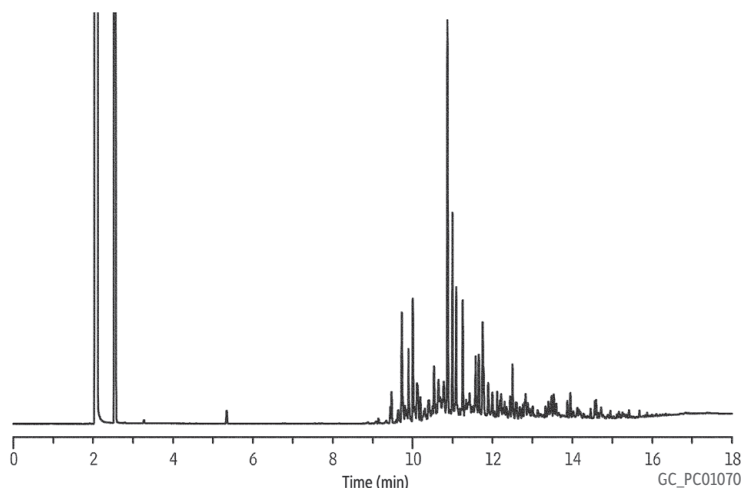
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Why Derivatize?
Improve GC Separations
with Derivatization

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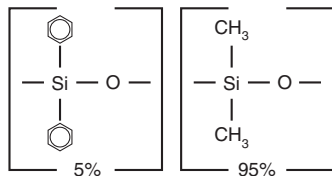
www.restek.com

lit. cat.#
CFTS1269

**99% Weathered Unleaded Gasoline on Rxi®-1ms**

Column Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample Unleaded gasoline: 99% weathered (cat.# 30436)
Diluent: Methanol
Conc.: 5,000 µg/mL
Injection
Inj. Vol.: 1.0 µL split (split ratio 20:1)
Liner: Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.: 250 °C
Oven
Oven Temp.: 50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas He, constant flow
Linear Velocity: 28 cm/sec
Detector FID @ 300 °C

Rxi®-5ms Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5ms SemiVolatiles, HP-5ms, HP-5msUI, DB-5, Ultra-2, CP-Sil 8 CB, ZB-5, ZB-5msi

free literature

Rxi® Columns

Lower Detection Limits with Ground-Breaking Column Technology

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GNFL1173A

Rxi®-5ms Columns (fused silica)

(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

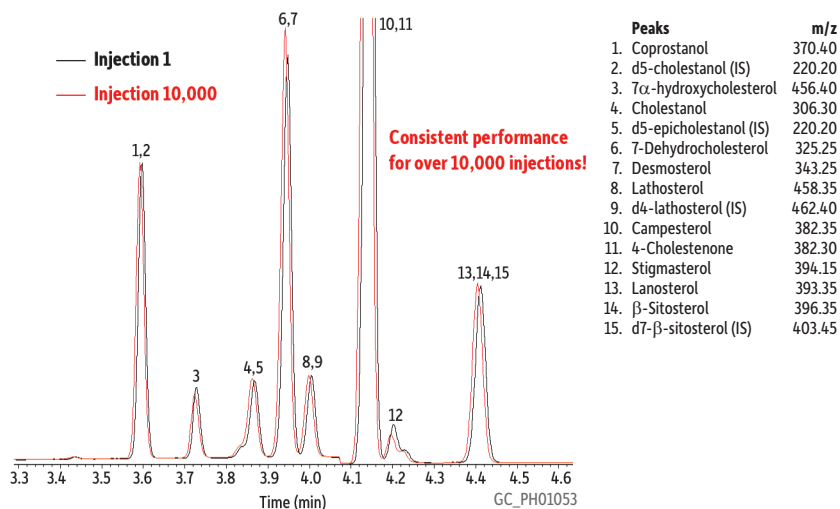
- General-purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g., Aroclor mixes), solvent impurities.
- Most inert column on the market.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Temperature range: -60 °C to 330/350 °C.
- Equivalent to USP G27 and G36 phases.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	
0.25 mm	0.25 µm	-60 to 330/350 °C	13420	13423	13426	
		-60 to 330/350 °C		13481		
	0.50 µm	-60 to 330/350 °C	13435	13438	13441	
		-60 to 330/350 °C				
1.00 µm	-60 to 330/350 °C	13450	13453	13456		
	-60 to 330/350 °C					
0.32 mm	0.25 µm	-60 to 330/350 °C	13421	13424	13427	
		-60 to 330/350 °C				
	0.50 µm	-60 to 330/350 °C	13436	13439	13442	
		-60 to 330/350 °C				
1.00 µm	-60 to 330/350 °C	13451	13454	13457		
	-60 to 330/350 °C					
0.53 mm	0.25 µm	-60 to 330/350 °C	13422	13425		
		-60 to 330/350 °C				
	0.50 µm	-60 to 330/350 °C	13437	13440		
		-60 to 330/350 °C				
1.00 µm	-60 to 330/350 °C	13452	13455			
	-60 to 330/350 °C					
1.50 µm	-60 to 330/350 °C	13467	13470			
	-60 to 330/350 °C					
ID	df	temp. limits	12-Meter cat.#	20-Meter cat.#	25-Meter cat.#	50-Meter cat.#
0.18 mm	0.18 µm	-60 to 330/350 °C		13402		
		-60 to 330/350 °C		13409		
		-60 to 330/350 °C		13411		
0.20 mm	0.33 µm	-60 to 330/350 °C	13497		13498	13499
		-60 to 330/350 °C				



Stringent quality testing ensures consistent performance, column to column and injection to injection.

Over 10,000 Injections of Lipidomics on Rxi®-5ms



Column Rxi®-5ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13423)
Sample Lipid plasma extract as trimethylsilyl derivatives
Injection
 Inj. Vol.: 1 µL split (split ratio 10:1)
 Liner: 4 mm split liner gooseneck with wool
 Inj. Temp.: 310 °C
Oven
 Oven Temp.: 250 °C (hold 1 min) to 320 °C at 30 °C/min (hold 1.6 min)
Carrier Gas He, constant flow
Flow Rate: 1.0 mL/min
Detector MS
Mode: SIM
Transfer Line Temp.: 330 °C
Ionization Mode: EI

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 semivolatiles compounds in drinking water.

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

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	30 to 340/360 °C	43702

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

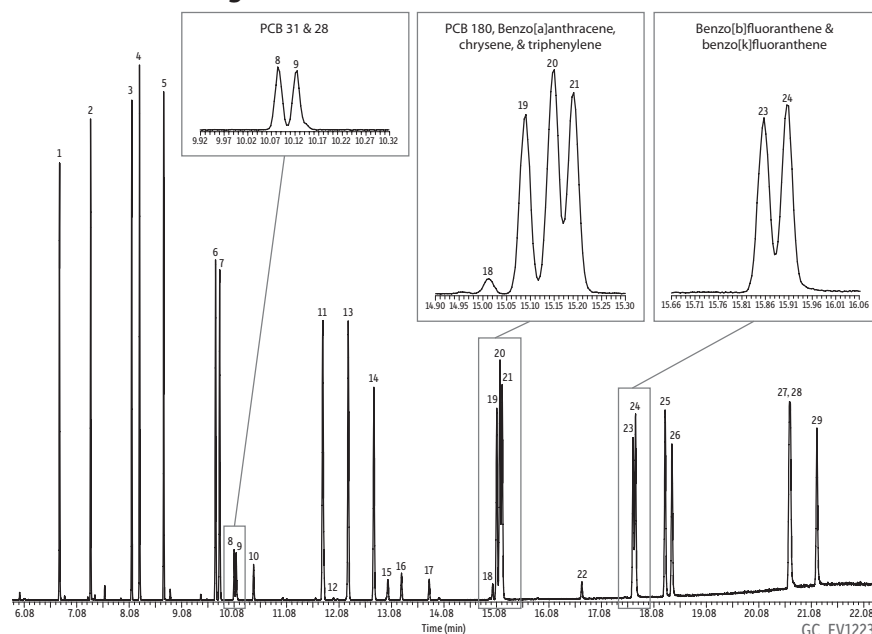
similar phases

DB-XLB, VF-Xms, MR1, ZB-XLB

i tech tip**Rxi®-XLB columns for Method 525**

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 target compounds.

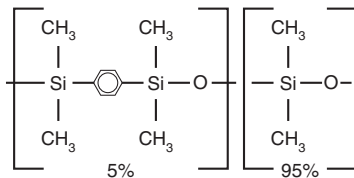
By eliminating contact between the sample and the hot metal surfaces in the injection port, a drilled Uniliner® inlet liner prevents analytes from degrading in the injection port.

PAHs and PCB Congeners on Rxi®-XLB

Peaks	Conc. (µg/mL)
1. Naphthalene	5
2. 2-Methylnaphthalene	5
3. Acenaphthylene	5
4. Acenaphthene	5
5. Fluorene	5
6. Phenanthrene	5
7. Anthracene	5
8. PCB 31	1
9. PCB 28	1
10. PCB 52	1
11. Fluoranthene	5
12. PCB 101	1
13. Pyrene	5
14. 2-Methylfluoranthene	5
15. PCB 118	1
16. PCB 153	1
17. PCB 138	1
18. PCB 180	1
19. Benzo[a]anthracene	5
20. Chrysene	5
21. Triphenylene	5
22. PCB 194	1
23. Benzo[b]fluoranthene	5
24. Benzo[k]fluoranthene	5
25. Benzo[e]pyrene	5
26. Benzo[a]pyrene	5
27. Dibenzo[a,h]anthracene	5
28. Indeno[1,2,3-cd]pyrene	5
29. Benzo[g,h,i]perylene	5

Column	Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)	Liner:	2.0 mm ID straight inlet liner w/wool (cat.# 21718)	Temp.:	300 °C
Sample	SV calibration mix #5 / 610 PAH mix (cat.# 31011)	Inj. Temp.:	300 °C	Analyzer Type:	Quadrupole
	Benzo(e)pyrene (cat.# custom)	Purge Flow:	50 mL/min	Source Temp.:	280 °C
	Triphenylene (cat.# custom)	Oven		Electron Energy:	70 eV
	2-Methylnaphthalene (cat.# 31285)	Oven Temp.:	40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)	Solvent Delay Time:	4 min
	2-Methylfluoranthene (cat.# custom)	Carrier Gas	He, constant flow	Tune Type:	manual
	PCB congener standard #2 (cat.# 32294)	Flow Rate:	1 mL/min	Ionization Mode:	EI
	PCB 31 (cat.# custom)	Detector	MS	Scan Range:	45-550 amu
Diluent:	Dichloromethane	Mode:	Scan	Scan Rate:	5 scans/sec
Injection		Transfer Line		Instrument	PE Clarus 500 GC & Clarus 500 MS
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)				

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

free literature

Rxi®-5Sil MS Columns
Assured Performance
for Forensic
Applications



lit. cat.#
CFBR1302A

Accurately Determine Mineral
Oil Hydrocarbons in Food and
Packaging



lit. cat.#
FFTS1921-UNV

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Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, 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 cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm 0.10 µm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm 0.25 µm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm 1.50 µm		-60 to 320/330 °C		13670	

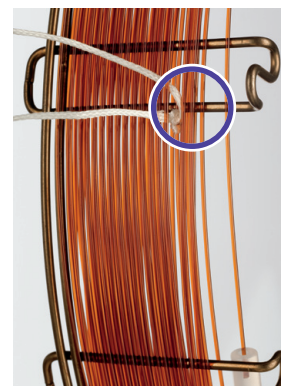
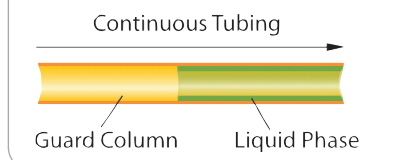
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm 0.15 µm	0.15 µm	-60 to 320/350 °C	43815			
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm 0.10 µm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Rxi®-5Sil MS with Integra-Guard®

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

Description	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125

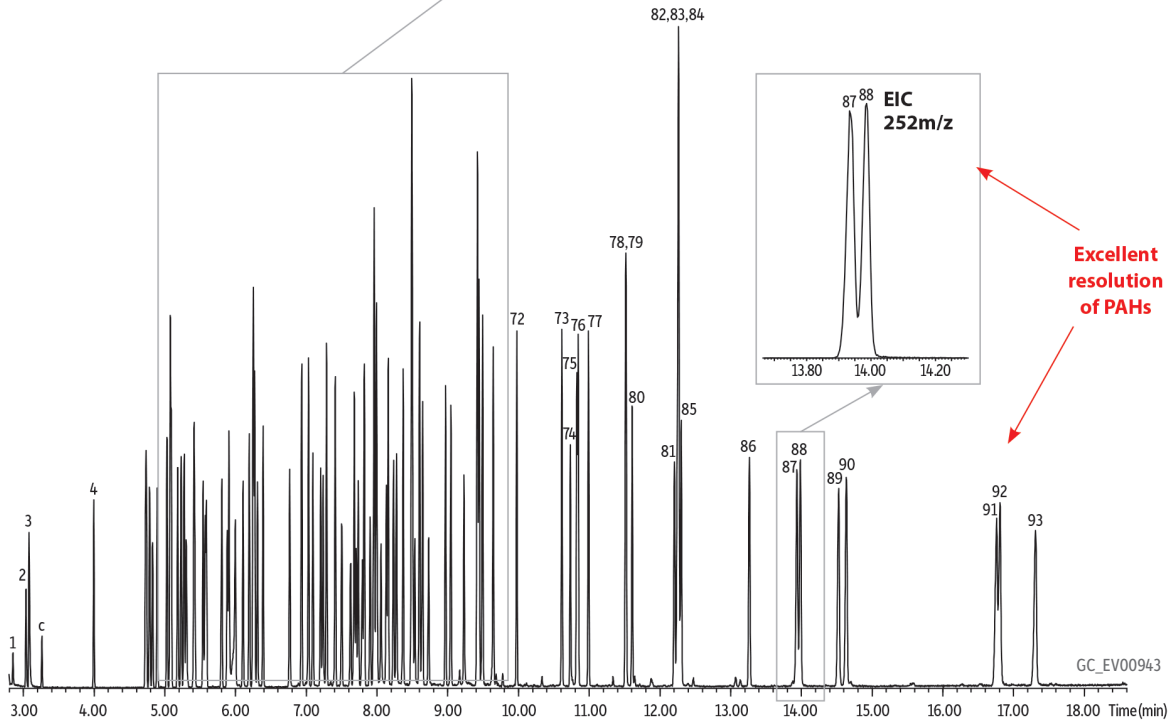
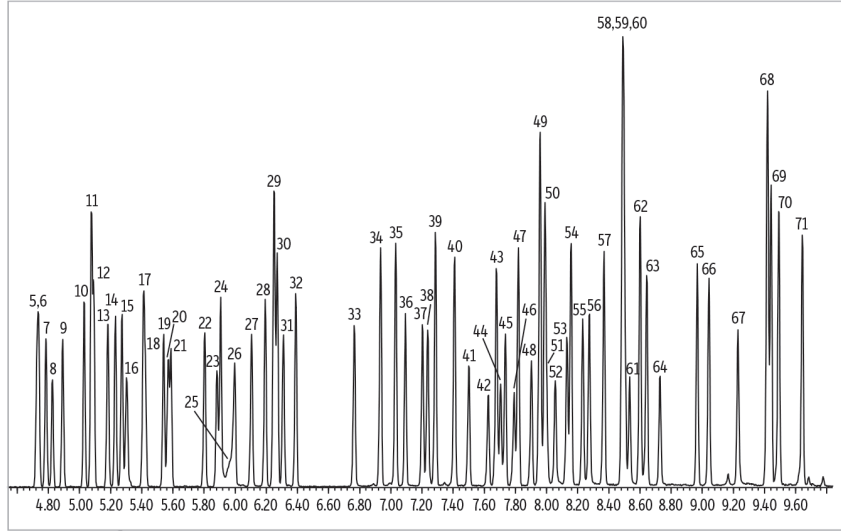
Integra-Guard® Built-In Guard Column



String indicates where the analytical column begins.

Semivolatiles by EPA Method 8270 on Rxi®-5Si1 MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner

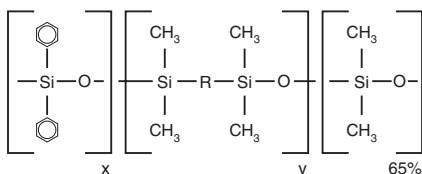
Column Rxi®-5Si1 MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample 8270 MegaMix® (cat.# 31850)
 Benzoic acid (cat.# 31879)
 8270 Benzidines mix (cat.# 31852)
 Acid surrogate mix (4/89 SOW) (cat.# 31025)
 Revised B/N surrogate mix (cat.# 31887)
 1,4-Dioxane (cat.# 31853)
 SV internal standard mix (cat.# 31206)
 10 µg/mL (IS 40 µg/mL)
Conc.:
Injection
 Inj. Vol.: 1.0 µL pulsed splitless (hold 0.15 min)
 Liner: 4 mm drilled Uniliner® (hole near bottom) (cat.# 20756)
 Inj. Temp.: 250 °C
 Pulse Pressure: 25 psi (172.4 kPa)
 Pulse Time: 0.2 min
 Purge Flow: 60 mL/min
Oven
 Oven Temp.: 40 °C (hold 1.0 min) to 280 °C at 25 °C/min to 320 °C at 5 °C/min (hold 1 min)
Carrier Gas
 Flow Rate: He, constant flow
 1.2 mL/min
Detector
 Mode: Scan
 Transfer Line Temp.: 280 °C
 Ionization Mode: EI
 Scan Range: 35-550 amu



Peaks	17. 4-Methylphenol/3-methylphenol	34. 2-Methylnaphthalene	52. 4-Nitrophenol	66. Hexachlorobenzene	85. Chrysene
1. 1,4-Dioxane	18. N-Nitrosodi-N-propylamine	35. 1-Methylnaphthalene	53. 2,4-Dinitrotoluene	67. Pentachlorophenol	86. Di-n-octyl phthalate
2. N-Nitrosodimethylamine	19. Hexachloroethane	36. Hexachlorocyclopentadiene	54. Dibenzofuran	68. Phenanthrene-d10 (IS)	87. Benzo[b]fluoranthene
3. Pyridine	20. Nitrobenzene-d5 (SS)	37. 2,4,6-Trichlorophenol	55. 2,3,5,6-Tetrachlorophenol	69. Phenanthrene	88. Benzo[k]fluoranthene
4. 2-Fluorophenol (SS)	21. Nitrobenzene	38. 2,4,5-Trichlorophenol	56. 2,3,4,6-Tetrachlorophenol	70. Anthracene	89. Benzo[a]pyrene
5. Phenol-d6 (SS)	22. Isophorone	39. 2-Fluorobiphenyl (SS)	57. Diethyl phthalate	71. Carbazole	90. Perylene-d12 (IS)
6. Phenol	23. 2-Nitrophenol	40. 2-Chloronaphthalene	58. 4-Chlorophenyl phenyl ether	72. di-n-Butyl phthalate	91. Indeno[1,2,3-cd]pyrene
7. Aniline	24. 2,4-Dimethylphenol	41. 2-Nitroaniline	59. Fluorene	73. Fluoranthene	92. Dibenzo[a,h]anthracene
8. Bis(2-chloroethyl) ether	25. Benzoic acid	42. 1,4-Dinitrobenzene	60. 4-Nitroaniline	74. Benzidine	93. Benzo[ghi]perylene
9. 2-Chlorophenol	26. Bis(2-chloroethoxy)methane	43. Dimethyl phthalate	61. 4,6-Dinitro-2-methylphenol	75. Pyrene-d10 (SS)	
10. 1,3-Dichlorobenzene	27. 2,4-Dichlorophenol	44. 1,3-Dinitrobenzene	62. n-Nitroso-diphenylamine (diphenylamine)	76. Pyrene	
11. 1,4-Dichlorobenzene-d4 (IS)	28. 1,2,4-Trichlorobenzene	45. 2,6-Dinitrotoluene	63. 1,2-Diphenylhydrazine (as azobenzene)	77. p-Terphenyl-d14 (SS)	
12. 1,4-Dichlorobenzene	29. Naphthalene-d8 (IS)	46. 1,2-Dinitrobenzene	64. 2,4,6-Tribromophenol (SS)	78. 3,3'-Dimethylbenzidine	
13. Benzyl alcohol	30. Naphthalene	47. Acenaphthylene	65. 4-Bromophenyl phenyl ether	79. Butyl benzyl phthalate	
14. 1,2-Dichlorobenzene	31. 4-Chloroaniline	48. 3-Nitroaniline		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	
		51. 2,4-Dinitrophenol		83. Bis(2-ethylhexyl)phthalate	
				84. Chrysene-d12 (IS)	

c = contaminant (toluene)

Rxi®-35Sil MS Structure



Similar to: (35%-phenyl)-methylpolysiloxane

Rxi®-35Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

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

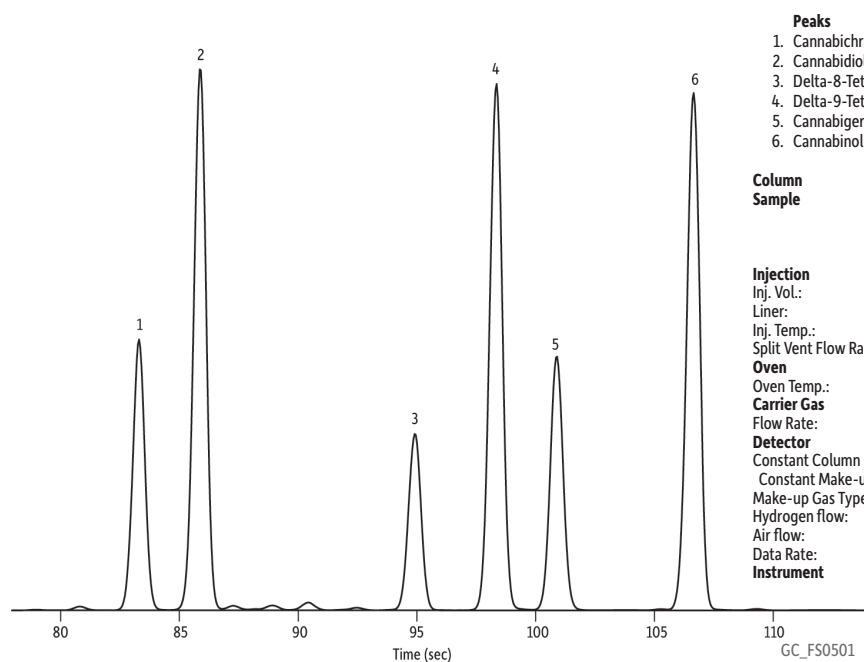
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	50 to 340/360 °C	13820	13823
	0.50 µm	50 to 340/360 °C	13835	13838
	1.00 µm	50 to 320/340 °C	13850	13853
0.32 mm	0.25 µm	50 to 340/360 °C	13821	13824
	0.50 µm	50 to 340/360 °C	13836	13839
	1.00 µm	50 to 320/340 °C	13851	13854
0.53 mm	0.50 µm	50 to 340/360 °C	13837	13840
	1.00 µm	50 to 325/340 °C	13852	13855
	1.50 µm	50 to 310/330 °C	13856	13857
3.00 µm	50 to 280/300 °C	13858	13859	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

similar phases

DB-35ms, DB-35msUI, VF-35ms, MR2

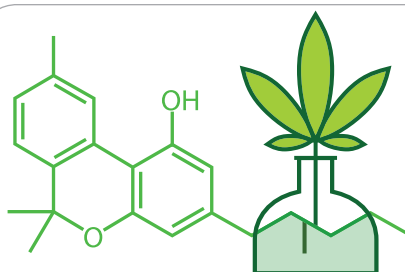
Cannabinoids on Rxi®-35Sil MS Using Hydrogen Carrier Gas by GC-FID



Peaks	iR (sec)
1. Cannabichromene	83.3
2. Cannabidiol	85.9
3. Delta-8-Tetrahydrocannabinol	94.9
4. Delta-9-Tetrahydrocannabinol	98.4
5. Cannabigerol	100.9
6. Cannabinol	106.7

Column Rxi®-35Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13820)
Sample Cannabinoids standard (cat.# 34014)
 Cannabichromene (cat.# 34092)
 delta-8-Tetrahydrocannabinol (THC) (cat.# 34090)
 Cannabigerol (cat.# 34091)

Injection
 Inj. Vol.: 1 µL split (split ratio 50:1)
 Liner: Sky® 4 mm Precision® liner w/wool (cat.# 23305.5)
 Inj. Temp.: 250 °C
 Split Vent Flow Rate: 125 mL/min
Oven
 Oven Temp.: 225 °C (hold 0.1 min) to 330 °C at 35 °C/min (hold 0.9 min)
Carrier Gas
 H₂, constant flow
 Flow Rate: 2.5 mL/min
Detector
 Constant Column +
 Constant Make-up: 50 mL/min
 Make-up Gas Type: N₂
 Hydrogen flow: 40 mL/min
 Air flow: 450 mL/min
 Data Rate: 20 Hz
Instrument Agilent/HP6890 GC



Growing Analytical Solutions for Medical Cannabis Labs

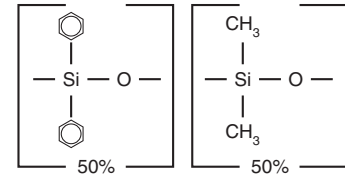
PRODUCTS AND EXPERTISE FOR ACCURATE, RELIABLE RESULTS EVERY TIME

www.restek.com/cannabis

Rxi®-17 Columns (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

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

Rxi®-17 Structure

Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

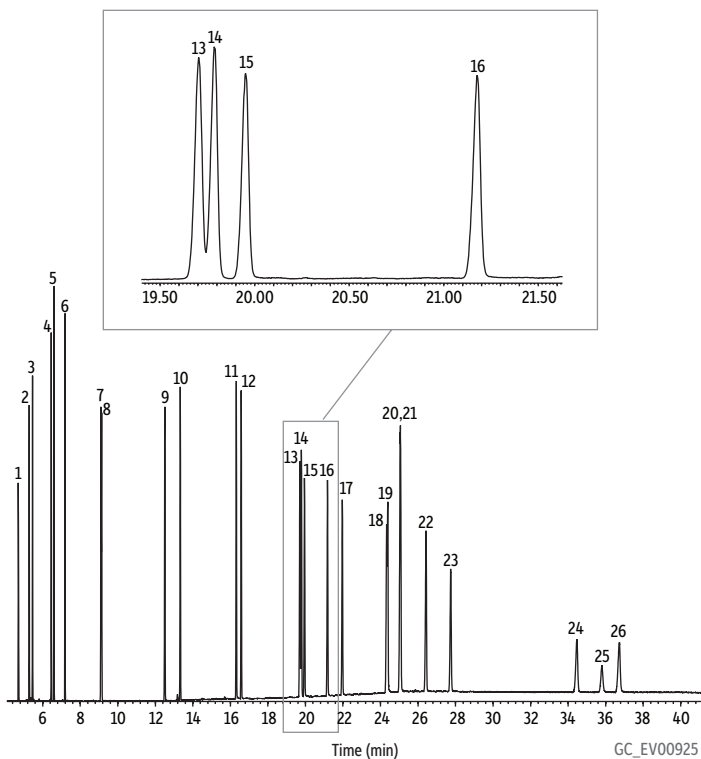
HP-17, DB-17, DB-17ht, DB-608, ZB-50

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	40 to 280/320 °C	13520	13523
	0.50 µm	40 to 280/320 °C		13538
	1.00 µm	40 to 280/320 °C		13553
0.32 mm	0.25 µm	40 to 280/320 °C	13524	13524
	0.50 µm	40 to 280/320 °C		13539
	1.00 µm	40 to 280/320 °C		13554
0.53 mm	0.25 µm	40 to 280/320 °C	13552	13525
	0.50 µm	40 to 280/320 °C		13540
	0.83 µm	40 to 280/320 °C		13569
	1.00 µm	40 to 280/320 °C		13555
	1.50 µm	40 to 280/320 °C		13570

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	40 to 280/320 °C	13502

Polycyclic Aromatic Hydrocarbons on Rxi®-17 column

Completely resolve
benzo(j)fluoranthene.

**Column Sample**

Rxi®-17, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13523)
SV Calibration Mix #5 / 610 PAH Mix (cat.# 31011)
PAH Supplement Mix for Method 8100 (cat.# 31857)
1-methylnaphthalene (cat.# 31283)
2-methylnaphthalene (cat.# 31285)
20 µg/mL each component

Conc.:**Injection**

Inj. Vol.: 1.0 µL pulsed splitless (hold 0.2 min)
Liner: Drilled Uniliner® (hole near top) (cat.# 21055)
Inj. Temp.: 300 °C
Pulse Pressure: 20 psi (137.9 kPa)
Pulse Time: 0.3 min
Purge Flow: 40 mL/min

Oven

Oven Temp.: 90 °C (hold 1.0 min) to 215 °C at 25 °C/min (hold 0.5 min) to 235 °C at 4 °C/min (hold 0 min) to 280 °C at 15 °C/min (hold 0 min) to 320 °C at 4 °C/min (hold 20 min)

Carrier Gas

Flow Rate: 1.2 mL/min

Detector

MS

Mode:

Scan

Analyzer Type:

Quadrupole

Solvent Delay Time:

4.0 min

Tune Type:

DFTPP

Ionization Mode:

EI

Scan Range:

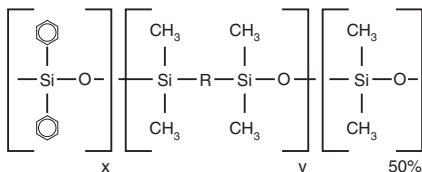
50-550 amu

Instrument

HP6890 GC & 5973 MSD

Peaks	tR (min)	9. Fluoranthene	12.50	18. Dibenz(a,h)acridine	24.33
1. Naphthalene	4.70	10. Pyrene	13.33	19. Dibenz[a,j]acridine	24.39
2. 1-Methylnaphthalene	5.28	11. Benz[a]anthracene	16.32	20. Indeno(1,2,3-cd)pyrene	25.04
3. 2-Methylnaphthalene	5.46	12. Chrysene	16.58	21. Dibenz[a,h]anthracene	25.07
4. Acenaphthylene	6.45	13. Benzo[b]fluoranthene	19.70	22. Benzo[ghi]perylene	26.43
5. Acenaphthene	6.60	14. Benzo[k]fluoranthene	19.78	23. 7H-Dibenzo(c,g)carbazole	27.75
6. Fluorene	7.18	15. Benzo[j]fluoranthene	19.95	24. Dibenzo(a,E)pyrene	34.46
7. Phenanthrene	9.10	16. Benzo[a]pyrene	21.17	25. Dibenzo(a,i)pyrene	35.80
8. Anthracene	9.14	17. 3-Methylcholanthrene	21.97	26. Dibenzo(a,h)pyrene	36.73

Rxi®-17Sil MS Structure



Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

DB-17ms, VF-17ms

Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

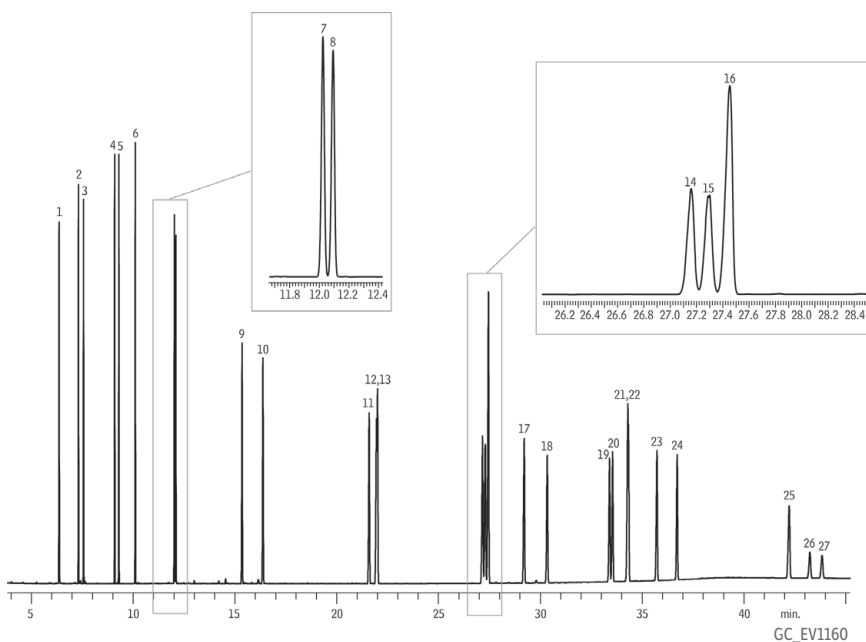
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Low bleed for use with sensitive detectors, such as MS.
- 340/360 °C upper temperature limits.
- Equivalent to USP phase G3.

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

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS



Excellent resolution and peak shape for PAHs that cannot be resolved by MS.

Peaks

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[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 Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
Sample PAH supplement mix for method 8100 (cat.# 31857)
 EPA Method 8310 PAH mixture (cat.# 31841)
 Triphenylene (custom)

Diluent: Dichloromethane
Conc.: 10 ppm

Injection
Inj. Vol.: 0.5 µL splitless (hold 1.75 min)
Liner: Auto SYS XL PSS split/splitless w/wool (cat.# 21718)
Inj. Temp.: 320 °C
Purge Flow: 75 mL/min

Oven
Oven Temp.: 65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)
Carrier Gas He, constant flow
Flow Rate: 2.0 mL/min
Detector FID @ 320 °C
Instrument PE Clarus 600 GC
Acknowledgement Instrument provided by PerkinElmer

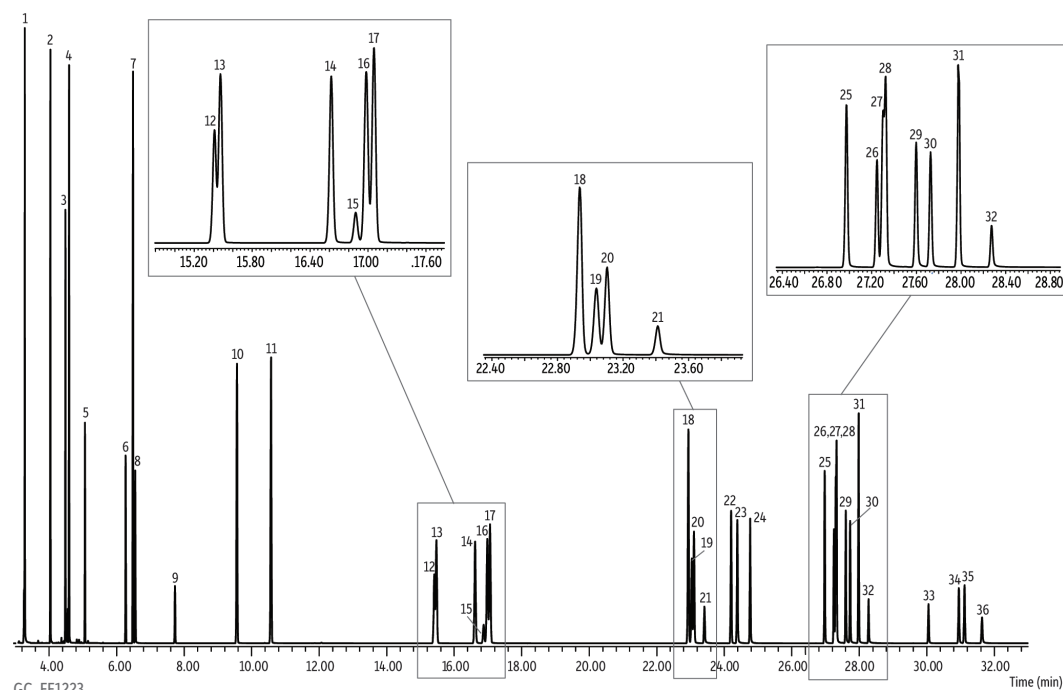
Rxi®-PAH Columns (fused silica)

(midpolarity proprietary phase)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low-volatility dibenzo pyrenes.



ID	df	temp. limits	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

NIST SRM 2260a PAH Mix on Rxi®-PAH**Peaks**

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def]phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benz[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

GC_FF1223

Time (min)

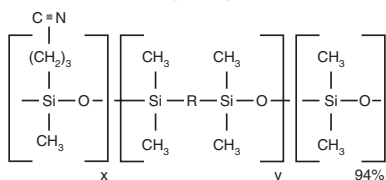
Column Rxi®-PAH, 40 m, 0.18 mm ID, 0.07 µm (cat.# 49316)
Sample NIST SRM 2260a PAH mix
Diluent: Toluene
Conc.: 0.2 - 2 µg/mL (SRM 2260a PAH mix was diluted 5x in toluene)
Injection
 Inj. Vol.: 0.5 µL pulsed splitless (hold 0.58 min)
 Liner: Sky® 2 mm single taper w/wool (cat.# 23316.1)
 Inj. Temp.: 275 °C
 Pulse Pressure: 80 psi (551.6 kPa)
 Pulse Time: 0.6 min
 Purge Flow: 40 mL/min
Oven
 Oven Temp.: 110 °C (hold 1 min) to 210 °C at 37 °C/min to 260 °C at 3 °C/min to 350 °C at 11 °C/min (hold 4.5 min)
Carrier Gas
 Flow Rate: He, constant flow 1.4 mL/min

Detector MS
Mode: SIM
SIM Program:

Group	Start Time (min)	Ion(s) (m/z)	Dwell (ms)
1	3.00	128, 152, 153, 154, 165	40
2	5.50	178, 184, 190, 202	50
3	13.00	226, 228	100
4	20.00	252	200
5	26.00	276, 278	100
6	29.00	300, 302	150

Transfer Line Temp.: 350 °C
 Analyzer Type: Quadrupole
 Source Temp.: 350 °C
 Quad Temp.: 200 °C
 Solvent Delay Time: 3.00 min
 Tune Type: PFTBA
 Ionization Mode: EI
Instrument Agilent 7890A GC & 5975C MSD

Rxi®-624Sil MS (G43) Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875



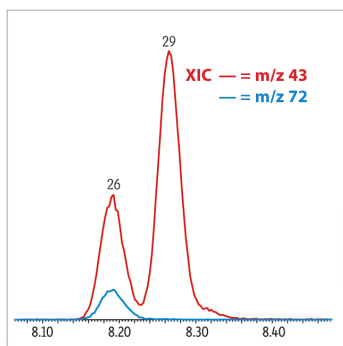
free literature

Rxi®-624Sil MS Columns: Exceptionally Inert, Low-Bleed Columns for Volatiles Analysis

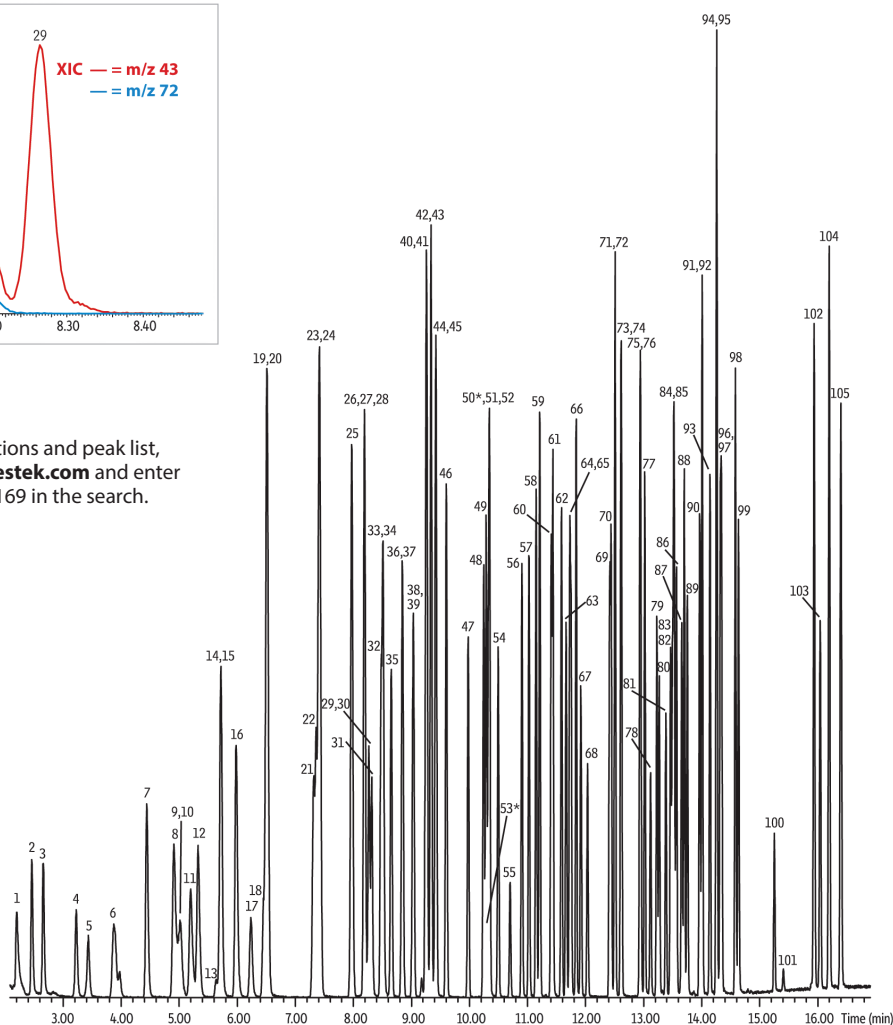
Download your free copy from www.restek.com

lit. cat.# GNBR1334A-UNV

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



For conditions and peak list, visit www.restek.com and enter GC_EV1169 in the search.



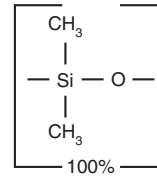
GC_EV1169

Rxi®-1HT Columns (fused silica)

(nonpolar phase; dimethyl polysiloxane)

- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as high molecular weight hydrocarbons.
- Temperature range: -60 to 400 °C.

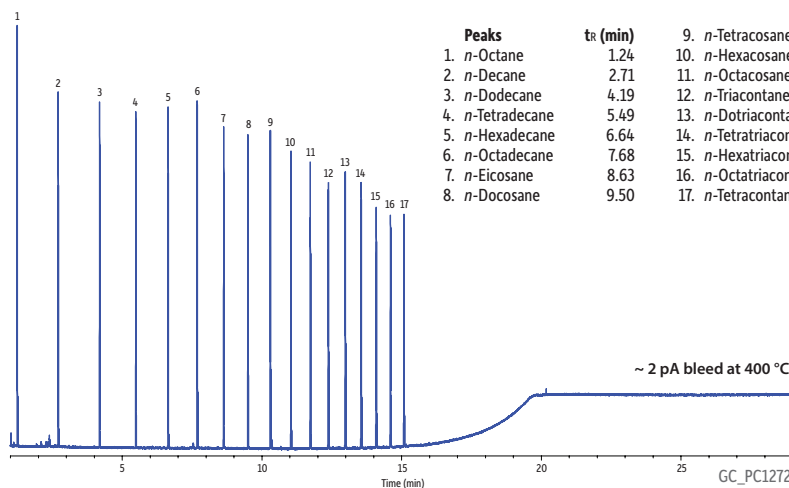
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 400 °C	13950	13951
	0.25 µm	-60 to 400 °C		13952
0.32 mm	0.10 µm	-60 to 400 °C	13953	13954
	0.25 µm	-60 to 400 °C		13955

Rxi®-1HT Structure

Similar to: (100%-methyl)-polysiloxane

similar phases

DB-1ht, ZB-1HTinferno

Florida TRPH Standard Mix on Rxi®-1HT

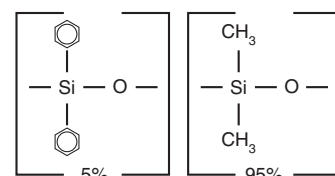
Column	Rxi®-1HT, 15 m, 0.25 mm ID, 0.10 µm (cat.# 13950)
Sample	Florida TRPH standard (cat.# 31266)
Diluent:	Hexane
Conc.:	50 ppm (1.25 ng on-column)
Injection	
Inj. Vol.:	1.0 µL split (split ratio 40:1)
Liner:	Sky® 4.0 mm ID Precision® inlet liner w/ wool (cat.# 23305.1)
Inj. Temp.:	275 °C
Oven	
Oven Temp.:	40 °C (hold 1.0 min) to 400 °C at 20 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Linear Velocity:	55 cm/sec
Detector	FID @ 400 °C
Make-up Gas	
Flow Rate:	45 mL/min
Make-up Gas	
Type:	N ₂
Hydrogen flow:	40 mL/min
Air flow:	450 mL/min
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC

Rxi®-5HT Columns (fused silica)

(low-polarity phase; diphenyl dimethyl polysiloxane)

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

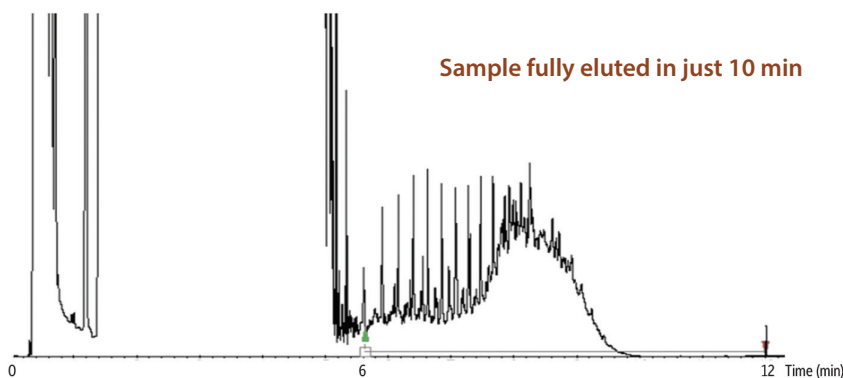
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 400 °C	13905	13908
	0.25 µm	-60 to 400 °C		13923
0.32 mm	0.10 µm	-60 to 400 °C	13906	13909
	0.25 µm	-60 to 400 °C		13924
0.53 mm	0.15 µm	-60 to 380/400 °C		13910

Rxi®-5HT Structure

Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ht, VF-5ht, ZB-5HTinferno

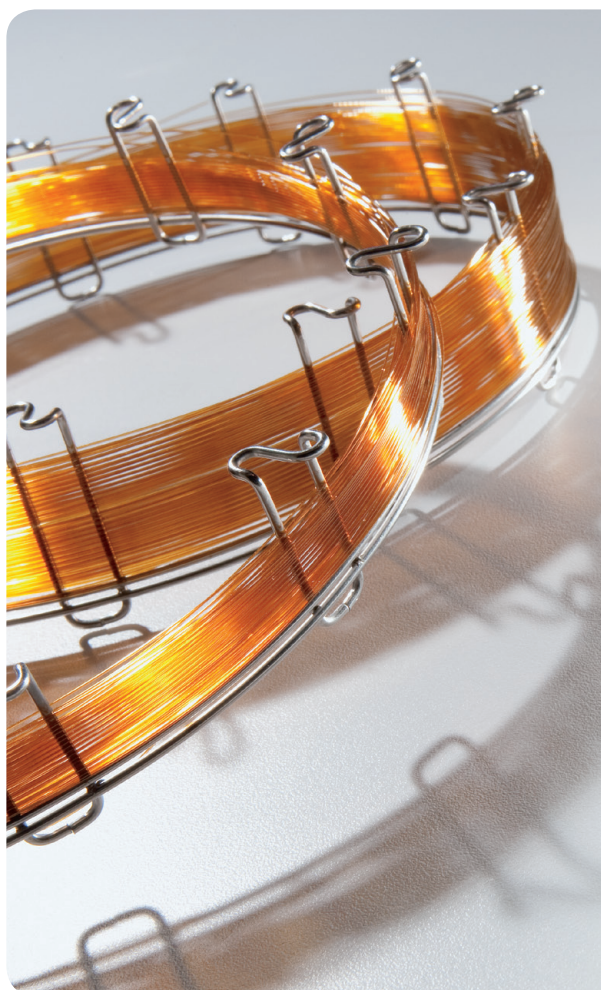
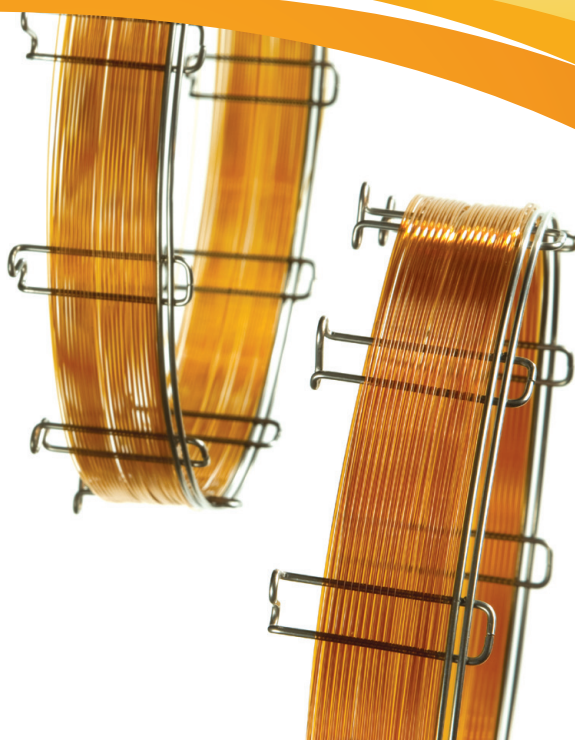
Mineral Oil on Rxi®-5HT by EN9377-2 (PTV large volume injection)

Column	Rxi®-5HT, 15 m, 0.32 mm ID, 0.10 µm (cat.# 13906)
Sample	Mineral oil
Diluent:	Hexane
Conc.:	25 ppm
Injection	
Inj. Vol.:	100 µL ptv splitless
Inlet Temp. Program:	45 °C (hold 0.45 min) to 350 °C at 200 °C/min (hold 10 min)
Oven	
Oven Temp.:	35 °C (hold 4 min) to 150 °C at 60 °C/min to 250 °C at 50 °C/min to 350 °C at 30 °C/min
Carrier Gas	He, constant flow
Flow Rate:	2 mL/min
Detector	FID @ 360 °C
Instrument	Varian 450
Acknowledgement	Ambiente Analisi S.r.l., Italy

GC_EV1180

General-Purpose Columns

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Chemically bonded capillary columns

- Reliable, rugged GC columns.
- 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 0.15 mm and 0.18 mm 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 Columns (fused silica)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), simulated distillation, arson accelerants, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, oxygenates.
- Long lifetime and very low bleed at high operating temperatures.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G1, G2, G38 phases.

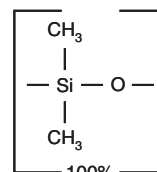
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	10105	10108	10111	
	0.25 µm	-60 to 330/350 °C	10120	10123	10126	10129
	0.50 µm	-60 to 330/350 °C	10135	10138	10141	10144
	1.00 µm	-60 to 320/340 °C	10150	10153	10156	10159
0.32 mm	0.10 µm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

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 330/350 °C	40101	40102	40103
	0.40 µm	-60 to 330/340 °C	40110	40111	40112

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-1 with Integra-Guard® Column

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

Rtx®-1 Structure

Similar to: (100%-methyl)-polysiloxane

similar phases

HP-1, DB-1, CP-Sil 5 CB, ZB-1

also available**Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

See **page 107**.**free literature**

Analyze ppb Level Sulfur Compounds Using an Rt®-XLSulfur Micropacked GC Column or an Rtx®-1 Thick Film Capillary GC Column

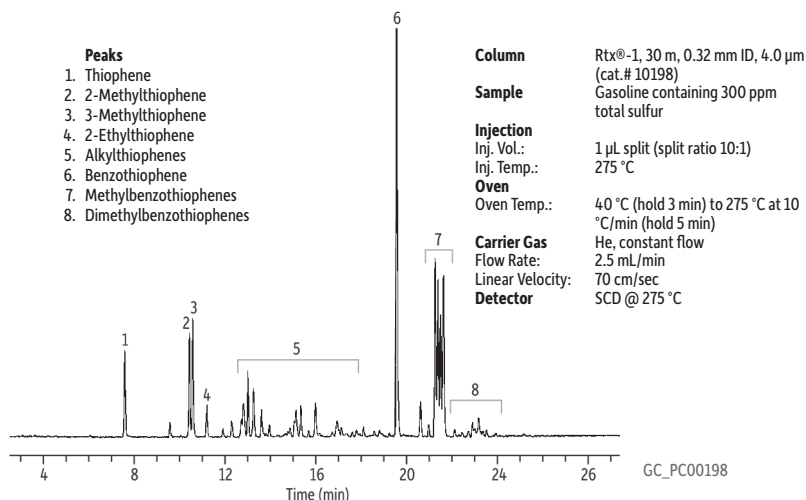
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www.restek.comlit. cat.#
PCAN1499-UNV**crossbond® technology**

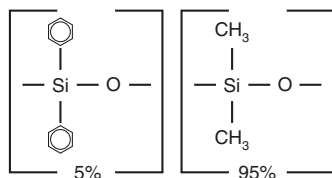
Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

Sulfur in Gasoline on Rtx®-1

Rtx®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5, DB-5, CP-Sil 8 CB, ZB-5

Rtx®-5 (G27) Columns (fused silica)
(low-polarity phase; Crossbond® diphenyl 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 diphenyl 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 monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209		
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

also available



Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-5 columnspage 108

also available

Rtx®-5 Amine columns.....page 100

Six columns for the price of five!

Other phases and configurations available on request.

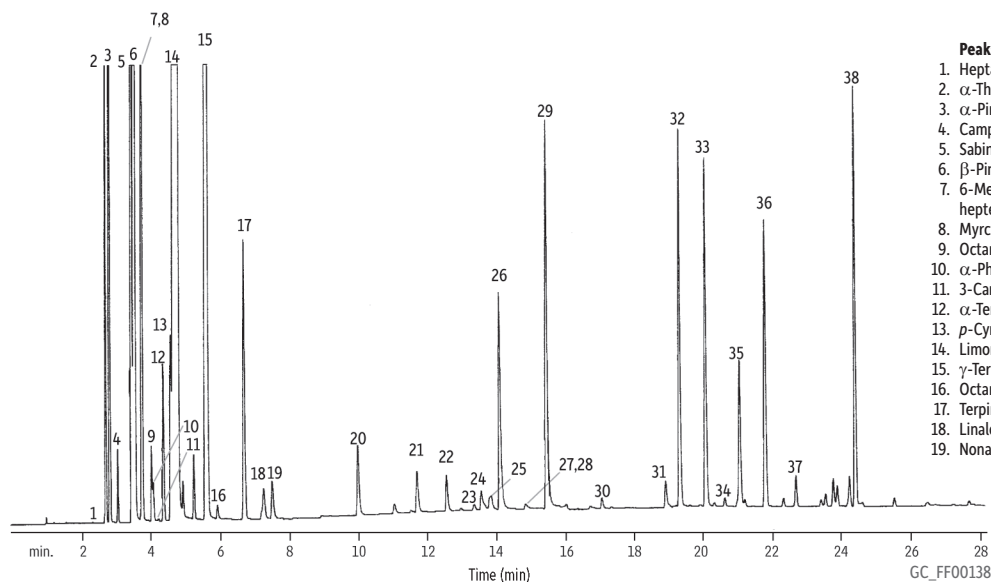
30-meter	6-pack cat.#
0.25 mm ID, 0.25 µm	10223-600
0.25 mm ID, 0.50 µm	10238-600
0.32 mm ID, 1.00 µm	10254-600
0.53 mm ID, 1.50 µm	10270-600

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- Get column recommendations
- Translate methods **NEW!**
- Calculate flows **NEW!**

Download today at www.restek.com/ezgc



Lemon Oil on Rtx[®]-5

Peaks

- | | |
|----------------------------|--|
| 1. Heptanol | 20. Citronellal |
| 2. α -Thujene | 21. Terpinene-4-ol |
| 3. α -Pinene | 22. α -Terpineol |
| 4. Camphene | 23. Decanol |
| 5. Sabinene | 24. Octyl acetate |
| 6. β -Pinene | 25. Nerol |
| 7. 6-Methyl-5-hepten-2-one | 26. Neral |
| 8. Myrcene | 27. Carvone |
| 9. Octanal | 28. Geranial |
| 10. α -Phellandrene | 29. Geranial |
| 11. 3-Carene | 30. Nonyl acetate |
| 12. α -Terpinene | 31. Citronellyl acetate |
| 13. <i>p</i> -Cymene | 32. Neryl acetate |
| 14. Limonene | 33. Geranyl acetate |
| 15. γ -Terpinene | 34. Dodecanal |
| 16. Octanol | 35. β -Caryophyllene |
| 17. Terpinolene | 36. <i>trans</i> - α -Bergamotene |
| 18. Linalool | 37. α -Humulene |
| 19. Nonanal | 38. β -Bisabolene |

Column Rtx[®]-5, 30 m, 0.32 mm ID, 0.25 μ m (cat.# 10224)
Sample Wet needle split injection of a neat lemon oil
Injection Split (split ratio 100:1)
Inj. Temp.: 250 °C
Oven
Oven Temp.: 75 °C (hold 8 min) to 250 °C at 4 °C/min

Carrier Gas H₂, constant flow
Flow Rate: 3.2 mL/min
Linear Velocity: 40 cm/sec
Detector FID @ 250 °C
Notes FID sensitivity: 2 x 10⁻¹¹ AFS

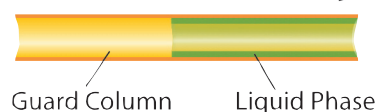
Rtx[®]-5 with Integra-Guard[®] Columns

- 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.

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 μ m Rtx-5 w/5 m Integra-Guard Column	ea.	10223-124
30 m, 0.25 mm ID, 0.25 μ m Rtx-5 w/10 m Integra-Guard Column	ea.	10223-127
30 m, 0.25 mm ID, 1.00 μ m Rtx-5 w/5 m Integra-Guard Column	ea.	10253-124
30 m, 0.32 mm ID, 0.25 μ m Rtx-5 w/5 m Integra-Guard Column	ea.	10224-125
30 m, 0.32 mm ID, 1.00 μ m Rtx-5 w/5 m Integra-Guard Column	ea.	10254-125
30 m, 0.53 mm ID, 5.00 μ m Rtx-5/Rtx-G27 w/5 m Integra-Guard Column	ea.	10279-126
60 m, 0.32 mm ID, 0.25 μ m Rtx-5 w/5 m Integra-Guard Column	ea.	10227-125

Integra-Guard[®] Built-In Guard Column

Continuous Tubing

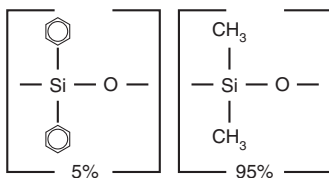


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Rtx[®]-5MS Structure

similar phases

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

Rtx[®]-5MS—Low-Bleed GC-MS Columns (fused silica)

(low-polarity phase; Crossbond[®] diphenyl dimethyl polysiloxane)

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

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

Note: The DB-5MS is a silarylene-based polymer equivalent to the Rxi-5Sil MS.

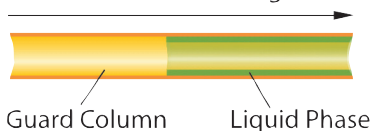
*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx[®]-5MS with Integra-Guard[®] Columns

Description	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12620-124
15 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12635-127
30 m, 0.25 mm ID, 0.10 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12608-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12623-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12623-127
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12638-124
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12638-127
30 m, 0.32 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12624-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12654-125

Integra-Guard[®] Built-In Guard Column

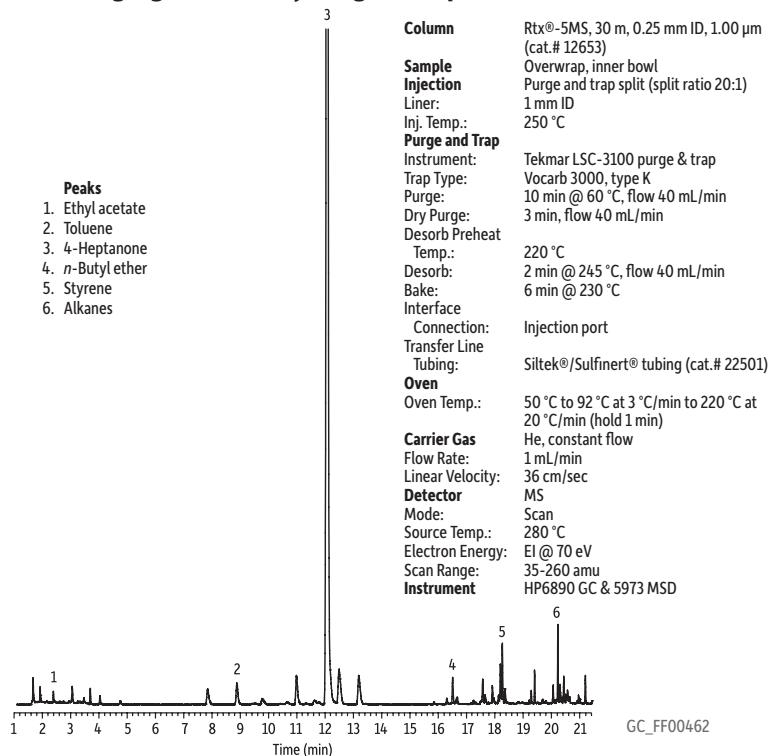
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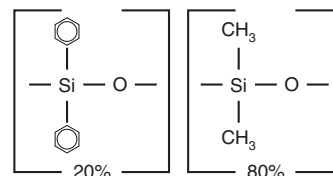
Food Packaging Volatiles by Purge & Trap GC-MS on Rtx[®]-5MS

Rtx[®]-20 Columns (fused silica)(low- to midpolarity phase; Crossbond[®] diphenyl dimethyl polysiloxane)

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

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

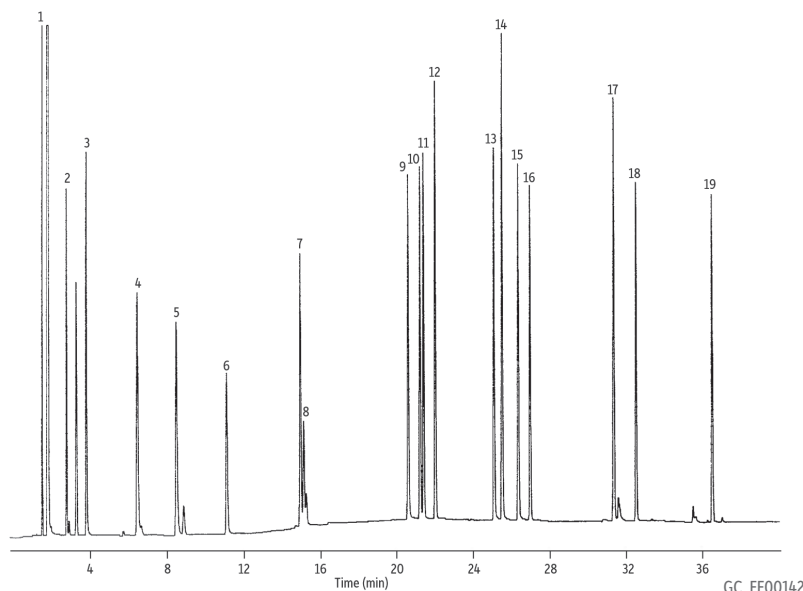
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μm	-20 to 300/320 °C	10323
	0.50 μm	-20 to 290/310 °C	10338
	1.00 μm	-20 to 280/300 °C	10353
0.32 mm	0.25 μm	-20 to 300/320 °C	10324
	0.50 μm	-20 to 290/310 °C	10339
	1.00 μm	-20 to 280/300 °C	10354
0.53 mm	1.00 μm	-20 to 260/280 °C	10355

Rtx[®]-20 Structure

Similar to: (20%-phenyl)-methylpolysiloxane

similar phases

SPB-20, EC-20, AT-20, 007-20

Mushroom Aroma (Synthetic) on Rtx[®]-20

Peaks	
1. Acetone	10. 3-Octanol
2. Ethyl Acetate	11. 3-Octanone
3. 1-Butanol	12. Benzaldehyde
4. 3-Methyl-1-butanol	13. Octyl alcohol
5. 1-Pentanol	14. Benzyl Alcohol
6. Hexanal	15. Phenylacetaldehyde
7. Furfural	16. Nonanal
8. Amyl acetate	17. α-terpineol
9. 1-Octen-3-ol	18. 2,4-Nonadienal
	19. 2,4-Decadienal

Column	Rtx [®] -20, 30 m, 0.32 mm ID, 1.00 μm (cat.# 10354)
Sample	synthetic mushroom aroma
Conc.:	10 ng per component
Injection	
Inj. Vol.:	1.0 μL split (split ratio 100:1)
Inj. Temp.:	260 °C
Oven	
Oven Temp.:	45 °C (hold 8 min) to 250 °C at 4 °C/min
Carrier Gas	H ₂ , constant pressure
Linear Velocity:	40 cm/sec
Detector	FID @ 260 °C
Notes	FID sensitivity: 4 x 10 ⁻¹¹ AFS

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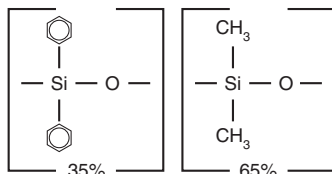
See pages 193–202 or visit www.restek.com/sky

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45

Rtx[®]-35 Structure

Similar to: (35%-phenyl)-methylpolysiloxane

similar phases

HP-35, DB-35, ZB-35

Rtx[®]-35 Columns (fused silica)(midpolarity phase; Crossbond[®] diphenyl 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.

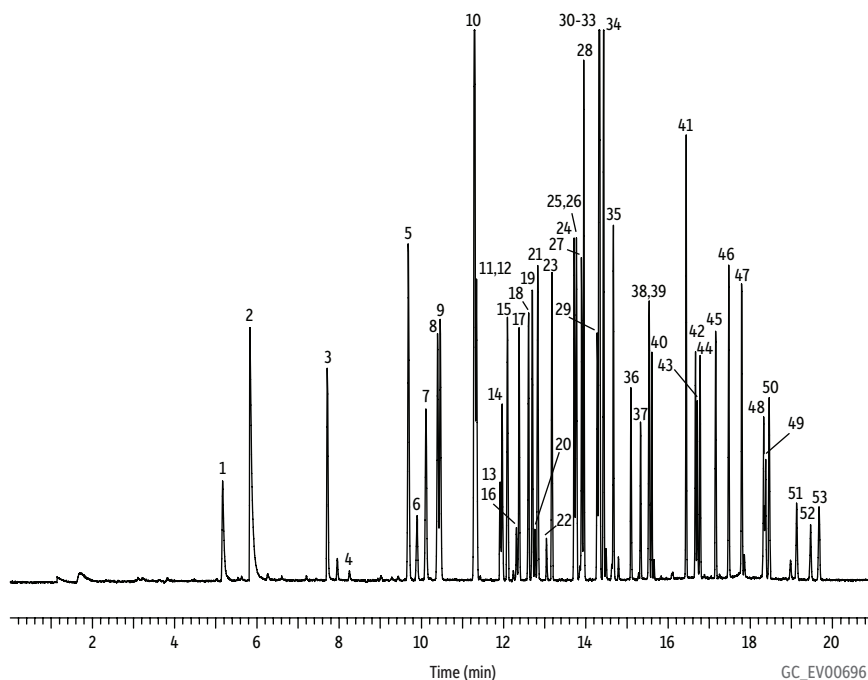
An Rtx[®]-35 column is a popular confirmation column for pesticides and herbicides in conjunction with an Rtx[®]-5 or Rtx[®]-1701 column. The higher phenyl content causes useful elution order and retention time changes.

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

also available

Rtx[®]-35 Amine columnspage 101

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

Organophosphorus Pesticides US EPA Method 8140/8141/8141A on Rtx[®]-35

Peaks	
1. Dichlorvos	27. Methyl parathion
2. Hexamethyl phosphoramide	28. Aspon
3. Mevinphos	29. Trichloronate
4. Trichlorfon	30. Chlorpyrifos
5. Tributyl phosphate (SS)	31. Fenitrothion
6. Demeton-o	32. Merphos
7. TEPP	33. Malathion
8. Thionazin	34. Parathion-ethyl
9. Ethoprop	35. Fenthion
10. Sulfotepp	36. Chlorfenvinphos
11. Naled	37. Crotoxyphos
12. Phorate	38. Merphos oxone
13. Dicrotophos	39. Prothiofos
14. Demeton-S	40. Stirofos
15. Terbufos	41. Ethion
16. Monocrotophos	42. Sulprofos
17. Diazinon	43. Fensulfthion
18. Fonophos	44. Carbofenthion
19. Disulfoton	45. Famphur
20. Dioxathion	46. Triphenyl phosphate (SS)
21. Dimethoate	47. Epn
22. Phosphamidon isomer	48. Phosmet
23. Dichlorfenthion	49. Leptophos
24. Chlorpyrifos methyl	50. Tri-o-cresyl phosphate
25. Phosphamidon	51. Azinphos-methyl
26. Ronnel	52. Azinphos-ethyl
	53. Coumaphos

Column Rtx[®]-35, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10424)
Sample triphenylphosphate (cat.# 32281)
 tributylphosphate (cat.# 32280)
 8140/8141 OP Pesticide Calibration Mix A (cat.# 32277)
 8141 OP Pesticide Calibration Mix B (cat.# 32278)
 0.1µg/mL US EPA Method 8141A Custom Standard Mixes (100ng/mL)

Conc.:
Injection 0.5 µL splitless (hold 5 min)
Inj. Vol.: Drilled Uniliner (hole near top) (cat.# 21054-214.1)
Liner:
Inj. Temp.: 220 °C

Oven
Oven Temp.: 100 °C to 180 °C at 10 °C/min (hold 2 min) to 300 °C at 18 °C/min (hold 10 min)
Carrier Gas He, constant pressure
Linear Velocity: 42 cm/sec @ 60 °C
Detector FPD @ 280 °C

Rtx[®]-50 Columns (fused silica)(midpolarity phase; Crossbond[®] phenyl methyl polysiloxane)

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

The high thermal stability of Rtx[®]-50 columns makes dual-column analysis possible with common phases such as Rtx[®]-1 or Rtx[®]-5MS.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 μm	40 to 300/320 °C	10520	10523	10526
	0.50 μm	40 to 290/310 °C	10535	10538	10541
	1.00 μm	40 to 280/300 °C	10550	10553	
0.32 mm	0.25 μm	40 to 300/320 °C	10521	10524	10527
	0.50 μm	40 to 290/310 °C	10536	10539	10542
	1.00 μm	40 to 280/300 °C	10551	10554	10557
0.53 mm	0.25 μm	40 to 280/300 °C	10522		
	0.50 μm	40 to 270/290 °C	10537	10540	10543
	0.83 μm	40 to 270/290 °C		10569	
	1.00 μm	40 to 260/280 °C	10552	10555	10558
	1.50 μm	40 to 250/270 °C	10567	10570	

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

Rtx[®]-65 Columns (fused silica)(mid- to high-polarity phase; Crossbond[®] diphenyl dimethyl polysiloxane)

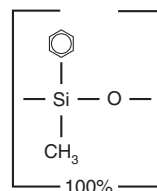
- General-purpose columns for phenols, fatty acids, triglycerides.
- Temperature range: 50 °C to 300 °C.

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 cat.#
0.25 mm	0.25 μm	50 to 300 °C	17023
	0.50 μm	50 to 280/300 °C	17038
	1.00 μm	50 to 260/280 °C	17053
0.32 mm	0.25 μm	50 to 300 °C	17024
	0.50 μm	50 to 280/300 °C	17039
	1.00 μm	50 to 260/280 °C	17054
0.53 mm	1.00 μm	50 to 250/270 °C	17055

also available**Rtx[®]-65TG Columns**

Tested specifically for triglycerides.

See **page 89**.**Rtx[®]-50 Structure**

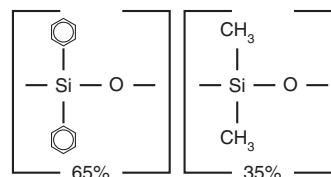
Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

HP-50+, CP-Sil 24 CB, SPB-50, AT-50, 007-17

also available**Metal MXT[®] Columns**

Rugged, flexible, Siltek[®]-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT[®]-50 columnspage 109**Rtx[®]-65 Structure**

Similar to: (65%-phenyl)-methylpolysiloxane

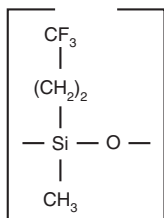
similar phases

007-65HT

crossbond[®] technology

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

Rtx®-200 Structure



Similar to: (trifluoropropyl)-methylpolysiloxane

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

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.15 mm	0.15 µm	-20 to 320/340 °C	43835	43836	
0.18 mm	0.20 µm	-20 to 310/330 °C	45001	45002	45003
	0.40 µm	-20 to 310/330 °C	45010	45011	45012

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

also available



Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

> MXT®-200 columns..... page 110

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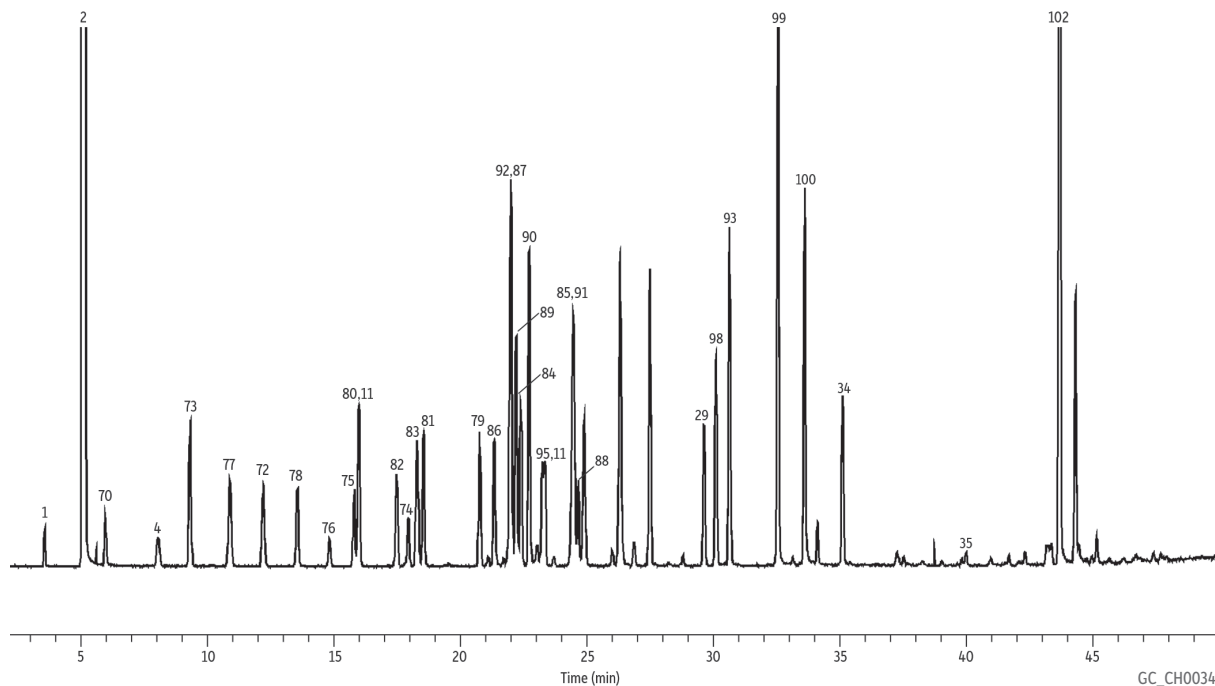
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Solvent Mixture #3 on Rtx[®]-200



Column	Rtx [®] -200, 60 m, 0.53 mm ID, 3.00 µm (cat.# 15088)	Peaks	27. Dodecane	54. 2-Octanone	81. Butyl acetate
Sample	Solvent mix #3	1. Pentane	28. Undecanal	55. <i>o</i> -Cresol	82. 2-Ethyl-1-butanol
Injection		2. Methylene chloride	29. Tridecane	56. α -Methylbenzyl alcohol	83. 3-Ethyl-3-pentanol
Inj. Vol.:	1.0 µL split	3. Ethylene glycol	30. Unknown	57. 5-Nonanone	84. 1,4-Dichlorobutane
Inj. Temp.:	275 °C	4. Heptane	31. Dodecanal	58. Nonanal	85. 2-Methyl-2,4-pentanediol
Split Vent		5. Cyclopentanol	32. Dicyclohexylamine	59. Decanal	86. Butoxyethanol
Flow Rate:	50 mL/min	6. 3-Hexanol	33. bis(2,2-methoxy)ethyl ether	60. Unknown	87. 1,2,3-Trichloropropane
Oven		7. Acetamide	34. Pentadecane	61. 1-Decanol	88. 1,4-Butanediol
Oven Temp.:	40 °C (hold 5 min) to 285 °C at 5 °C/min	8. 2-Methyl-1-pentanol	35. Heptadecane	62. 1-Undecanol	89. Methyl hexanoate
Carrier Gas	He, constant flow	9. Furfuryl alcohol	36. Octadecane	63. 2-Dodecanone	90. 1,2,4-Trimethylbenzene
Linear Velocity:	40 cm/sec	10. Butyl ether	37. Nonadecane	64. 1-Dodecanol	91. 2-Ethyl-1-hexanol
Detector	MS	11. Nonane	38. Eicosane	65. Tetraethylene glycol	92. Dipentene/Limonene
Mode:	Scan	12. Cumene	39. Acetyl tributyl citrate	66. Dibenzyl	93. Tetrahydrofurfuryl acetate
Source Temp.:	285 °C	13. Ethyl amyl ketone	40. 2-Buten-1-ol	67. Diethyl Phthalate	94. Unknown
		14. Heptanol	41. Formamide	68. Tributyl phosphate	95. Decahydronaphthalene
		15. Butyl butanoate	42. 3-Pentanol	69. Diphenyl sulfone	96. Unknown
		16. Unknown	43. 1-Nitropropane	70. Allyl alcohol	97. Unknown
		17. Benzyl alcohol	44. Dimethylformamide	71. Unknown	98. 2-Decanol
		18. Dipropylene glycol	45. 2-Methyl-3-pentanol	72. Isopropyl acetate	99. 1,2-Bis(2-methoxyethoxy)ethane
		19. Benzene, diethyl-	46. Toluene	73. Benzene	100. 2-Phenoxyethanol
		20. Unknown	47. Ethyl chloroacetate	74. 2-Nitropropane	101. Unknown
		21. Unknown	48. Dimethylacetamide	75. Nitroethane	102. Benzyl ether
		22. Hexachloroethane	49. <i>p</i> -Xylene	76. Pentanal	
		23. Undecane	50. <i>sec</i> -tetrachloroethane	77. 2-Bromobutane	
		24. 1-Nonanol	51. Benzaldehyde	78. 1-Chloropentane	
		25. <i>p</i> -Methoxyphenol	52. α -Chlorotoluene	79. Cyclopentanol	
		26. Triethylene glycol	53. 2,6-Dimethyl-4-heptanone	80. 2-Hexanol	

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 cat.#
0.25 mm	0.10 µm	-20 to 320/340 °C	15608
	0.25 µm	-20 to 320/340 °C	15623
	0.50 µm	-20 to 310/330 °C	15638
	1.00 µm	-20 to 290/310 °C	15653
0.32 mm	0.10 µm	-20 to 320/340 °C	15609
	0.25 µm	-20 to 320/340 °C	15624
	0.50 µm	-20 to 310/330 °C	15639
	1.00 µm	-20 to 290/310 °C	15654

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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.

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

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	20 to 320 °C	42902

Organochlorine Pesticides by EPA Method 8081A on Rtx[®]-440 (dual column w/ Rtx[®]-CLPesticides2)

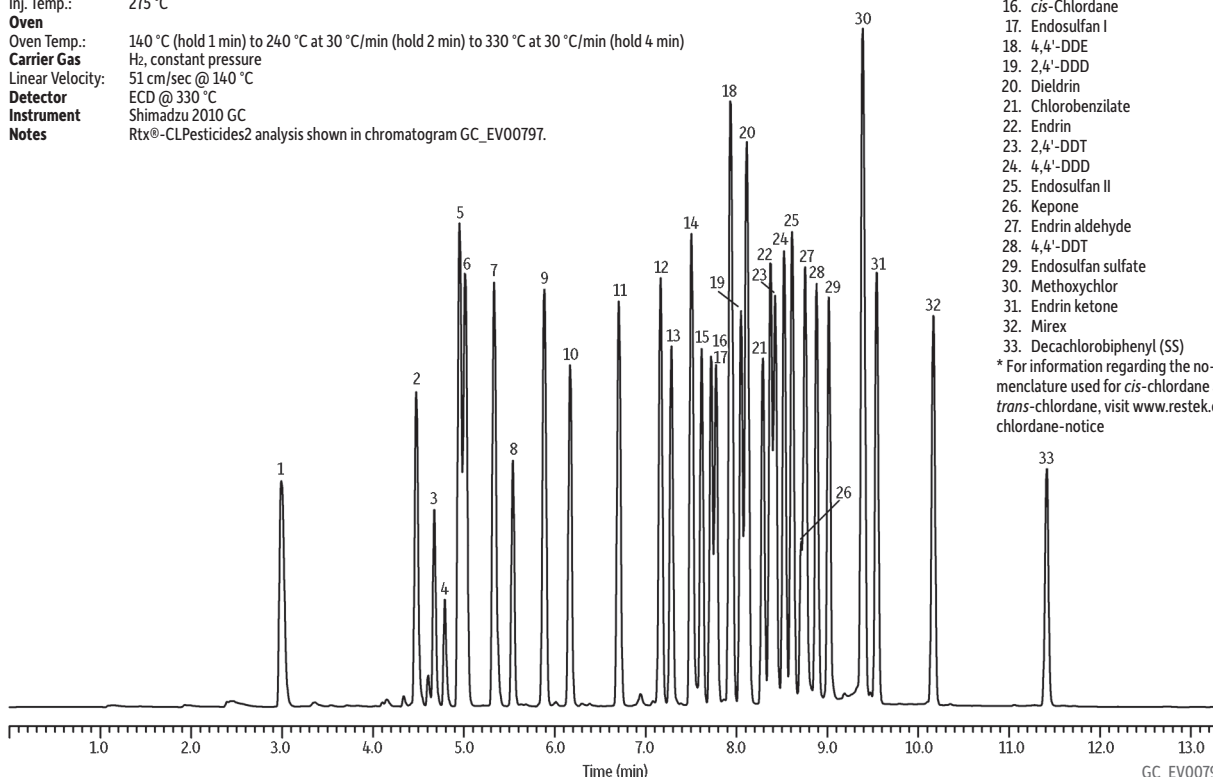
Column Rtx[®]-440, 30 m, 0.32 mm ID, 0.50 µm (cat.# 12939)
Sample Organochlorine pesticide mix AB #2, 8-80 µg/mL in ethyl acetate (cat.# 32292)
 Chlorobenzilate, 1,000 µg/mL in methanol (cat.# 32211)
 Hexachlorobenzene, 1,000 µg/mL in acetone (cat.# 32231)
 Hexachlorocyclopentadiene, 1,000 µg/mL in methanol (cat.# 32232)
 2,4'-DDD, 1,000 µg/mL in methanol (cat.# 32098)
 2,4'-DDE, 1,000 µg/mL in methanol (cat.# 32099)
 2,4'-DDT, 1,000 µg/mL in methanol (cat.# 32200)
 2,4,5,6-Tetrachloro-*m*-xylene, 200 µg/mL in acetone (cat.# 32027)
 Decachlorobiphenyl (BZ #209), 200 µg/mL in acetone (cat.# 32029)
 Diallyate (*cis* & *trans*), 1,000 µg/mL in hexane (cat.# custom)
 Isodrin, 1,000 µg/mL in hexane (cat.# custom)
 Kepone, 1,000 µg/mL in hexane (cat.# custom)
 Mirex, 1,000 µg/mL in hexane (cat.# custom)

Injection
 Inj. Vol.: 1.0 µL splitless (hold 0.75 min)
 Liner: Siltek[®] single taper (cat.# 20961-214.1)
 Inj. Temp.: 275 °C
Oven
 Oven Temp.: 140 °C (hold 1 min) to 240 °C at 30 °C/min (hold 2 min) to 330 °C at 30 °C/min (hold 4 min)
Carrier Gas
 Hz, constant pressure
 Linear Velocity: 51 cm/sec @ 140 °C
Detector
 ECD @ 330 °C
Instrument
 Shimadzu 2010 GC
Notes
 Rtx[®]-CLPesticides2 analysis shown in chromatogram GC_EV00797.

Peaks

1. Hexachlorocyclopentadiene
2. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
3. *cis*-Diallyate
4. *trans*-Diallyate
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. *trans*-Chlordane
16. *cis*-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)

* For information regarding the nomenclature used for *cis*-chlordane and *trans*-chlordane, visit www.restek.com/chlordane-notice



GC_EV00796

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

(low- to midpolarity phase)

- 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 lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed—even with sensitive detectors such as ECDs and MSDs.

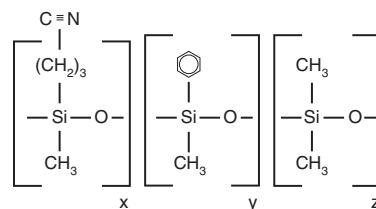
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	0.25 µm	-20 to 280 °C	16020	16023	16026		
	0.50 µm	-20 to 270 °C		16038			
	1.00 µm	-20 to 260 °C		16053	16056		
	1.40 µm	-20 to 240 °C			16016		
0.32 mm	0.25 µm	-20 to 280 °C	16021	16024			
	0.50 µm	-20 to 270 °C		16039	16042		
	1.00 µm	-20 to 260 °C		16054	16057		
	1.50 µm	-20 to 250 °C	16066	16069	16072		
	1.80 µm	-20 to 240 °C		16092	16093		
0.53 mm	0.25 µm	-20 to 280 °C		16025			
	0.50 µm	-20 to 270 °C		16040	16043		
	1.00 µm	-20 to 260 °C	16052	16055	16058		
	1.50 µm	-20 to 250 °C		16070			
	3.00 µm	-20 to 240 °C		16085	16088	16076	16091

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-1301 with 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.

Description	qty.	cat.#
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126

Rtx®-1301 Structure

Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

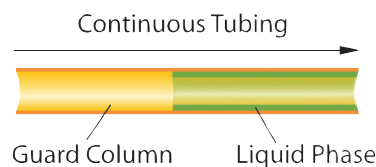
DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301, ZB-624

also
available

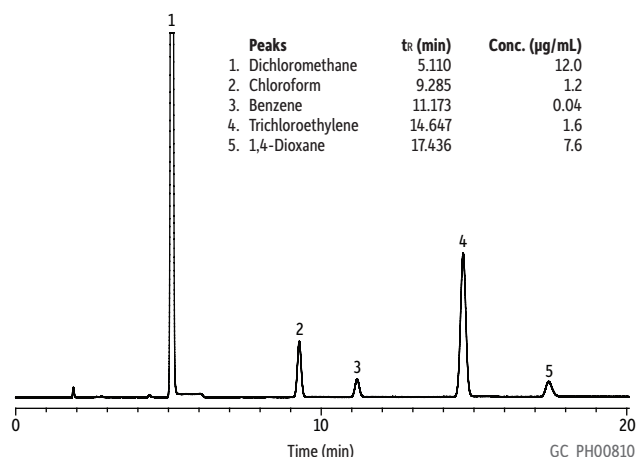
**Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1301 columnspage 109

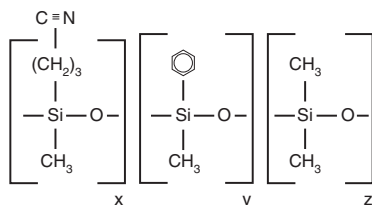
Integra-Guard® Built-In Guard Column

Get the protection without the connection!

USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace

Column	Rtx®-1301 w/5 m Integra-Guard®, 30 m, 0.53 mm ID, 3.00 µm (cat.# 16085-126)	Mixer time: 2.0 min
Sample	USP <467> Calibration Mixture #5 (cat.# 36007)	Mixing level: 5
Diluent:	DMSO	Mixer stabilize time: 0.5 min
Conc.:	To each 22 mL headspace vial 5ml water, ~1.0 g of sodium sulfate and 100 µL of stock standard were added.	Vial Pressure: 15 psi
Injection	headspace-loop split (split ratio 2:1)	Pressurize Time: 2.0 min
Headspace-Loop		Pressure
Inj. Port Temp.:	180 °C	Equilibration Time: 0.5 min
Instrument:	Teledyne Tekmar HT3	Loop Pressure: 5 psi
Inj. Time:	1.0 min	Loop Fill Time: 2.0 min
Transfer Line Temp.:	150 °C	Loop fill equil. time: 0.5 min
Valve Oven Temp.:	150 °C	Oven
Standby flow rate:	10 mL/min	Oven Temp.: 40 °C (hold 20 min) to 240 °C at 25 °C/min (hold 10 min)
Sample Temp.:	80 °C	Carrier Gas
Platen temp		Flow Rate: He, constant flow 5 mL/min
equil. time:	2.0 min	Detector
Sample Equil. Time:	15.0 min	Make-up Gas: 45 mL/min
		Flow Rate: 5 mL/min
		Notes
		FID conditions: hydrogen flow: 40 mL/min air flow: 450 mL/min

Rtx®-624 Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301, ZB-624

also available



Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-624 columns.....page 111

Rtx®-624 Columns (fused silica)

(low- to midpolarity phase)

- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 240 °C.
- Equivalent to USP G43 phase.

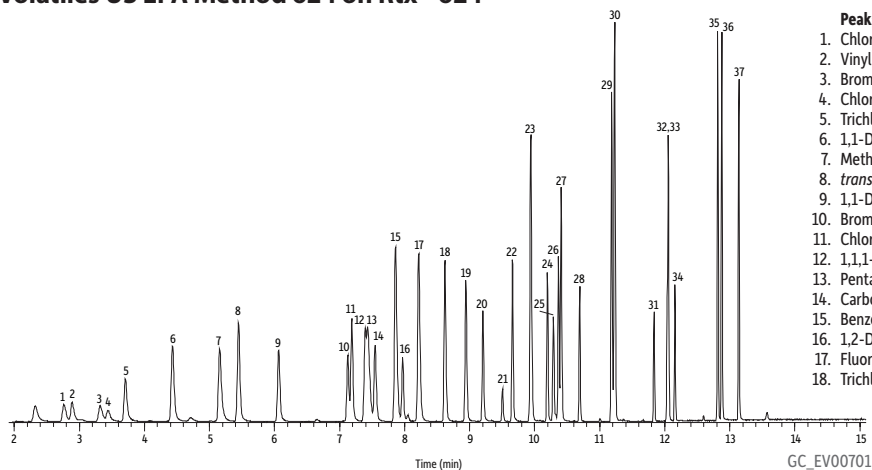
The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first six gases in EPA Methods 8260 and 524.2. This stationary phase is especially well-suited for EPA Method 524.2 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 cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 240 °C	10968	10969		
0.32 mm	1.80 µm	-20 to 240 °C	10970	10972		
0.53 mm	3.00 µm	-20 to 240 °C	10971	10973	10974	10975

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

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Volatiles US EPA Method 624 on Rtx®-624



Peak #	Compound Name
1	Chloromethane
2	Vinyl chloride
3	Bromomethane
4	Chloroethane
5	Trichlorofluoromethane
6	1,1-Dichloroethene
7	Methylene Chloride
8	trans-1,2-Dichloroethene
9	1,1-Dichloroethane
10	Bromochloromethane
11	Chloroform
12	1,1,1-Trichloroethane
13	Pentafluorobenzene
14	Carbon Tetrachloride
15	Benzene
16	1,2-Dichloroethane
17	Fluorobenzene
18	Trichloroethene
19	1,2-Dichloropropane
20	Bromodichloromethane
21	2-Chloroethyl vinyl ether
22	cis-1,3-Dichloropropene
23	Toluene
24	2-Bromo-1-chloropropane
25	1,1,2-Trichloroethane
26	Tetrachloroethene
27	Dibromochloromethane
28	trans-1,3-Dichloropropene
29	Chlorobenzene
30	Ethylbenzene
31	Bromoform
32	1,4-Dichlorobutane
33	4-Bromofluorobenzene
34	1,1,2,2-Tetrachloroethane
35	1,3-Dichlorobenzene
36	1,4-Dichlorobenzene
37	1,2-Dichlorobenzene

Column Rtx®-624, 40 m, 0.18 mm ID, 1.00 µm (cat.# 40925)

Sample 624 Internal Standard Mix (cat.# 30023)
624 Surrogate Standard Mix (cat.# 30243)
Volatiles MegaMix™, EPA Method 624 (cat.# 30497)
compounds at 50 ppb (IS @ 40ppb) in 5mL of RO water
purge and trap split (split ratio 40:1)
250 °C

Conc.:**Injection**

Inj. Temp.: 250 °C

Purge and Trap

Instrument: Tekmar LSC-3100 Purge and Trap

Trap Type: Vocarb 3000 (type K)

Purge: 11 min @ ambient, flow 40 mL/min

Dry Purge: 1 min, flow 40 mL/min

Desorb Preheat

Temp.: 245 °C

Desorb: 2 min @ 250 °C, flow 10 mL/min

Bake: 8 min @ 260 °C

Interface Connection: injection port

Transfer Line Tubing: Silcosteel® transfer line, 1mm ID sleeve

Oven

Oven Temp.:

50 °C (hold 4 min) to 100 °C at 12 °C/min to 230 °C
at 27 °C/min (hold 2 min)

Carrier Gas

Flow Rate:

He, constant flow

Dead Time:

2.06 min @ 50 °C

Detector

Transfer Line Temp.:

280 °C

Analyzer Type:

Quadrupole

Tune Type:

PFTBA/BFB

Ionization Mode:

EI

Scan Range:

35-260 amu

Notes

(MCS bypassed using Silcosteel® tubing)

Rtx®-1701 Columns (fused silica)

(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), pesticides, and fragrance compounds.
- 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.

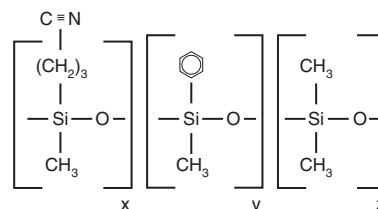
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-20 to 280 °C			12011
	0.25 µm	-20 to 280 °C	12020	12023	12026
	0.50 µm	-20 to 270/280 °C	12035	12038	12041
	1.00 µm	-20 to 260/280 °C	12050	12053	12056
0.32 mm	0.10 µm	-20 to 280 °C		12009	
	0.25 µm	-20 to 280 °C	12021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

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-20 to 280 °C	42001	42002	42003
	0.40 µm	-20 to 280 °C		42011	42012

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-1701 with Integra-Guard® Columns

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm Rtx-1701 w/5 m Integra-Guard Column	ea.	12023-124

Rtx®-1701 Structure

Similar to: (14%-cyanoethylphenyl)-methylpolysiloxane

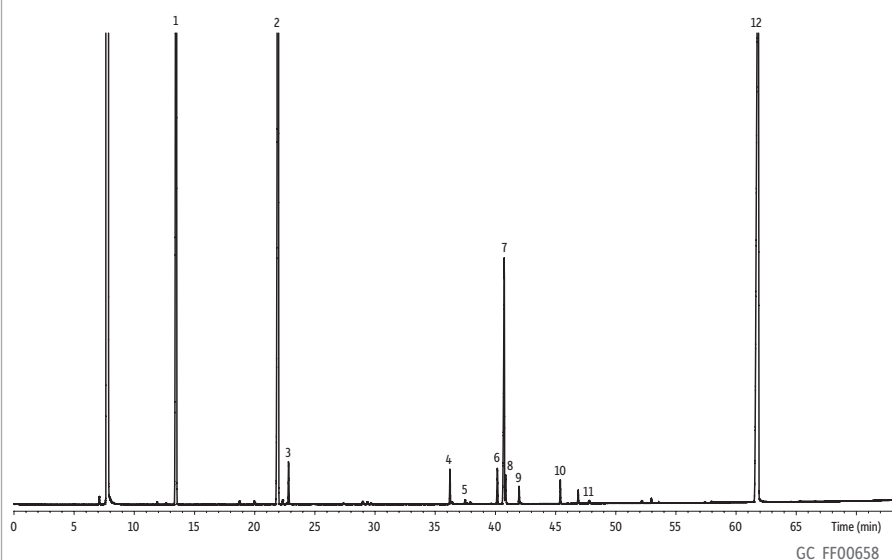
similar phases

DB-1701P, DB-1701, CP-Sil 19 CB, VF-1701ms, VF-1701 Pesticides, ZB-1701, ZB-1701P

also available**Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

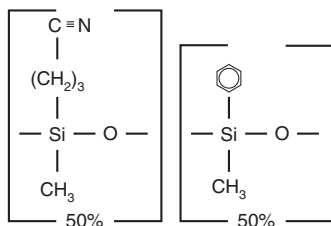
MXT®-1701 columnspage 109

5% Fragrance Materials Association Mix on Rtx®-1701

Peaks	Conc. (wt.%)
1. Ethyl butyrate	35.7
2. Limonene	20.0
3. Eucalyptol	0.5
4. Geraniol	0.6
5. Benzoic acid	1.0
6. Cinnamic aldehyde	0.5
7. Hydroxycitronellal	5.0
8. Thymol	0.3
9. Cinnamyl alcohol	0.3
10. Cinnamyl acetate	0.3
11. Vanillin	0.1
12. Benzyl salicylate	35.7

Column	Rtx®-1701, 60 m, 0.25 mm ID, 0.25 µm (cat.# 12026)
Sample	Fragrance materials test mix (cat.# 31807)
Conc.:	5% FMA mix in acetone
Injection	
Inj. Vol.:	1 µL split (split ratio 40:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	285 °C
Oven	
Oven Temp.:	50 °C to 270 °C at 3 °C/min
Carrier Gas	He, constant flow
Flow Rate:	0.6 mL/min
Detector	FID @ 300 °C

Rtx®-225 Structure



Similar to: (50%-cyanopropylmethyl)-methylphenylpolysiloxane

similar phases

DB-225ms, CP-Sil 43 CB

Rtx®-225 Columns (fused silica)

(polar phase; Crossbond® cyanopropylmethyl 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 cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 220/240 °C	14020	14023	14026
	0.50 µm	40 to 220/240 °C		14038	
0.32 mm	0.25 µm	40 to 220/240 °C	14021	14024	
	0.50 µm	40 to 220/240 °C		14039	
	1.00 µm	40 to 200/220 °C	14051	14054	14057
0.53 mm	0.25 µm	40 to 200/220 °C	14022	14025	
	0.50 µm	40 to 200/220 °C		14040	
	1.00 µm	40 to 200/220 °C	14052	14055	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.



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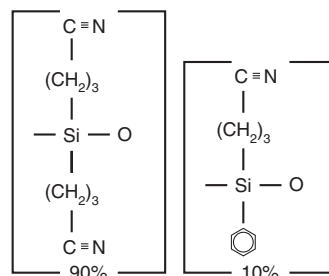
www.restek.com/ezgc

Rtx[®]-2330 Columns (fused silica)

(highly polar phase; biscyanopropyl cyanopropylphenyl polysiloxane)

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

Rtx[®]-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 Rtx[®]-2330 phase. In addition, our improved polymer produces columns with better column efficiency and lower bleed.

Rtx[®]-2330 Structure

Similar to: (95%-cyanopropyl)-phenyl polysiloxane

similar phases

VF-23ms

**tech tip**

Do not solvent rinse Rtx[®]-2330 and Rt[®]-2560 columns. These columns are not fully bonded and solvent rinsing will remove the stationary phase.

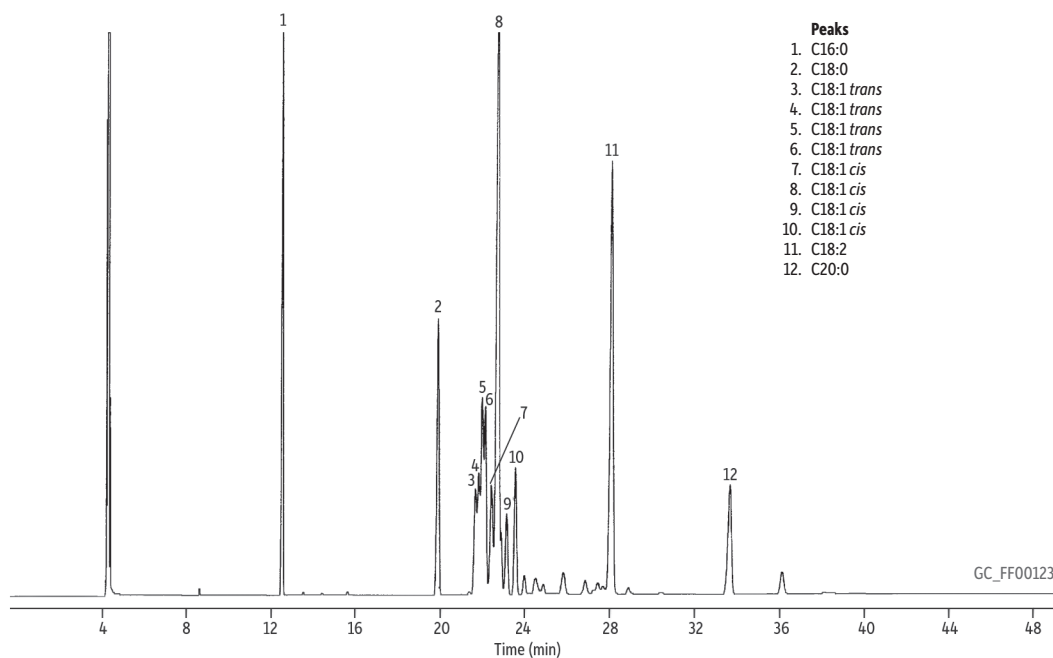
ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 μm	0 to 260/275 °C	10708	10711	10714
	0.20 μm	0 to 260/275 °C	10723	10726	10729
0.32 mm	0.20 μm	0 to 260/275 °C	10724	10727	10730
0.53 mm	0.20 μm	0 to 260/275 °C	10725	10728	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.10 μm	0 to 260 °C	40701	40702	40703

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

FAMES (Commercial Margarine) on Rt[®]-2330

(split injection)



Column Rt[®]-2330, 105 m, 0.25 mm ID, 0.20 μm (cat.# 10729)
Sample Commercial margarine mixture
 Conc.: Approximately 5 μg
Injection
 Inj. Vol.: 1.0 μL split (split ratio 50:1)
 Inj. Temp.: 275 °C

Oven
 Oven Temp.: 165 °C
Carrier Gas Hz, constant pressure
 Linear Velocity: 40 cm/sec
Detector FID @ 275 °C
Notes FID sensitivity: 4 x 10⁻¹¹ AFS

similar phases

HP-88, CP-Sil 88, SPB-2560

Rt[®]-2560 Column (fused silica)

(highly polar phase; biscyanopropyl polysiloxane—not bonded)

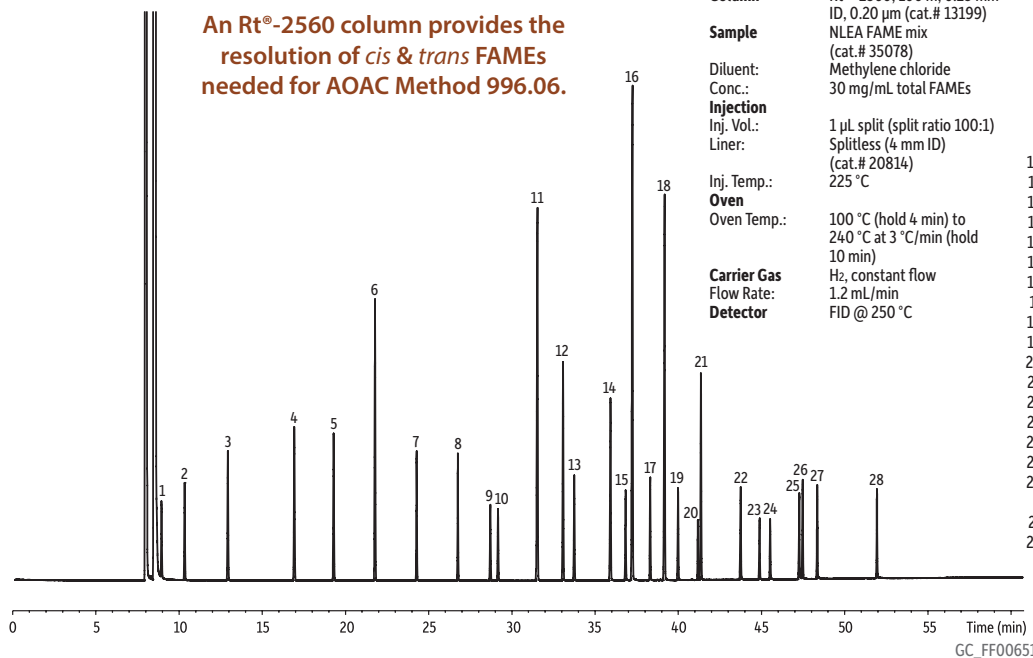
- Application-specific column for *cis/trans* FAMES.
- Stable to 250 °C.

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

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

FAMES (NLEA Mix) on Rt[®]-2560

An Rt[®]-2560 column provides the resolution of *cis* & *trans* FAMES needed for AOAC Method 996.06.



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Rtx®-Wax Columns (fused silica)

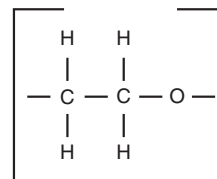
(polar phase; Crossbond® polyethylene glycol)

- 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.

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

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

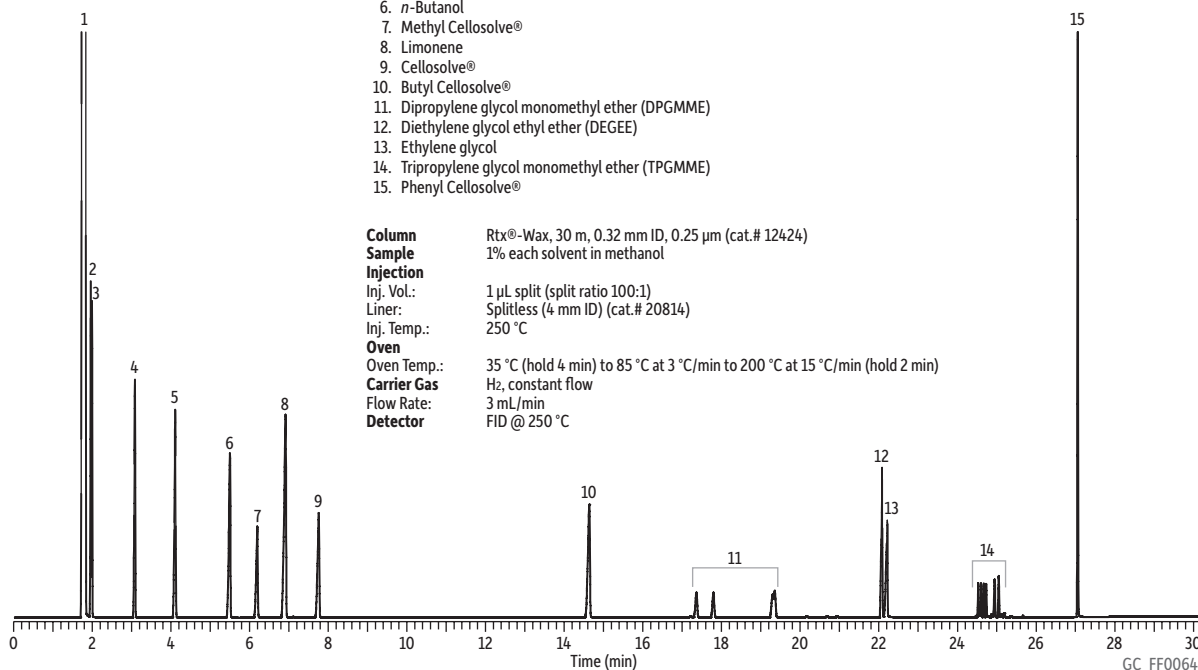
Rtx®-Wax Structure**similar phases**

DB-Wax, CP-Wax 52 CB, ZB-Wax

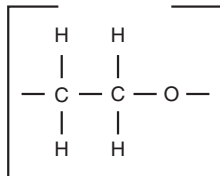
Cleaning Solvents on Rtx®-Wax**Peaks**

1. Methanol
2. Isopropanol
3. Ethanol
4. *n*-Propanol
5. Isobutanol
6. *n*-Butanol
7. Methyl Cellosolve®
8. Limonene
9. Cellosolve®
10. Butyl Cellosolve®
11. Dipropylene glycol monomethyl ether (DPGMME)
12. Diethylene glycol ethyl ether (DEGEE)
13. Ethylene glycol
14. Tripropylene glycol monomethyl ether (TPGMME)
15. Phenyl Cellosolve®

Column Rtx®-Wax, 30 m, 0.32 mm ID, 0.25 µm (cat.# 12424)
Sample 1% each solvent in methanol
Injection
 Inj. Vol.: 1 µL split (split ratio 100:1)
 Liner: Splitless (4 mm ID) (cat.# 20814)
 Inj. Temp.: 250 °C
Oven
 Oven Temp.: 35 °C (hold 4 min) to 85 °C at 3 °C/min to 200 °C at 15 °C/min (hold 2 min)
Carrier Gas Hz, constant flow
Flow Rate: 3 mL/min
Detector FID @ 250 °C



Stabilwax® Structure



similar phases

HP-INNOWax, CP-Wax 52 CB, VF-WAX MS, ZB-WAXplus

Stabilwax® Columns (fused silica)

(polar phase; Crossbond® polyethylene glycol)

- Rugged enough to withstand repeated water injections.
- Low-bleed PEG column ensures long column lifetimes.
- 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.

Six columns for the price of five!

Call 800-356-1688, ext. 3, or your Restek representative for details!

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

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

also available

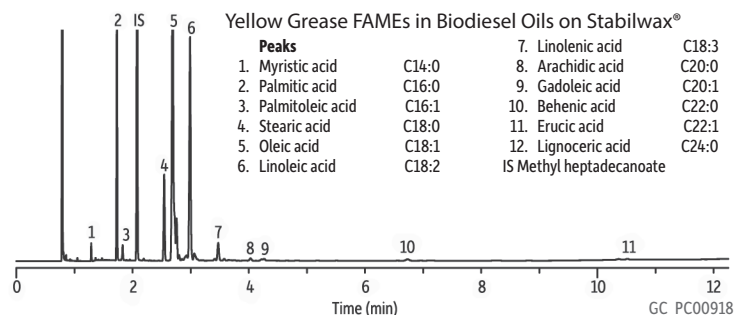
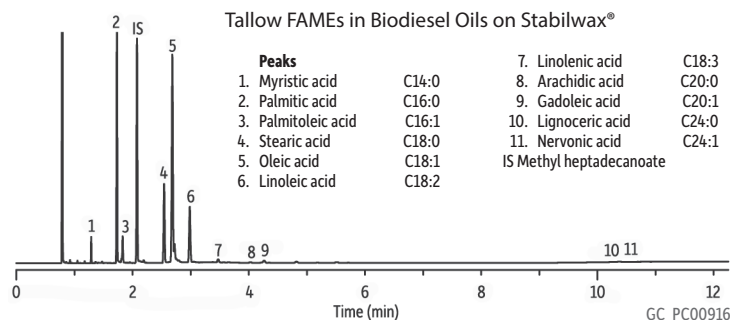


Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-WAX columnspage 110

FAMES in Biodiesel Oils on Stabilwax®



Column Sample Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Tallow source of biodiesel (B100), prepared according to European Method EN 14103

Injection
Inj. Vol.: 1.0 µL split (split ratio 100:1)
Liner: Cycloplitter® (cat.# 20706)
Inj. Temp.: 250 °C

Oven
Oven Temp.: 210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)

Carrier Gas H₂, constant flow

Flow Rate: 3 mL/min

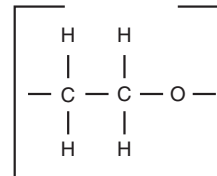
Linear Velocity: 60 cm/sec

Detector FID @ 250 °C

Visit www.restek.com for soy FAMES and rapeseed FAMES analyses.

Stabilwax®-MS Columns (fused silica)

- High-polarity, stable polyethylene glycol (PEG) stationary phase.
- Low bleed and rugged enough to withstand repeated temperature cycles without retention time shifting.
- Ideal for food, flavor, fragrance, and industrial chemical and solvent analysis.
- Temperature range: 40 °C to 250/260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

**Stabilwax®-MS Structure**

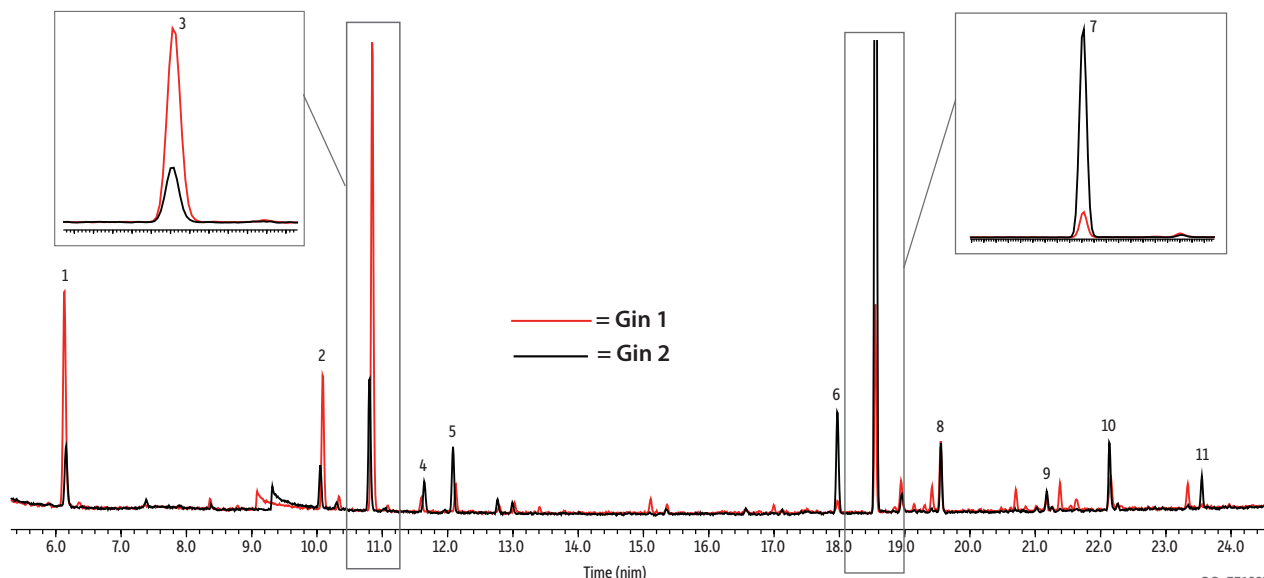
New Stabilwax®-MS columns ensure reproducible retention times from run to run, even with temperature cycling. When methods require trace analysis, this highly polar, low-bleed stationary phase produces excellent signal-to-noise levels! Ideal for food and flavor analysis (e.g., essential oils), fragrance and allergen analysis, as well as industrial solvent and chemical analysis.

ID	df	30-Meter cat.#
0.25 mm	0.25 µm	10673
0.32 mm	0.25 µm	10674

also available

Stabilwax®-DA and
Stabilwax®-DB
Columns

See pages 98 and 102.

**Two Brands of Gin on Stabilwax®-MS (Overlay)**

GC_FF1237

Column Stabilwax®-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673)
Sample Two different brands of gin
Conc.: Neat
Injection
 Inj. Vol.: 1 µL split (split ratio 20:1)
 Liner: Sky® 3.5 mm Precision® liner w/wool (cat.# 23320.1)
 Inj. Temp.: 250 °C
Oven
 Oven Temp.: 35 °C (hold 5 min) to 250 °C at 7 °C/min (hold 5 min)
Carrier Gas He, constant linear velocity
 Linear Velocity: 36 cm/sec
Detector MS
 Mode: Scan
 Scan Program:

Group	Start Time (min)	Scan Range (amu)	Scan Rate (scans/sec)
1	0.5	40-550	2

Transfer Line Temp.: 260 °C
 Analyzer Type: Quadrupole
 Source Temp.: 250 °C
 Solvent Delay Time: 0.5 min
 Ionization Mode: EI
Instrument Shimadzu 2010 GC & QP2010+ MS

Peaks

Peak	tr (min)
1. α-Pinene	6.16
2. Beta-myrcene	10.05
3. D-Limonene	10.81
4. Isoamyl alcohol*	11.64
5. γ-Terpinene	12.08
6. Camphor*	17.97
7. Linalool	18.56
8. 4-Terpineol	19.56
9. α-Terpineol*	21.18
10. Nerol acetate*	22.14
11. Geraniol*	23.55

* Not found in gin represented by red trace.

Restek GCxGC Columns: Your One Source for 2D Gas Chromatography

Why Use GCxGC?

GCxGC is a powerful multidimensional GC technique that combines two independent separations to accurately analyze highly complex samples. GCxGC involves two columns with differing stationary phase selectivity (orthogonal) that are press-fitted together in series and separated by a modulator. The first (primary) column performs an initial separation, and its effluent is continually focused and “injected” in defined cycles by the modulator onto the second (secondary) column, where another separation occurs. By choosing a secondary column that is orthogonal (has different selectivity) to the primary column, it is possible to separate and identify analytes that cannot be separated by the primary column. And, by keeping the secondary column very short, it is possible to maintain the separation produced by the primary column. Results generated through a series of high-speed chromatograms are plotted as a contour plot, sometimes known as a retention plane (Figure 1).

So, why use GCxGC? Because comprehensive two-dimensional gas chromatography allows you to perform separations that are simply not possible using standard one-dimensional chromatography!

Why Use Restek GCxGC Columns?

- Wide range of stationary phases offers orthogonal separations.
- High thermal stability increases system ruggedness.
- Unrivaled column inertness for accurate analysis of active compounds.
- 0.15, 0.18, and 0.25 mm ID formats accommodate varying sample capacities, speeds, and detectors.
- Secondary columns come in convenient 2 m lengths for economical methods development.

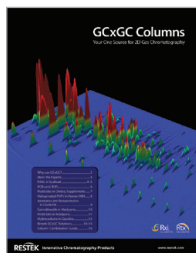
Restek has been performing comprehensive two-dimensional gas chromatography since its commercial inception. Our Innovations lab boasts multiple instruments dedicated to GCxGC applications, and we are continually exploring new application areas—including environmental, food safety, petroleum, forensics, fragrance, natural products, tobacco, metabolomics, and dietary supplements.

Restek's GCxGC secondary columns can be matched with any Restek® Rtx® or Rxi® primary column to create the perfect orthogonal separation for your application. See our combination guide below for help choosing your GCxGC columns. We also offer a range of complementary GC accessories—including Sky® inlet liners, the Restek® electronic leak detector, and Press-Tight® connectors—to boost your success with GCxGC.

Restek GCxGC Column Combination Guide

To achieve ideal results in a GCxGC analysis, it is imperative that your primary and secondary columns feature orthogonal phases capable of producing differing separations. Use the chart below to find the perfect combination of Restek® columns to maximize the effectiveness of your GCxGC system.

Application Area	Primary Column		Secondary Column	
	Phase	Selectivity	Phase	Selectivity
Petrochemical	Rxi®-1ms	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Petrochemical	Rxi®-5Sil MS	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-1ms	Nonpolar
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-5Sil MS	Nonpolar
PCBs, PBDEs, PAHs, environmental	Rxi®-XLB	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Mono-ortho, coplanar PCBs	Rxi®-1ms	Nonpolar	Rxi®-XLB	Planar selective
Mono-ortho, coplanar PCBs	Rxi®-5Sil MS	Nonpolar	Rxi®-XLB	Planar selective
Pesticides, nitroaromatics, halogenated compounds	Rxi®-1ms	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-5Sil MS	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-XLB	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Flavors, fragrances	Rxi®-1ms	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Rxi®-5Sil MS	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-1ms	Nonpolar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-5Sil MS	Nonpolar



free literature

GCxGC Columns: Your One Source for 2D Gas Chromatography

Download your free copy from www.restek.com

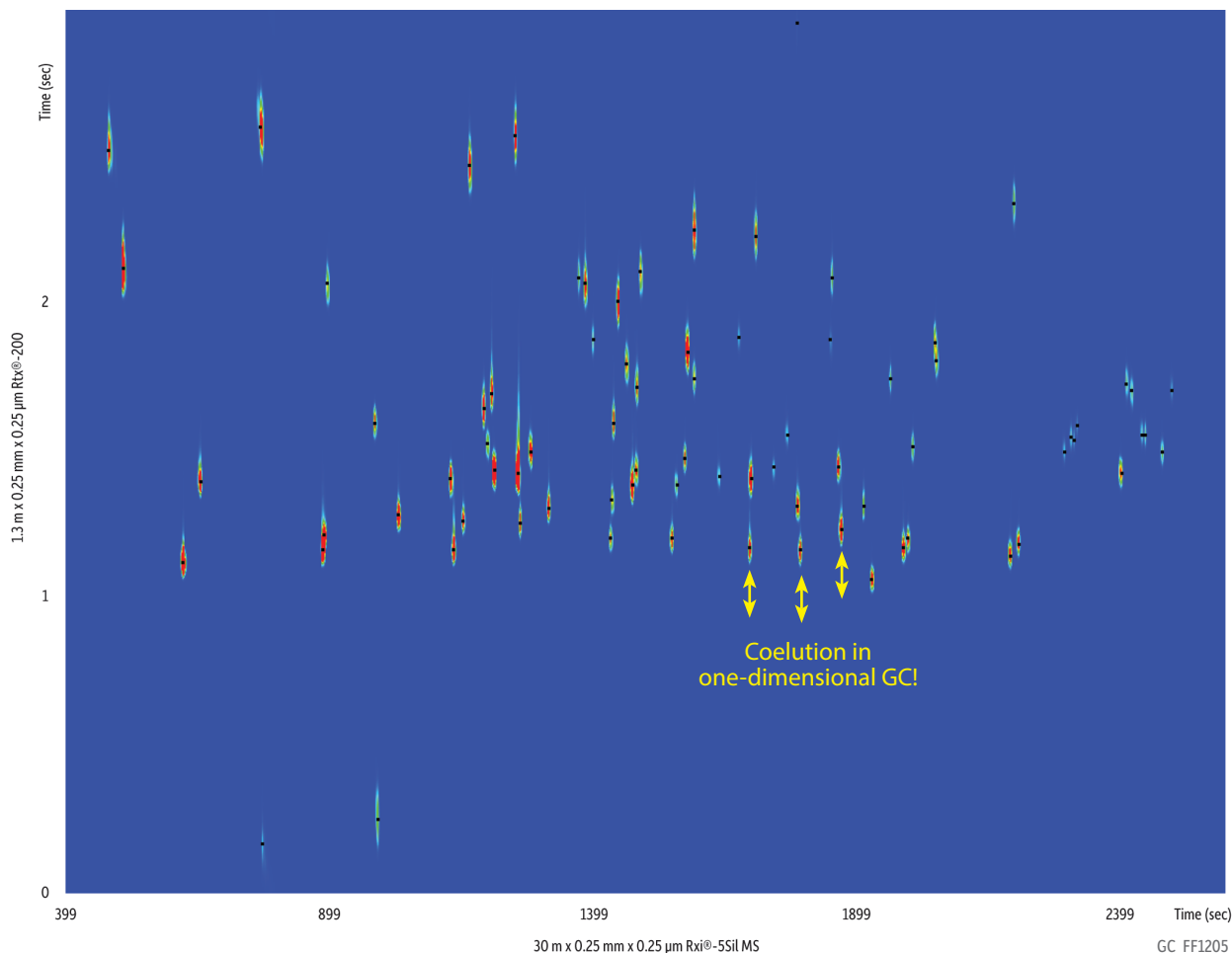
lit. cat.# GNBR1585-UNV



To order Restek GCxGC columns and accessories, see **page 62**.

To get additional assistance in choosing a column pair, visit www.restek.com/gcxcg

Figure 1: In a contour plot like this one showing clear determination of over 80 pesticides in marijuana, the x-axis represents the primary column retention time and the y-axis represents the secondary column retention time. Peaks aligned along the y-axis would coelute in one-dimensional GC, which is especially problematic if they cannot then be separated by MS.



Column: Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020); **Sample:** Diluent: Toluene; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); **Liner:** Sky™ 4 mm single taper w/wool (cat.# 23303.1); **Inj. Temp.:** 250 °C; **Purge Flow:** 40 mL/min; **Oven:** Oven Temp.: Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min; Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min; **Carrier Gas:** He, corrected constant flow (2 mL/min); **Modulation:** Modulator Temp. Offset: 20 °C; **Second Dimension Separation Time:** 3 sec; **Hot Pulse Time:** 0.9 sec; **Cool Time between Stages:** 0.6 sec; **Detector:** TOFMS; **Transfer Line Temp.:** 290 °C; **Analyzer Type:** TOF; **Source Temp.:** 225 °C; **Electron Energy:** 70 eV; **Mass Defect:** -20 mu/100 u; **Solvent Delay Time:** 5 min; **Tune Type:** PFTBA; **Ionization Mode:** EI; **Acquisition Range:** 45-550 amu; **Spectral Acquisition Rate:** 100 spectra/sec; **Instrument:** LECO Pegasus 4D GCxGC-TOFMS; **Notes:** Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

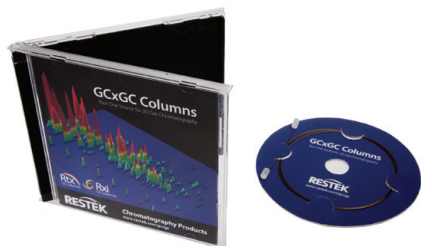
For a peak list, visit www.restek.com and enter chromatogram GC_FF1205 in the search function.

ChromaBLOGraphy

Check out the Restek blog for the most current topics in GCxGC.

blog.restek.com

To choose the perfect primary/secondary column combination for your application, use our guide on page 60!



To choose the perfect primary/secondary column combination for your application, use our guide on page 60!



- Each kit includes one Rxi[®]-1ms, Rxi[®]-5Sil MS, Rxi[®]-17Sil MS, Rtx[®]-200, Rxi[®]-XLB, and Stabilwax[®] column.
- Comprehensive kit simplifies column selection for method developers and frequent GCxGC users alike.
- Included Press-Tight[®] connectors offer a reliable, hassle-free installation.

Primary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	30 m	0.25 mm	0.25 μ m	-60 to 330/350 °C	13323
Rxi-5Sil MS	30 m	0.25 mm	0.25 μ m	-60 to 320/350 °C	13623
Rxi-XLB	30 m	0.25 mm	0.25 μ m	30 to 340/360 °C	13723
Rxi-17Sil MS	30 m	0.25 mm	0.25 μ m	40 to 340/360 °C	14123
Rtx-200	30 m	0.25 mm	0.25 μ m	-20 to 320/340 °C	15023
Stabilwax	30 m	0.25 mm	0.25 μ m	40 to 250/260 °C	10623

Secondary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	2 m	0.15 mm	0.15 μ m	-60 to 330/350 °C	15114
	2 m	0.18 mm	0.18 μ m	-60 to 330/350 °C	15120
	2 m	0.25 mm	0.25 μ m	-60 to 330/350 °C	15127
Rxi-5Sil MS	2 m	0.15 mm	0.15 μ m	-60 to 330/350 °C	15113
	2 m	0.18 mm	0.18 μ m	-60 to 330/350 °C	15119
	2 m	0.25 mm	0.25 μ m	-60 to 330/350 °C	15126
Rxi-XLB	2 m	0.15 mm	0.15 μ m	30 to 340/360 °C	15115
	2 m	0.18 mm	0.18 μ m	30 to 340/360 °C	15121
	2 m	0.25 mm	0.25 μ m	30 to 340/360 °C	15128
Rxi-17Sil MS	2 m	0.15 mm	0.15 μ m	40 to 340/360 °C	15110
	2 m	0.18 mm	0.18 μ m	40 to 340/360 °C	15116
	2 m	0.25 mm	0.25 μ m	40 to 340/360 °C	15123
Rtx-200	2 m	0.15 mm	0.15 μ m	-20 to 320/340 °C	15111
	2 m	0.18 mm	0.18 μ m	-20 to 320/340 °C	15117
	2 m	0.25 mm	0.25 μ m	-20 to 320/340 °C	15124
Stabilwax	2 m	0.15 mm	0.15 μ m	40 to 250/260 °C	15112
	2 m	0.18 mm	0.18 μ m	40 to 250/260 °C	15118
	2 m	0.25 mm	0.25 μ m	40 to 250/260 °C	15125

GCxGC Secondary Column Selectivity Kits

Description	qty.	cat.#
GCxGC (0.15 mm) Selectivity Kit	kit	15129
Includes (each product also available separately)		
Rxi-1ms	ea.	15114
Rxi-5Sil MS	ea.	15113
Rxi-XLB	ea.	15115
Rxi-17Sil MS	ea.	15110
Rtx-200	ea.	15111
Stabilwax	ea.	15112
Universal Press-Tight Connectors	5-pk.	20429

Description	qty.	cat.#
GCxGC (0.18 mm) Selectivity Kit	kit	15130
Includes (each product also available separately)		
Rxi-1ms	ea.	15120
Rxi-5Sil MS	ea.	15119
Rxi-XLB	ea.	15121
Rxi-17Sil MS	ea.	15116
Rtx-200	ea.	15117
Stabilwax	ea.	15118
Universal Press-Tight Connectors	5-pk.	20429

Description	qty.	cat.#
GCxGC (0.25 mm) Selectivity Kit	kit	15131
Includes (each product also available separately)		
Rxi-1ms	ea.	15127
Rxi-5Sil MS	ea.	15126
Rxi-XLB	ea.	15128
Rxi-17Sil MS	ea.	15123
Rtx-200	ea.	15124
Stabilwax	ea.	15125
Universal Press-Tight Connectors	5-pk.	20429

Shorten Analysis Time and Boost Productivity With Restek Fast GC Columns

The math is simple: the less time it takes to perform each analysis, the more samples your laboratory can process. The easiest way to reduce analysis time while still maintaining resolution of critical compounds is to use hydrogen as your carrier gas. If hydrogen is not an option, or if you already use it and want to go even faster, turn to the higher resolving power of smaller-bore capillary columns from Restek.

As column ID decreases, column efficiency (i.e., plates/meter) increases, allowing you to achieve the same, or even better, resolution using a shorter length—and significantly less time. Whether you are currently using 0.25 or 0.53 mm ID columns, you can shorten analysis times as much as twofold by switching to Restek® 0.15 mm ID fast GC columns. These high-efficiency columns speed up separations on your existing GC or GC-MS instrumentation—while maintaining resolution and meeting method criteria—so you can make more runs per shift with the same exceptional accuracy you've come to expect from Restek.

Fast GC 0.15 mm ID Columns

- Increase productivity up to 2x without sacrificing resolution.
- Compatible with your existing GC setup.
- Low bleed for maximum sensitivity and accurate GC-MS analyses.
- Thick films (up to 2 µm) eliminate loadability issues.
- OD similar to 0.25 mm columns for easy installation.
- Excellent as secondary columns for GCxGC.
- Available in a variety of stationary phases.

Rxi®-1ms Columns for Fast GC (fused silica) (nonpolar phase; Crossbond® dimethyl polysiloxane)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	-60 to 330/350 °C	43800	43801

Rxi®-5Sil MS Columns for Fast GC (fused silica) (low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816
	2.0 µm	-60 to 320/350 °C		

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

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

Stabilwax® Columns for Fast GC (fused silica) (polar phase; Crossbond® polyethylene glycol)

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

tech tip

Use a 20 m fast GC column in place of a standard 30 m column; a 10 m in place of a 15 m; and a 40 m in place of a 60 m.

Speed Up
and Simplify GC
Method Development
Restek's EZGC®
Online Suite

www.restek.com/ezgc



How to Get the Same Chromatogram With a Fast GC Column

For over 20 years, 0.15 mm ID columns have been proven to work in virtually any application field. When switching to a smaller-ID and shorter-length column, there are several things you must do in order for your new, faster method to give you the same chromatogram (i.e., separations) as your old method:

- 1) Choose a column with the same phase ratio.
- 2) Adapt the temperature program so that the analyte elution temperatures are the same.
- 3) Adjust the linear velocity. (For a good starting point, see your column's certificate of analysis.)

Following these guidelines will help ensure that you achieve similar chromatography (i.e., identical elution order and resolution)—in a fraction of the time.

Application-Specific Columns

Clinical, Forensic, & Toxicology.....	65
Environmental	66–81
Foods, Flavors, & Fragrances	82–89
Petroleum & Petrochemical	90–93
Pharmaceutical.....	94–97
Specially Deactivated.....	98–103



Unique Column Chemistries for Application-Specific and Specially Deactivated Columns

Designed to help solve chromatographic challenges, these stationary phases are optimized for the best separations, accurate quantification, and shorter analysis times.

Application-Specific Columns

- Clinical, Forensic, & Toxicology
- Environmental
- Foods, Flavors, & Fragrances
- Petroleum and Petrochemical
- Pharmaceutical

Specially Deactivated Columns

Designed for specific classes of compounds.

- Acidic compound analysis
- Basic compound analysis
- Chiral analysis

Blood Alcohol Analysis

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.
- Stable to 260 °C.

These application-specific columns for blood alcohol analysis baseline separate all critical compounds—including ethanol, methanol, acetone, *tert*-butanol, acetaldehyde, isopropanol, and *n*-propanol—in less than 2 minutes. Every Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 column is qualified with a test mix containing these important BAC target compounds to ensure reproducibility.

These columns baseline separate all blood alcohol compounds in blood, breath, or urine, in less than 2 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 two elution order changes between the columns.

Rtx®-BAC Plus 1 Columns (fused silica)

ID	df	temp. limits	30-Meter cat.#
0.32 mm	1.80 µm	-20 to 240/260 °C	18004
0.53 mm	3.00 µm	-20 to 240/260 °C	18005

Rtx®-BAC Plus 2 Columns (fused silica)

ID	df	temp. limits	30-Meter cat.#
0.32 mm	0.6 µm	-20 to 240/260 °C	18006
0.53 mm	1.0 µm	-20 to 240/260 °C	18007

similar phases

DB-ALC1, ZB-BAC1
DB-ALC2, ZB-BAC2

free literature

Rtx®-BAC Plus 1 and
Rtx®-BAC Plus 2 Columns
Advanced Technology for Fast,
Reliable Measurement
of Alcohol in Blood

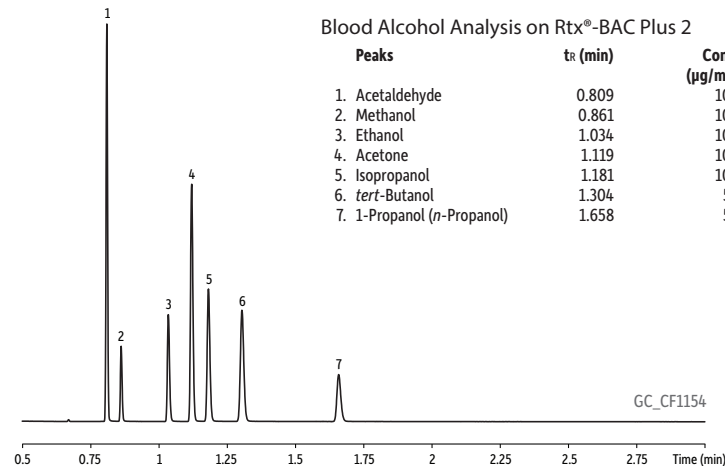
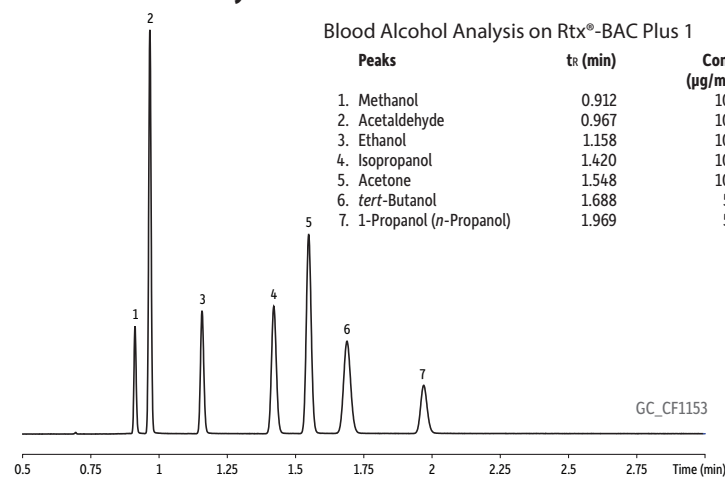
Download your
free copy from

www.restek.com

lit. cat.#
CFBR1538-UNV



Blood Alcohol Analysis on Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2



Column Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004)
Sample BAC resolution control standard n-P (cat.# 36010)
BAC resolution control standard t-B (cat.# 36011)

Diluent: Water
Conc.: 50 µL of each standard were diluted in 900 µL water in a 20 mL headspace vial.

Injection
Liner: Headspace-loop split (split ratio 50:1)
1 mm ID straight inlet liner (cat.# 20972)

Headspace-Loop
Inj. Port Temp.: 200 °C
Instrument: Tekmar HT3
Inj. Time: 3 min
Transfer Line
Temp.: 125 °C
Valve Oven Temp.: 125 °C

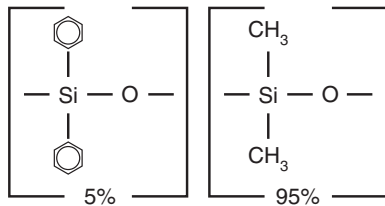
Standby flow
rate: 50 mL/min
Sample Temp.: 60 °C

Sample Equil.
Time: 5 min
Vial Pressure: 30 psi
Pressurize Time: 1 min
Loop Pressure: 20 psi
Loop Fill Time: 1 min

Oven
Oven Temp.: 40 °C (hold 3 min)
Carrier Gas He, constant flow
Linear Velocity: 80 cm/sec @ 40 °C

Detector
Make-up Gas N₂
Flow Rate: 30 mL/min
Make-up Gas Type: Agilent/HP6890 GC
Instrument Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.
Notes

Brominated Flame Retardants Analysis

Rtx[®]-1614 StructureRtx[®]-1614 Columns (fused silica)

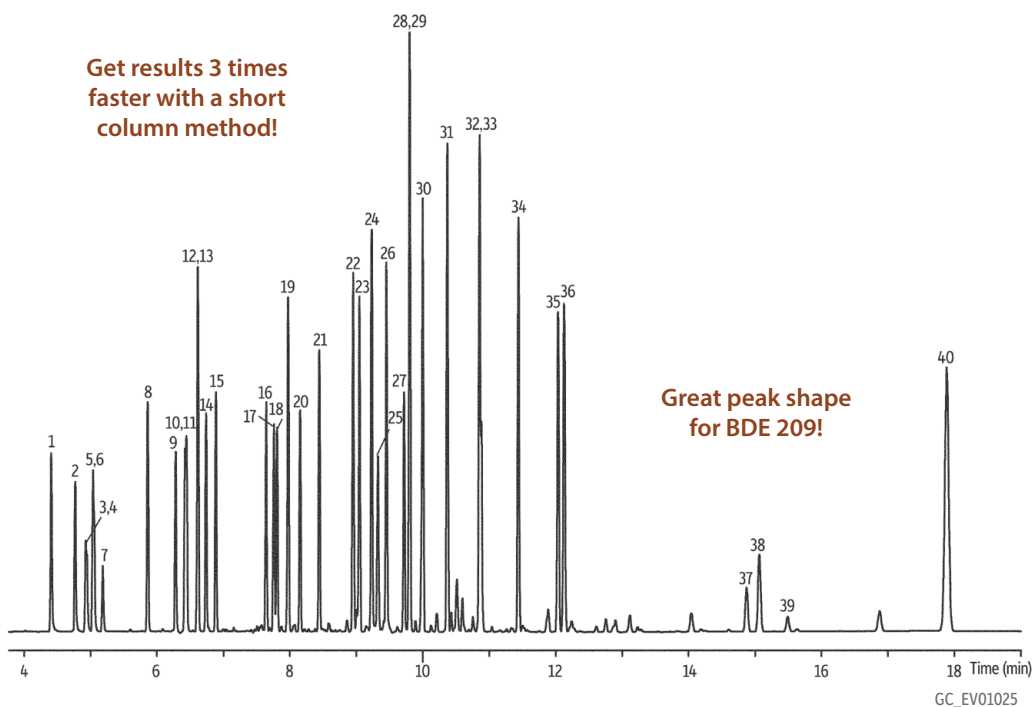
(5% diphenyl, 95% dimethyl polysiloxane)

- 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 than competitor columns, for greater analytical sensitivity.
- Exceeds EPA Method 1614 resolution criteria for BDE-49 and BDE-71.
- Stable to 360 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/360 °C	10296	10295

Brominated Flame Retardants on Rtx[®]-1614

Get results 3 times
faster with a short
column method!



Peaks

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

Column Rtx[®]-1614, 15 m, 0.25 mm ID, 0.10 µm (cat.# 10296)
Sample 100 - 300 ppb PBDE PAR solution (#EO-5113, Cambridge Isotope Laboratories Inc.)
 500 ppb decabromodiphenyl ether (#BDE-209, Wellington Laboratories)

Injection
 Inj. Vol.: 1 µL splitless (hold 1 min)
 Liner: 4 mm cyclo double taper (cat.# 20896)
 Inj. Temp.: 340 °C

Oven
 Oven Temp.: 120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)

Carrier Gas
 Linear Velocity: He, constant linear velocity
 60 cm/sec @ 120 °C

Detector µ-ECD @ 345 °C

Dioxin & Furan Analysis

Rxi®-5Sil MS Columns (fused silica)

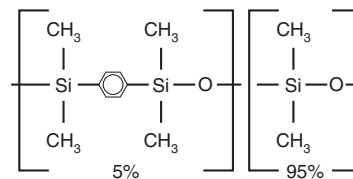
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- Ideal for use in dual column confirmation of dioxin and furan.
- 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 cat.#	60-Meter cat.#
0.18 mm	0.10 µm	-60 to 320/350 °C		43607
0.25 mm	0.25 µm	-60 to 320/350 °C	13623	

Rxi®-5Sil MS Structure

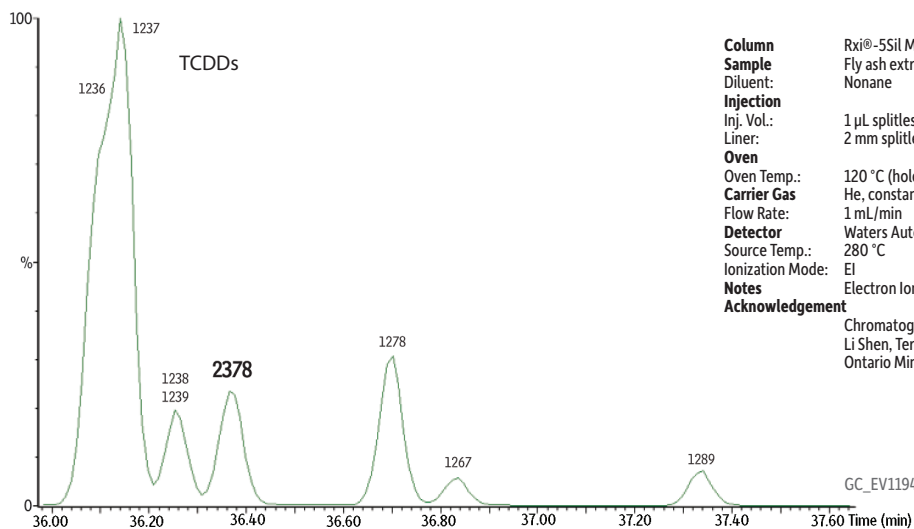


Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

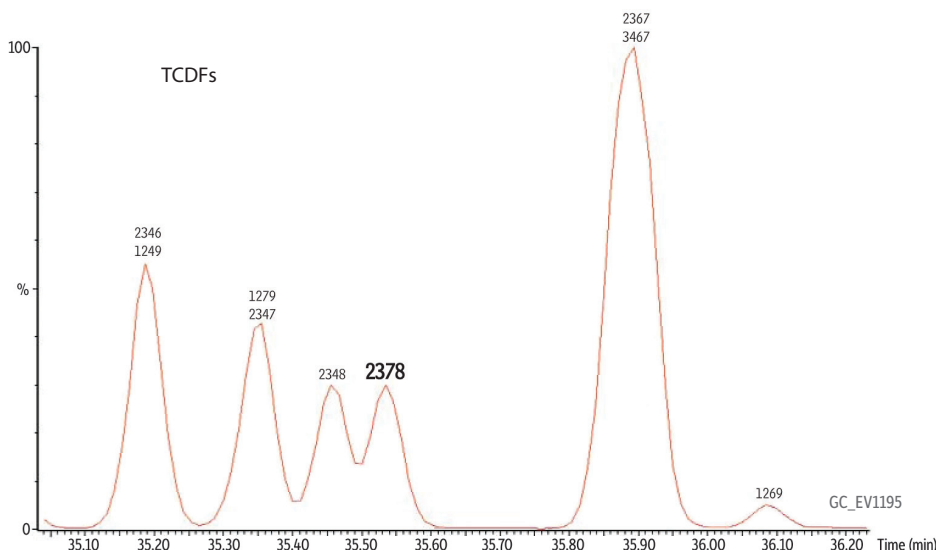
DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

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
 Inj. Vol.: 1 µL splitless
 Liner: 2 mm splitless liner (cat.# 20712)
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.

“Using the Rtx®-Dioxin2 column allowed us to combine EPA 1613 TCDD-only and TCDF confirmation analyses onto one column and one instrument. This resulted in multiple benefits—we shortened run times, reduced instrument downtime and column changes, and increased instrument capacity for our full list samples.”

Owen Cosby

Supervisor, HRMS Services

Maxxam Analytics

Dioxin & Furan Analysis

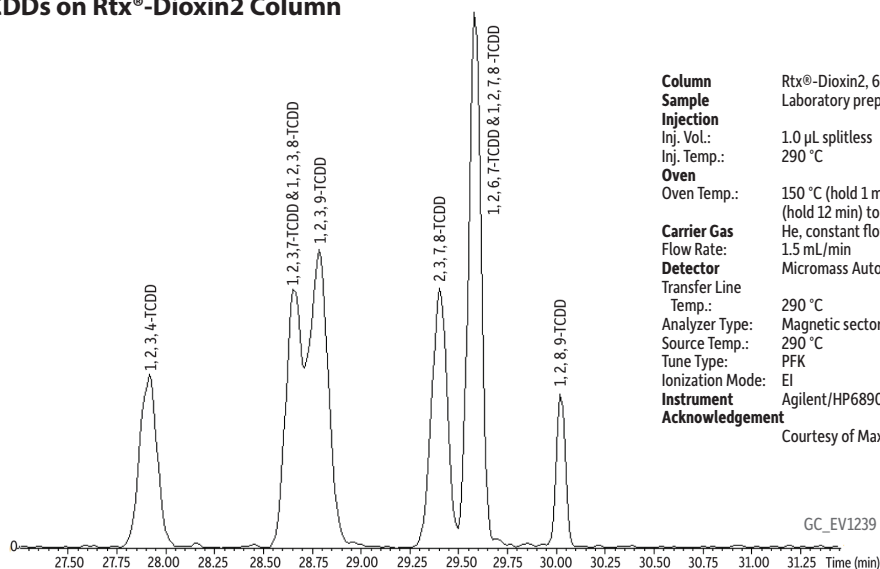
Rtx®-Dioxin2 Columns (fused silica)

(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 allows use as a confirmation GC column.

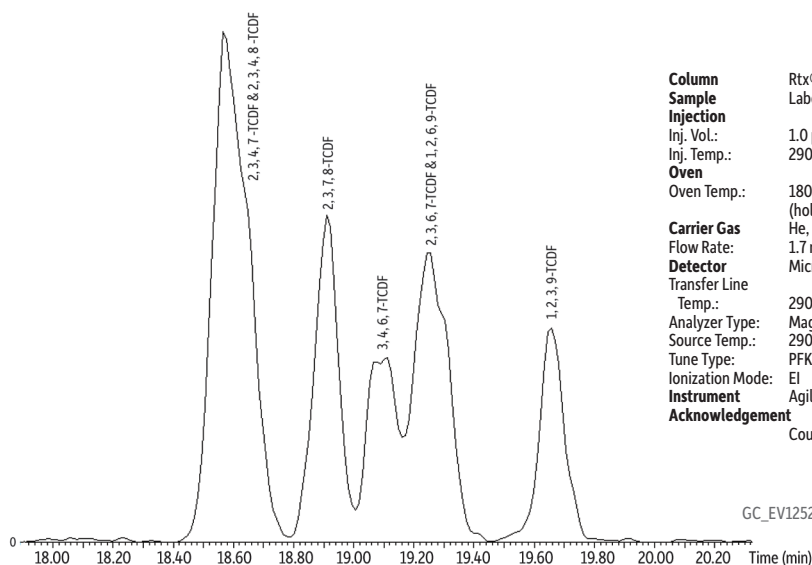
ID	df	temp. limits	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	20 to 320/340 °C	10759	
0.25 mm	0.25 µm	20 to 320/340 °C		10758

TCDDs on Rtx®-Dioxin2 Column



Column Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample Laboratory prepared test mix
Injection
 Inj. Vol.: 1.0 µL splitless
 Inj. Temp.: 290 °C
Oven
 Oven Temp.: 150 °C (hold 1 min) to 210 °C at 30 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 12 min) to 330 °C at 70 °C/min (hold 6 min)
Carrier Gas
 Flow Rate: He, constant flow
 1.5 mL/min
Detector Micromass Autospec Ultima
Transfer Line
 Temp.: 290 °C
Analyzer Type: Magnetic sector
Source Temp.: 290 °C
Tune Type: PFK
Ionization Mode: EI
Instrument Agilent/HP6890 GC
Acknowledgement Courtesy of Maxxam Analytics (Ontario, Canada).

TCDFs on Rtx®-Dioxin2 Column



Column Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample Laboratory prepared test mix
Injection
 Inj. Vol.: 1.0 µL splitless
 Inj. Temp.: 290 °C
Oven
 Oven Temp.: 180 °C (hold 1 min) to 235 °C at 45 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 15 min) to 300 °C at 50 °C/min (hold 1 min)
Carrier Gas
 Flow Rate: He, constant flow
 1.7 mL/min
Detector Micromass Autospec Ultima
Transfer Line
 Temp.: 290 °C
Analyzer Type: Magnetic sector
Source Temp.: 290 °C
Tune Type: PFK
Ionization Mode: EI
Instrument Agilent/HP6890 GC
Acknowledgement Courtesy of Maxxam Analytics (Ontario, Canada).

Mineral Oils/Extractable Petroleum Hydrocarbon 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 volumes 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.

ID	df	temp. limits	15-Meter cat.#
0.32 mm	0.10 µm	-60 to 380/400 °C	18079
	0.15 µm	-60 to 380/400 °C	18074
	0.30 µm	-60 to 380/400 °C	18075

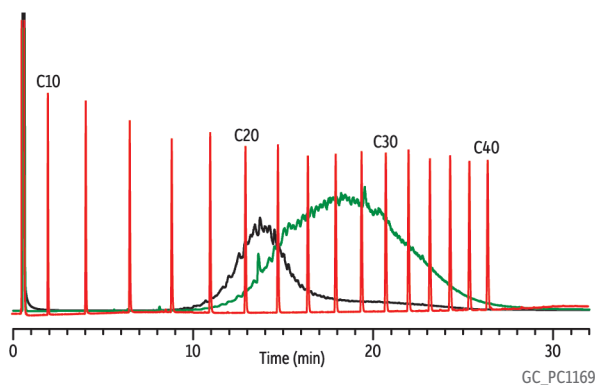
similar phases

Select Mineral Oil

Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

Mineral Oil and Motor Oil on Rtx®-Mineral Oil



Column Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)

Sample Custom mineral oil/motor oil mix

Diluent: Hexane

Conc.: 500 µg/mL

Injection

Inj. Vol.: 0.5 µL cold on-column

Temp. Program: 53 °C to 300 °C at 10 °C/min (hold 20 min)

Oven

Oven Temp.: 50 °C to 300 °C at 10 °C/min (hold 20 min)

Carrier Gas H₂, constant flow

Linear Velocity: 40 cm/sec @ 50 °C

Dead Time: 0.625 min @ 50 °C

Detector FID @ 330 °C

Make-up Gas

Flow Rate: 30 mL/min

Make-up Gas Type: N₂

Data Rate: 20 Hz

Instrument Agilent/HP6890 GC

Notes Black trace = mineral oil
Green trace = motor oil
Red trace = C10-C40 standard



Restek's state-of-the-art facility and rigorous product testing programs ensure you get the quality you need for accurate, reliable results.

PCB Congeners Analysis

Restek innovation!

Rtx®-PCB Columns (fused silica)

(proprietary Crossbond® phase)

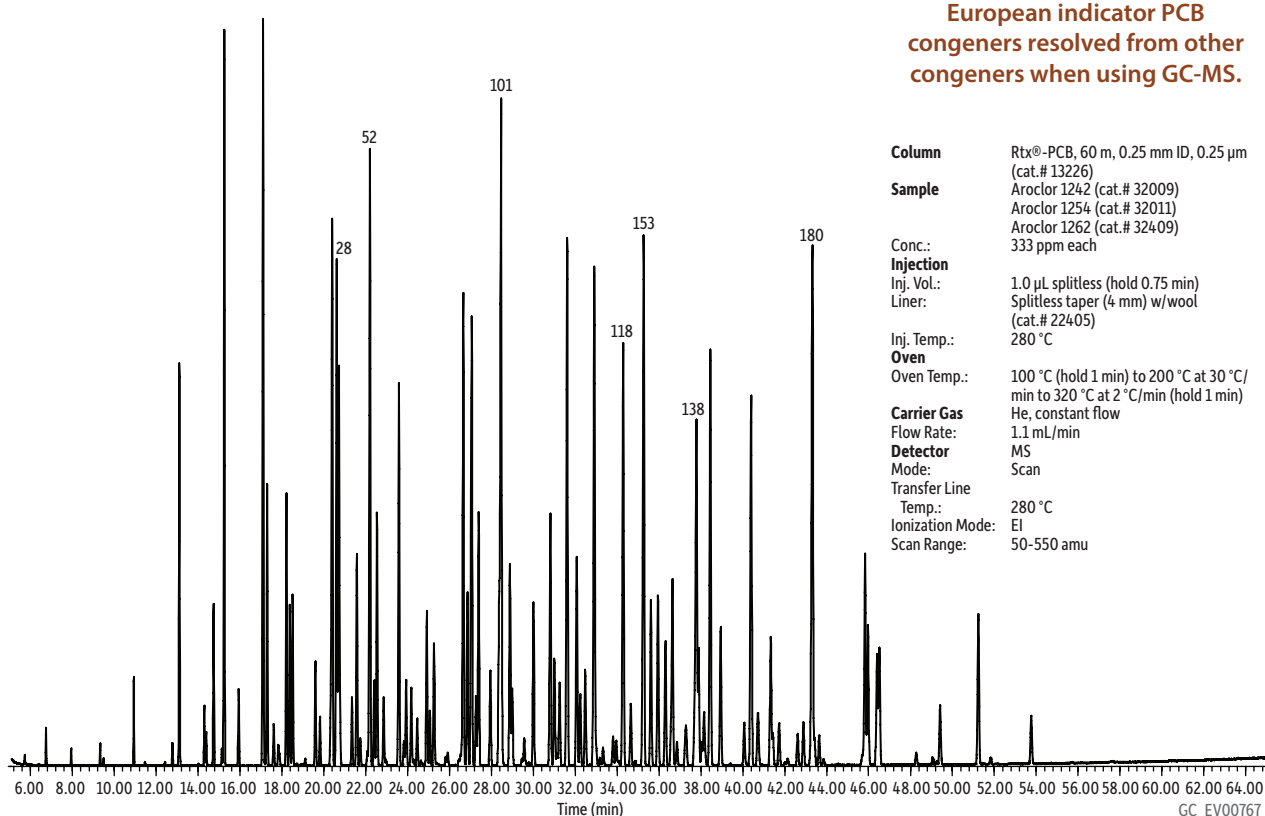
- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Stable to 340 °C.



ID	df	temp. limits*	20-Meter cat.#	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	30 °C to 320 °C	41302		41303	41304
0.25 mm	0.25 µm	30 °C to 320/340 °C		13223		13226
0.32 mm	0.50 µm	30 °C to 320/340 °C		13239		

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Aroclor PCBs on Rtx®-PCB



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.

similar phases

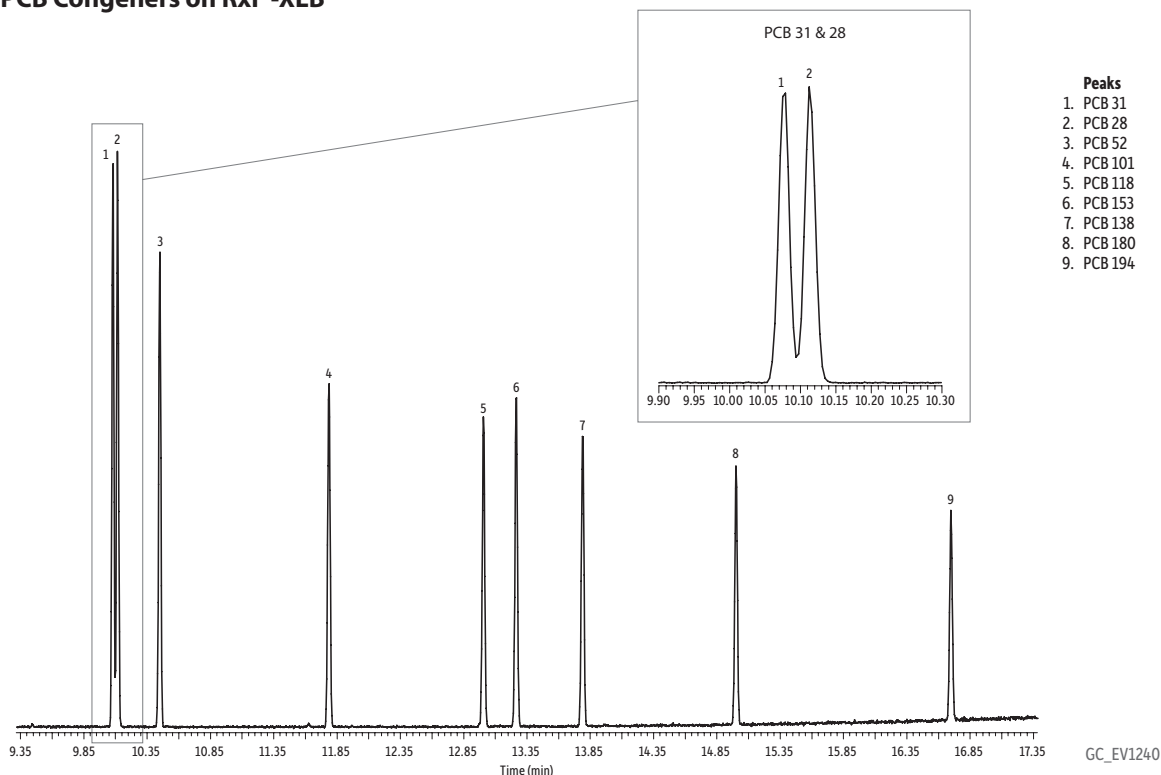
DB-XLB, VF-Xms, MR1, ZB-XLB

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

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	30 to 340/360 °C	43702

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

EU PCB Congeners on Rxi®-XLB



Column Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)
Sample PCB congener standard #2 (cat.# 32294)
 PCB 31 (cat.# custom)

Diluent: Dichloromethane
Conc.: 3.5 ppm

Injection

Inj. Vol.: 0.5 µL splitless (hold 1.75 min)
Liner: 2.0 mm ID straight inlet liner w/wool (cat.# 21718)
Inj. Temp.: 300 °C
Purge Flow: 50 mL/min

Oven

Oven Temp.: 40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)

Carrier Gas He, constant flow
Flow Rate: 1 mL/min

Detector MS

Mode: Scan

Transfer Line

Temp.: 300 °C

Analyzer Type: Quadrupole

Source Temp.: 280 °C

Electron Energy: 70 eV

Ionization Mode: EI

Scan Range: 45-550 amu

Scan Rate: 5 scans/sec

Instrument PE Clarus 500 GC & Clarus 500 MS

Restek innovation!

CarboPrep®
SPE Cartridges
See **page 398**.



also available
Column connectors

See **pages 227–233**
for a wide selection.

**free literature**

Analyze Chlorinated Pesticides,
PCBs and Chlorinated
Herbicides

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free copy from

www.restek.com

lit. cat.#
EVBR1013D-UNV



Save money with our
kits. Each includes
recommended guard
and analytical column
combinations.

kit

Pesticides Analysis (Chlorinated)

Rtx®-CLPesticides/Rtx®-CLPesticides2

- Application-specific columns for organochlorine pesticides and herbicides.
- Low bleed—ideal for high sensitivity GC-ECD or GC-MS analyses.
- Baseline separations in less than 10 minutes.
- Stable to 340 °C.
- Analyze EPA Method 8081B, 8082A, 8151A, 504.1, 515, 508.1, and 552.2 compounds without time-consuming column changes.

Rtx®-CLPesticides Columns (fused silica)
(proprietary Crossbond® phases)

ID	df	temp. limits	15-Meter cat.#	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	-60 to 320/340 °C		42102		
0.25 mm	0.25 µm	-60 to 320/340 °C	11120		11123	11126
0.32 mm	0.32 µm	-60 to 320/340 °C			11141	
	0.50 µm	-60 to 320/340 °C	11136		11139	
0.53 mm	0.50 µm	-60 to 300/320 °C			11140	

Rtx®-CLPesticides2 Columns (fused silica)
(proprietary Crossbond® phases)

ID	df	temp. limits	10-Meter cat.#	15-Meter cat.#	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.18 mm	0.14 µm	-60 to 320/330 °C	42301		42302		
0.25 mm	0.20 µm	-60 to 320/340 °C				11323	11326
0.32 mm	0.25 µm	-60 to 320/340 °C		11321		11324	
	0.50 µm	-60 to 320/340 °C				11325	
0.53 mm	0.42 µm	-60 to 300/320 °C		11337		11340	

NOTE: Analyzing dirty or derivatized samples can contaminate your column. Restek does not recommend analyzing trace-level pesticide samples following derivatized samples (e.g., Methods 8151A and 552.2) without first performing inlet maintenance. Standard steps include trimming the guard column and changing the inlet liner, O-ring, seal, and septum.

Rtx®-CLPesticides Column Kit (0.25 mm ID)

(Note: Columns are not preconnected in this kit.)

Description	qty.	cat.#
Rtx-CLPesticides Kit (0.25 mm ID)	kit	11199
Includes (each product also available separately)		
30m, 0.25mm ID, 0.25µm Rtx-CLPesticides Column Column	ea.	11123
30m, 0.25mm ID, 0.20µm Rtx-CLPesticides2 Column Column	ea.	11323
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5 m, 0.25 mm ID Siltek Guard Column	ea.	10026

kit

Rtx®-CLPesticides Column Kit (0.32 mm ID)

(Note: Columns are not preconnected in this kit.)

Description	qty.	cat.#
Rtx-CLPesticides Kit (0.32 mm ID)	kit	11196
Includes (each product also available separately)		
30m, 0.32mm ID, 0.32µm Rtx-CLPesticides Column Column	ea.	11141
30m, 0.32mm ID, 0.25µm Rtx-CLPesticides2 Column Column	ea.	11324
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5 m, 0.32 mm ID Siltek Guard Column	ea.	10027

kit

Rtx®-CLPesticides Column Kit (0.53 mm ID)

(Note: Columns are not preconnected in this kit.)

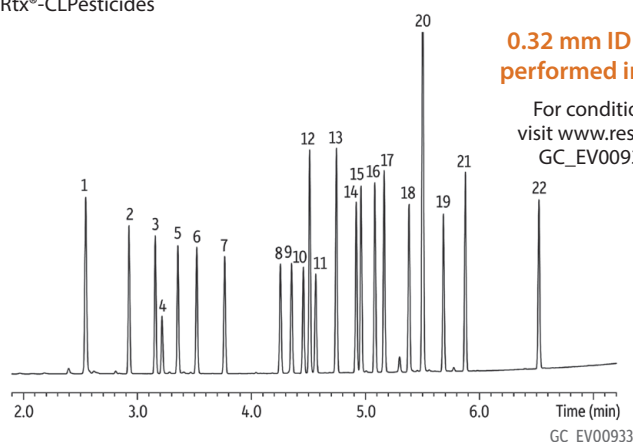
Description	qty.	cat.#
Rtx-CLPesticides Kit (0.53 mm ID)	kit	11197
Includes (each product also available separately)		
30m, 0.53mm ID, 0.50µm Rtx-CLPesticides Column Column	ea.	11140
30m, 0.53mm ID, 0.42µm Rtx-CLPesticides2 Column Column	ea.	11340
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5m, 0.53mm ID IP Deactivated Guard Column	ea.	10045

Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.32 mm ID column set)

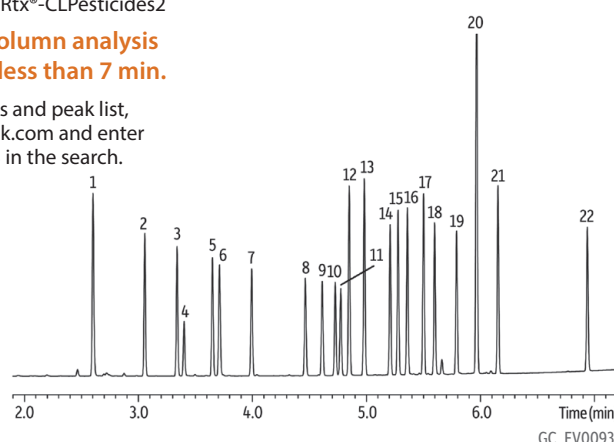
Rtx®-CLPesticides

Rtx®-CLPesticides2

0.32 mm ID column analysis performed in less than 7 min.

For conditions and peak list, visit www.restek.com and enter GC_EV00933 in the search.

GC_EV00933



GC_EV00933A

Method Compound List	Column Pair	Analysis Time (min)	Coelutions	Restek Advantage
8081B (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	0 / 0	• Increase sample throughput with 7 min analyses and baseline resolution.
	Competitor A set	7 / 8	0 / 1	
	Competitor B set	10 / 9	0 / 0	
8081B (extended) (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	24 / 23	1 / 2	• Best balance of speed and selectivity. • All compounds are resolved on at least one column.
	Competitor A set	27 / 29	0 / 3	
	Competitor B set	NDP / 16	NDP / 3	
8082A (Polychlorinated biphenyls (PCBs), Aroclors)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	n/a	• Fast PCB analysis times.
	Competitor A set	6 / 7	n/a	
	Competitor B set	24 / 21	n/a	
8151A (Chlorinated herbicides)	Rtx-CLPesticides / Rtx-CLPesticides2	13 / 13	1 / 0	• More elution order changes improve confidence in confirmational results.
	Competitor A set	13 / 13	0 / 0	
	Competitor B set	16 / 15	1 / 1	
504.1 (EDB, DBCP, TCP)	Rtx-CLPesticides / Rtx-CLPesticides2	6 / 6	0 / 0	• Reliably separate analytes from trihalomethane interferences.
	Competitor A set	6 / 6	0 / 0	
	Competitor B set	NDP	NDP	
505 (Organohalide pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	18 / 18.5	1 / 1	• All compounds resolved on at least one column.
	Competitor A set	14 / 14	0 / 1	
	Competitor B set	35 / 36	1 / 2	
508.1 (Chlorinated pesticides, herbicides, organohalides)	Rtx-CLPesticides / Rtx-CLPesticides2	23.5 / 24	2 / 2	• Good balance of speed and resolution.
	Competitor A set	21 / 23	0 / 3	
	Competitor B set	18 / 17	2 / 4	
552.2 (Haloacetic acids, dalapon)	Rtx-CLPesticides / Rtx-CLPesticides2	12 / 12	0 / 0	• No coelutions—get accurate results for compounds that coelute on other columns.
	Competitor A set	8 / 9	1 / 1	
	Competitor B set	NDP/10	NDP/1	

Comparison based on published competitor data. All columns tested were 0.32 mm ID. NDP = no data published.

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.

did you know?

Analyzing dirty or derivatized samples can contaminate your column. Restek does not recommend analyzing trace-level pesticide samples following derivatized samples (e.g., Methods 8151A and 552.2) without first performing inlet maintenance. Standard steps include trimming the guard column and changing the inlet liner, O-ring, seal, and septum.

For more information go to

www.restek.com/CLP7

FASTefficient analysis
of OPPs in EPA
Method 8141**Restek innovation!**

- Better separations
- Faster analyses

Pesticides Analysis (Organophosphorus)**Rtx®-OPPesticides/Rtx®-OPPesticides2**

- Application-specific columns for organophosphorus pesticides; best column combination for U.S. EPA Method 8141.
- 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 8141. Separation is improved and analysis time is significantly reduced, compared to other columns. The extended upper temperature limit of these phases (330 °C) allows analysts to bake out high molecular weight contamination typically associated with pesticide samples. The low-bleed columns are a perfect match for sensitive detection systems.

Rtx®-OPPesticides Columns (fused silica)

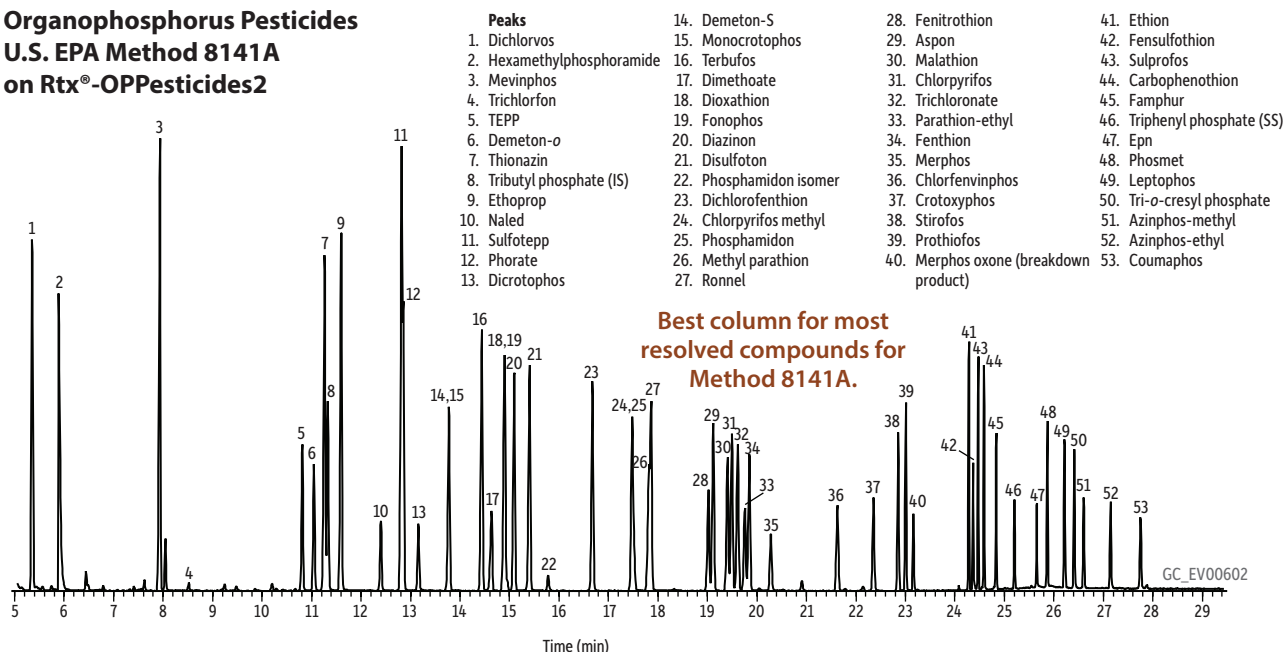
(proprietary Crossbond® phases)

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-20 to 310/330 °C	11223
0.32 mm	0.50 µm	-20 to 310/330 °C	11239
0.53 mm	0.83 µm	-20 to 310/330 °C	11240

Rtx®-OPPesticides2 Columns (fused silica)

(proprietary Crossbond® phases)

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#
0.18 mm	0.20 µm	-20 to 310/330 °C	11244	
0.25 mm	0.25 µm	-20 to 310/330 °C		11243
0.32 mm	0.32 µm	-20 to 310/330 °C		11241
0.53 mm	0.50 µm	-20 to 300/330 °C		11242

**Organophosphorus Pesticides
U.S. EPA Method 8141A
on Rtx®-OPPesticides2**


Column Rtx®-OPPesticides2, 30 m, 0.25 mm ID, 0.25 µm (cat.# 11243)

Sample Triphenylphosphate (cat.# 32281)
Tributylphosphate (cat.# 32280)
8140/8141 OP pesticide calibration mix A (cat.# 32277)
8141 OP pesticide calibration mix B (cat.# 32278)

Conc.: 100 ppm (100 ng on-column)

Injection 1.0 µL splitless (hold 0.4 min)

Inj. Vol.: Double taper splitless (4 mm) (cat.# 20785)

Inj. Temp.: 250 °C

Oven 80 °C (hold 0.5 min) to 140 °C at 20 °C/min to 210 °C at 4 °C/min (hold 1 min) to 280 °C at 30 °C/min (hold 5 min)

Carrier Gas He, constant flow

Flow Rate: 1.0 mL/min

Detector MS

Mode: Scan

Transfer Line Temp.: 280 °C

Analyzer Type: Quadrupole

Ionization Mode: EI

Scan Range: 35-400 amu

Notes U.S. EPA Method 8141A custom standard mix. Additional mixes not shown. Contact Restek for more information.

Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

Rxi®-5Sil MS Columns (fused silica)

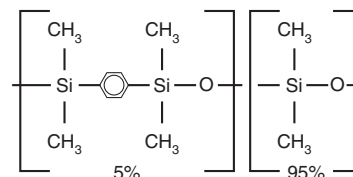
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

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

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Rxi®-5Sil MS Structure

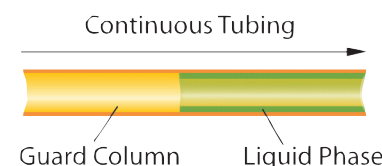


Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

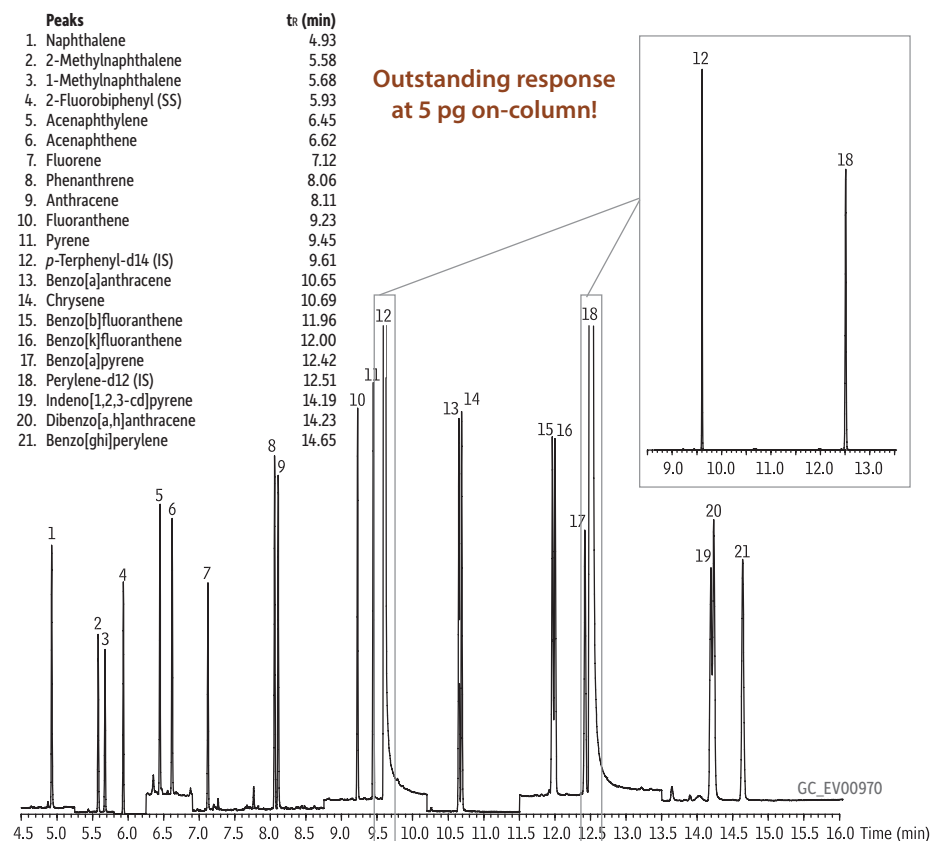
Integra-Guard® Built-In Guard Column



Get the protection without the connection!

See page 23 for Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns.

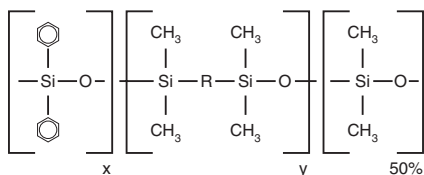
Polycyclic Aromatic Hydrocarbons on Rxi®-5Sil MS



Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)	
Sample	PAH mix, 1 µL of 0.005 µg/mL (1S 2 µg/mL) SV Calibration mix #5 / 610 PAH Mix (cat.# 31011) 1-Methylnaphthalene (cat.# 31283) 2-Methylnaphthalene (cat.# 31285) 2-Fluorobiphenyl (cat.# 31091) 5 pg on-column	
Conc.:		
Injection	1.0 µL pulsed splitless (hold 0.15 min)	
Inj. Vol.:		
Liner:	Drilled Uniliner® (hole near top) w/wool (cat.# 21055-200.5)	
Inj. Temp.:	300 °C	
Pulse Pressure:	20 psi (137.9 kPa)	
Pulse Time:	0.2 min	
Purge Flow:	60 mL/min	
Oven		
Oven Temp.:	50 °C (hold 0.5 min) to 290 °C at 25 °C/min to 320 °C at 5 °C/min	
Carrier Gas	He, constant flow	
Flow Rate:	1.4 mL/min	
Detector	MS	
Mode:	SIM	
SIM Program:		
Start Time		
Group (min)	Ion(s)	Dwell (ms)
1	128 m/z	100
2	142 m/z	100
3	172 m/z	100
4	152 m/z	100
5	166 m/z	100
6	178 m/z	100
7	202,244 m/z	100
8	228 m/z	100
9	252,264 m/z	100
10	276,278 m/z	100
Transfer Line		
Temp.:	290 °C	
Ionization Mode:	EI	

Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

Rxi®-17Sil MS Structure



Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

DB-17ms, VF-17ms

Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- 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.

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

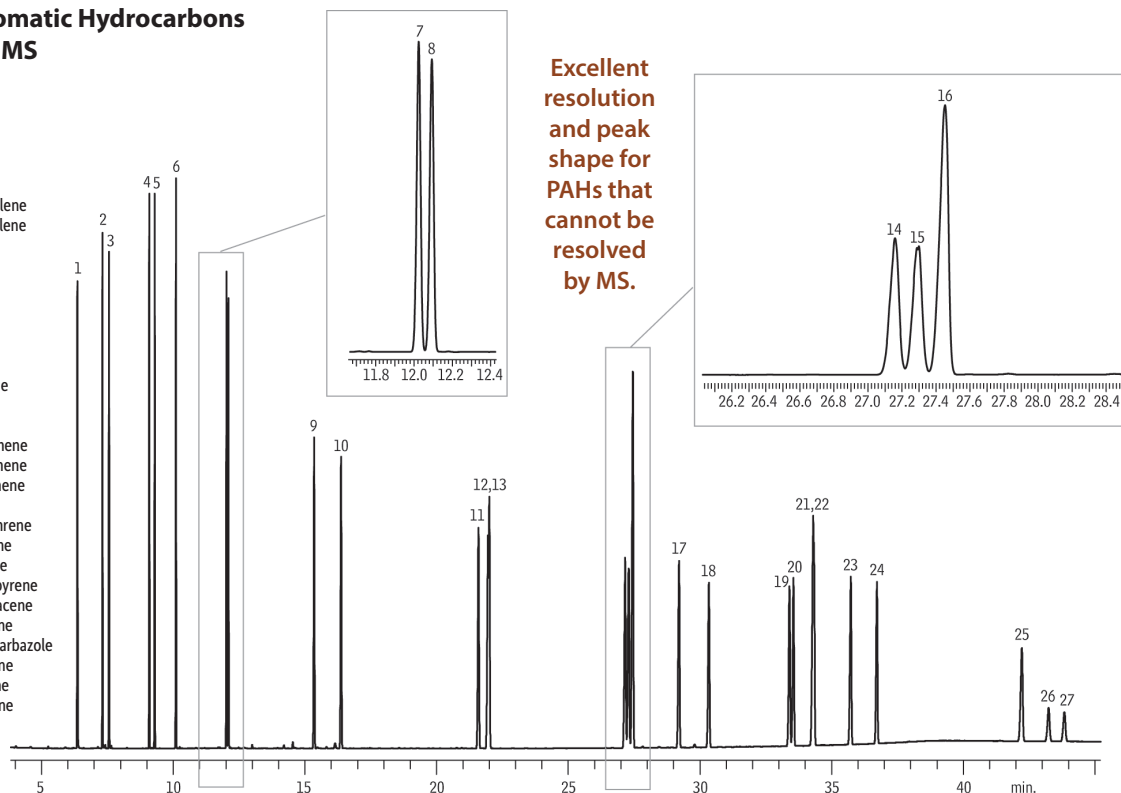
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS

Peaks

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



Excellent resolution and peak shape for PAHs that cannot be resolved by MS.

Column Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)

Sample PAH supplement mix for method 8100 (cat.# 31857)
EPA Method 8310 PAH mixture (cat.# 31841)
Triphenylene (custom)

Diluent: Dichloromethane

Conc.: 10 ppm

Injection

Inj. Vol.: 0.5 µL splitless (hold 1.75 min)

Liner: Auto SYS XL PSS split/splitless w/wool (cat.# 21718)

Inj. Temp.: 320 °C

Purge Flow: 75 mL/min

Oven

Oven Temp.: 65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)

Carrier Gas He, constant flow

Flow Rate: 2.0 mL/min

Detector FID @ 320 °C

Instrument PE Clarus 600 GC

Acknowledgement Instrument provided by PerkinElmer

GC_EV1160

Semivolatiles Analysis

Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

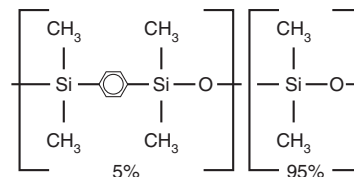
- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, 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 cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

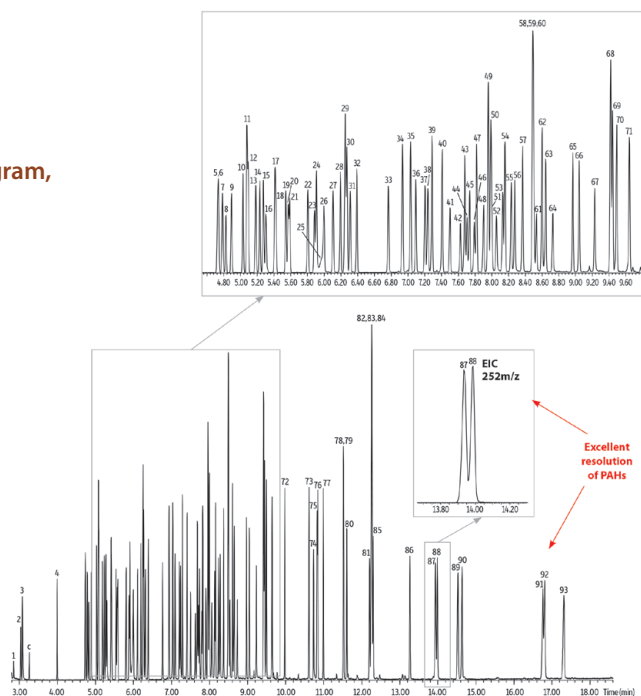
ordering note

Get the protection without the connection!

For Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns, see **page 23**.

Semivolatiles by EPA Method 8270 on Rxi®-5Sil MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner

For complete chromatogram, see page 33.

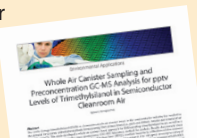


GC_EV00943

free literature

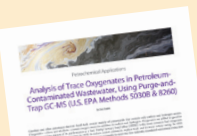
Whole Air Canister Sampling and Preconcentration GC-MS Analysis for pptv Levels of Trimethylsilanol in Semiconductor Cleanroom Air

lit. cat.#
EVAN1788-UNV



Analysis of Trace Oxygenates in Petroleum-Contaminated Wastewater, Using Purge-and-Trap GC-MS (U.S. EPA Methods 5030B & 8260)

lit. cat.#
EVAN1449-UNV



Download your free copies from

www.restek.com

Volatile Organics Analysis

Rtx®-VMS Columns (fused silica)

(proprietary Crossbond® phase)

- Application-specific columns for analyzing volatile organic pollutants by GC-MS including Methods TO-15, TMS, and EPA 8260.
- Complete separation of U.S. EPA Method 8260 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 U.S. 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-and-trap transfer line in a system equipped with a jet separator.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#
0.25 mm	1.40 µm	-40 to 240/260 °C	19915	19916	
0.32 mm	1.80 µm	-40 to 240/260 °C	19919	19920	
0.45 mm	2.55 µm	-40 to 240/260 °C	19908	19909	
0.53 mm	3.00 µm	-40 to 240/260 °C	19985	19988	19974

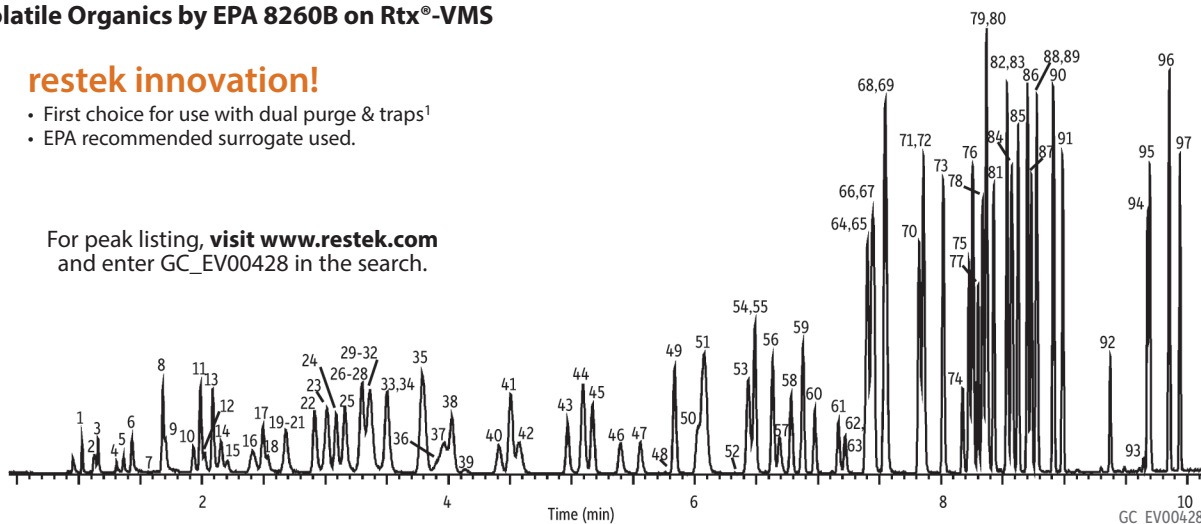
ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-40 to 240/260 °C	49914	49915

Volatile Organics by EPA 8260B on Rtx®-VMS

restek innovation!

- First choice for use with dual purge & traps¹
- EPA recommended surrogate used.

For peak listing, visit www.restek.com and enter GC_EV00428 in the search.



Column Sample Rtx®-VMS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 49914)

Diluent: Water

Conc.: 10 ppb in 5 mL RO water (unless noted); ketones 2.5X

Injection Purge and trap split (split ratio 40:1)

Liner: 1 mm split (cat.# 20973)

Inj. Temp.: 220 °C

Purge and Trap

Instrument: Tekmar LCS 3100

Trap Type: Vocab® 3000

Purge: 11 min @ ambient, flow 40 mL/min

Dry Purge: 1 min, flow 40 mL/min

Desorb Preheat Temp.: 245 °C

Desorb: 2 min @ 250 °C, flow 40 mL/min

Bake: 8 min @ 260 °C

Interface

Connection: Injection port

Transfer Line Tubing: Silcosteel® treated 0.53 mm ID tubing (cat.# 20595)

Transfer Line Temp.: 120 °C

Oven

Oven Temp.: 50 °C (hold 4 min) to 100 °C at 18 °C/min (hold 0 min) to 230 °C at 40 °C/min (hold 3 min)

Carrier Gas He, constant flow

Flow Rate: 1.0 mL/min

Detector MS

Mode: Scan

Transfer Line

Temp.: 280 °C

Analyzer Type: Quadrupole

Tune Type: BFB

Ionization Mode: EI

Scan Range: 35-300 amu

Instrument HP6890 GC & 5973 MSD

Notes For proper flows, adjust retention time of dichlorodifluoromethane to a retention time of 1.03 min @ 50 °C

¹A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

Volatile Organics Analysis

Rtx®-VRX Columns (fused silica)

(proprietary Crossbond® phase)

- Application-specific columns for volatile organic pollutants.
- Excellent for U.S. 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.

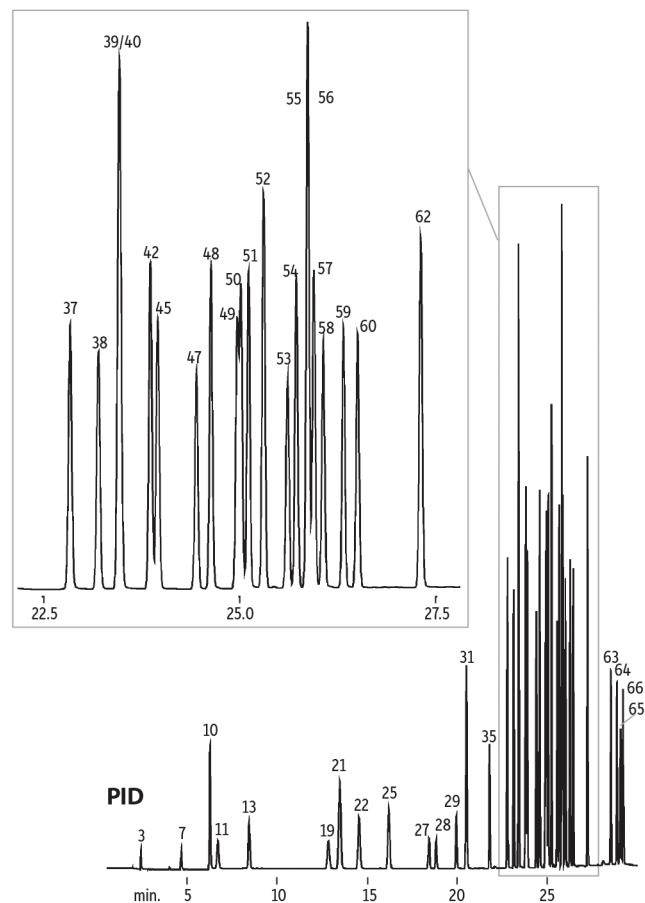
ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#
0.25 mm	1.40 µm	-40 to 240/260 °C	19315	19316	
0.32 mm	1.80 µm	-40 to 240/260 °C	19319	19320	
0.45 mm	2.55 µm	-40 to 240/260 °C	19308		19309
0.53 mm	3.00 µm	-40 to 240/260 °C	19385	19388	

ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-40 to 240/260 °C	49314	49315

similar phases

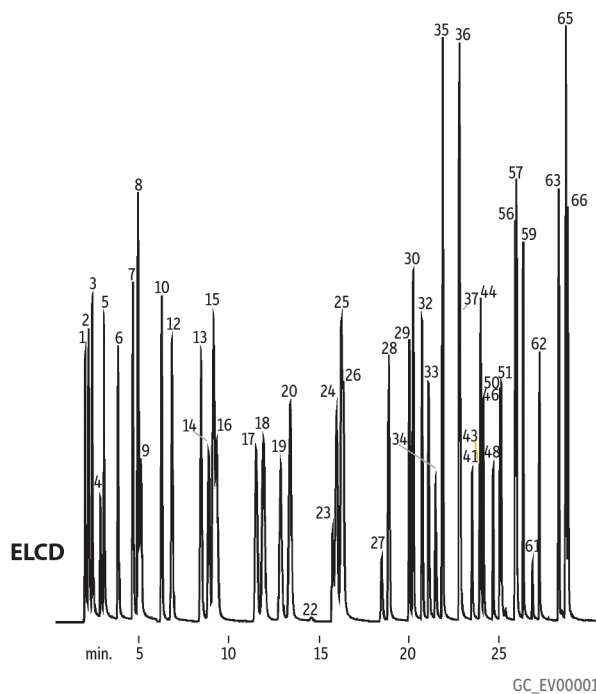
DB-VRX

Volatile Organics by EPA 8021 on Rtx®-VRX



Good choice for wastewater analysis.

For peak list and conditions, visit
www.restek.com
 and enter GC_EV00001 in the search.



similar phases

DB-502.2

also available



Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-502.2 columnspage 111

MXT®-Volatilespage 111

similar phases

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 U.S. 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 U.S. 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 cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 250/270 °C	10915	10916		
0.32 mm	1.80 µm	-20 to 250/270 °C	10919	10920		10921
0.45 mm	2.55 µm	-20 to 250/270 °C			10986	
0.53 mm	3.00 µm	-20 to 250/270 °C	10908	10909		10910

ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-20 to 250/270 °C	40914	40915

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

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 U.S. 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 cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	1.00 µm	-20 to 270/280 °C	10900	10903	
0.32 mm	1.50 µm	-20 to 270/280 °C	10901	10904	
0.53 mm	2.00 µm	-20 to 270/280 °C	10902	10905	10906

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.



True Blue Performance





See pages 193–202 or visit www.restek.com/sky

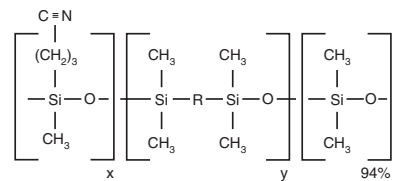
Volatile Organics Analysis

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

Rxi®-624Sil MS (G43) Structure



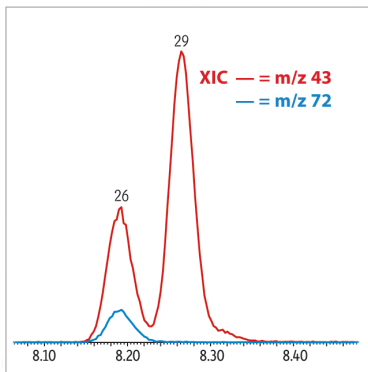
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



Resolution of critical pairs, low bleed, and high inertness make this a great column for volatiles!

For peak list, visit www.restek.com and enter GC_EV1169 in the search.

Column Sample

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.:

Injection

Inj. Temp.:

Purge and Trap

Instrument:

Trap Type:

Purge:

Desorb Preheat Temp.:

Desorb:

Bake:

Interface Connection:

Oven

Oven Temp.:

Carrier Gas

Flow Rate:

Detector

Mode:

Transfer Line Temp.:

Analyzer Type:

Source Temp.:

Quad Temp.:

Electron Energy:

Solvent Delay Time:

Tune Type:

Ionization Mode:

Scan Range:

Instrument

Notes

Other Purge-and-Trap Conditions:

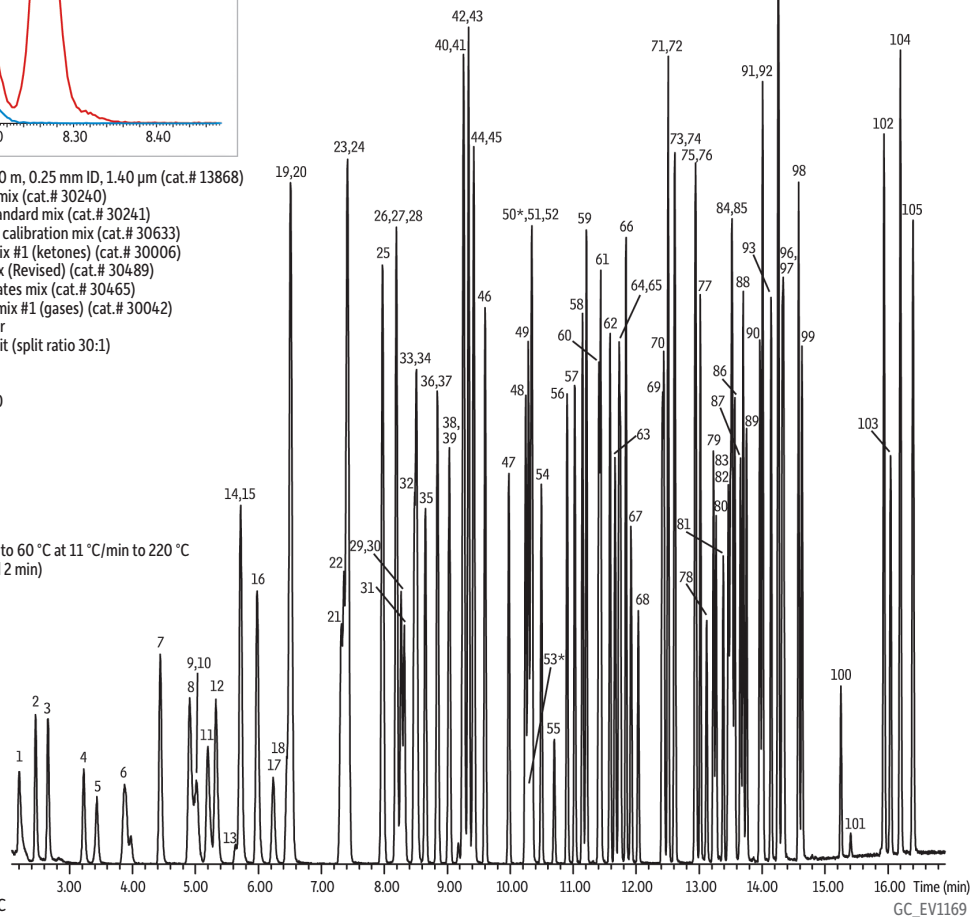
Sample Inlet: 40 °C

Sample: 40 °C

Water Management: Purge 110 °C, Desorb 0 °C, Bake, 240 °C

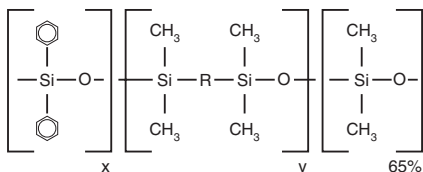
Acknowledgement

Eclipse 4660 purge-and-trap courtesy of O.I. Analytical, College Station, TX.



Cannabis Potency Analysis

Rxi®-35Sil MS Structure



similar phases

DB-35ms, DB-35msUI, VF-35ms, MR2

Rxi®-35Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

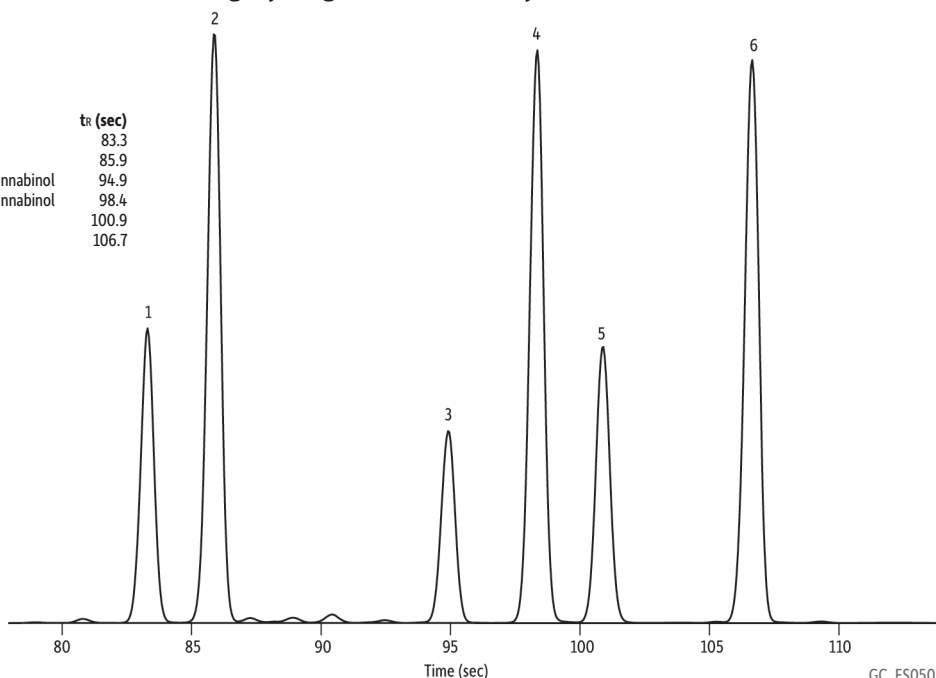
- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Provides superior separation for cannabinoids.
- Very low-bleed phase for GC-MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

The higher aromatic content of the Rxi®-35Sil MS column allows for superior separation of cannabinoids over traditional 5-type columns. Baseline separation can be achieved for a comprehensive list of cannabinoids by using a cost-effective 15 m column and readily available hydrogen carrier gas. The arylene content of the Rxi®-35Sil MS stationary phase ensures long column lifetime at the high elution temperatures required for cannabinoids analysis.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	50 to 340/360 °C	13820	13823

Cannabinoids on Rxi®-35Sil MS Using Hydrogen Carrier Gas by GC-FID

Peaks	tr (sec)
1. Cannabichromene	83.3
2. Cannabidiol	85.9
3. Delta-8-Tetrahydrocannabinol	94.9
4. Delta-9-Tetrahydrocannabinol	98.4
5. Cannabigerol	100.9
6. Cannabinol	106.7



GC_FS0501

Column Rxi®-35Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13820)
Sample Cannabinoids standard (cat.# 34014)
 Cannabichromene (cat.# 34092)
 delta-8-Tetrahydrocannabinol (THC) (cat.# 34090)
 Cannabigerol (cat.# 34091)

Injection
 Inj. Vol.: 1 µL split (split ratio 50:1)
 Liner: Sky® 4 mm Precision® liner w/wool (cat.# 23305.5)
 Inj. Temp.: 250 °C
 Split Vent Flow Rate: 125 mL/min
Oven
 Oven Temp.: 225 °C (hold 0.1 min) to 330 °C at 35 °C/min (hold 0.9 min)
Carrier Gas
 H₂, constant flow
 Flow Rate: 2.5 mL/min
Detector
 FID @ 350 °C
 Constant Column +
 Constant Make-up: 50 mL/min
 Make-up Gas Type: N₂
 Hydrogen flow: 40 mL/min
 Air flow: 450 mL/min
 Data Rate: 20 Hz
Instrument Agilent/HP6890 GC



FAME Analysis (*cis/trans*)

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

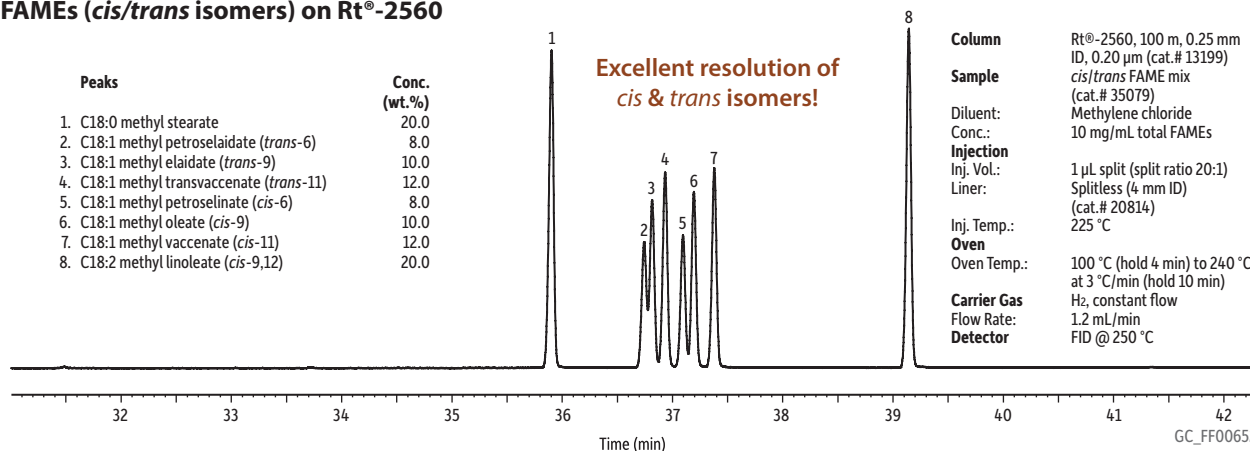
HP-88, CP-Sil 88, SPB-2560

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

FAMEs (*cis/trans* isomers) on Rt[®]-2560

Peaks	Conc. (wt.%)
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselinic acid (<i>trans</i> -6)	8.0
3. C18:1 methyl elaidic acid (<i>trans</i> -9)	10.0
4. C18:1 methyl transvaccenic acid (<i>trans</i> -11)	12.0
5. C18:1 methyl petroselinic acid (<i>cis</i> -6)	8.0
6. C18:1 methyl oleic acid (<i>cis</i> -9)	10.0
7. C18:1 methyl vaccenic acid (<i>cis</i> -11)	12.0
8. C18:2 methyl linoleic acid (<i>cis</i> -9,12)	20.0

Excellent resolution of *cis* & *trans* isomers!



Column	Rt [®] -2560, 100 m, 0.25 mm ID, 0.20 μm (cat.# 13199)
Sample	<i>cis/trans</i> FAME mix (cat.# 35079)
Diluent:	Methylene chloride
Conc.:	10 mg/mL total FAMEs
Injection	
Inj. Vol.:	1 μL split (split ratio 20:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	225 °C
Oven	
Oven Temp.:	100 °C (hold 4 min) to 240 °C at 3 °C/min (hold 10 min)
Carrier Gas	H ₂ , constant flow
Flow Rate:	1.2 mL/min
Detector	FID @ 250 °C

FAME Analysis (Polyunsaturated)

FAMEWAX Columns (USP G16) (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.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μm	20 to 240/250 °C	12497
0.32 mm	0.25 μm	20 to 240/250 °C	12498
0.53 mm	0.50 μm	20 to 250 °C	12499

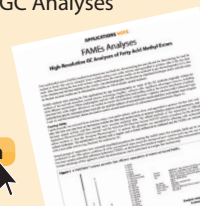
FAMEs Analyses

High-Resolution GC Analyses of Fatty Acid Methyl Esters

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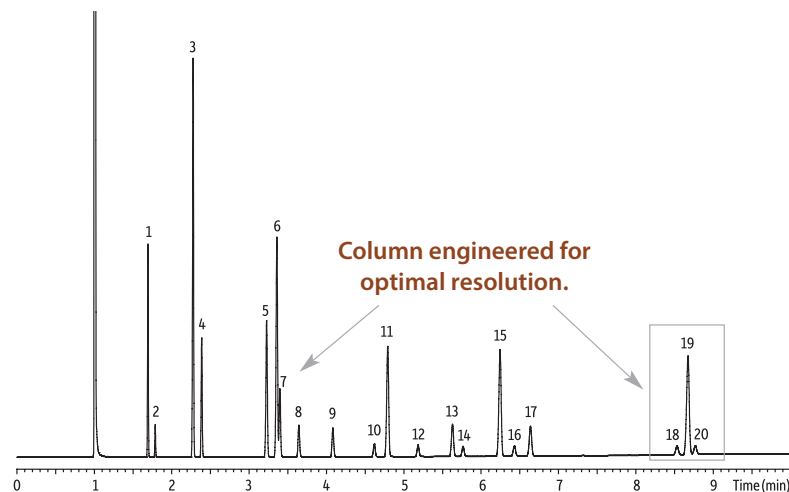
lit. cat.# 59584B



similar phases

Select FAME, Omegawax

FAMEs (Marine Oil Standard) on FAMEWAX



Peaks	Conc. (μg/mL)	10. C20:0	100
1. C14:0	600	11. C20:1	900
2. C14:1	100	12. C20:2	100
3. C16:0	1,600	13. C20:4	300
4. C16:1	500	14. C20:3	100
5. C18:0	800	15. C20:5	1,000
6. C18:1 (oleate)	1,300	16. C22:0	100
7. C18:1 (vaccenate)	400	17. C22:1	300
8. C18:2	200	18. C24:0	100
9. C18:3	200	19. C22:6	1,200
		20. C24:1	100

Column	FAMEWAX, 30 m, 0.32 mm ID, 0.25 μm (cat.# 12498)
Sample	Marine oil FAME mix (cat.# 35066)
Diluent:	Isooctane
Conc.:	10,000 μg/mL (total FAMEs; see breakdown in peak list)
Injection	
Inj. Vol.:	1 μL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	195 °C to 240 °C at 5 °C/min (hold 1 min)
Carrier Gas	H ₂ , constant flow
Flow Rate:	3 mL/min
Detector	FID @ 275 °C

PAHs in Food Analysis

“The Rxi®-PAH column enabled us to separate important PAH derivative isomers, which we were experiencing trouble with for months. This column is excellent for PAH, NPAH, and OPAH separation and I would recommend anyone working in this field to try it out. Thank you Restek!”

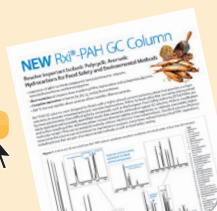
Mohammed Salim Alam
Research Fellow
University of Birmingham, UK

Rxi®-PAH GC Column
Resolve Important Isobaric
Polycyclic Aromatic Hydrocarbons
for Food Safety and Environmental
Methods

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lit. cat.#
GNTS1718-UNV

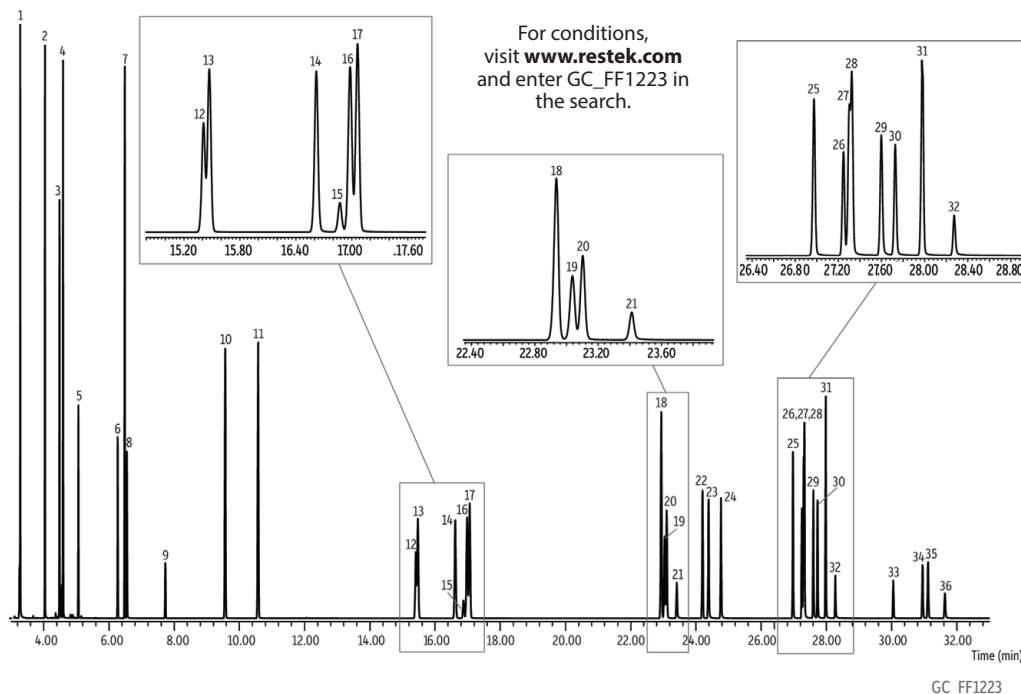
**Rxi®-PAH Columns** (fused silica)

(midpolarity proprietary phase)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low volatility dibenzo pyrenes.

The Rxi®-PAH GC columns were designed by Restek with a higher phenyl-content stationary phase that provides unique selectivity to separate important polycyclic aromatic hydrocarbons (PAH) for food safety that cannot be distinguished by mass spectrometry. Even difficult priority compounds, such as the European Food Safety Authority (EFSA) PAH4, are easily separated and accurately quantified—results that cannot be achieved on typical GC columns. Arylene modification and surface bonding of the stationary phase increase thermal stability and ruggedness so relatively nonvolatile, higher molecular weight PAHs can be analyzed routinely without interference from column bleed. Excellent column efficiency means that the column can be trimmed for maintenance purposes many times without losing critical PAH separations, including those that are part of environmental methods, as well as food safety testing. The selectivity and efficiency of the Rxi®-PAH column make it ideal for EFSA PAH4 analysis; chrysene/triphenylene separation and resolution of all benzofluoranthenes are easily achieved.

ID	df	temp. limits	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

NIST SRM 2260a PAH Mix on Rxi®-PAH**Peaks**

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def]phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benz[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

Pesticide Analysis in Cannabis

Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

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

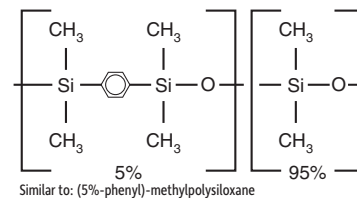
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-60 to 320/350 °C	13623
	0.50 µm	-60 to 320/350 °C	13638

Rxi®-5Sil MS with Integra-Guard®

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

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124

Rxi®-5Sil MS Structure



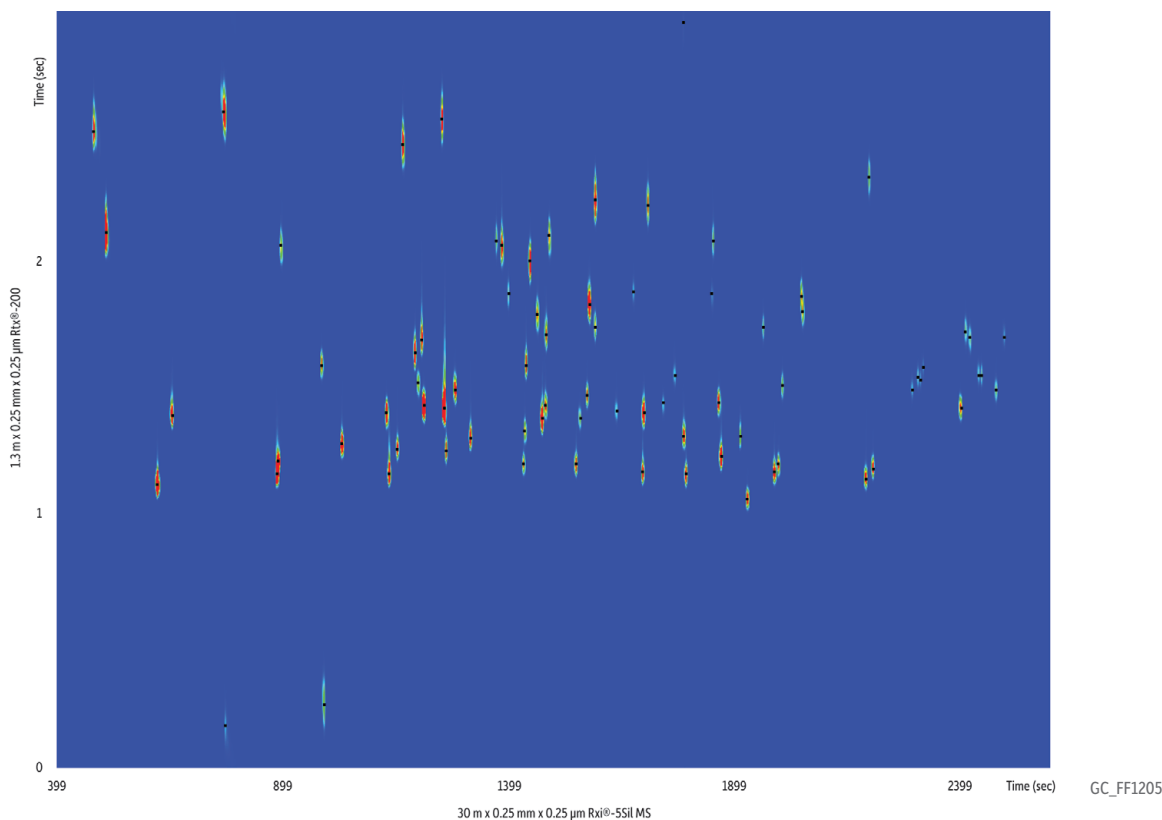
similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

Growing Analytical Solutions for Medical Cannabis Labs

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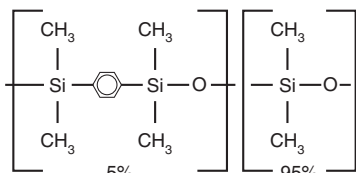
Marijuana Pesticides by GCxGC on Rxi®-5Sil MS and Rtx®-200



Column: Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020); **Sample:** Diluent: Toluene; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); **Liner:** Sky® 4 mm single taper w/wool (cat.# 23303.1); **Inj. Temp.:** 250 °C; **Purge Flow:** 40 mL/min; **Oven:** Oven Temp.: Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min; Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min; **Carrier Gas:** He, corrected constant flow (2 mL/min); **Modulation:** Modulator Temp. Offset: 20 °C; Second Dimension Separation Time: 3 sec; Hot Pulse Time: 0.9 sec; Cool Time between Stages: 0.6 sec; **Detector:** TOFMS; Transfer Line Temp.: 290 °C; **Analyzer Type:** TOF; **Source Temp.:** 225 °C; **Electron Energy:** 70 eV; **Mass Defect:** -20 mu/100 u; **Solvent Delay Time:** 5 min; **Tune Type:** PFTBA; **Ionization Mode:** EI; **Acquisition Range:** 45-550 amu; **Spectral Acquisition Rate:** 100 spectra/sec; **Instrument:** LECO Pegasus 4D GCxGC-TOFMS; **Notes:** Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

For a peak list, visit www.restek.com and enter chromatogram GC_FF1205 in the search function.

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

also available

Comprehensive 203-compound GC multiresidue pesticide kit



See page 568.

Pesticide Residues in Food Analysis

Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, 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 cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm 0.10 µm		-60 to 320/350 °C	13605	13608	
0.25 µm		-60 to 320/350 °C	13620	13623	13626
0.50 µm		-60 to 320/350 °C	13635	13638	
1.00 µm		-60 to 320/350 °C	13650	13653	13697
0.32 mm 0.25 µm		-60 to 320/350 °C	13621	13624	
0.50 µm		-60 to 320/350 °C		13639	
1.00 µm		-60 to 320/350 °C		13654	
0.53 mm 1.50 µm		-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm 0.15 µm		-60 to 320/350 °C	43815	43816		
2.0 µm		-60 to 320/350 °C		43817		
0.18 mm 0.10 µm		-60 to 320/350 °C				43607
0.18 µm		-60 to 320/350 °C		43602	43605	
0.36 µm		-60 to 320/350 °C		43604		

Chlorinated Pesticide Residues in Olive Oil on Rxi®-5Sil MS

Column Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample Olive oil spiked with organochlorine pesticide mix AB # 3 (cat.# 32415)
Conc.: 10 µg/mL

Injection
Inj. Vol.: 1 µL splitless (hold 0.5 min)
Liner: Single taper w/wool (cat.# 22286-200.1)
Inj. Temp.: 225 °C

Oven
Oven Temp.: 130 °C (hold 0.5 min) to 330 °C at 5 °C/min

Carrier Gas He, constant flow

Flow Rate: 1 mL/min

Detector MS

Mode: SIM

Transfer Line 320 °C

Temp.: 320 °C

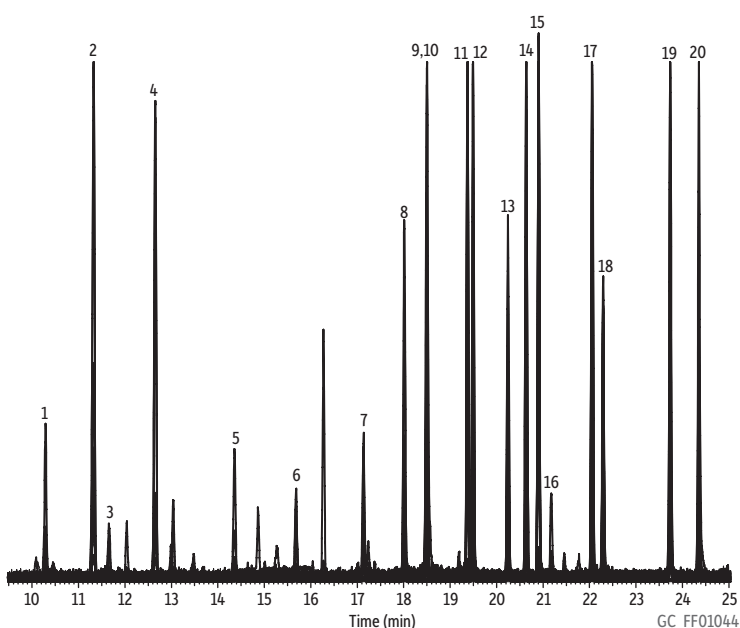
Ionization Mode: EI

Notes

Extraction and dSPE Cleanup for Pesticide Residues in Olive Oil

Test sample: A 1.5 mL sample of commercially obtained virgin olive oil was spiked with a standard organochlorine pesticide mix. The spiked sample was processed as follows.

1. Dilute with 1.5 mL hexane.
2. Add 6 mL of acetonitrile (ACN).
3. Mix for 30 minutes on a shaker.
4. Allow layers to separate (approximately 20 minutes), then collect the top (ACN) layer.
5. Repeat the liquid-liquid extraction (steps 2-4) and combine both ACN extract layers.
6. Place 1 mL of the combined ACN extract in a 1.5 mL tube containing 150 mg magnesium sulfate and 50 mg PSA.
7. Shake the tube for 2 minutes.
8. Centrifuge at 3,000 U/min for approximately 5 minutes.
9. Remove the top layer and inject directly into the gas chromatograph system.



For peak list, visit www.restek.com and enter GC_FF01044 in the search



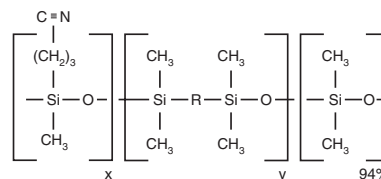
Residual Solvent Analysis for Cannabis Concentrates

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

Rxi®-624Sil MS (G43) Structure



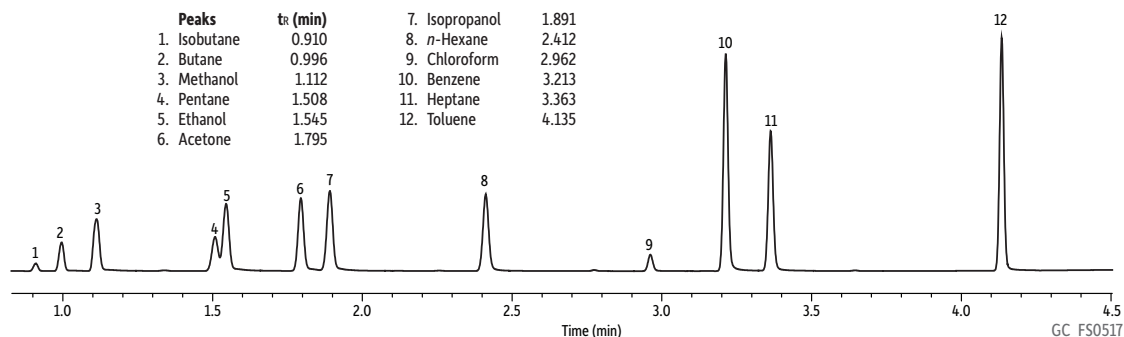
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Residual Solvents in Cannabis Concentrates on Rxi®-624Sil MS by Headspace–Full Evaporation Technique (HS-FET)



Column Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
Sample Residual solvent mix
Diluent: Dimethyl sulfoxide (DMSO)
Conc.: 500 ppm (For the HS-FET technique, 10 µL of a 1,000 µg/mL standard was placed into a 20 mL headspace vial to represent a 500 ppm sample concentration, assuming a 20 mg sample.)
Injection headspace-loop split (split ratio 10:1)
Liner: Sky® 1.0 mm ID straight inlet liner (cat.# 23333.1)
Headspace-Loop
Instrument: Tekmar HT3
Inj. Time: 1.0 min
Transfer Line Temp.: 160 °C
Valve Oven Temp.: 160 °C
Needle Temp.: 140 °C
Sample Temp.: 140 °C
Platen temp
equil. time: 1.0 min
Sample Equil. Time: 30.0 min
Vial Pressure: 20 psi
Pressurize Time: 5.0 min
Loop Pressure: 15 psi
Loop Fill Time: 2.0 min

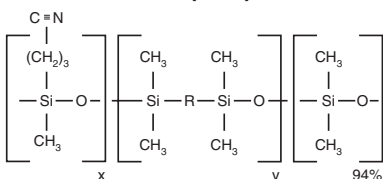
Oven
Oven Temp.: 35 °C (hold 1.5 min) to 300 °C at 30 °C/min (hold 2.0 min)
Carrier Gas He, constant flow
Linear Velocity: 80 cm/sec
Detector FID @ 250 °C
Make-up Gas
Flow Rate: 45 mL/min
Make-up Gas Type: N₂
Hydrogen flow: 40 mL/min
Air flow: 450 mL/min
Data Rate: 20 Hz
Instrument Agilent/HP6890 GC
Notes The butane used for standard preparation was a mixture of butane and isobutane in an unknown ratio. The concentrations of butane and isobutane should be considered approximate, but do not exceed 500 ppm for either component.

Check out the Restek blog for the most current topics in chromatography.

blog.restek.com

Terpenes Analysis for Cannabis and Hops

Rxi®-624Sil MS (G43) Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB

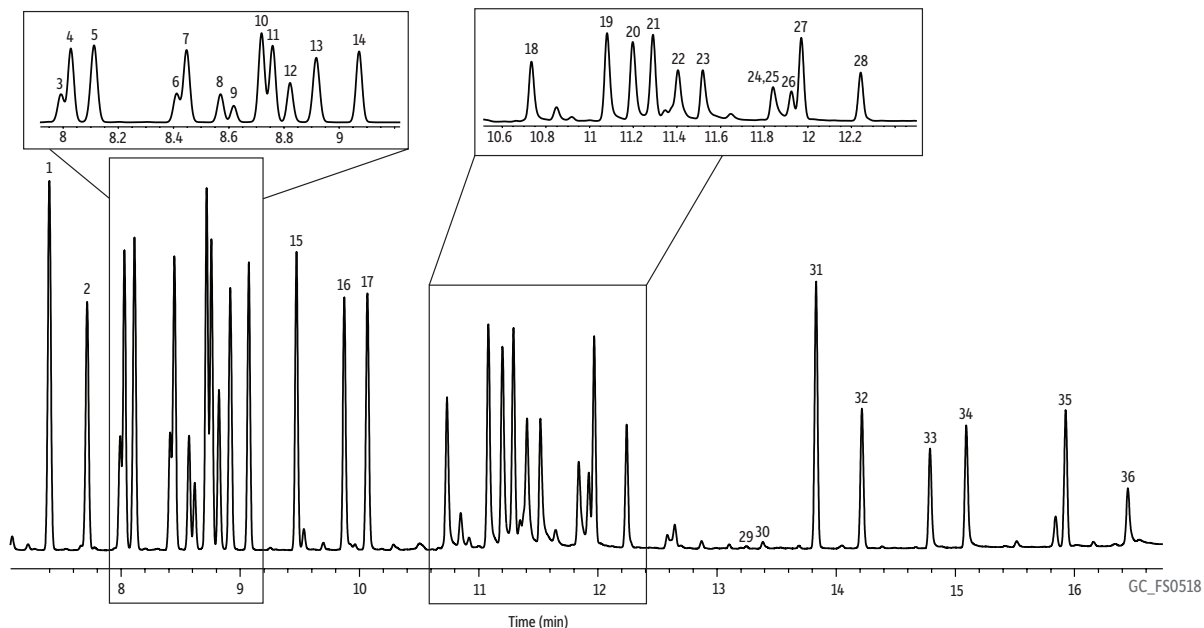
Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Medical Cannabis Terpenes on Rxi®-624Sil MS by FET-HS-GC



Peaks	tr (min)	10. Limonene	8.71	20. Borneol	11.19	30. Citral 4	13.43
1. α-Pinene	7.39	11. p-Cymene	8.75	21. α-Terpineol	11.29	31. β-caryophyllene	13.83
2. Camphene	7.71	12. β-Ocimene	8.82	22. Dihydrocarveol	11.40	32. α-Humulene	14.21
3. β-Myrcene	7.98	13. Eucalyptol	8.91	23. Citronellol	11.51	33. Nerolidol 1	14.78
4. Sabinene	8.02	14. γ-Terpinene	9.06	24. Geraniol	11.82	34. Nerolidol 2	15.08
5. β-Pinene	8.11	15. Terpinolene	9.47	25. 2-Piperidinone	11.88	35. Caryophyllene oxide	15.92
6. α-Phellandrene	8.4	16. Linalool	9.87	26. Citral 1	11.92	36. α-Bisabolol	16.43
7. δ-3-Carene	8.44	17. Fenchone	10.06	27. Pulegone	11.97		
8. α-Terpinene	8.57	18. Isopulegol	10.73	28. Citral 2	12.24		
9. Ocimene	8.61	19. dl-Menthol	11.08	29. Citral 3	13.19		

Column Rxi® -624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)

Sample Terpenes mix

Diluent: Isopropyl alcohol

Conc.: 200 ng/µL (0.02% wt/vol). The sample was prepared by placing 10 µL into the headspace vial.

Injection headspace-loop split (split ratio 10:1)

Liner: Sky® 1.0 mm ID straight inlet liner (cat.# 23333.1)

Headspace-Loop

Inj. Port Temp.: 250 °C

Instrument: Tekmar HT-3

Inj. Time: 1.0 min

Transfer Line Temp.: 160 °C

Valve Oven Temp.: 160 °C

Needle Temp.: 140 °C

Sample Temp.: 140 °C

Sample Equil. Time: 30.0 min

Vial Pressure: 20 psi

Loop Pressure: 15 psi

Oven

Oven Temp.: 60 °C (hold 0.10 min) to 300 °C at 12.50 °C/min (hold 3.0 min)

Carrier Gas He, constant flow

Linear Velocity: 33 cm/sec

Detector FID @ 320 °C

Make-up Gas

Flow Rate: 45 mL/min

Make-up Gas Type: N₂

Hydrogen flow: 40 mL/min

Air flow: 450 mL/min

Data Rate: 20 Hz

Instrument Agilent/HP6890 GC

Triglycerides in Foods Analysis

Rtx®-65TG Columns (fused silica)

(high-polarity phase; Crossbond® diphenyl 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.

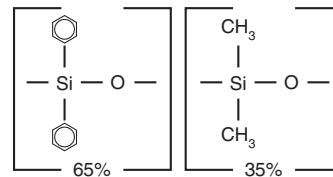
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	40 to 370 °C	17005	17008
0.32 mm	0.10 µm	40 to 370 °C	17006	17009
0.53 mm	0.10 µm	40 to 370 °C	17007	17010

please note

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

- Vu2 Union® connectors (see page 229.)
- MXT®-Union connector kits for fused silica (see page 231.)

Rtx®-65TG Structure

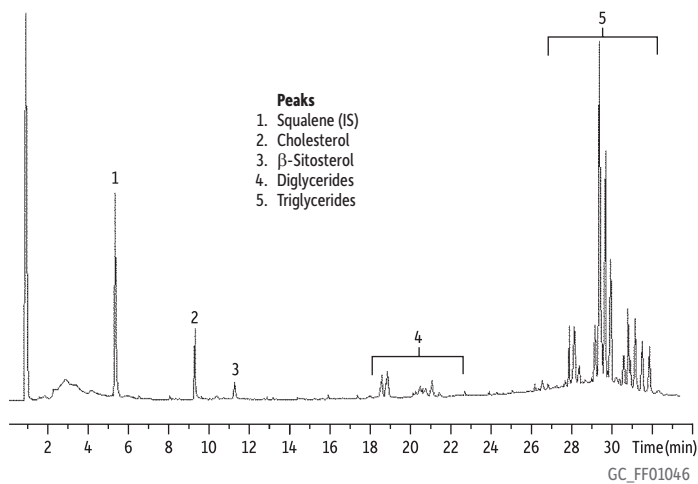


Similar to: (65%-phenyl)-methylpolysiloxane

crossbond® technology

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

Egg Pasta Sterols & Glycerides on Rtx®-65TG



Column Rtx®-65TG, 30 m, 0.25 mm ID, 0.10 µm (cat.# 17008)
Sample Fat extract from egg pasta in diethyl ether solution with 3,000 ppm squalene (IS)
Conc.: 50 µg/mL
Injection
 Inj. Vol.: 0.5 µL pvt split (split ratio 80:1)
 Inlet Temp. Program: 70 °C (hold 12 min) to 370 °C at 99 °C/min (hold 5 min)
Oven
 Oven Temp.: 220 °C (hold 2 min) to 360 °C at 5 °C/min (hold 5 min)
Carrier Gas H₂, constant flow
Flow Rate: 1.5 mL/min
Detector FID @ 370 °C

Acknowledgement
 Daniele Naviglio, Fabiana Pizzolongo; Dipartimento di Scienza degli Alimenti – Università degli Studi di Napoli “Federico II” – Via Università, 100 - 80055 Portici (NA) – Italia



How can we help you today? Restek's Customer Service and Technical Service specialists are here to help you find the products and information you need quickly and efficiently.

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 1,100 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.

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

similar phases

SPB-TCEP, CP-TCEP

free literature

Analyzing Oxygenates in Gasoline Using TCEP and Rt®-1/MXT®-1 Columns

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lit. cat.# 59587A



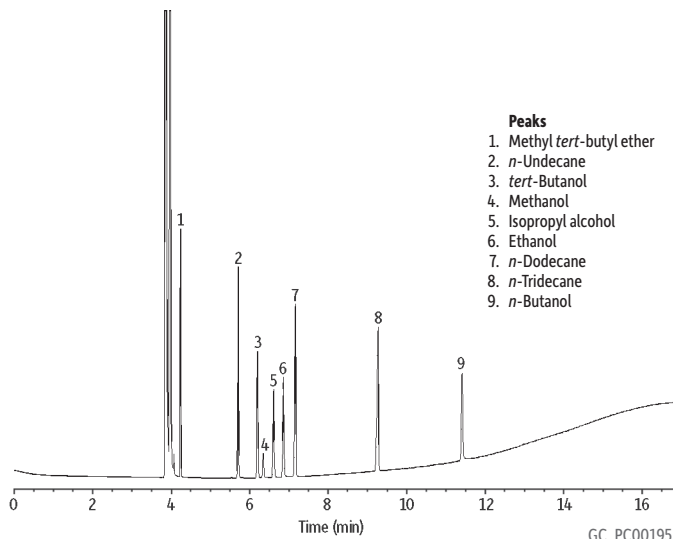
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Petroleum Oxygenates on Rt®-TCEP



Column Rt®-TCEP, 60 m, 0.25 mm ID, 0.40 µm (cat.# 10999)
Sample Conc.: 500 ppm
Injection Inj. Vol.: 1.0 µL split
 Inj. Temp.: 200 °C
 Split Vent Flow Rate: 46 mL/min
Oven Oven Temp.: 60 °C (hold 5 min) to 100 °C at 5 °C/min (hold 10 min)
Carrier Gas He, constant pressure
 Linear Velocity: 30 cm/sec @ 80 °C
Detector FID @ 200 °C
Notes FID sensitivity: 6.4 x 10⁻¹¹ AFS

Biodiesel Fuels Analysis

Rtx®-Biodiesel TG Columns (fused silica)

- Linearity for all reference compounds exceeds method requirements.
- Columns with retention gaps feature Alumaseal® connectors to prevent leaks and extend column life.
- Low column bleed at high temperatures.
- For glycerin and glycerides analysis, according to ASTM D6584 and EN 14105 methods.
- Stable to 350 °C.

Description	temp. limits	cat.#
10 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10291
15 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10294
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10293

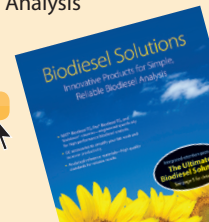
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Biodiesel Solutions
 Innovative Products for Simple,
 Reliable Biodiesel Analysis

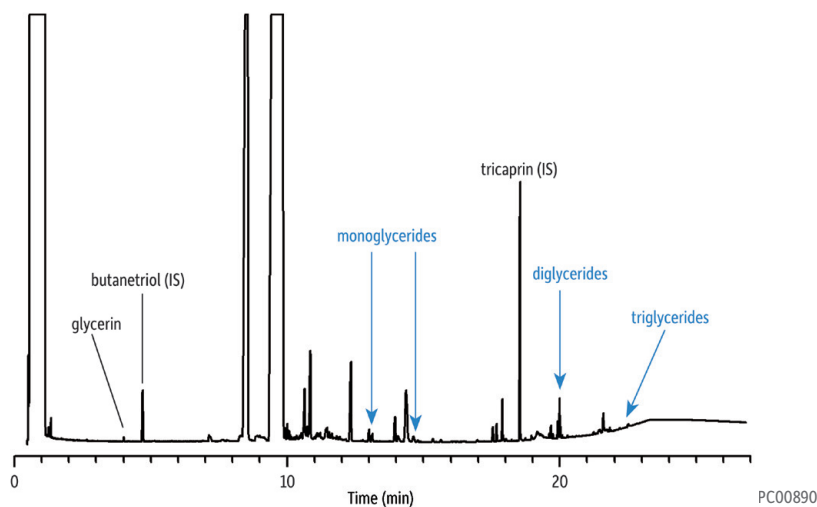
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lit. cat.#
 PCFL1409-UNV



Glycerin in Biodiesel on Rtx®-Biodiesel TG



Column Rtx®-Biodiesel TG, 10 m, 0.32 mm ID, 0.10 µm using Hydroguard® tubing 2 m, 0.53 mm ID, with Alumaseal® connector (cat.# 10291)

Sample Injection
 Inj. Vol.: 1.0 µL cold on-column
 Temp. Program: oven track

Oven
 Oven Temp.: 50 °C (hold 1 min) to 180 °C at 15 °C/min (hold 7 min) to 230 °C at 30 °C/min to 380 °C at 30 °C/min (hold 5 min)

Carrier Gas H₂, constant flow

Flow Rate 4 mL/min

Detector FID @ 380 °C

did you know?

Using hydrogen instead of helium can cut analysis time in half! Visit www.restek.com to learn more.

similar phases

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

Method Recommended

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

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Detailed Hydrocarbon Analysis
Featuring Rtx®-DHA Columns

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lit. cat.#
PCFL1007B-UNV



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.
- Stable to 340 °C.

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.

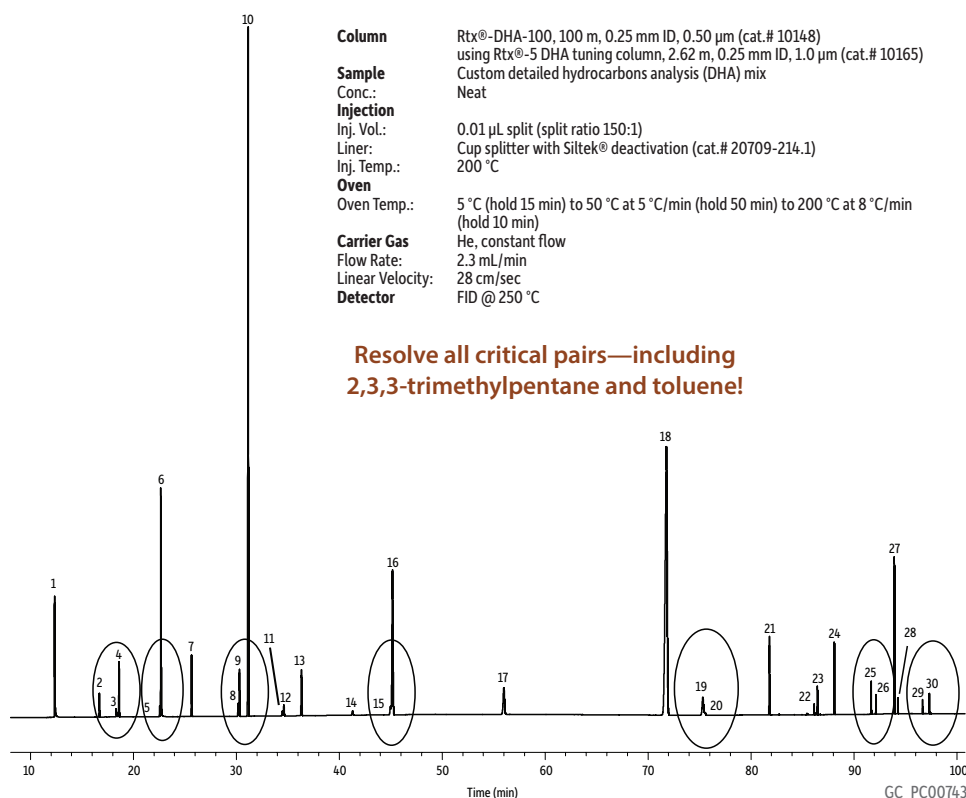
ID	df	temp. limits	50-Meter cat.#	100-Meter cat.#	150-Meter cat.#
0.20 mm	0.50 μ m	-60 to 300/340 °C	10147		
0.25 mm	0.50 μ m	-60 to 300/340 °C		10148	
	1.00 μ m	-60 to 280/340 °C			10149

Rtx®-5 DHA Tuning Column (fused silica)

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

ID	df	temp. limits	5-Meter cat.#
0.25 mm	1.00 μ m	-60 to 325/350 °C	10165

Detailed Hydrocarbons Analysis on Rtx®-DHA-100



Column Rtx®-DHA-100, 100 m, 0.25 mm ID, 0.50 μ m (cat.# 10148) using Rtx®-5 DHA tuning column, 2.62 m, 0.25 mm ID, 1.0 μ m (cat.# 10165)
Sample Custom detailed hydrocarbons analysis (DHA) mix
Conc.: Neat
Injection
 Inj. Vol.: 0.01 μ L split (split ratio 150:1)
 Liner: Cup splitter with Siltek® deactivation (cat.# 20709-214.1)
 Inj. Temp.: 200 °C
Oven
 Oven Temp.: 5 °C (hold 15 min) to 50 °C at 5 °C/min (hold 50 min) to 200 °C at 8 °C/min (hold 10 min)
Carrier Gas He, constant flow
 Flow Rate: 2.3 mL/min
 Linear Velocity: 28 cm/sec
Detector FID @ 250 °C

- Peaks**
1. Ethanol
 2. C5
 3. *tert*-Butanol
 4. 2-Methylbutene-2
 5. 2,3-Dimethylbutane
 6. Methyl *tert*-butyl ether (MTBE)
 7. C6
 8. 1-Methylcyclopentene
 9. Benzene
 10. Cyclohexane
 11. 3-Ethylpentane
 12. 1-*tert*-2-Dimethylcyclopentane
 13. C7
 14. 2,2,3-Trimethylpentane
 15. 2,3,3-Trimethylpentane
 16. Toluene
 17. C8
 18. Ethylbenzene
 19. *p*-Xylene
 20. 2,3-Dimethylheptane
 21. C9
 22. 5-Methylnonane
 23. 1,2-Methylethylbenzene
 24. C10
 25. C11 (undecane)
 26. 1,2,3,5-Tetramethylbenzene
 27. Naphthalene
 28. C12 (dodecane)
 29. 1-Methylnaphthalene
 30. C13 (tridecane)

Resolve all critical pairs—including
2,3,3-trimethylpentane and toluene!

Simulated Distillation Analysis (C5-C44)

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 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 cat.#
0.53 mm	2.65 µm	-60 to 360 °C	10199

similar phases

DB-2887, Petrocol 2887, Petrocol EX2887

also available

MXT®-1HT SimDist
and more simulated
distillation products

See **pages 113–115.**



free literature

Rtx®-2887/MXT®-2887

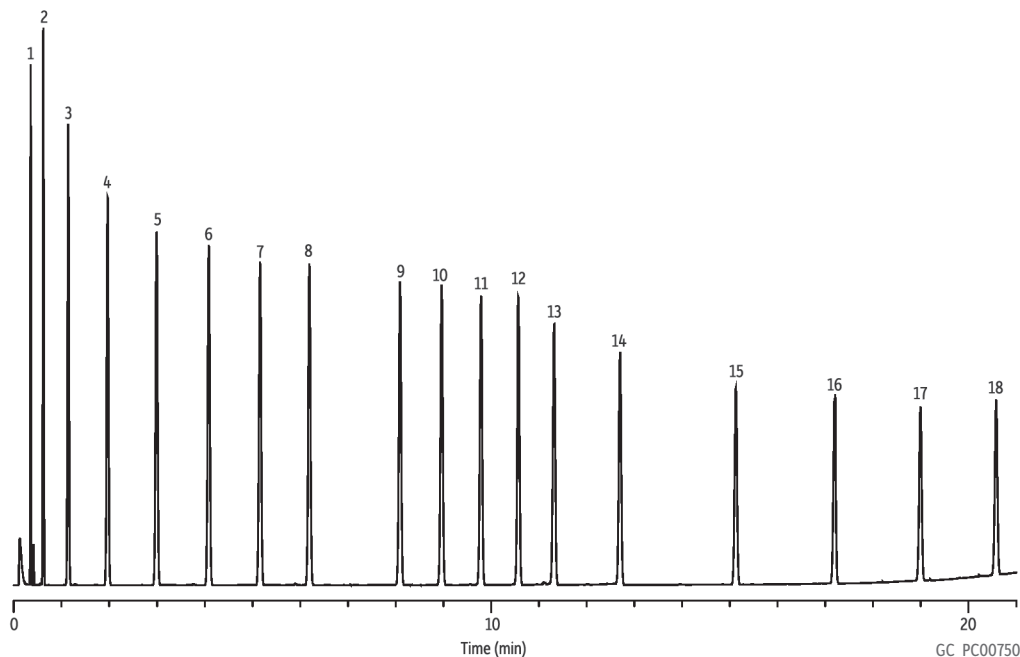
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lit. cat.# 59567B



Simulated Distillation (C5-C44) on Rtx®-2887

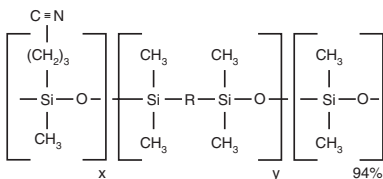


- Peaks**
1. C5
 2. C6
 3. C7
 4. C8
 5. C9
 6. C10
 7. C11
 8. C12
 9. C14
 10. C16
 11. C18
 12. C20
 13. C24
 14. C28
 15. C32
 16. C36
 17. C40
 18. C44

Column Rtx®-2887, 10 m, 0.53 mm ID, 2.65 µm (cat.# 10199)
Sample C5 to C44 hydrocarbon standard
Diluent: Carbon disulfide
Conc.: 0.01-0.1 wt. %
Injection
Inj. Vol.: 1 µL direct
Inj. Temp.: 360 °C
Oven
Oven Temp.: 35 °C to 360 °C at 15 °C/min (hold 5 min)
Carrier Gas He, constant flow
Flow Rate: 15 mL/min
Linear Velocity: 112 cm/sec
Detector FID @ 360 °C

G43 phase

Rxi®-624Sil MS Structure



similar phases

DB-624, VF-624ms, CP-Select 624 CB

Organic Volatile Impurities (OVI) Analysis

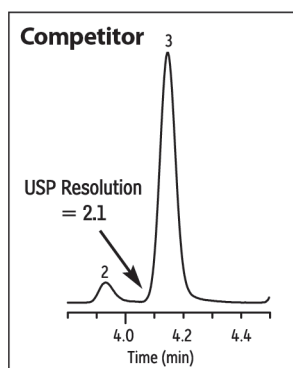
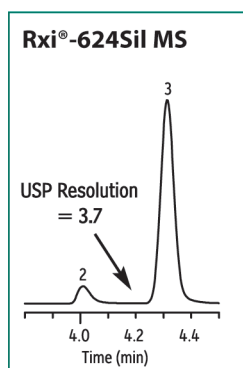
Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

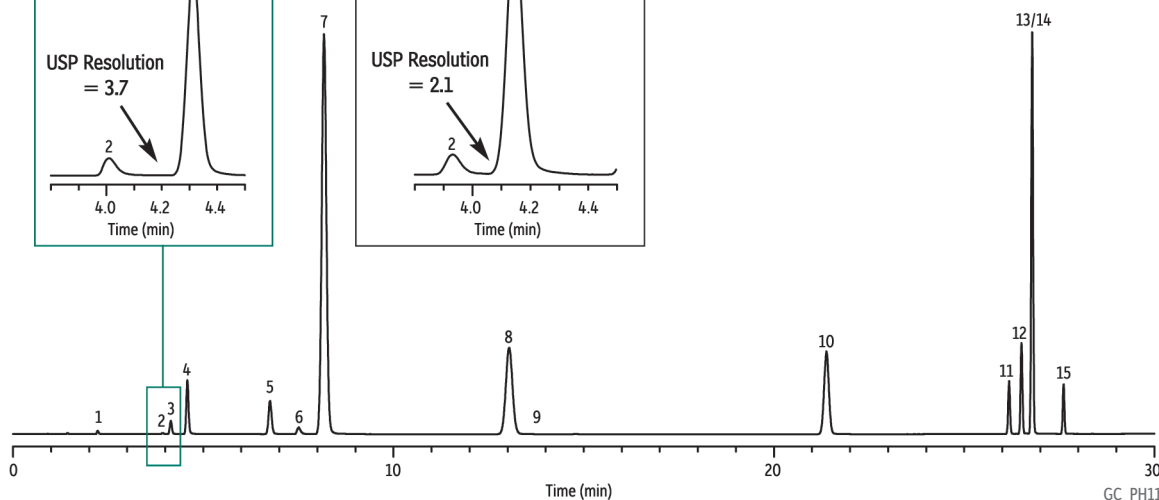
- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Competitor Comparison: Class 2 - Mix A Residual Solvents for USP <467> Water-Soluble Articles



Improve system suitability pass rates with greater resolution on Rxi®-624Sil MS columns.



GC_PH1161

Column Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample Residual solvents class 2 - mix A (cat.# 36271)
Diluent: Water
Injection Headspace-loop split (split ratio 5:1)
Liner: 1 mm split (cat.# 20972)
Headspace-Loop
 Inj. Port Temp.: 140 °C
 Instrument: Tekmar HT3
 Inj. Time: 1 min
 Transfer Line Temp.: 110 °C
 Valve Oven Temp.: 110 °C
 Sample Temp.: 80 °C
 Sample Equil. Time: 60 min
 Vial Pressure: 10 psi
 Pressurize Time: 0.5 min
Pressure
 Equilibration Time: 0.05 min
 Loop Pressure: 5 psi
 Loop Fill Time: 0.1 min
Oven
 Oven Temp.: 40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)
Carrier Gas
 He, constant flow
 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

Peaks	TR (min)	Conc. (µg/mL)
1. Methanol	2.281	25.00
2. Acetonitrile	4.009	3.42
3. Dichloromethane	4.313	5.00
4. <i>trans</i> -1,2-Dichloroethene	4.798	7.83
5. <i>cis</i> -1,2-Dichloroethene	7.028	7.83
6. Tetrahydrofuran	7.706	5.75
7. Cyclohexane	8.708	32.33
8. Methylcyclohexane	14.099	9.83
9. 1,4-Dioxane	15.054	3.17
10. Toluene	22.018	7.42
11. Chlorobenzene	26.570	3.00
12. Ethylbenzene	26.837	3.07
13. <i>m</i> -Xylene	27.147	10.85
14. <i>p</i> -Xylene	27.147	2.53
15. <i>o</i> -Xylene	27.927	1.63

Organic Volatile Impurities (OVI) Analysis

Stabilwax® Columns (fused silica)

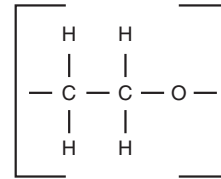
(polar phase; Crossbond® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest-bleed PEG column on the market; long column lifetimes.
- 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	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 µm	40 to 240/250 °C	10651	10654	10657
0.53 mm	0.25 µm	40 to 250/260 °C	10622	10625	10628
	0.50 µm	40 to 250/260 °C	10637	10640	10643
	1.00 µm	40 to 240/250 °C	10652	10655	10658
	1.50 µm	40 to 230/240 °C	10666	10669	10672
	2.00 µm	40 to 220/230 °C	10667	10670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

G16 phase**Stabilwax® Structure****similar phases**

HP-INNOWax, CP-Wax 52 CB, VF-WAX MS, ZB-WAXplus

ordering note

Get the protection without the connection!

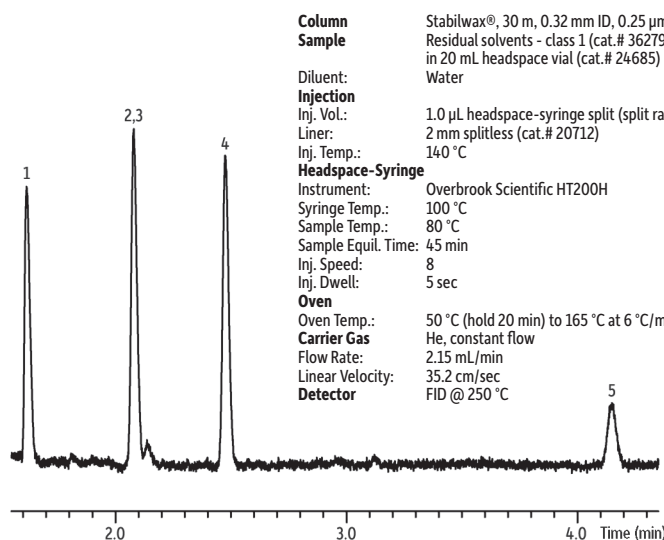
For Stabilwax® columns with built-in Integra-Guard® guard columns, see **page 23**.

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lit. cat.#
PHTS1212

**Residual Solvents (Class 1) on Stabilwax® (G16)**

Column Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample Residual solvents - class 1 (cat.# 36279)
 in 20 mL headspace vial (cat.# 24685)
Diluent: Water
Injection
 Inj. Vol.: 1.0 µL headspace-syringe split (split ratio 5:1)
 Liner: 2 mm splitless (cat.# 20712)
 Inj. Temp.: 140 °C
Headspace-Syringe
 Instrument: Overbrook Scientific HT200H
 Syringe Temp.: 100 °C
 Sample Temp.: 80 °C
 Sample Equil. Time: 45 min
 Inj. Speed: 8
 Inj. Dwell: 5 sec
Oven
 Oven Temp.: 50 °C (hold 20 min) to 165 °C at 6 °C/min (hold 20 min)
Carrier Gas
 He, constant flow
 Flow Rate: 2.15 mL/min
 Linear Velocity: 35.2 cm/sec
Detector
 FID @ 250 °C

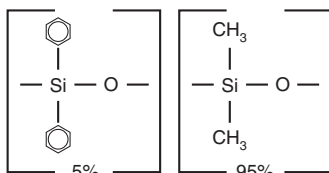
Peaks

- 1,1-Dichloroethene
- 1,1,1-Trichloroethane
- Carbon tetrachloride
- Benzene
- 1,2-Dichloroethane

**System suitability
criteria met**

GC_PH00951

G27 phase

Rtx[®]-5 Structure

Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5, DB-5, CP-Sil 8 CB, ZB-5

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

USP

Pharmaceutical
Standards

See pages 595–596.



Organic Volatile Impurities (OVI) Analysis

Rtx[®]-5 (G27) Columns (fused silica)(low-polarity phase; Crossbond[®] diphenyl dimethyl polysiloxane)

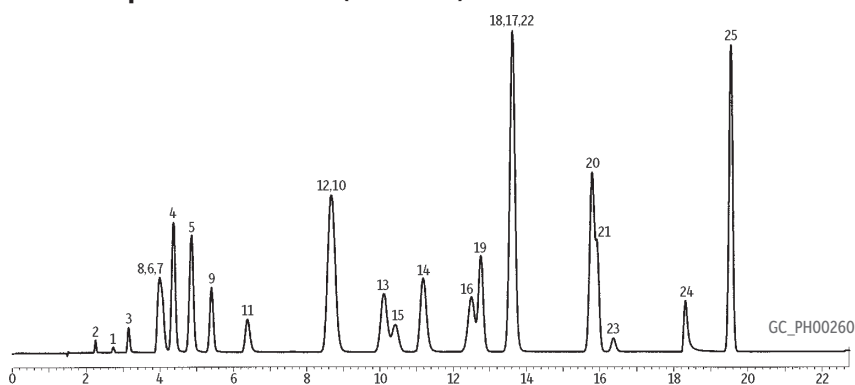
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

The diphenyl 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*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209		
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Organic Volatile Impurities on Rtx[®]-5 (Rtx[®]-G27)

Peaks

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

Column	Rtx [®] -5 w/5m Integra-Guard [®] Column (Rtx [®] -G27), 30 m, 0.53 mm ID, 5.00 µm (cat.# 10279-126)
Sample	Headspace injection of common solvents for pharmaceutical processing. Prepared to equal about 500 ppm in the bulk pharmaceutical. Samples shaken and heated at 90 °C for 15 minutes, 1 mL headspace injection.
Injection	
Inj. Vol.:	1,000 µL headspace-syringe split (split ratio 2:1)
Inj. Temp.:	220 °C
Oven	
Oven Temp.:	35 °C (hold 10 min) to 100 °C at 5 °C/min to 240 °C at 25 °C/min (hold 5 min)
Carrier Gas	He, constant pressure
Linear Velocity:	35 cm/sec @ 35 °C
Detector	FID @ 240 °C
Notes	FID sensitivity: 1.05 x 10 ⁻¹¹ AFS

Organic Volatile Impurities (OVI) Analysis

Rtx®-G27 Column (fused silica with 5-meter Integra-Guard® guard column)

(Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns for residual solvents in pharmaceutical products.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G27 stable to 290 °C.

Some 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 cat.#
0.53 mm	5.00 µm	-60 to 270/290 °C	10279-126

Rtx®-G43 Column (fused silica with 5-meter Integra-Guard® guard column)

(Crossbond® cyanopropylmethyl phenylmethyl 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 cat.#
0.53 mm	3.00 µm	-20 to 240 °C	16085-126

free literature

A Technical Guide for
Static Headspace
Analysis
Using GC

lit. cat.#
59895B



Custom Residual
Solvents
Mixes

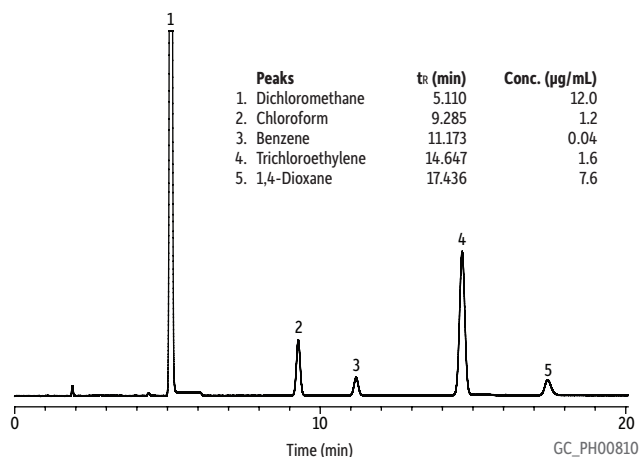
lit. cat.#
PHTS1212



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USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace



Column

Rtx®-1301 w/5 m Integra-Guard®, 30 m, 0.53 mm ID, 3.00 µm (cat.# 16085-126)

Sample

USP <467> calibration mixture #5 (cat.# 36007)

Diluent:

DMSO

Conc.:

To each 22 mL headspace vial 5mL water, ~ 1.0 g of sodium sulfate and 100 µL of stock standard were added. headspace-loop split (split ratio 2:1)

Injection Headspace-Loop

Inj. Port Temp.: 180 °C
Instrument: Teledyne Tekmar HT3
Inj. Time: 1.0 min
Transfer Line Temp.: 150 °C
Valve Oven Temp.: 150 °C
Standby flow rate: 10 mL/min
Sample Temp.: 80 °C
Platen temp equil. time: 2.0 min
Sample Equil. Time: 15.0 min
Mixer time: 2.0 min
Mixing level: 5
Mixer stabilize time: 0.5 min
Vial Pressure: 15 psi
Pressurize Time: 2.0 min
Pressure Equilibration Time: 0.5 min
Loop Pressure: 5 psi
Loop Fill Time: 2.0 min
Loop fill equil. time: 0.5 min

Oven

40 °C (hold 20 min) to 240 °C at 25 °C/min (hold 10 min)

Carrier Gas

He, constant flow

Flow Rate:

5 mL/min

Detector

FID @ 250 °C

Make-up Gas Flow Rate:

45 mL/min

Notes

FID conditions:
hydrogen flow: 40 mL/min
air flow: 450 mL/min

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 260 °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

HP-FFAP, DB-FFAP, CP-WAX 58 FFAP CB, NUKOL, ZB-FFAP

crossbond® technology

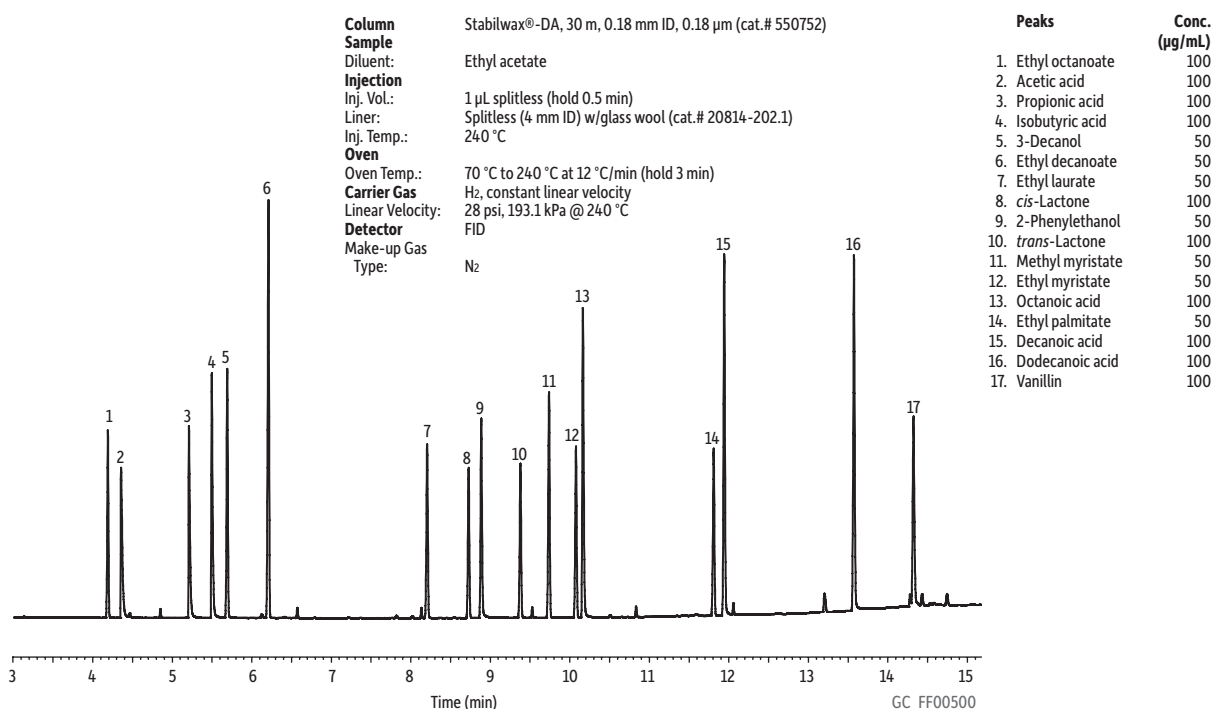
Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

please note

Stabilwax®-DA columns should not be rinsed with water.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	11005	11008	
	0.25 µm	40 to 250/260 °C	11020	11023	11026
	0.50 µm	40 to 250/260 °C	11035	11038	11041
0.32 mm	0.10 µm	40 to 250/260 °C		11009	
	0.25 µm	40 to 250/260 °C	11021	11024	11027
	0.50 µm	40 to 250/260 °C	11036	11039	11042
	1.00 µm	40 to 240/250 °C	11051	11054	11057
0.53 mm	0.10 µm	40 to 250/260 °C	11007		
	0.25 µm	40 to 250/260 °C	11022	11025	
	0.50 µm	40 to 250/260 °C	11037	11040	
	1.00 µm	40 to 240/250 °C	11052	11055	11058
	1.50 µm	40 to 230/240 °C	11062	11065	11068

Underivatized Alcoholic Beverage Acids and Methyl Esters on Stabilwax®-DA



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 symmetrical 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.

similar phases

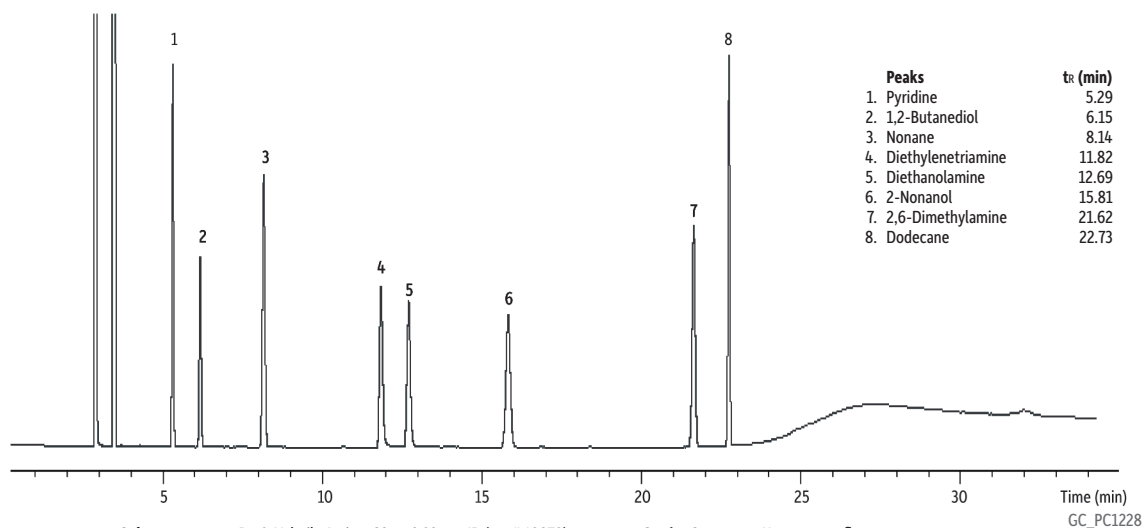
CP-Volamine

please note

We recommend using base-deactivated fused silica guard columns (**page 22**) and base-deactivated liners (**page 203**) with Rtx®-Volatile Amine columns.

ID	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.32 mm	-60 to 270/290 °C	18076	18077	18078

Volatile Amine Test Mix on Rtx®-Volatile Amine (60 m x 0.32 mm ID)



Column Rtx®-Volatile Amine, 60 m, 0.32 mm ID (cat.# 18078)
Sample Volatile amine column test mix (cat.# 35008)
Diluent: Methanol:dichloromethane (50:50)
Conc.: 900-1,800 µg/mL snap and shoot
Injection
Inj. Vol.: 1 µL split (split ratio 17.8:1)
Liner: Sky® 4 mm single taper w/wool (cat.# 23303.1)
Inj. Temp.: 250 °C
Split Vent
Flow Rate: 60 mL/min
Oven
Oven Temp.: 160 °C (hold 21 min) to 290 °C at 40 °C/min (hold 10 min)

Carrier Gas He, constant flow
Flow Rate: 3.4 mL/min
Detector FID @ 300 °C
Make-up Gas
Flow Rate: 30 mL/min
Make-up Gas Type: Nz
Data Rate: 50 Hz
Instrument Agilent/HP6890 GC

GC_PC1228

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innovation!

similar phases

Optima-5Amine

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.

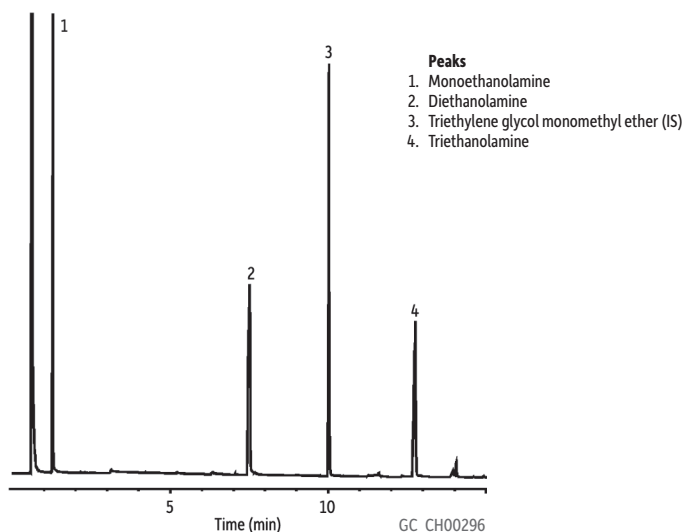
Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-5 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-5 Amine column is ideal for 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 cat.#	30-Meter cat.#
0.25 mm	0.25 µm	-60 to 315 °C	12320	12323
	0.50 µm	-60 to 300/315 °C	12335	12338
	1.00 µm	-60 to 300/315 °C	12350	12353
0.32 mm	1.00 µm	-60 to 300/315 °C	12351	12354
	1.50 µm	-60 to 290/305 °C	12366	12369
0.53 mm	1.00 µm	-60 to 290/305 °C	12352	12355
	3.00 µm	-60 to 280/295 °C	12382	12385

please note

We recommend using base-deactivated fused silica guard columns ([page 22](#)) and base-deactivated liners ([page 203](#)) with Rtx®-5 Amine columns.

Ethanolamines on Rtx®-5 Amine



Column Rtx®-5 Amine, 15 m, 0.25 mm ID, 0.50 µm (cat.# 12335)
Sample Ethanolamine mix
Diluent: Methanol
Conc.: 34 ng on column
Injection
Inj. Vol.: 1.0 µL split (split ratio 58:1)
Inj. Temp.: 280 °C
Oven
Oven Temp.: 50 °C (hold 2 min) to 180 °C at 10 °C/min (hold 2 min)
Carrier Gas H₂, constant pressure
Linear Velocity: 43 cm/sec @ 50 °C
Detector FID @ 300 °C
Notes FID sensitivity: 6.4 x 10⁻¹¹ AFS

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.

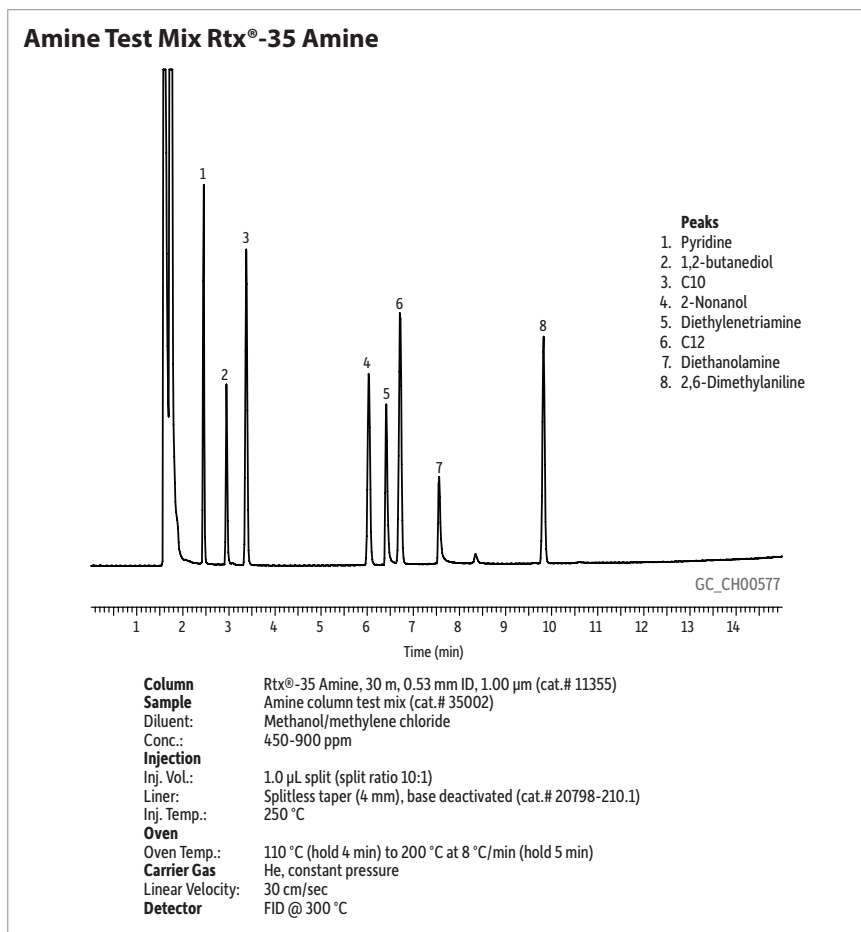
Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-35 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-35 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds and 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 cat.#	30-Meter cat.#
0.25 mm	0.50 µm	0 to 220 °C	11335	11338
	1.00 µm	0 to 220 °C	11350	11353
0.32 mm	1.00 µm	0 to 220 °C	11351	11354
	1.50 µm	0 to 220 °C	11366	11369
0.53 mm	1.00 µm	0 to 220 °C	11352	11355
	3.00 µm	0 to 220 °C		11385

Restek innovation!

please note

We recommend using base-deactivated fused silica guard columns (**page 22**) and base-deactivated liners (**page 203**) with Rtx®-35 Amine columns.



Because Restek is employee owned and independent, we are dedicated to providing the right solutions for all types of instruments.

similar phases

CAM, CP-WAX 51 for Amines,
Carbowax® Amine

NEW!



Speed Up
and Simplify GC
Method Development
Restek's EZGC®
Online Suite

www.restek.com/ezgc

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

Volatile Organic Compounds by U.S. EPA Method 1671 on Stabilwax®-DB

Peaks	tr _R (min)	Conc. (µg/mL)
1. Dimethylamine	1.71	200
2. Methylamine	1.76	200
3. Diethylamine	2.46	200
4. Triethylamine	2.64	200
5. Tetrahydrofuran (IS)	4.88	100
6. Methanol	7.12	40
7. Ethanol	8.01	40
8. Acetonitrile	9.82	200
9. <i>n</i> -Propanol	11.03	200
10. Methyl Cellosolve®	15.56	200
11. Formamide	18.68	500
12. Dimethyl sulfoxide	23.75	100
13. Ethylene glycol*		500

*Included in sample, but does not elute due to base deactivation in the DB phase.

Columns Stabilwax®-DB 30 m, 0.32 mm ID, 1.00 µm (cat.# 10854) and Stabilwax® 30 m, 0.32 mm ID, 1.00 µm (cat.# 10654) using IP deactivated guard column 5 m, 0.53 mm ID (cat.# 10045) with SeCure® "Y" connector kit (cat.# 20278)

Sample 1671 Volatile organics mix

Diluent: Deionized water

Injection

Inj. Vol.: 1.0 µL split (split ratio 12:1)

Liner: Gooseneck splitless (4 mm) (cat.# 20798)

Inj. Temp.: 200 °C

Oven

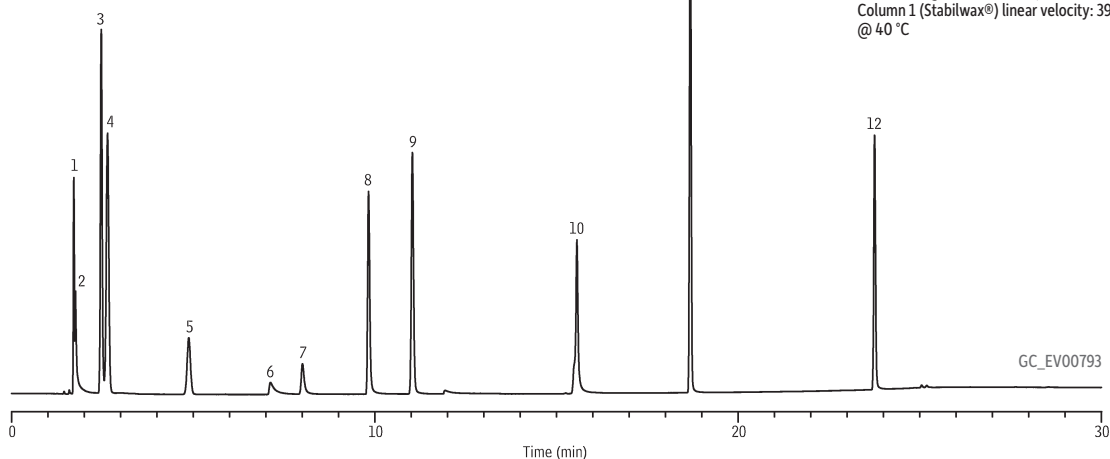
Oven Temp.: 40 °C (hold 5 min) to 180 °C at 7 °C/min (hold 5 min)

Carrier Gas He, constant pressure

Linear Velocity: 39.68 cm/sec @ 40 °C

Detector FID @ 250 °C

Notes "Y" Press-Tight® Connector (cat.# 20405) also used Column 1 (Stabilwax®) linear velocity: 39.25 cm/sec @ 40 °C





Chiral 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[®]- γ DEXsa Columns (fused silica)

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

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

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13113
0.32 mm	0.25 μ m	40 to 230 °C	13112

Rt[®]- β DEXm Columns (fused silica)

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

Uses: General-purpose chiral phase with many published applications.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13100
0.32 mm	0.25 μ m	40 to 230 °C	13101

Rt[®]- β DEXsm Columns (fused silica)

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

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

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13105
0.32 mm	0.25 μ m	40 to 230 °C	13104

Rt[®]- β DEXse Columns (fused silica)

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

Uses: Similar in performance to Rt- β DEXsm 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 cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13107
0.32 mm	0.25 μ m	40 to 230 °C	13106

Rt[®]- β DEXsp Columns (fused silica)

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

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

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13111
0.32 mm	0.25 μ m	40 to 230 °C	13110

Rt[®]- β DEXsa Columns (fused silica)

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

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

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13109
0.32 mm	0.25 μ m	40 to 230 °C	13108

Rt[®]- β DEXcst Columns (fused silica)

(Proprietary cyclodextrin material added 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 cat.#
0.25 mm	0.25 μ m	40 to 230 °C	13103
0.32 mm	0.25 μ m	40 to 230 °C	13102

free literature

Grape Flavor Analysis,
Using an Rt[®]- γ DEXsa
GC Column

lit. cat.#
59553



GC Analysis of Chiral Flavor
Compounds in Apple Juices,
Using Rt[®]- β DEXsm and
Rt[®]- β DEXse
Columns

lit. cat.#
59546



tech tip

Lower elution temperatures significantly improve chiral selectivity.

This can be achieved the following ways:

- 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.

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