Restek GC

Rxi-5Sil MS

Assured Performance for Forensic Applications

- Exceptional column inertness means greater certainty and lower detection limits.
- Versatile selectivity lets you keep analyzing samples instead of changing columns between methods.
- Robust, low-bleed phase results in better sensitivity and longer column lifetime.

RESTEK Pure Chromatography www.restek.com

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

Whether analyzing postmortem samples or supporting athletic or workplace drug testing, toxicology labs are challenged with producing critical evidence that stands up under scrutiny. Increased pressure for fast, definitive results is driving labs to investigate standardized procedures and certifications aimed at reducing variability. GC column choice plays a vital role in data quality, and using rugged, versatile Rxi-5Sil MS capillary columns is an easy way to improve chromatography performance and simplify lab operations.

For years, "5"-type (5% diphenyl/95% dimethyl polysiloxane) columns have been recognized as the column of choice for analyzing drugs of abuse because they offer higher selectivity and retention for functionalized compounds than "1"-type columns (100% dimethyl polysiloxane). While the selectivity of 5-type columns has many forensic applications, column performance can vary significantly among these columns. Some 5-type columns have inadequate deactivations, causing tailing peaks, or are poorly stabilized, resulting in high bleed levels, reduced sensitivity, and shorter column lifetimes. Rxi-5Sil MS columns are based on a silarylene phase (Figure 1) that offers improved inertness and stability compared to typical 5-type columns.

Toxicology labs interested in improved data quality can increase confidence in results and reduce downtime by using Rxi-5Sil MS columns. Exceptional inertness increases accuracy and precision at trace levels while ruggedness assures low bleed and long column lifetime. As shown on the following pages, these versatile columns can improve lab efficiency and data quality for many different drugs of abuse, including cannabinoids, benzodiazepines, cocaine, opiates, and amphetamines.

Exceptional Inertness Means Greater Certainty and Lower Detection Limits

Column inertness improves peak shape, which greatly affects the signal-to-noise ratio and, therefore, analytical sensitivity. Rxi-5Sil MS columns are exceptionally inert, ensuring symmetric peak shape and high response for a wide range of analyte chemistries. In addition to influencing signal-to-noise ratios, column inertness also affects retention time stability, which is an important factor for correct peak identification. Inertness is critical because peak tailing will increase as column activity increases, causing retention times to shift (Figure 2). Analyzing derivatized amphetamines or cocaine and its metabolites on highly inert Rxi-5Sil MS columns results in symmetric peak shapes and excellent low-level response (Figures 3 and 4).

Figure 1: Rxi-5Sil MS columns: phase structure results in a more inert, low-bleed column with broad selectivity for a wide range of compounds.

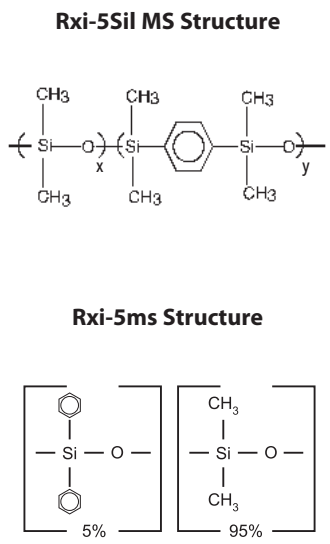


Figure 2: As column activity increases, signal decreases and retention time shifts.

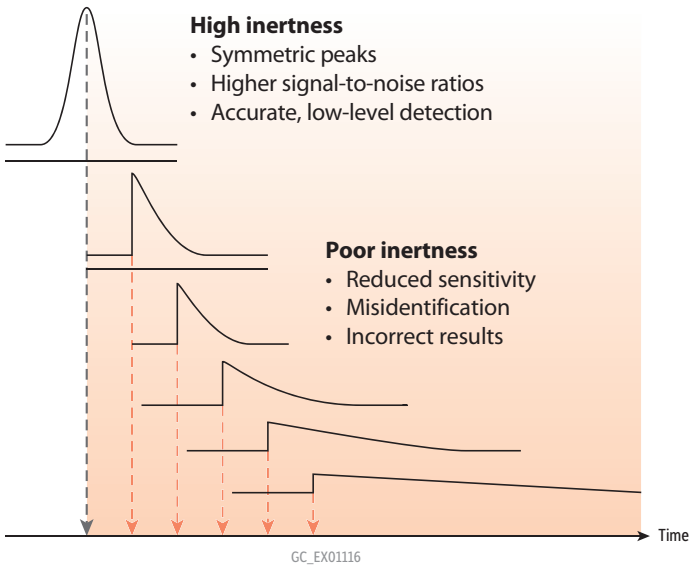
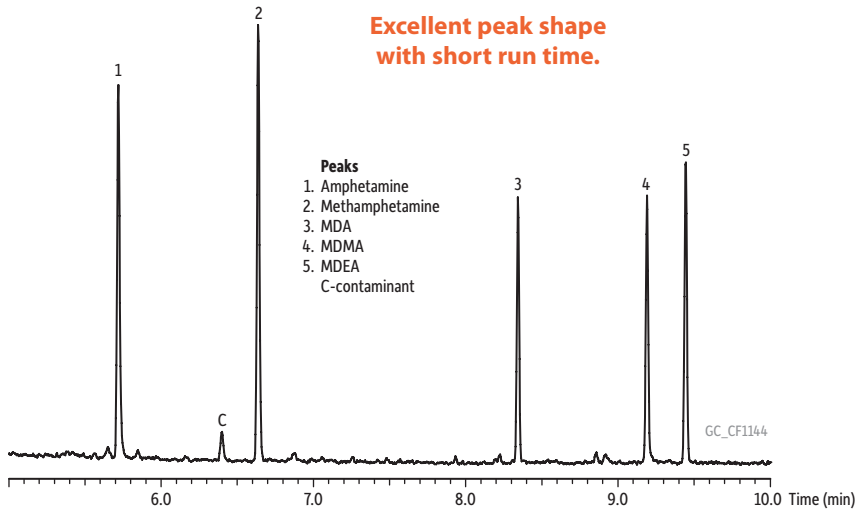


Figure 3: Robust, inert Rxi-5Sil MS columns do not break down under harsh conditions, such as exposure to the derivatization reagents used in amphetamines analysis. Compounds shown are HFAA derivatives.



Column: Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); **Sample:** 500 ng/mL HFAA derivatives in butyl chloride; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); Liner: 3.5 mm splitless taper w/wool (cat.# 22286-200.1); Inj. Temp.: 250 °C; Purge Flow: 28 mL/min; **Oven:** Oven Temp: 75 °C to 300 °C at 15 °C/min; Carrier Gas; He, constant linear velocity, 45 cm/sec, 13.5 psi, 93.1 kPa @ 75 °C; **Detector:** MS, Scan; Transfer Line Temp.: 250 °C; Analyzer Type: Quadrupole; Source Temp.: 200 °C; Electron Energy: 70 eV; Solvent Delay Time: 4 min; Tune Type: PFTBA; Ionization Mode: EI; Scan Range: 40-300 amu; Scan Rate: 5 scans/sec; **Instrument:** Shimadzu 2010 GC & QP2010+ MS.

Lower Detection Limits with Ground-Breaking Column Technology

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

Visit us at **www.restek.com/rxi**

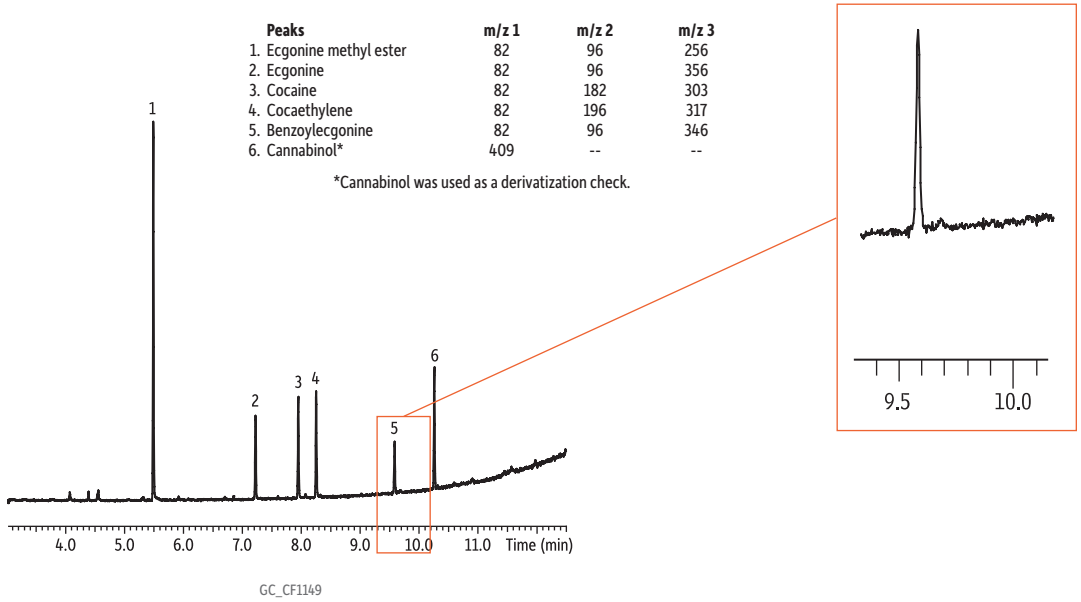
phases available

- Rxi-1ms
- Rxi-1HT
- Rxi-5ms
- Rxi-SVOCms
- Rxi-5Sil MS
- Rxi-5HT
- Rxi-XLB
- Rxi-624Sil MS
- Rxi-35Sil MS
- Rxi-17
- Rxi-17Sil MS
- Rxi-PAH
- Rxi-LAO
- Rxi guard/ retention gap columns

Figure 4: Low levels of derivatized cocaine and its metabolites can also be reliably separated on Rxi-5Sil MS columns.

Peaks	m/z 1	m/z 2	m/z 3
1. Ecgonine methyl ester	82	96	256
2. Ecgonine	82	96	356
3. Cocaine	82	182	303
4. Cocaethylene	82	196	317
5. Benzoylecgonine	82	96	346
6. Cannabinol*	409	--	--

*Cannabinol was used as a derivatization check.



Column: Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); **Standard/Sample:** Diluent: Butyl chloride; Conc.: 100 ng/mL; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); Liner: Single taper w/wool (cat.# 22286-200.1); Inj. Temp.: 250 °C; Purge Flow: 20 mL/min; **Oven:** Oven Temp.: 100 °C to 200 °C at 30 °C/min to 300 °C at 15 °C/min; **Carrier Gas:** He, constant linear velocity; Linear Velocity: 40 cm/sec, 12.5 psi, 86.2 kPa @ 100 °C; **Detector:** MS; Mode: SIM; Transfer Line Temp.: 310 °C; Source Temp.: 250 °C; Solvent Delay Time: 4 min; Tune Type: PFTBA; Ionization Mode: EI; **Instrument:** Shimadzu 2010 GC & QP2010+ MS; **Sample Preparation:** Standards brought to dryness under nitrogen, then 50 µL BSTFA + 1% TMCS (cat.# 35606) were added. 50 µL pyridine was then added, and samples were incubated at 70 °C for 30 min. After incubation, samples were diluted with butyl chloride.

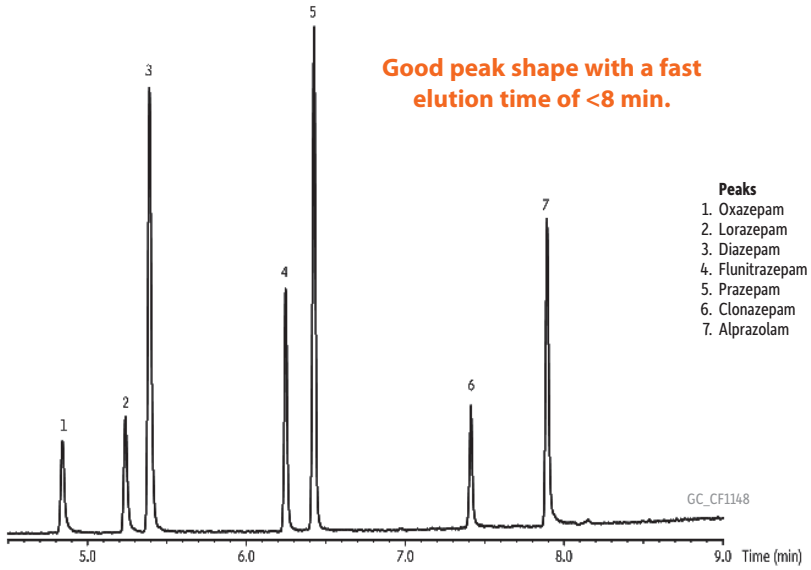
Rxi-5Sil MS Columns…Assured Performance for Forensic Applications

Optimized Selectivity Lets You Keep Analyzing Samples Instead of Changing Columns Between Methods

While the inertness of Rxi-5Sil MS columns exceeds typical 5-type columns, the selectivity is similar and is ideal for many toxicological applications. A wide range of analyte classes can be reliably separated on Rxi-5Sil MS columns, including structurally-related compounds, such as benzodiazepines. Benzodiazepines are often analyzed on a fluorinated phase (e.g., Rtx-200), but the selectivity of the Rxi-5Sil MS column provides complete separation of all peaks of interest (Figure 5). Since a fluorinated column is no longer necessary, more time can be spent running samples with fewer time-consuming column changes between methods.

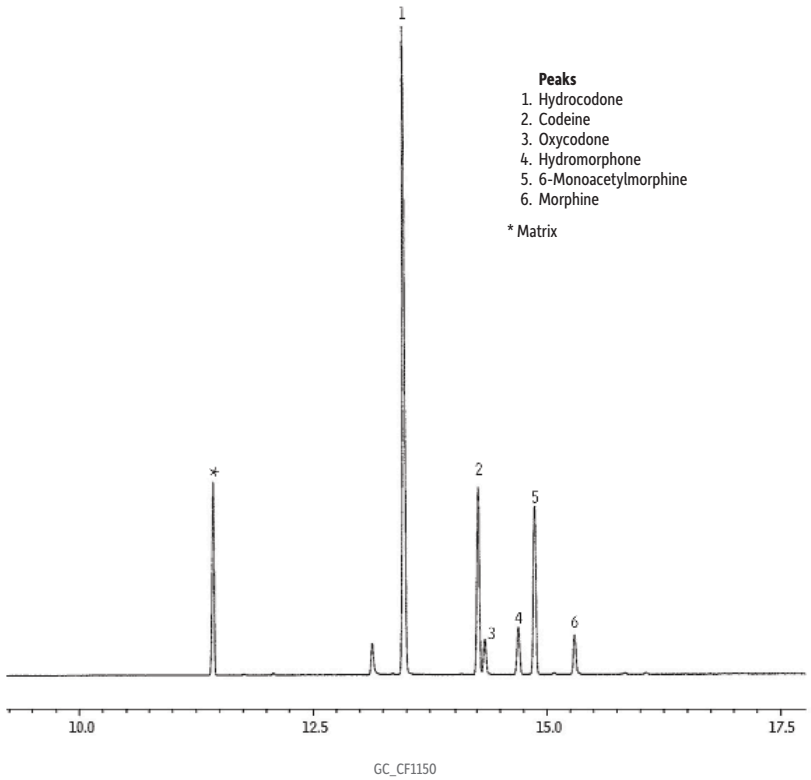
In addition to benzodiazepines, the selectivity of the Rxi-5Sil MS column is also well suited for the analysis of several common classes of drugs of abuse, including cannabinoids, cocaine and its metabolites, opiates, and amphetamines. The Miami Dade Medical Examiner's Laboratory provides another example of how Rxi-5Sil MS columns can simplify analyses and improve lab efficiency. The versatility and robustness of the Rxi-5Sil MS column assisted the lab in streamlining operations by reducing time-consuming column changes and maintenance. One of the applications routinely run on this column is the analysis of opiates (Figure 6). The selectivity of the Rxi-5Sil MS column gives excellent separation between all compounds, and very low limits of detection are achieved since bleed is minimal. In addition, the column stands up extremely well to the derivatization reagents used prior to analysis, further increasing throughput by reducing instrument downtime for maintenance. The Rxi-5Sil MS column also produces excellent chromatography for cannabinoids (Figure 7).

Figure 5: No need to change columns to analyze benzodiazepines—Rxi-5Sil MS columns give excellent separation of structurally-related benzodiazepines.



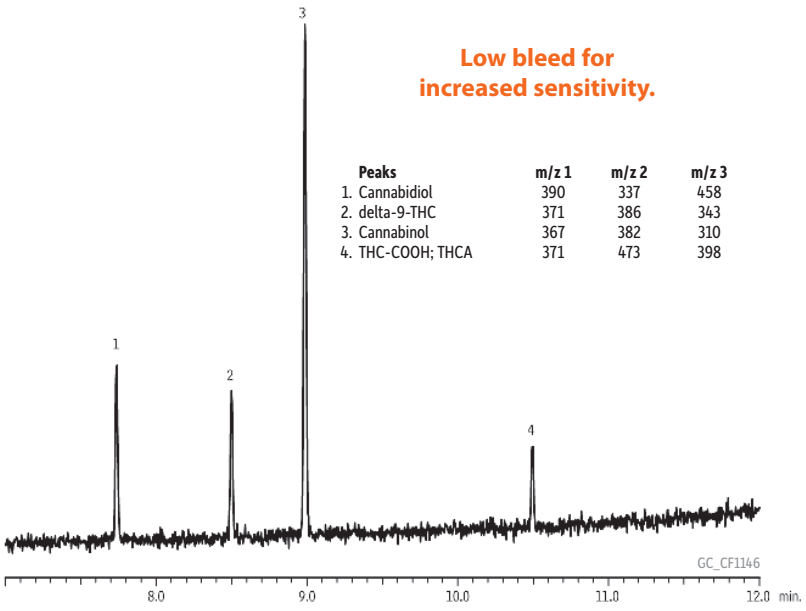
Column: Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); **Sample:** 15 µg/mL in butyl chloride; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); Liner: 3.5 mm splitless taper w/wool (cat.# 22286-200.1); Inj. Temp.: 280 °C; Purge Flow: 32.2 mL/min (20:1 split); **Oven:** Oven Temp: 200 °C to 330 °C at 15 °C/min (hold 3 min); **Carrier Gas:** He, constant linear velocity, 50 cm/sec, 23.7 psi, 163.4 kPa @ 200 °C; **Detector:** MS, Scan; Transfer Line Temp: 280 °C; Analyzer Type: Quadrupole; Source Temp.: 200 °C; Electron Energy: 70 eV; Solvent Delay Time: 4 min; Tune Type: PFTBA; Ionization Mode: EI; Scan Range: 50-350 amu; Scan Rate: 5 scans/sec; **Instrument:** Shimadzu 2010 GC & QP2010+ MS

Figure 6: Analysis of derivatized opiates on an Rxi-5Sil MS column performed by the Miami Dade Medical Examiner's lab.



Column	Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Standard/Sample	
Diluent:	Ethyl acetate
Conc.:	100 ng/mL propionic anhydride derivatives
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	4 mm splitless taper w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Purge Flow:	100 mL/min
Oven	
Oven Temp.:	65 °C (hold 1 min) to 315 °C at 15 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	35 cm/sec @ 65 °C
Detector	MS
Mode:	SIM
Transfer Line Temp.:	250 °C
Analyzer Type:	Quadrupole
Solvent Delay Time:	7 min
Tune Type:	PFTBA
Ionization Mode:	EI
Sample Preparation	Opiates were spiked into a blood sample and extracted by SPE, then derivatized with propionic anhydride.
Acknowledgement	Data courtesy of Miami Dade County Medical Examiner Department.

Figure 7: High signal response due to column inertness and efficiency, combined with low bleed, results in maximum sensitivity for derivatized cannabinoids (50 ng/mL).



Column	Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Ethyl acetate
Conc.:	50 ng/mL TMS derivatives
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min.)
Liner:	3.5 mm splitless taper w/wool (cat.# 22286-200.1)
Inj. Temp.:	250 °C
Purge Flow:	21.4 mL/min
Oven	
Oven Temp:	150 °C to 330 °C at 15 °C/min (hold 3 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	40 cm/sec, 13.8 psi, 95.1 kPa @ 150 °C
Detector	MS
Mode:	SIM
SIM Program:	390, 337, 458, 367, 382, 310, 371, 386, 343, 473, 398 m/z
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	200 °C
Solvent Delay Time:	4 min
Tune Type:	PFTBA
Ionization Mode:	EI
Instrument	Shimadzu 2010 GC & QP2010+ MS

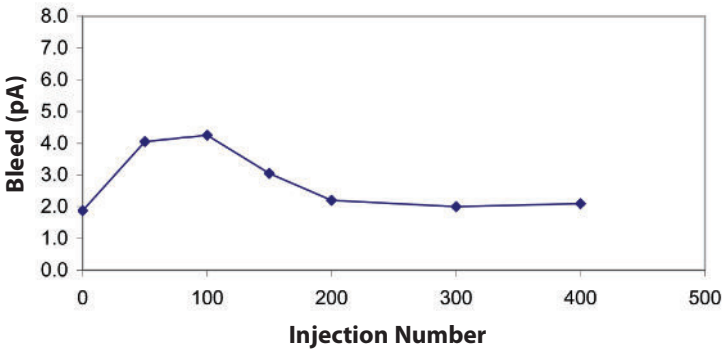
Rxi-5Sil MS Columns…Assured Performance for Forensic Applications

Robust, Low-Bleed Phase Results in Better Sensitivity and Longer Column Lifetime

Many drug assays require that compounds be derivatized prior to analysis. Derivatization not only allows for GC analysis of compounds not otherwise amenable to gas chromatography but it also helps to produce unique, high molecular weight fragments that assist with GC-MS quantitation. While derivatization has its advantages, derivatization reagents and their byproducts are extremely harsh and can reduce column lifetimes by damaging the stationary phase. Phase damage usually manifests as increased bleed and tailing of active compounds. The unique Rxi-5Sil MS stationary phase, with its embedded arylene groups, provides a more rigid matrix that is less likely to be damaged by derivatization reagents or their byproducts.

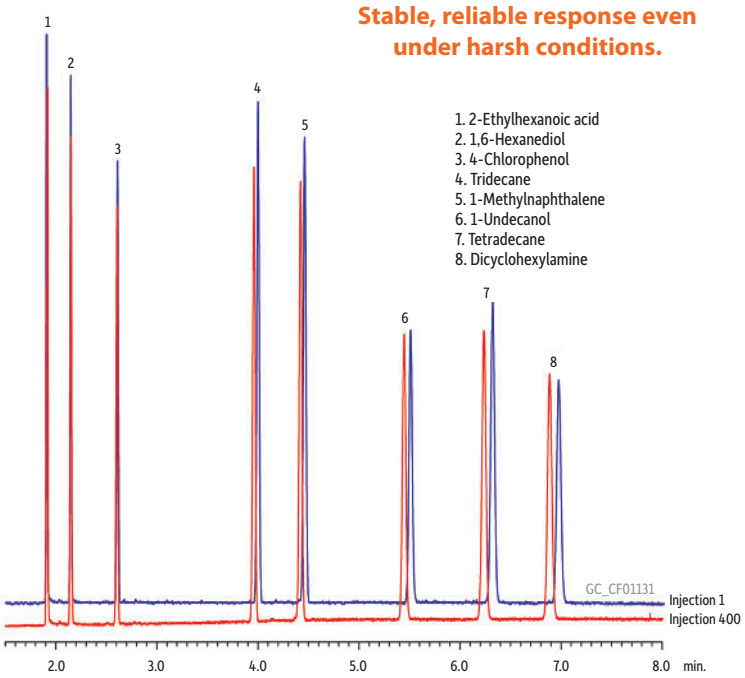
As a test of column lifetime, an Rxi-5Sil MS column was subjected to repeated injections of high concentration HFAA, a harsh derivatization reagent, as well as prolonged exposure to the column's maximum operational temperature during each injection. Throughout lifetime testing, column bleed and inertness were tested by analyzing a mixture of active test compounds that tail severely on less inert columns. After 400 injections, no change in bleed or inertness was observed (Figures 8 and 9). The enhanced stability of Rxi-5Sil MS columns reduces phase bleed, resulting in longer column lifetimes and improved performance with sensitive mass spectrometry detectors.

Figure 8: Low column bleed results in long column lifetimes, saving labs replacement costs.



Column bleed over 400 injections of HFAA derivatization reagent. Column was held at the maximum isothermal temperature.

Figure 9: Rugged Rxi-5Sil MS columns produce consistent retention times, even after 400 injections of derivatization reagent.



Column: Rxi-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); **Sample:** Column test mix (cat.# 35226); **Inj.:** 1.0 µL split (split ratio 1:60), 4 mm recessed single taper (cat.# 20983); Inj. temp.: 250 °C; **Carrier gas:** helium, constant pressure; Linear velocity: 36 cm/sec @ 125 °C; Oven temp.: 125 °C; **Det:** FID @ 320 °C; Instrument: Agilent 6890

Conclusion

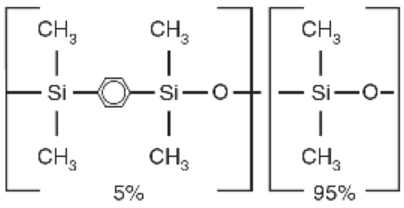
Rxi-5Sil MS columns are ideal for toxicology labs interested in improving data quality by increasing certainty and reducing downtime. These columns have similar selectivity to conventional 5-type columns but are significantly more inert and robust. Rxi-5Sil MS columns provide more accurate trace-level results and reduced downtime for column changes, offering labs a valuable tool for improving methods for the routine analysis of drugs of abuse.

Restek's low-bleed MS columns exceed requirements of the most sensitive mass spectrometers.

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

- General-purpose columns for GC-MS analysis of most semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- Temperature range: -60 °C to 350 °C.
- Some dimensions also available as Integra-Guard columns — a guard and analytical column in one to eliminate connection problems!

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.



Similar to: (5%-phenyl)-methylpolysiloxane

Restek's low-bleed MS columns exceed requirements of the most sensitive mass spectrometers.

ordering notes

Custom lengths and film thicknesses available. Contact Technical Service or your local Restek representative.

SAVE MONEY! Get six columns for the price of five. Contact Customer Service or your local Restek representative for details!

ID	df	Length	Temp. Limits	qty.	Similar to Part #	cat.#
0.10 mm	0.10 µm	10 m	-60 to 320/350 °C	ea.		43601
0.15 mm	0.15 µm	10 m	-60 to 320/350 °C	ea.		43815
	0.15 µm	20 m	-60 to 320/350 °C	ea.		43816
	2.0 µm	20 m	-60 to 320/350 °C	ea.		43817
0.18 mm	0.10 µm	60 m	-60 to 320/350 °C	ea.		43607
	0.18 µm	20 m	-60 to 320/350 °C	ea.	Agilent 121-5522UI; Phenomenex 7FD-G030-08	43602
	0.18 µm	40 m	-60 to 320/350 °C	ea.		43605
	0.36 µm	20 m	-60 to 320/350 °C	ea.	Agilent 121-5523UI; Phenomenex 7FD-G030-53	43604
0.25 mm	0.10 µm	15 m	-60 to 320/350 °C	ea.		13605
	0.10 µm	30 m	-60 to 320/350 °C	ea.	Phenomenex 7HG-G030-02-C	13608
	0.25 µm	15 m	-60 to 320/350 °C	ea.	Agilent 122-5512UI; Phenomenex 7EG-G030-11	13620
	0.25 µm	30 m	-60 to 320/350 °C	ea.	Agilent 122-5532UI; Phenomenex 7HG-G030-11	13623
	0.25 µm	30 m	-60 to 320/350 °C	6-pk.		13623-600
	0.25 µm	60 m	-60 to 320/350 °C	ea.	Agilent 122-5562UI; Phenomenex 7KG-G030-11	13626
	0.50 µm	15 m	-60 to 320/350 °C	ea.	Phenomenex 7EG-G030-17	13635
	0.50 µm	30 m	-60 to 320/350 °C	ea.	Agilent 122-5536UI; Phenomenex 7HG-G030-17	13638
	1.00 µm	15 m	-60 to 320/350 °C	ea.	Agilent 122-5513UI	13650
	1.00 µm	30 m	-60 to 320/350 °C	ea.	Agilent 122-5533UI; Phenomenex 7HG-G030-22	13653
	1.00 µm	60 m	-60 to 320/350 °C	ea.	Agilent 122-5563UI; Phenomenex 7KG-G030-22	13697
0.32 mm	0.25 µm	15 m	-60 to 320/350 °C	ea.		13621
	0.25 µm	30 m	-60 to 320/350 °C	ea.	Agilent 123-5532UI; Phenomenex 7HM-G030-11	13624
	0.50 µm	30 m	-60 to 320/350 °C	ea.	Phenomenex 7HM-G010-17	13639
	1.00 µm	30 m	-60 to 320/350 °C	ea.	Agilent 123-5533UI; Phenomenex 7HM-G030-22	13654
0.53 mm	1.50 µm	30 m	-60 to 320/330 °C	ea.		13670

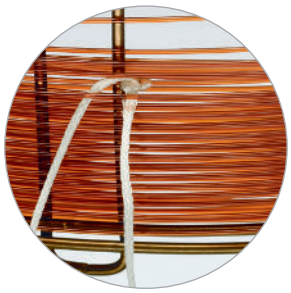
Innovative Integra-Guard Columns

Get the protection without the connection!

- These innovative columns incorporate both guard column and analytical column in a continuous length of tubing, eliminating the connection and all connection-associated problems!
- The guard column section is marked separately from the analytical column, using high-temperature string.
- 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.
- A wide variety of our Integra-Guard capillary columns are available.

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.



ID	df	Length	Temp. Limits	Modification	qty.	cat.#
Rxi-5Sil MS						
0.25 mm	0.25 µm	15 m	-60 to 330/350 °C	w/10 m Integra-Guard Column	ea.	13620-127
	0.25 µm	30 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13623-124
	0.25 µm	30 m	-60 to 320/350 °C	w/10 m Integra-Guard Column	ea.	13623-127
	0.25 µm	60 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13626-124
	0.25 µm	60 m	-60 to 320/350 °C	w/10 m Integra-Guard Column	ea.	13626-127
	0.50 µm	15 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13635-124
	0.50 µm	30 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13638-124
	0.50 µm	30 m	-60 to 320/350 °C	w/10 m Integra-Guard Column	ea.	13638-127
	1.00 µm	30 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13653-124
0.32 mm	0.50 µm	30 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13639-125
	1.00 µm	30 m	-60 to 320/350 °C	w/5 m Integra-Guard Column	ea.	13654-125

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

Topaz GC Inlet Liners

Topaz GC inlet liners feature revolutionary technology and inertness to deliver you the next level of True Blue Performance:

- **Deactivation**—unbelievably low breakdown for accurate and precise low-level GC analyses.
- **Reproducibility**—unbeatable manufacturing controls and QC testing for superior reliability across compound classes.
- **Productivity**—unparalleled cleanliness for maximized GC uptime and lab throughput.
- **100% Satisfaction**—if a liner doesn't perform to your expectations, we will replace it or credit your account.*

Patented

More columns, inlet liners, standards, and accessories are available at **www.restek.com**

Recommended for Splitless Injection

Topaz 4.0 mm ID Single Taper Inlet Liner w/ Wool

for Agilent GCs equipped with split/splitless inlets

Description	Length	ID	OD	Deacti-vation	Material	Packing	qty	Similar to Part #	cat.#
4.0 mm ID Single Taper Liner w/Wool	78.5 mm	4.0 mm	6.5 mm	Premium	Borosili-cate Glass	Quartz Wool	5-pk.	Agilent 5062-3587 (ea.), 5183-4693 (5-pk.), 5183-4694 (25-pk.), 5190-2293 (ea.), 5190-3163 (5-pk.), 5190-3167 (25-pk.), 5190-3171 (100-pk.)	23303

Topaz 4.0 mm ID Single Taper Inlet Liner

for Agilent GCs equipped with split/splitless inlets

Description	Length	ID	OD	Deactiva-tion	Material	qty	Similar to Part #	cat.#
4.0 mm ID Single Taper Liner	78.5 mm	4.0 mm	6.5 mm	Premium	Borosilicate Glass	5-pk.	Agilent 5181-3316 (ea.), 5183-4695 (5-pk.), 5183-4696 (25-pk.), 5190-2292 (ea.), 5190-3162 (5-pk.), 5190-3166 (25-pk.), 5190-3170 (100-pk.)	23302

Recommended for Split Injection

Topaz 4.0 mm ID Precision Inlet Liner w/ Wool

for Agilent GCs equipped with split/splitless inlets

Description	Length	ID	OD	Deactiva-tion	Material	Packing	qty	Similar to Part #	cat.#
4.0 mm ID Preci-sion Liner w/Wool	78.5 mm	4.0 mm	6.3 mm	Premium	Borosilicate Glass	Quartz Wool	5-pk.	Agilent 210-4004-5	23305

Topaz 4.0 mm ID Cyclo Inlet Liner

for Agilent GCs equipped with split/splitless inlets

Description	Length	ID	OD	Deactivation	Material	qty	cat.#
4.0 mm ID Cyclo Liner	78.5 mm	4.0 mm	6.3 mm	Premium	Borosilicate Glass	5-pk.	23312

* 100% SATISFACTION GUARANTEE: If your Topaz inlet liner does not perform to your expectations for any reason, simply contact Restek Technical Service or your local Restek representative and provide a sample chromatogram showing the problem. If our GC experts are not able to quickly and completely resolve the issue to your satisfaction, you will be given an account credit or replacement product (same cat.#) along with instructions for returning any unopened product. (Do not return product prior to receiving authorization.) For additional details about Restek's return policy, visit www.restek.com/warranty

22656

Flowmeter Specifications
Type of Flowmeter: Volumetric
Battery: 2-AA
Operating Temp. Range: 32–120 °F (0–48 °C)
Warranty: One-year warranty (excludes recalibration)
Certification/Compliance: CE, Ex, Canadian ICES-003, WEEE, RoHS 2, China RoHS 2, UKCA

Restek ProFLOW 6000 Electronic Flowmeter

The Restek ProFLOW 6000 is the only flowmeter you need for any type of chromatography gas measurement because of its wide range of capabilities. The ProFLOW 6000 is an electronic meter capable of measuring volumetric flow for most gases. Real-time measurements can be made for various types of flow paths, including continually changing gas types. This portable unit is designed for easy handheld use, and the stand adds benchtop convenience.

State-of-the-art features include:

- Measures volumetric flow for gases across a range of 0.5–500 mL/min.
- NIST traceable calibration.
- Ex rating (electrical apparatus for explosive gas atmospheres) for hydrogen and related gas types.
- Accuracy of ± 2.00% of flow reading or ± 0.200 mL/min, whichever is greater.
- Over-range warning indicator.
- Auto shutoff feature.
- Use as a benchtop or handheld unit.
- Ergonomic design and side grips for comfort.
- Measures most gas types.*
- Convenient carrying/storage case included.
- Uses two AA batteries (included).
- Data output via USB port.
- One-year warranty (excludes recalibration).
- Recalibration service available.

*The flowmeter is designed to measure clean, dry, noncorrosive gases.

Description	qty.	cat.#
Restek ProFLOW 6000 Electronic Flowmeter with Hard-Sided Carrying Case	ea.	22656

Patented

Restek's Competitive Advantage: Comparing Flowmeters

Manufacturer/ Description	Low Flow (mL/min)	High Flow (mL/min)	Accuracy	Gases Measured	Volumetric or Mass Flow Measured	Gas Exhaust	Data Port	Power Supply
Restek ProFLOW 6000	0.5	500	Accuracy of ± 2.00% of flow reading or ± 0.200 mL/min, whichever is greater.	Most*	Volumetric	Yes	USB	2-AA
Agilent ADM	0.5	750	Accuracy of ± 2.00% of flow reading or ± 0.200 mL/min, whichever is greater.	Most	Volumetric	No	USB	3-AA or USB
Alicat M Series	Five versions of flow	Five versions of flow	±0.4.00%	30 single and combo gases	Mass	No	RS232	9 volt

Restek Electronic Leak Detector

New and improved! Prevent small leaks from causing big problems with a Restek leak detector.

- Detects a broad range of gases and indicates leak severity with both an LED display and audible tone.
- No more waiting for a full charge—can be operated during charging or used up to 12 hours between charges.
- Charging kit includes both universal AC power adaptor and USB charging cable, so you can charge anywhere, anytime.
- Pinpoint very small gas leaks quickly and accurately before they cause damage and downtime.
- Compact, handheld unit is easy to operate and convenient to use anywhere you need to check for leaks.

Features & benefits include:

- Detects a broad range of gases.
- Audible tone and LED display indicate the severity of a leak.
- Can be operated during charging or used up to 12 hours between charges.
- Ergonomic, handheld design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Automatic shutoff.
- A convenient carrying and storage case.
- Easy-to-clean probe assembly.
- A universal AC power adaptor (U.S., UK, Europe, Australia, Japan).
- USB charging cable.

Backed by a one-year warranty, the Restek leak detector is the industry standard for performance and affordability in handheld leak detectors.

Description	Includes	qty.	cat.#
Restek Electronic Leak Detector	carrying case, universal AC power adaptor [U.S., UK, Europe, Australia, Japan], 6-ft USB charging cable	ea.	28500

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

*Caution: The Restek electronic leak detector should only be used to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek electronic leak detector may only be used for determining trace amounts in a GC environment.

28500

Leak Detector Specifications
Detectable Gases: Helium, nitrogen, argon, carbon dioxide, hydrogen*
Battery: Rechargeable nickel-metal hydride (NiMH) internal battery pack (12 hours normal operation)
Ambient Temperature: 50–98.6 °F (10–37 °C)
Humidity Range: 0–97%
Warranty: One year
Certification/Compliance: CE (EU, Korea, Japan, Australia); CSA/UL tested, not listed; WEEE; CEC; China RoHS 2; UKCA
Indoor Use Only

Limits of Detection
These gases can be detected with the Restek electronic leak detector at the following leak rates:
Minimum Detectable Gas Limits and Indicating LED Color:
Helium, 1.0×10^{-5}, red LED
Hydrogen*, 1.0×10^{-5}, red LED
Nitrogen, 1.4×10^{-3}, yellow LED
Argon, 1.0×10^{-4}, yellow LED
Carbon dioxide, 1.0×10^{-4}, yellow LED
Gas detection limits measured in atm cc/sec.

Restek's Competitive Advantage: Comparing Leak Detectors

	Restek Leak Detector	Agilent G3388B	GOW-MAC 21-070 (Mini)
Battery rating	12 hours normal operation	5 hours normal operation	8 hours normal operation
Battery type	NiMH	Lithium ion	Nickel cadmium
Leak indicator	Incremental visual (LEDs) Incremental audible	Incremental visual (LCD & LED) Step audible	Incremental visual (LEDs) Audible at maximum
Helium leak sensitivity	1×10^{-5} cc/sec	1×10^{-4} cc/sec (standard range) 1×10^{-5} cc/sec (high range)	1×10^{-5} cc/sec
Weight	252 grams	95 grams	476 grams
Handheld?	Yes	Yes	No

THE RESTEK BIPHENYL
LEADING RESOLUTION IN LC
★ est. 2005 ★

Restek Biphenyl LC Columns

Better Selectivity than a C18: Separate a Wider Range of Analytes in Highly Complex Samples

Whether you are analyzing foods, drug testing samples, or other complex matrices, Restek Biphenyl columns retain and separate a broader range of compound chemistries than is possible on popular C18 phases. Heightened selectivity separates difficult analytes—even isobars—and stronger retention protects early eluting compounds from matrix-related ionization suppression.

- Ideal for food, urine, blood, oral fluid, and other difficult matrices.
- Superior selectivity separates a broader range of analytes than a C18 column.
- Increased retention of early eluting compounds minimizes matrix effects.
- Improved sensitivity with simple, MS-friendly mobile phases.

The Right LC Phase in Any Format.

- **Raptor SPP columns**
  Superficially porous particle columns that deliver UHPLC speed for high-throughput LC-MS/MS.
- **Force FPP columns**
  Fully porous particle columns that scale easily and completely between HPLC and UHPLC.

Learn How to Achieve Better Separations with Restek Biphenyl LC Columns
www.restek.com/biphenyl

RESTEK
Pure Chromatography

Questions? Contact us or your local Restek representative (www.restek.com/contact-us).

www.restek.com

QUALITY ISO 9001 · 17025 · 17034

Lit. Cat.# CFSS1302B-UNV