Restek GC

Stabilwax-MS Columns

Thermally Stable, High-Polarity GC Columns for Flavor, Food, Fragrance, Industrial Chemical, and Solvent Analyses

- 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.

RESTEK Pure Chromatography www.restek.com

Stabilwax-MS Columns

Stabilwax-MS Features	Your Benefit
High thermal stability polyethylene glycol (PEG) stationary phase	Able to couple to MS detector Temperature range: 40 °C to 260 °C
Lower bleed than VF-WAXms	Lower detection limits
Ultra-clean, Restek-manufactured phase and bonding chemistries	Extraordinary inertness and stability against chemicals and high temperatures
Withstand repeated water injections with no phase loss or degradation	Longer column lifetime and solvent rinseable
Equivalent to USP G14, G15, G16, G20, and G39 phases	Ideal for polar analytes in foods, flavors, fragrances, industrial chemicals, and solvents

Challenges of Polar Compound Analysis by GC

One of the most widely used columns in gas chromatography is a polyethylene glycol (PEG) or "wax" phase. This unique column is highly polar compared to nonpolar methyl phases like Rxi-1 columns (100% dimethyl polysiloxane) or Rxi-5 columns (5% diphenyl/95% dimethyl polysiloxane) due to the presence of a polyethylene glycol backbone (Figure 1). The incorporation of the oxygen group in the backbone creates a phase with high selectivity for polar analytes, such as alcohols, glycols, esters, and ethers. These compound classes are commonly found in pharmaceutical raw materials, alcoholic beverages, industrial chemicals, flavors, and fragrances. A wax phase is capable of providing resolution of these compound classes that will not be achievable on nonpolar and intermediate polarity columns.

Due to phase structure, wax columns typically have lower maximum operating temperatures (240-250 °C) than nonpolar columns (e.g., max temp of an Rxi-5ms column is 360 °C) and exhibit higher column bleed levels than silicone phases. Because of this, retention time shifting can occur on some wax columns due to the loss of stationary phase (column bleed) that occurs during GC oven temperature cycling. Wax phases are also susceptible to oxygen contamination and can degrade quickly if exposed to oxygen from a leak in the GC at high temperatures. Oxygen contamination is chromatographically seen as a high column baseline that cannot be decreased by column conditioning or maintenance. A Restek electronic leak detector is the best way to ensure a leak-free system and long column lifetimes. See page 12 for details on this product and view the leak-checking demo on our website for how to properly use an electronic leak detector.

Figure 1: The highly polar nature of the Stabilwax-MS column makes it ideal for separating polar compounds found in food, flavors, fragrances, pharmaceutical raw materials, and industrial chemicals.

Over the past several years, benchtop mass spectrometer (MS) detectors have become the GC detector of choice since they provide high sensitivity, quantitative retention time data, and compound identification. GC-MS users have long wanted thermally stable polar phases to use with their MS systems to take advantage of their unique selectivity without the worry of the column bleed seen on most wax columns.

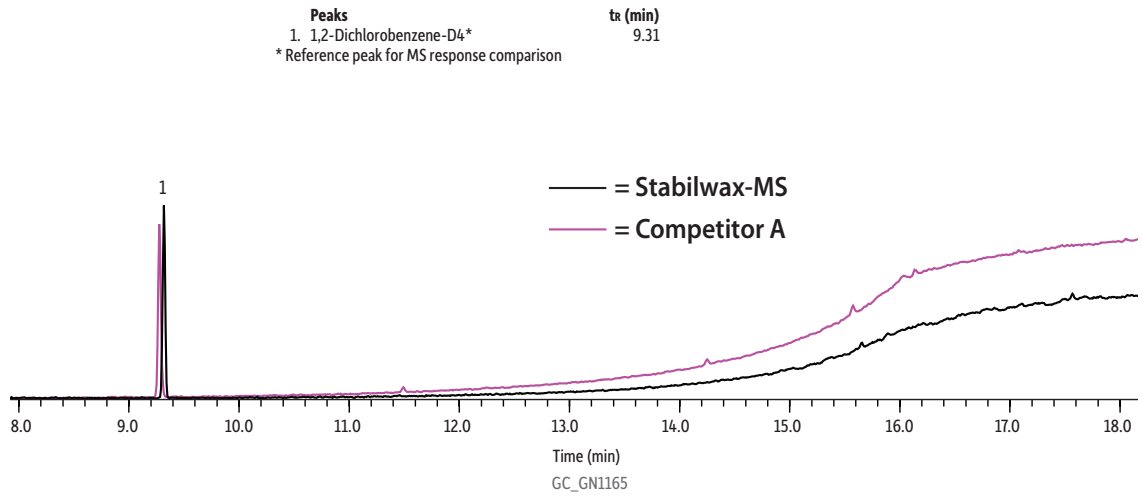
Stabilwax-MS Columns: A Wax Phase Suitable for GC-MS

The Stabilwax-MS column from Restek meets a GC-MS user's challenges. The polar deactivated surface tightly binds the polyethylene glycol polymer to the fused silica tubing, resulting in a high maximum operating temperature (260 °C). This allows for faster elution of higher molecular weight compounds since the column can be taken to high temperatures. In addition, low-bleed levels are ensured by strict quality testing that specifies maximum allowable bleed levels of 4.0 pA for 0.25 mm ID columns and 5.0 pA for 0.32 mm ID columns. When comparing actual bleed levels on a mass spectrometer, Stabilwax-MS columns outperform the VF-WAXms column (Figure 2). When tested at the 250 °C temperature limit of the VF-WAXms column, less bleed is seen on the Stabilwax-MS column.

When methods require trace analysis of polar compounds, the **Stabilwax-MS** column produces excellent sensitivity and low bleed levels.

The low-bleed level of the Stabilwax-MS column makes it suitable for GC-MS analysis of a wide range of polar compounds and matrices, including FAMEs, flavor compounds; essential oils; solvents; aromatics (including xylene isomers); acrolein/acrylonitrile; and oxygenated compounds. The Stabilwax-MS column is also useful for purity testing of chemicals and analyzing impurities in water and alcoholic beverages. When methods require trace analysis, the highly polar, low-bleed Stabilwax-MS column produces excellent results compared to conventional wax columns. Review the applications in this brochure and try a low-bleed Stabilwax-MS column for yourself!

Figure 2: Stabilwax-MS columns exhibit lower bleed levels than VF-WAXms columns and are stable up to 260 °C.



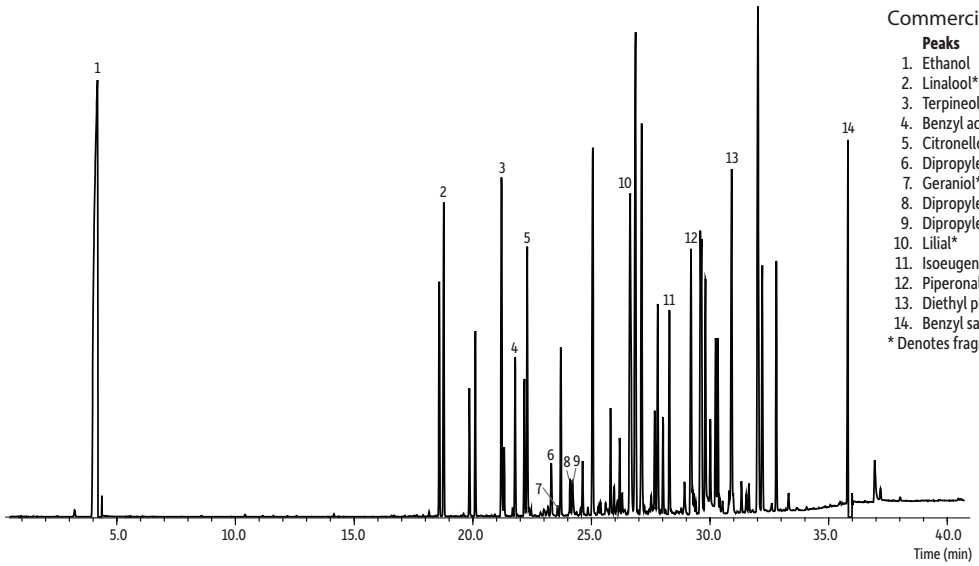
Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); VF-WAXms, 30 m, 0.25 mm ID, 0.25 µm; **Standard/Sample:** 1,2-dichlorobenzene-d4 (cat.# 30049); Diluent: acetonitrile; Conc.: 2 µg/mL; **Injection**: 1 µL splitless (hold 0.50 min); Liner: Topaz, Single Taper, Splitless Inlet Liner, 3.5 mm x 5.0 x 95, for Shimadzu GCs 17A, 2010, 2014, and 2030, w/Quartz Wool, Premium Deactivation, 5-pk. (cat.# 23322), Inj. Temp.: 250 °C; Oven: 40 °C (hold 2 min) to 250 at 15 °C/min (hold 5 min); Carrier Gas: He, constant flow; Flow Rate: 1.0 mL/min; Linear Velocity: 36.1 cm/sec @ 40 °C; **Detector**: MS, scan mode; Scan Range (amu): 45-550; Scan Rate (scans/sec): 2; Transfer Line Temp: 260 °C; Analyzer Type: Quadrupole; Source Temp.: 250 °C; Ionization Mode: EI; **Instrument**: Shimadzu 2010 GC & QP2010+ MS.

Fragrance Analysis

Commercial Perfumes

Materials containing fragrances, such as personal care products and perfumes, can be challenging to analyze by GC-MS due to their complex nature. Manufacturers analyze these difficult mixtures for quality control and stability purposes as well as during formulation. Because these mixtures contain a diverse range of compounds at varying concentrations, a stationary phase that offers good selectivity and excellent resolution for a wide range of analytes, high inertness, and low bleed for low-level analysis is necessary. The Stabilwax-MS column provides excellent separation of the alcohols, glycols, and terpenes in a commercial perfume sample analyzed by GC-MS in Figure 3.

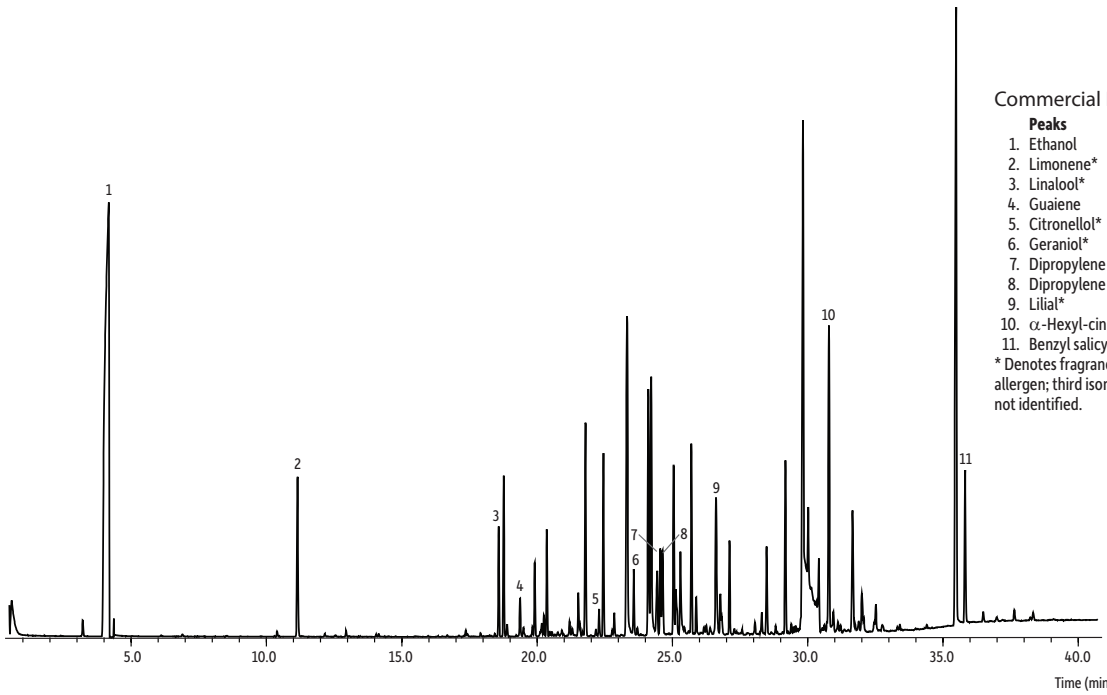
Figure 3: Fragrance Allergens and Common Compounds in Commercial Perfume Separated on a Stabilwax-MS Column



Commercial Perfume A

	Peaks	t_R (min)
1.	Ethanol	4.18
2.	Linalool*	18.59
3.	Terpineol	21.21
4.	Benzyl acetate	21.78
5.	Citronellol*	22.29
6.	Dipropylene glycol isomer 1	23.31
7.	Geraniol*	23.57
8.	Dipropylene glycol isomer 2	24.10
9.	Dipropylene glycol isomer 3	24.20
10.	Lilial*	26.63
11.	Isoeugenol*	28.29
12.	Piperonal	29.20
13.	Diethyl phthalate	30.91
14.	Benzyl salicylate*	35.81

* Denotes fragrance allergen or suspected allergen



Commercial Perfume B

	Peaks	t_R (min)
1.	Ethanol	4.18
2.	Limonene*	11.47
3.	Linalool*	18.58
4.	Guaiene	19.37
5.	Citronellol*	22.29
6.	Geraniol*	23.57
7.	Dipropylene glycol isomer 1	24.11
8.	Dipropylene glycol isomer 2	24.21
9.	Lilial*	26.61
10.	α-Hexyl-cinnamaldehyde*	30.78
11.	Benzyl salicylate*	35.82

* Denotes fragrance allergen or suspected allergen; third isomer of dipropylene glycol not identified.

Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); **Sample**: commercial perfumes, neat; **Injection**: 1 µL split (split ratio 200:1); Liner: Topaz, Single Taper, Splitless Inlet Liner, 3.5 mm x 5.0 x 95, for Shimadzu GCs 17A, 2010, 2014, and 2030, w/Quartz Wool, Premium Deactivation, 5-pk. (cat.# 23322), Inj. Temp.: 250 °C; **Oven:** 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, scan mode; Scan Range (amu): 40-550; Scan Rate (scans/sec): 2; Transfer Line Temp: 260 °C; Analyzer Type: Quadrupole; Source Temp.: 250 °C; Ionization Mode: EI; **Instrument**: Shimadzu 2010 GC & QP2010+ MS.

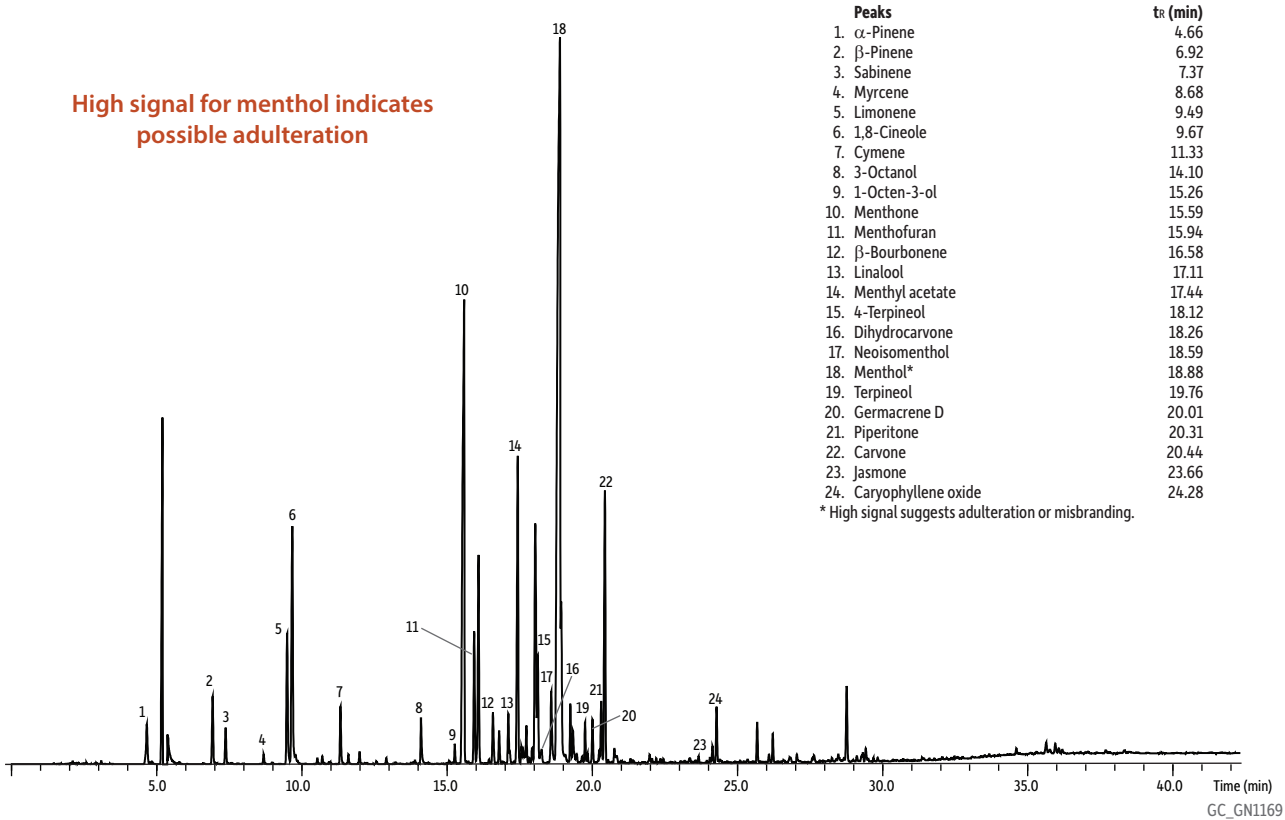
Flavor and Food Analysis

Spearmint Oil

Flavor and food samples contain numerous aromatic compounds; some are naturally present in the raw materials, and some form during processing. GC-MS is extensively used for the analysis of these compounds, which include esters, fatty acids, alcohols, aldehydes, and terpenes. It is also used to detect and measure contaminants from spoilage or adulteration that may be harmful to humans and, therefore, are often controlled by governmental agencies.

Spearmint oil is used in a variety of commercially available products, including food and personal care items. Companies manufacturing materials containing spearmint oil generally control quality by testing for carvone, the main active component that gives spearmint oil its minty flavor. Menthol is also often a target compound as it should be a minor component in spearmint oil but is commonly added as an adulterant. The large menthol peak shown in the spearmint oil sample in Figure 4 indicates that this sample is likely either spearmint oil with menthol added or a different type of oil (e.g., misbranded peppermint oil). The Stabilwax-MS column provides the required selectivity to give excellent separation of this complex natural sample while exhibiting minimal column bleed at 250 °C by GC-MS.

Figure 4: Commercial Spearmint Oil Analyzed on a Stabilwax-MS Column



	Peaks	t_R (min)
1.	α-Pinene	4.66
2.	β-Pinene	6.92
3.	Sabinene	7.37
4.	Myrcene	8.68
5.	Limonene	9.49
6.	1,8-Cineole	9.67
7.	Cymene	11.33
8.	3-Octanol	14.10
9.	1-Octen-3-ol	15.26
10.	Menthone	15.59
11.	Menthofuran	15.94
12.	β-Bourbonene	16.58
13.	Linalool	17.11
14.	Menthyl acetate	17.44
15.	4-Terpineol	18.12
16.	Dihydrocarvone	18.26
17.	Neoisomenthol	18.59
18.	Menthol*	18.88
19.	Terpineol	19.76
20.	Germacrene D	20.01
21.	Piperitone	20.31
22.	Carvone	20.44
23.	Jasmone	23.66
24.	Caryophyllene oxide	24.28

* High signal suggests adulteration or misbranding.

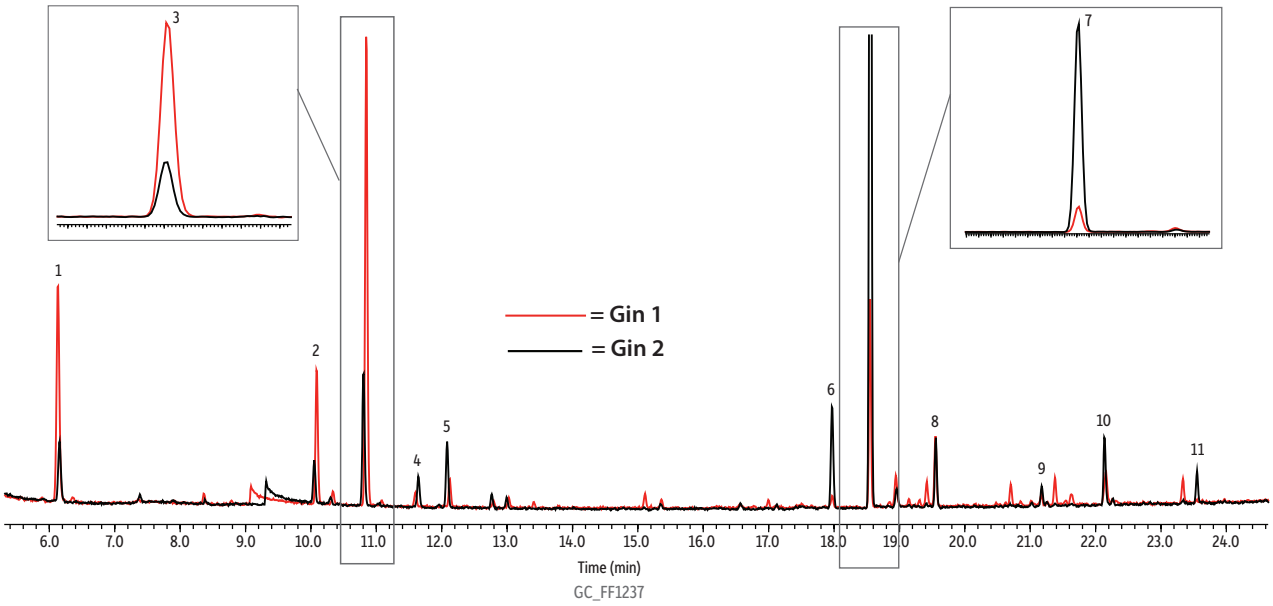
Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); **Sample**: commercial spearmint oil, neat; **Injection**: 1 µL split (split ratio 150:1); Liner: Topaz, Single Taper, Splitless Inlet Liner, 3.5 mm x 5.0 x 95, for Shimadzu GCs 17A, 2010, 2014, and 2030, w/Quartz Wool, Premium Deactivation, 5-pk. (cat.# 23322), Inj. Temp.: 250 °C; **Oven:** 45 °C (hold 5 min) to 250 °C at 7 °C/min (hold 10 min); **Carrier Gas:** He, constant linear velocity; Linear Velocity: 36 cm/sec; **Detector**: MS, scan mode; Scan Range (amu): 40-550; Scan Rate (scans/sec): 3.3 ; Transfer Line Temp: 260 °C; Analyzer Type: Quadrupole; Source Temp.: 250 °C; Ionization Mode: EI; **Instrument**: Shimadzu 2010 GC & QP2010+ MS.

Flavor and Food Analysis *(cont.)*

Alcoholic Beverages

Alcoholic beverages contain a wide range of volatile compounds, including alcohols and short-chain aldehydes, which manufacturers analyze for quality control, authenticity, and brand identification purposes. Gas chromatography can be used to determine these compounds since capillary columns offer efficient separations. Capillary GC is especially useful in the analysis of structurally similar compounds, such as fusel alcohols (i.e., isoamyl alcohol, 4-terpeniol, linalool, geraniol, etc.). The unique polarity of the Stabilwax-MS stationary phase ensures excellent resolution of a range of alcohols and fusel alcohols (also known as fusel oils) as shown in the analysis of a gin sample in Figure 5. The low bleed level obtained with a Stabilwax-MS column permits excellent response and quantitation of the gin volatiles to aid in accurate brand identification.

Figure 5: Different brands of gin are compared using a Stabilwax-MS column.



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:	Premium 3.5 mm Precision liner w/wool (cat.# 23320)
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	t_R (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.

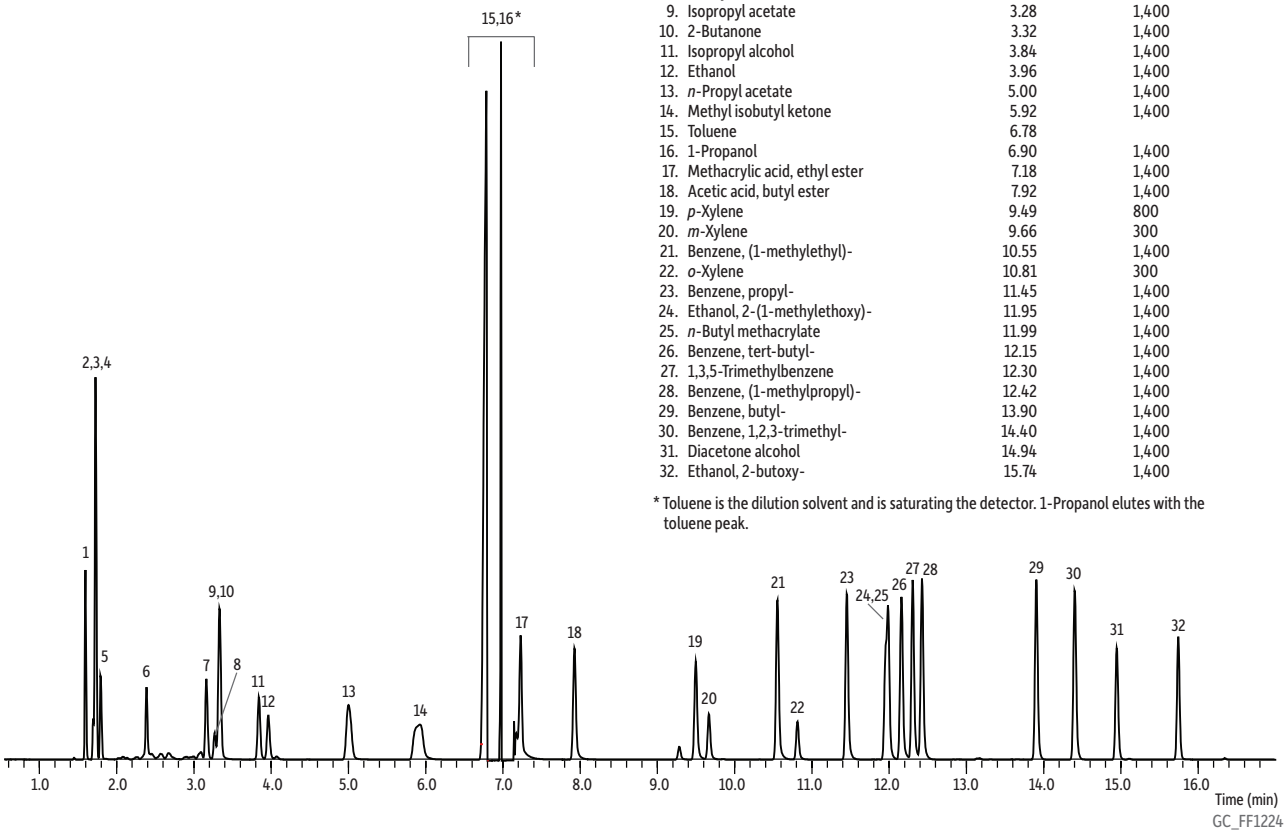
Industrial Chemicals Analysis

Industrial chemicals and solvents are used in dry cleaning agents, paint thinners, spot removers, perfumes, inks, adhesives, and hundreds of other materials. Many also are used to manufacture polymers, fine chemicals, celluloid cements, and lacquers, such as wood stains and printing applications, as well as in the manufacture of coatings, pharmaceuticals, paints, and packaging material. Analysis of these chemicals and solvents is performed to monitor incoming purity, process control, and disposal (drum waste). Many of the compounds analyzed in Figure 6 are found in packaging samples and industrial hygiene samples. Figure 7 shows excellent separation of chemicals and solvents commonly identified in process control and purity samples. The thermal stability of the Stabilwax-MS column permits fast analysis times for a wide range of compounds in a temperature programmed run and results in low column bleed at 250 °C by GC-MS.

Figure 6: Excellent Resolution and Inertness of Alcohols and Acetates on a Stabilwax-MS Column

Peaks	t_R (min)	Conc. (µg/mL)
1. *n*-Hexane	1.59	1,400
2. Hexane, 2-methyl-	1.72	200
3. Pentane, 2,3-dimethyl-	1.70	200
4. Hexane, 3-methyl-	1.72	500
5. Heptane	1.79	500
6. Acetone	2.38	1,400
7. Ethyl acetate	3.16	1,400
8. Methyl alcohol	3.26	1,400
9. Isopropyl acetate	3.28	1,400
10. 2-Butanone	3.32	1,400
11. Isopropyl alcohol	3.84	1,400
12. Ethanol	3.96	1,400
13. *n*-Propyl acetate	5.00	1,400
14. Methyl isobutyl ketone	5.92	1,400
15. Toluene	6.78	
16. 1-Propanol	6.90	1,400
17. Methacrylic acid, ethyl ester	7.18	1,400
18. Acetic acid, butyl ester	7.92	1,400
19. *p*-Xylene	9.49	800
20. *m*-Xylene	9.66	300
21. Benzene, (1-methylethyl)-	10.55	1,400
22. *o*-Xylene	10.81	300
23. Benzene, propyl-	11.45	1,400
24. Ethanol, 2-(1-methylethoxy)-	11.95	1,400
25. *n*-Butyl methacrylate	11.99	1,400
26. Benzene, tert-butyl-	12.15	1,400
27. 1,3,5-Trimethylbenzene	12.30	1,400
28. Benzene, (1-methylpropyl)-	12.42	1,400
29. Benzene, butyl-	13.90	1,400
30. Benzene, 1,2,3-trimethyl-	14.40	1,400
31. Diacetone alcohol	14.94	1,400
32. Ethanol, 2-butoxy-	15.74	1,400

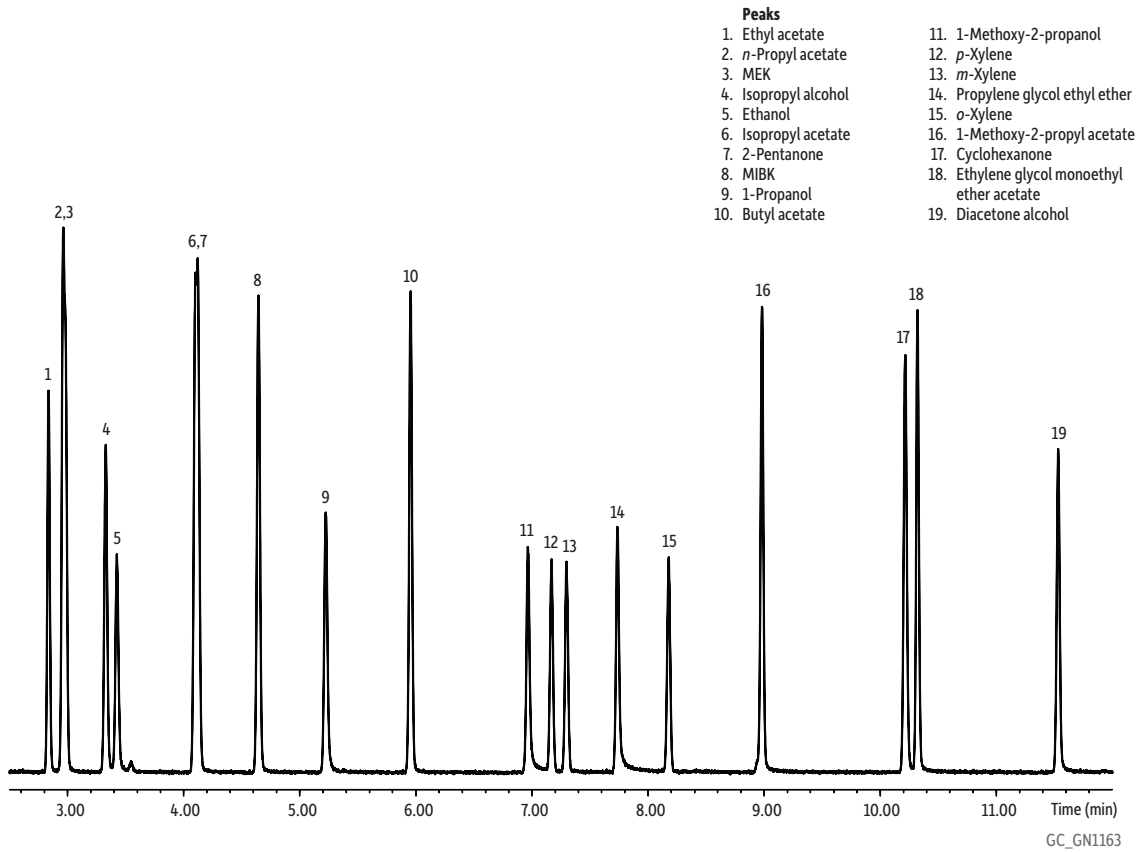
* Toluene is the dilution solvent and is saturating the detector. 1-Propanol elutes with the toluene peak.



Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); **Sample**: custom standard prepared in toluene; **Injection**: 1 µL split (split ratio 200:1); Liner: Topaz, Single Taper, Splitless Inlet Liner, 3.5 mm x 5.0 x 95, for Shimadzu GCs 17A, 2010, 2014, and 2030, w/Quartz Wool, Premium Deactivation, 5-pk.(cat.# 23322), Inj. Temp.: 250 °C; **Oven:** 35 °C (hold 5 min) to 250 °C at 7 °C/min (hold 5 min); **Carrier Gas:** He, constant flow; Flow Rate: 1 mL/min; Linear Velocity: 36.1 cm/sec @ 35 °C; **Detector**: MS, scan mode; Scan Range (amu): 30-400; Transfer Line Temp: 260 °C; Analyzer Type: Quadrupole; Source Temp.: 250 °C; Ionization Mode: EI; **Instrument**: Shimadzu 2010 GC & QP2010+ MS.

Industrial Chemicals Analysis *(cont.)*

Figure 7: Analysis of Common Industrial Chemicals and Solvents on a Stabilwax-MS Column by GC-MS in Less Than 12 Min.

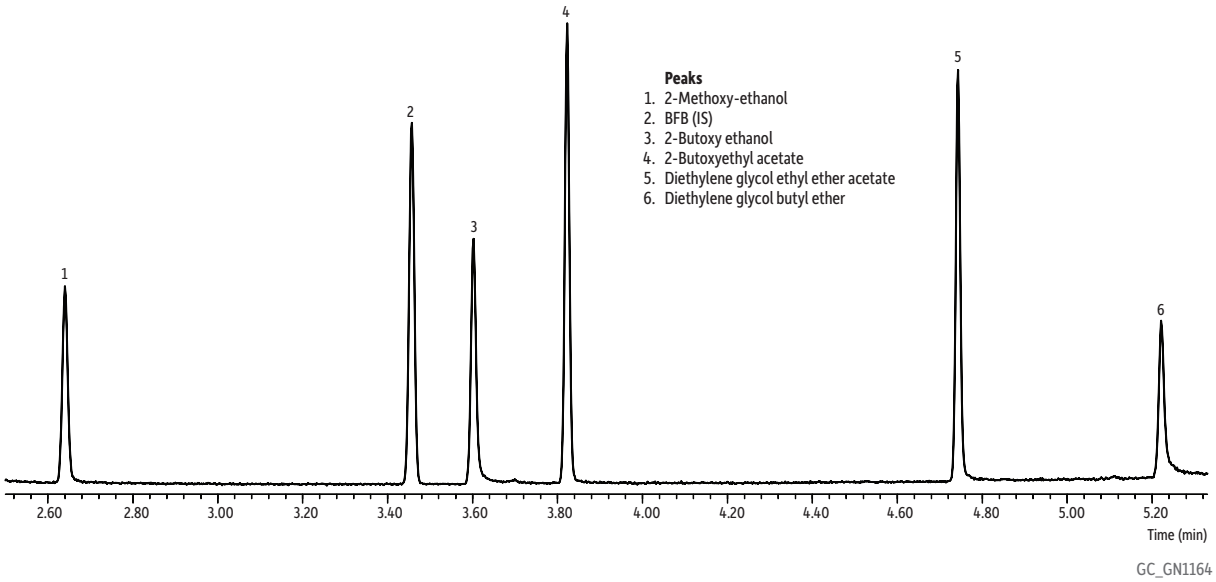


Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); **Sample**: 400 ppm custom solvent standard prepared in cyclohexane; **Injection:** 0.5 µL split (split ratio 200:1); Liner: Topaz, Precision, Split Inlet Liner, 4.0 mm x 6.3 x 78.5, for Agilent GCs, w/Quartz Wool, Premium Deactivation, 5-pk. (cat.# 23305), Inj. Temp.: 200 °C; **Oven:** 40 °C (hold 3 min) to 130 °C at 8 °C/min; **Carrier Gas:** He, constant flow; Flow Rate: 1 mL/min; **Detector**: MS, scan mode; Scan Program: 30-150 amu; Transfer Line Temp: 200 °C; Analyzer Type: Quadrupole; Source Temp.: 200 °C; Quad Temp: 150 °C; Ionization Mode: EI; **Instrument**: Agilent 7890A GC & 5975C MSD.

Cleaning Solvent Analysis

Cleaning solvents are used primarily to dissolve organic material. They clean without leaving residue, making them very useful in products, such as glass cleaners. The main criterion for cleaning solvents is water miscibility as the solvent must form a solution with the other water-soluble components. Thus, alcohols and glycols are popular choices. Glycol ethers are made from ethylene and propylene, and they prove to be excellent degreasers, cleaners, and intermediates. There are more than 30 different commonly used glycol ethers with varying technical properties and toxicity profiles. For example, diethylene glycol ethyl ether acetate (EGEEA) has been identified by the European Union as a reproductive toxin and is not manufactured or used in France. In fact, the use of glycol ethers is controlled or has been eliminated in many European countries. The Stabilwax-MS column has excellent selectivity and inertness for alcohols and glycol ethers found in cleaning solvents with the added advantage of good thermal stability. Figure 8 shows baseline resolution is achieved with a fast, 5-minute, temperature-programmed run to 220 °C. The thermal stability of the Stabilwax-MS column would allow a bakeout ramp to 250 °C to remove any high molecular weight contaminants in the cleaning solvents, which would prolong column lifetime and reduce column maintenance.

Figure 8: Cleaning Solvents Analyzed on a Stabilwax-MS Column



Columns: Stabilwax-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673); **Sample**: 200 ppm custom standard prepared in methanol; **Injection**: 1.0 µL split (split ratio 300:1); Liner: Topaz, Precision, Split Inlet Liner, 4.0 mm x 6.3 x 78.5, for Agilent GCs, w/Quartz Wool, Premium Deactivation, 5-pk. (cat.# 23305), Inj. Temp.: 200 °C; **Oven:** 60 °C to 220 °C at 30 °C/min; **Carrier Gas:** He, constant flow; Flow Rate: 1 mL/min; **Detector**: MS, scan mode; Scan Range: 30-200 amu; Transfer Line Temp: 200 °C; Analyzer Type: Quadrupole; Source Temp.: 200 °C; Quad Temp: 150 °C; **Instrument**: Agilent 7890A GC & 5975C MSD.

Recommended Products

Thermally stable, high polarity

Stabilwax-MS

columns are ideal for flavor, food, fragrance, industrial chemical, and solvent analyses.

Stabilwax-MS Columns

Cat.#	Length	ID	df
10673	30 m	0.25 mm	0.25 µm
10674	30 m	0.32 mm	0.25 µm

Try one today!

Thermolite Plus Septa

- Usable to 350 °C inlet temperature.*
- Ultra-low bleed minimizes background signal.
- Plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Septa have a CenterGuide design to minimize coring. (Not available on 6 mm, 7 mm, 8 mm, 9.5 mm, 10 mm, and Shimadzu plug.)
- 5 mm septa are partially predrilled for improved puncturability.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs.

cat.#	Description
23860	Septa, Thermolite Plus 5 mm ($^3/_{16}$), with CenterGuide and pre-drilled, 50 pk.
23861	Septa, Thermolite Plus 5 mm ($^3/_{16}$), with CenterGuide and pre-drilled, 100 pk.
23862	Septa, Thermolite Plus 9 mm, with CenterGuide 50 pk.
23863	Septa, Thermolite Plus 9 mm, with CenterGuide 100 pk.
23864	Septa, Thermolite Plus 11 mm ($^7/_{16}$), with CenterGuide 50 pk.
23865	Septa, Thermolite Plus 11 mm ($^7/_{16}$), with CenterGuide 100 pk.
23866	Septa, Thermolite Plus 11.5 mm, with CenterGuide 50 pk.
23867	Septa, Thermolite Plus 11.5 mm, with CenterGuide 100 pk.
23868	Septa, Thermolite Plus 12.7 mm ($^1/_2$), with CenterGuide 48 pk.
23870	Septa, Thermolite Plus 17 mm, with CenterGuide 48 pk.
23872	Septa, Thermolite Plus Shimadzu Plug, 50 pk.
23873	Septa, Thermolite Plus Shimadzu Plug, 100 pk.
23874	Septa, Thermolite Plus 6 mm ($^1/_4$), 50 pk.
23875	Septa, Thermolite Plus 7 mm, 50 pk.
23876	Septa, Thermolite Plus 8 mm, 50 pk.
23877	Septa, Thermolite Plus 9.5 mm ($^3/_8$), 50 pk.
23878	Septa, Thermolite Plus 10 mm, 50 pk.

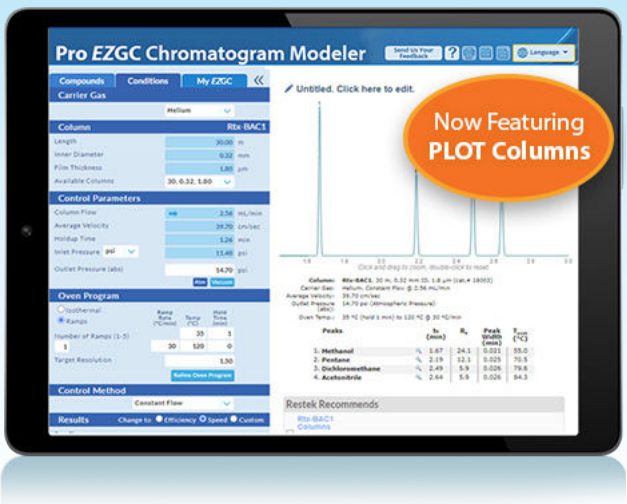
Note: Due to differences in inlet design, the actual septum temperature for a given inlet set point can vary by manufacturer. Restek recommends using only BTO septa in older Thermo TRACE and Focus GCs. For Thermo TRACE 1300/1310 GCs, this recommendation does not apply; septa can be used to their maximum recommended temperature.
*For 17 mm inlets, the maximum temperature for Thermolite Plus septa is 300 °C.

Explore the Added Capabilities of Our Pro *EZ*GC Software Which Now Includes Modeling for PLOT Columns!

Restek's free Pro *EZ*GC Chromatogram modeler makes it easy to simulate your analysis in minutes without stepping foot into the lab. With a range of compounds now available for **PLOT columns**, be sure to check out this convenient tool before beginning your method development or method optimization.

- Free, interactive method development tools from the convenience of your desk.
- Save resources and reduce waste by beginning method development with our virtual modeling.
- Refine method parameters without the hassle of spending hours in the lab.

Explore the Pro EZGC Modeler at
www.restek.com/proezgc



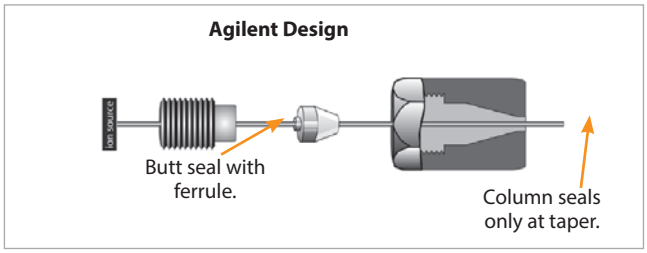
Reduce the Chance of a Leak with Our Redesigned MSD Fittings

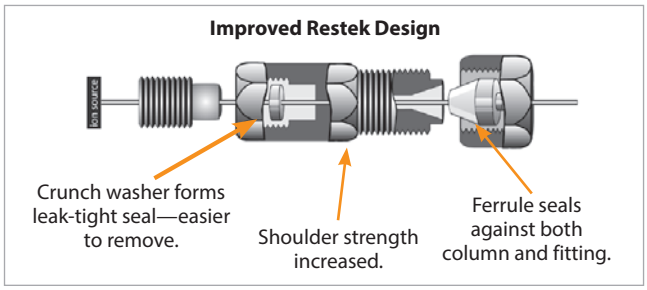
MSD Conversion Fitting

21314

- A flat, soft, aluminum sealing ring deforms and butt seals against the MSD interface.
- A standard Vespel ferrule seals the column and 1/16-inch, stainless-steel nut.
- Fitting is constructed of nickel-plated brass for longevity and softness.
- Use any standard Vespel or Vespel/graphite 1/16-inch ferrule.
- Includes a 1/16-inch, stainless-steel nut and two replacement sealing rings. Order ferrules separately.
- Improved design reduces chance of leaks.

Description	qty.	cat.#
MSD Conversion Fitting	ea.	21314
Replacement Ring Seal for MSD Conversion Fitting	2-pk.	21313





Inland 45 Pump Oil

Recommended for most mass spectrometers.

- Ease at cold start.
- Low vapor pressure 10^{-7} torr.
- Nontoxic and noncorrosive.
- Compatible with buna-N, neoprene, and Viton seals.
- Optimum vacuum pump performance.
- Lowest mass spectrometer background.
- Recommended for optimum mass spec performance.

Description	Similar to Agilent part #	qty.	cat.#
Inland 45 Pump Oil	6040-0834	1 liter	24819

GC-MS Cleaning Kit

Poor sensitivity, loss of sensitivity at high masses, or high multiplier gain during an auto-tune are all indicators that your mass spectrometer source may need to be cleaned. Restek has assembled all of the necessary components for cleaning and polishing your ion source.

Description	qty.	cat.#
Mass Spec Cleaning Kit with Dremel Tool	kit	27194
Mass Spec Cleaning Kit without Dremel Tool	kit	27195
Mass Spec Cleaning Kit Replacement Parts Kit Includes: cloths, micro mesh sheets, small and large gloves	kit	27196

ETP Electron Multipliers
for Mass Spectrometry

- Air stable.
- Two-year shelf-life guarantee.
- Discrete dynode design extends operating life.

Description	qty.	cat.#
Electron Multipliers for Agilent GC-MS and LC-MS		
For Agilent 5973 & 5975 GC-MS (includes mount for initial installation)*†	ea.	23074
For Agilent 5973 & 5975 GC-MS and LC-MSD (Replacement Multiplier)*†	ea.	23075

Other ETP Electron Multipliers are available upon request. Call us or contact your Restek representative if you do not see your instrument listed.

Ion Source Cleaning Powder

Use this aluminum oxide powder to clean surfaces that contact the sample or ion beam when you encounter poor sensitivity and inadequate abundances at high masses.

Description	Similar to Agilent part #	qty.	cat.#
Ion Source Cleaning Powder	8660-0791	1 kg	22685

Recommended Products

Dynamic Duo (Restek Leak Detector and ProFLOW 6000 Flowmeter)

Protect your instrument and improve data quality with this powerful pair from Restek. Checking for leaks and verifying flows before you start running help you avoid costly problems later.

Description	Certification/Compliance	Includes	qty.	cat.#
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)		Restek Electronic Leak Detector (cat.# 28500) & ProFLOW 6000 Flowmeter (cat.# 22656)	kit	22654
Restek Electronic Leak Detector	CE (EU, Korea, Japan, Australia), CSA/UL tested, not listed., WEEE, CEC, China RoHS 2, UKCA	carrying case, universal AC power adaptor [U.S., UK, Europe, Australia, Japan], 6-ft USB charging cable	ea.	28500
Small Probe Adaptor for Leak Detector			ea.	22658
Restek ProFLOW 6000 Electronic Flowmeter with Hard-Sided Carrying Case	CE, Ex, Canadian ICES-003, WEEE, RoHS 2, China RoHS 2, UKCA		ea.	22656
Soft-Sided Storage Case for Restek Leak Detector or ProFLOW 6000 Flowmeter			ea.	22657
Charging Kit		6-ft USB charging cable and universal AC power adaptor [U.S., UK, Europe, Australia, Japan]	kit	28502
6-ft USB charging cable			ea.	28501

Restek's Electronic Leak Detector

Redesigned and better than ever, our new leak detector is an essential tool for troubleshooting and routine maintenance of your gas chromatograph. Don't risk damaging your system or losing sensitivity; check for leaks often, and protect your GC column and instrument with a Restek leak detector!

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 x 10^{-5}, red LED
Hydrogen*, 1.0 x 10^{-5}, red LED
Nitrogen, 1.4 x 10^{-3}, yellow LED
Argon, 1.0 x 10^{-4}, yellow LED
Carbon dioxide, 1.0 x 10^{-4}, yellow LED
Gas detection limits measured in atm cc/sec.

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

*Caution: The Restek electronic leak detector 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.

ProFLOW 6000 Flowmeter

With its wide range of capabilities, the ProFLOW 6000 flowmeter simplifies gas flow measurement in the lab. Real-time measurements can be made for various types of flow paths, including continually changing gas types.

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

Patented

22656

Optional Accessories

22657

Soft-Sided Storage Case
Ideal for storing your leak detector or flowmeter in smaller spaces, such as your toolbox.


22658

Small Probe Adaptor for Restek Electronic Leak Detector
Verify hard-to-reach leaks using the small probe adaptor.

RESTEK
Pure Chromatography

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

www.restek.com

Lit. Cat.# GNSS1818A-UNV