

# Stabilwax®-MS Columns

## Thermally Stable, High Polarity GC Columns

for Flavor, Food, Fragrance,  
Industrial Chemical, and Solvent Analyses

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# NEW! Stabilwax®-MS Columns

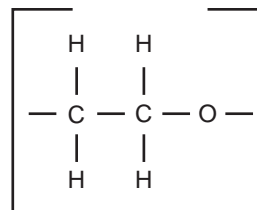
Stabilwax®-MS Features	Your Benefit
High thermal stability polyethylene glycol (PEG) stationary phase	Able to couple to MS detector Temperature range: 40 °C to 260 °C
Lower bleed than VF-WAXms	Lower detection limits
Ultra-clean, Restek-manufactured phase and bonding chemistries	Extraordinary inertness 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.



RESTEK

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.

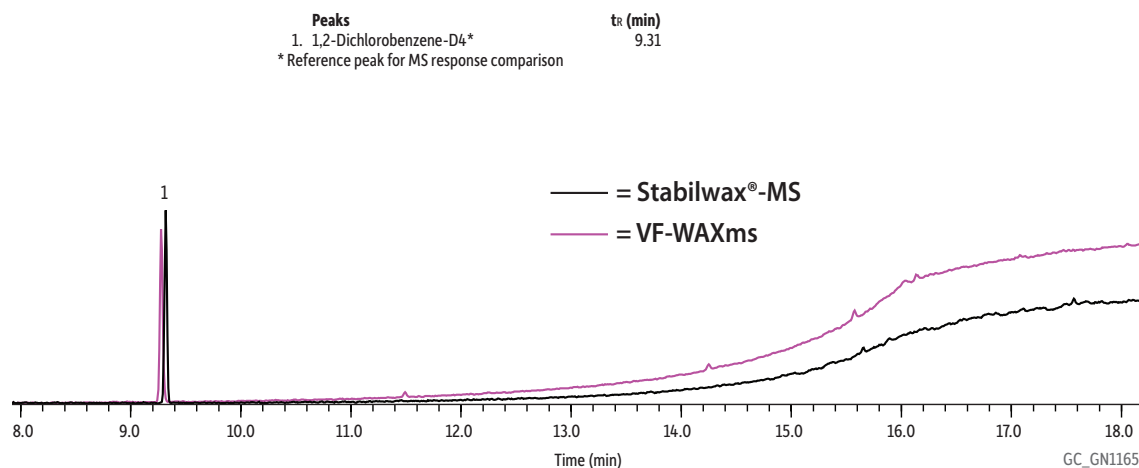
### Stabilwax®-MS Columns: A Wax Phase Suitable for GC-MS

The new 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 new **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; **Sample:** 2 µg/mL 1,2-Dichlorobenzene-d4 in acetonitrile (reference peak 1 for MS response comparison), (cat.# 30049); **Injection:** 1 µL splitless (hold 0.50 min); **Liner:** Sky® 3.5 mm single taper w/wool (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.



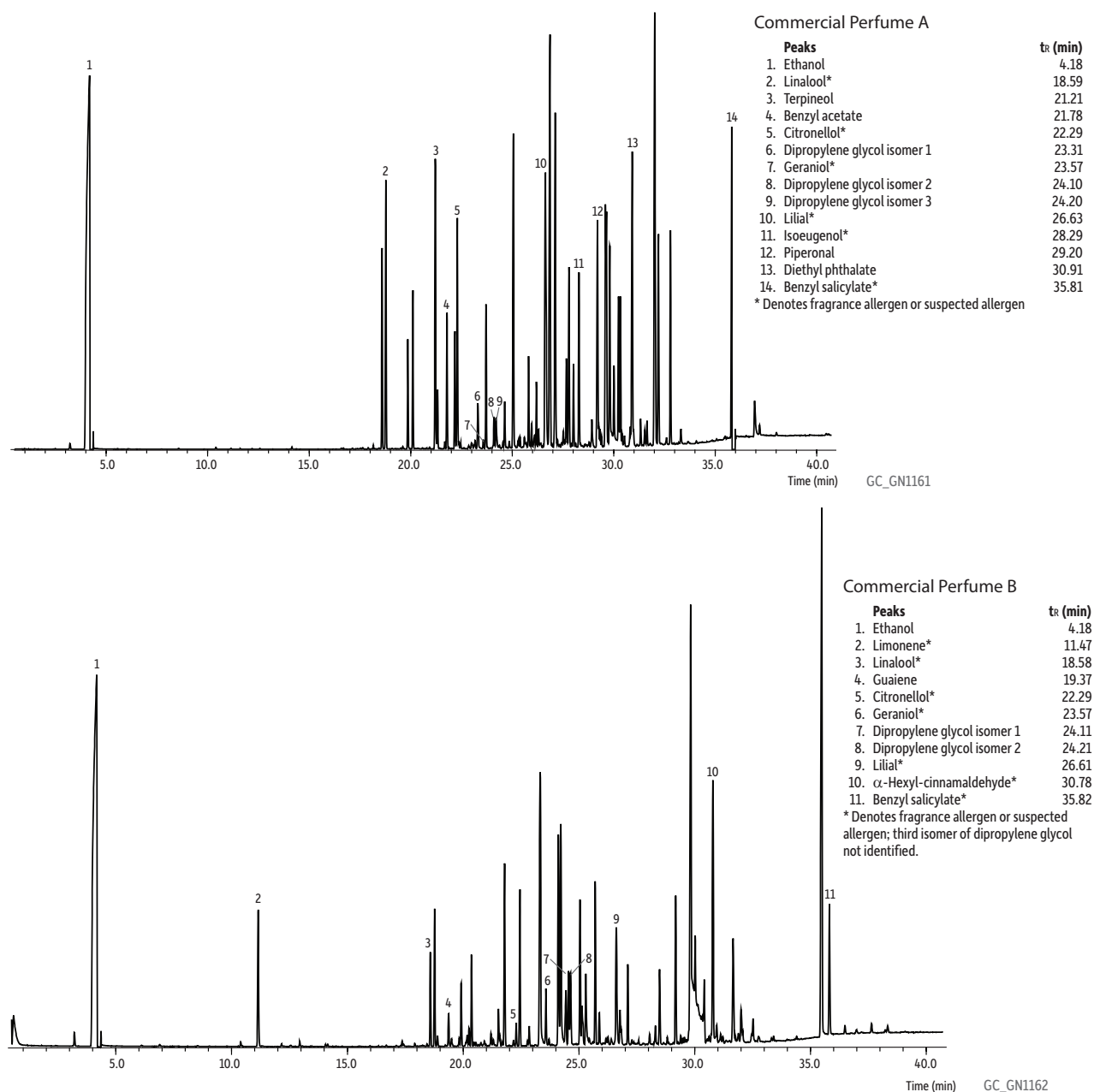
# Fragrance Analysis



## 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.



**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:** Sky® 3.5 mm single taper w/wool (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

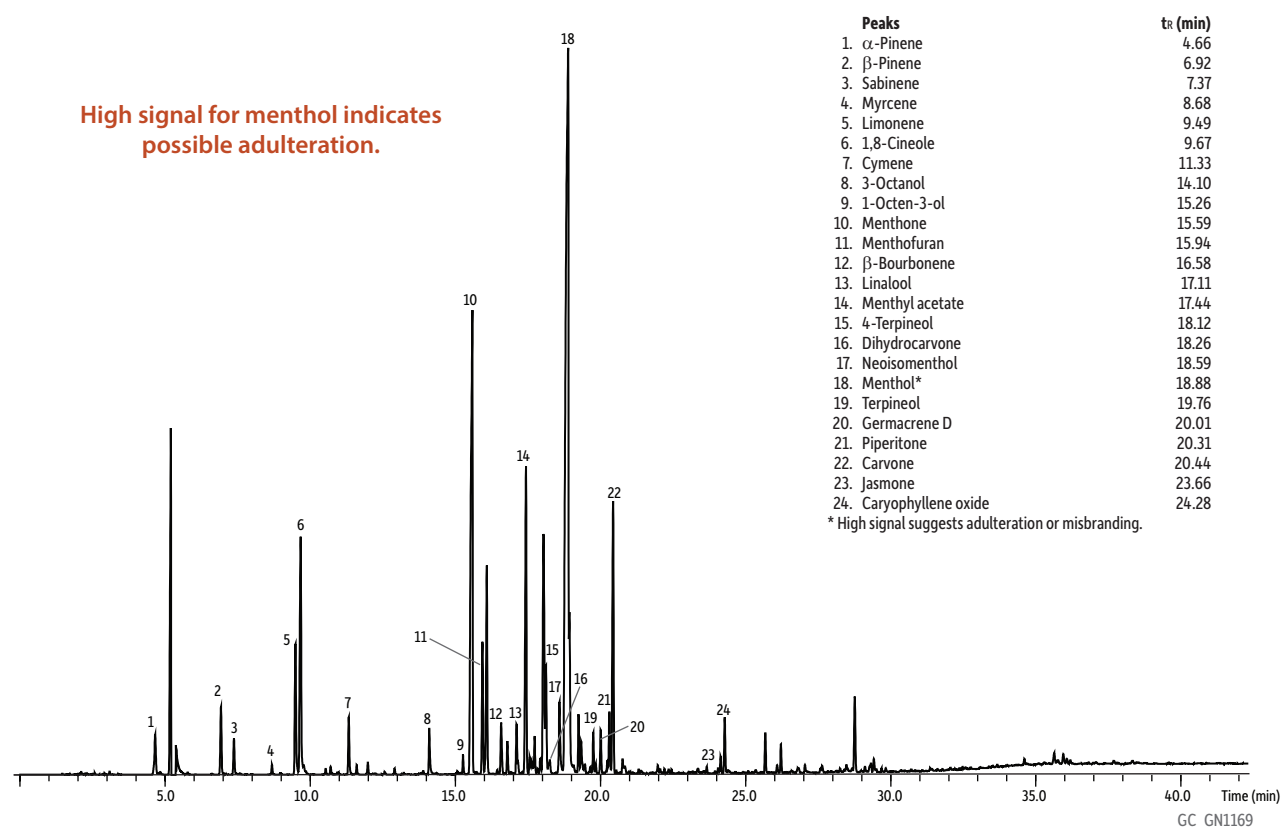
## Spearmint Oil

Flavor and food samples contain numerous aromatic compounds; some naturally present in the raw materials and some forming 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.



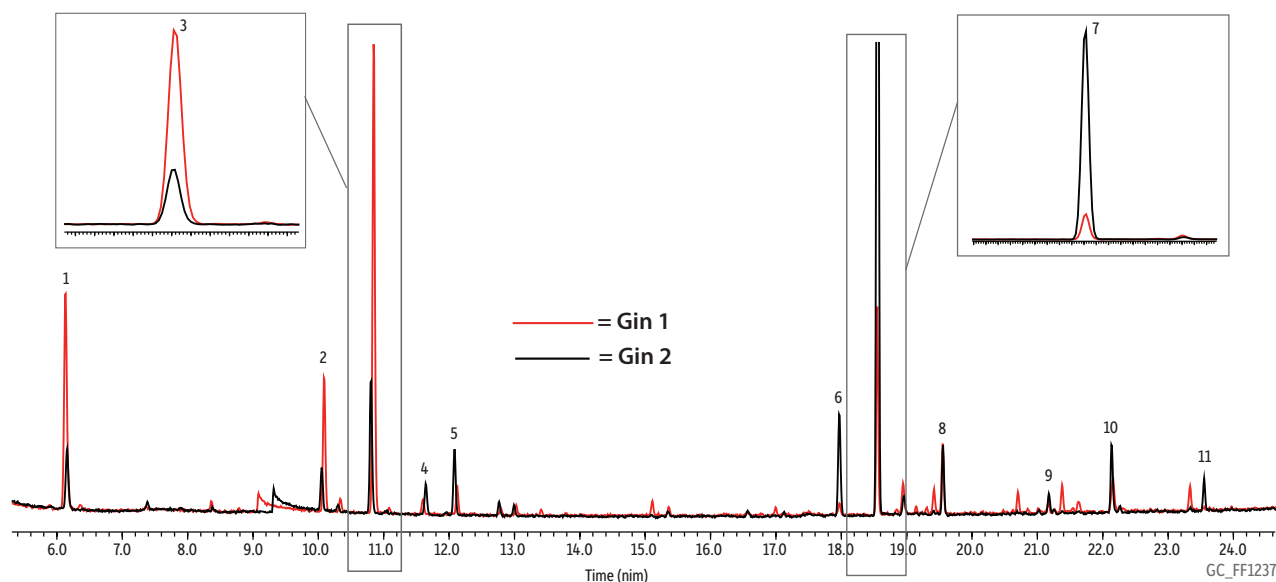
Columns: Stabilwax®-MS, 30 m, 0.25 mm ID, 0.25  $\mu$ m (cat.# 10673); Sample: commercial spearmint oil, neat; Injection: 1  $\mu$ L split (split ratio 150:1); Liner: Sky® 3.5 mm single taper w/wool (cat.# 23322), Inj. Temp.: 250 °C; Oven: 45 °C (hold 5 min) to 250 °C at 7 °C/min (hold 10 min); Carrier 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.

## 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: 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



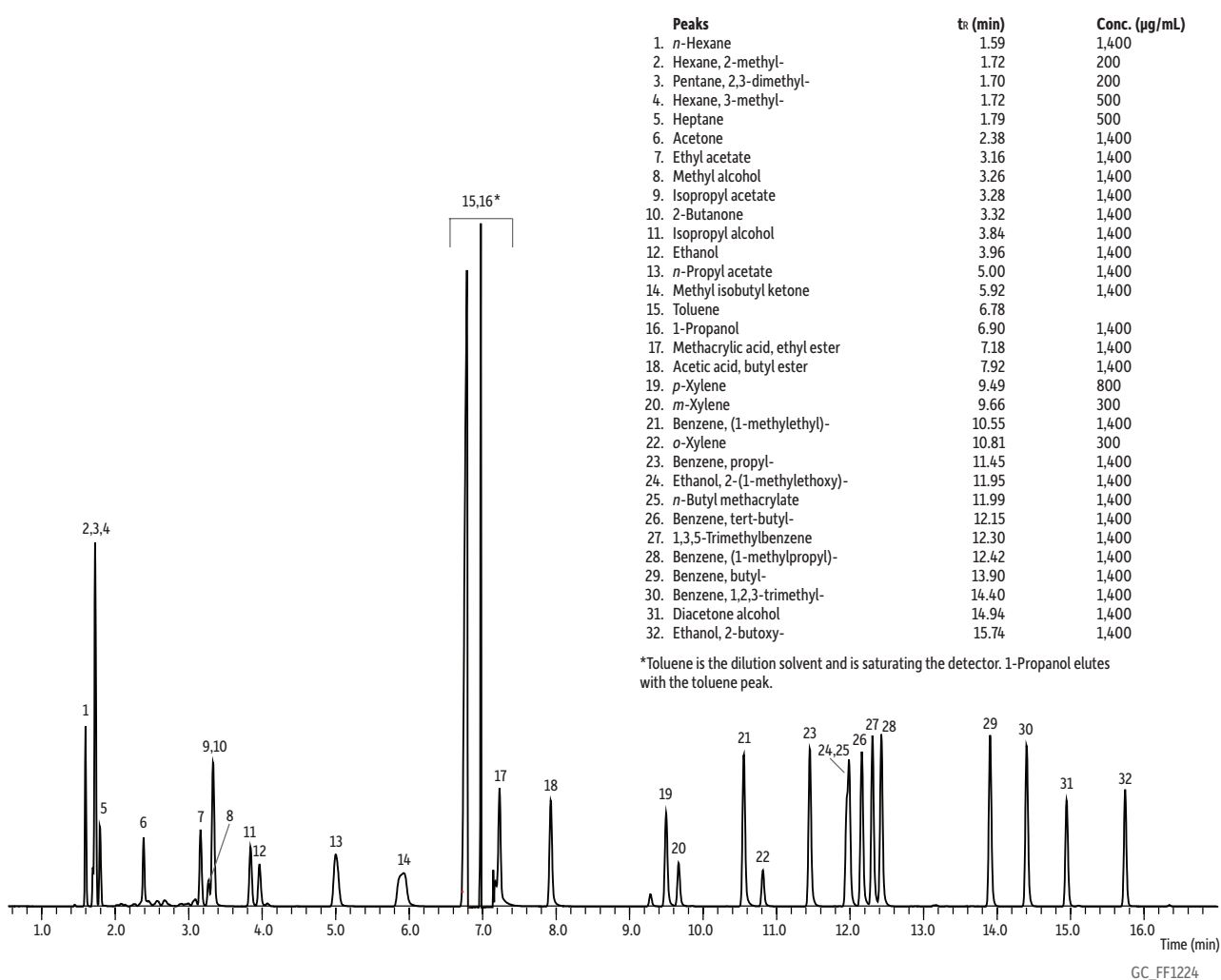
Peaks	tr (min)
1. α-Pinene	6.16
2. Beta-myrcene	10.05
3. D-Limonene	10.81
4. Isoamyl alcohol*	11.64
5. γ-Terpinene	12.08
6. Camphor*	17.97
7. Linalool	18.56
8. 4-Terpineol	19.56
9. α-Terpineol*	21.18
10. Nerol acetate*	22.14
11. Geraniol*	23.55

\* Not found in gin represented by red trace.

# Industrial Chemicals Analysis

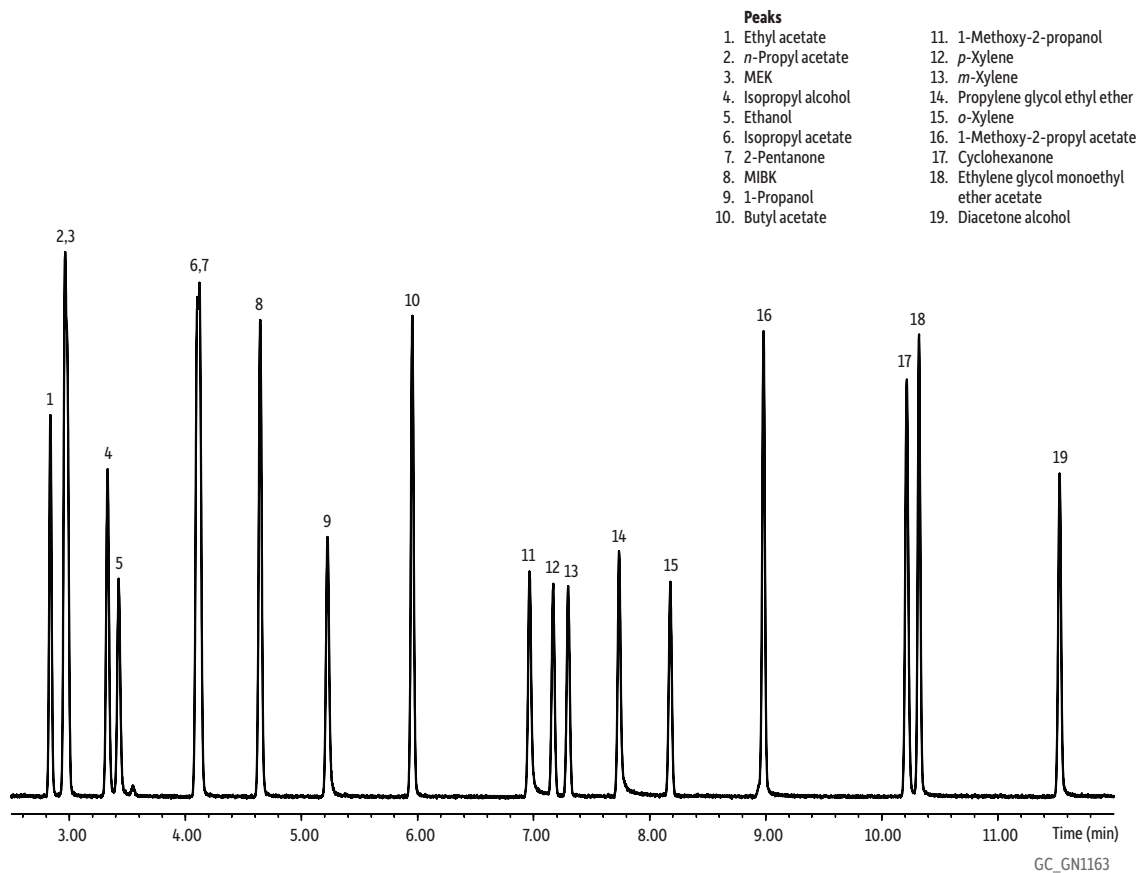
Industrial chemicals and solvents are used in dry cleaning agents, paint thinners, spot removers, perfumes, inks, adhesives, and hundreds of other materials. Many also are used to manufacture polymers, fine chemicals, celluloid cements, and lacquers, such as wood stains and printing applications, as 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.



**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:** Sky® 3.5 mm single taper w/wool (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.

**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:** Sky® 4 mm Precision® liner w/wool (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.



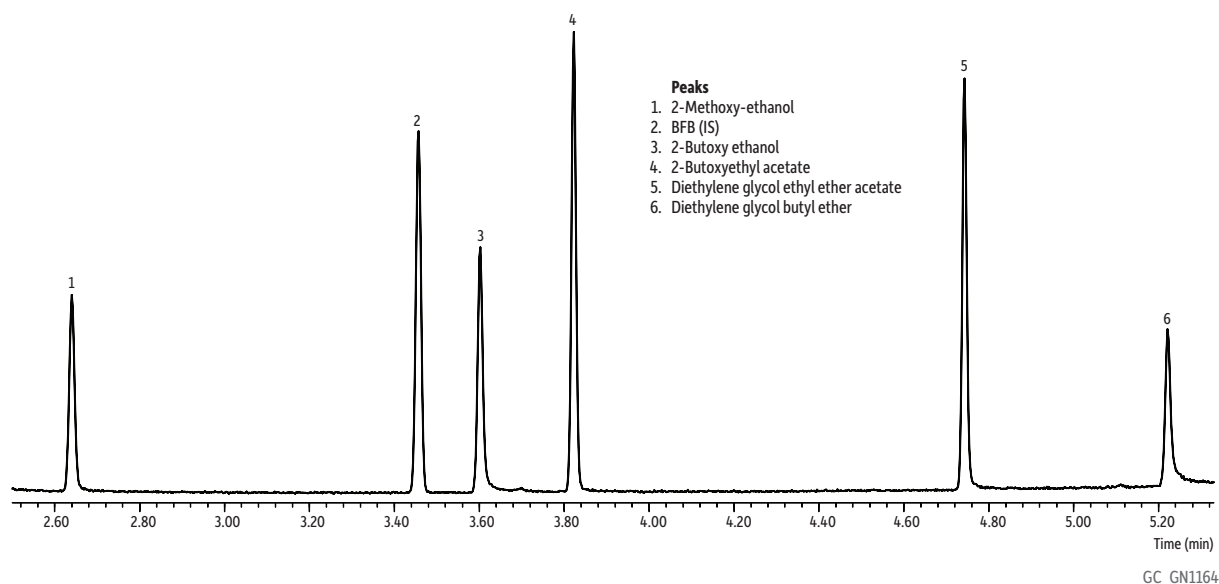


# Cleaning Solvent Analysis



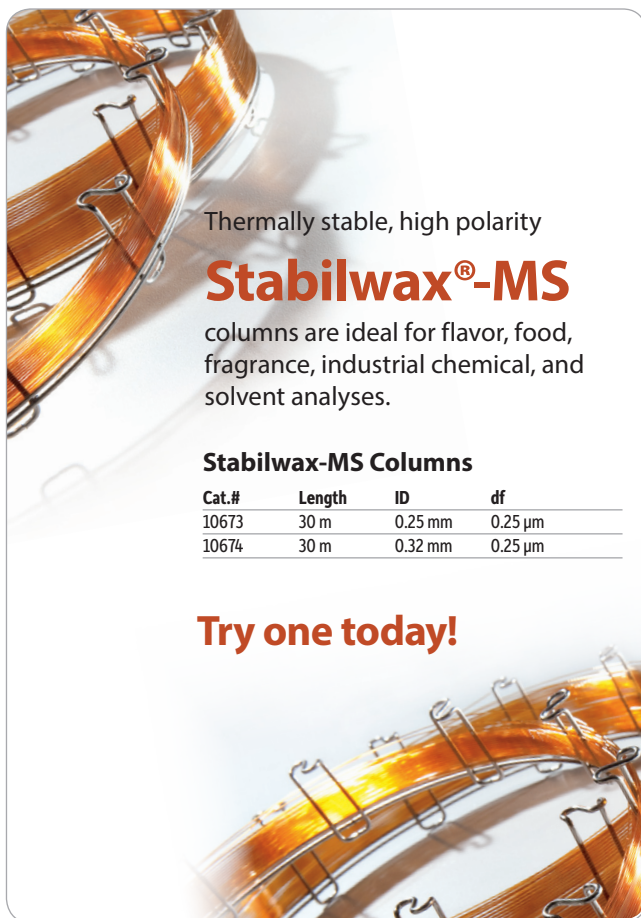
Cleaning solvents are used primarily to dissolve organic material. They clean without leaving residue, making them very useful in products such as glass cleaners. The main criterion for cleaning solvents is water miscibility, as the solvent must form a solution with the other water-soluble components. 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 add 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 bake out 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:** Sky® 4 mm Precision® liner w/ wool (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!**

## Restek Thermolite® Septa

- Usable to 340 °C inlet temperature\*.
- Precision molding assures consistent, accurate fit.
- Excellent puncturability.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs\*\*.
- A Restek exclusive!



Septum Diameter	50-pk.	100-pk.
5 mm (3/16")	27121	27122
6 mm (1/4")	27124	27125
7 mm	27127	27128
8 mm	27130	27131
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
11.5 mm	27145	27146
12.7 mm (1/2")	27148	27149
17 mm	27151	27152
Shimadzu Plug	27154	27155

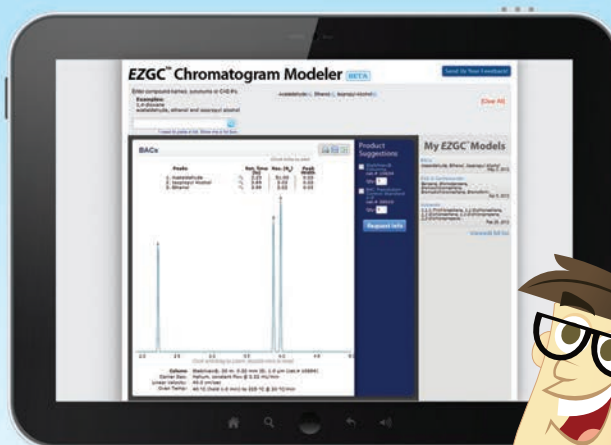
Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

\*For 17 mm inlets, the maximum temperature is 330 °C.

\*\*12.7 mm and 17 mm septa packaged in precleaned glass jars.

## Now Online! Our EZGC™ Web App Will Kick-Start Your GC Method Development

- **EZ to Register** – If you have a Restek login, you're already done! (And if you don't, you can get one at no charge and with no hassle.)
- **EZ to Get Started** – A quick, 5-minute video will show you everything you need to know.
- **EZ to Use** – Just enter your target compounds, and in seconds, the EZGC™ system gives you a customized method, including column, conditions, and model chromatogram.
- **EZ to Analyze** – Model chromatograms are fully interactive. Zoom in, view chemical structures, and even overlay mass spectra.
- **EZ to Save** – Print your chromatogram and custom settings, or save them for future reference.



Start developing incredible GC methods today!

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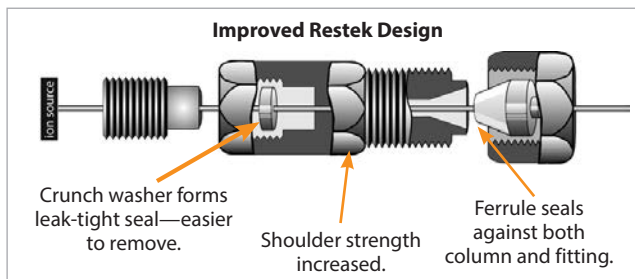
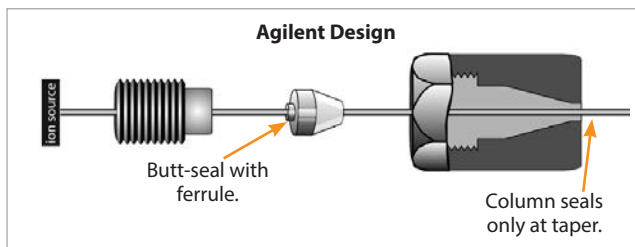
## Reduce the Chance of a Leak With Our Redesigned MSD Fittings

### MSD Conversion Fitting

- 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

### ETP Electron Multipliers

for Mass Spectrometry

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



Description	qty.	cat.#
<b>Electron Multipliers for Agilent GC-MS and LC-MS</b>		
For Agilent 5970 GC-MS	ea.	23072
For Agilent 5971, 5972, GC GC-MS	ea.	23073
For Agilent 5973 & 5975 GC-MS (includes mount for initial installation)*†	ea.	23074
For Agilent 5973 & 5975 GC-MS and LC-MSD (Replacement Multiplier)*†	ea.	23075

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

### 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

### 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 helps you avoid costly problems later.

Description	qty.	cat.#
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
<b>Related Products and Accessories</b>		
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Restek ProFLOW 6000 Electronic Flowmeter With Hard-Sided Carrying Case	ea.	22656
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657



### Restek's New 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!

#### Leak Detector Specifications

Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable lithium ion internal battery pack (12 hours normal operation)
Operating Temp. Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

#### Limits of Detection

These gases can be detected with the Restek electronic leak detector at the following leak rates:

##### Minimum Detectable Gas Limits and Indicating LED Color:

Helium, $1.0 \times 10^{-5}$ , red LED
Hydrogen*, $1.0 \times 10^{-5}$ , red LED
Nitrogen, $1.4 \times 10^{-3}$ , yellow LED
Argon, $1.0 \times 10^{-4}$ , yellow LED
Carbon dioxide, $1.0 \times 10^{-4}$ , yellow LED

Gas detection limits measured in atm cc/sec.



### 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
Certifications:	CE, Ex
Compliance:	WEEE, RoHS

Patented.



## Optional Accessories



22657

#### Soft-Side Carry/Storage Case

Ideal for storing your leak detector or flowmeter in smaller spaces such as a tool box.



22658

#### Small Probe Adaptor for Leak Detector

Verify hard-to-reach leaks using the small probe adaptor.

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**U.S.** • 110 Benner Circle • Bellefonte, PA 16823 • 1-814-353-1300 • 1-800-356-1688 • fax: 1-814-353-1309 • [www.restek.com](http://www.restek.com)

**China** • phone: +86-10-5629-6620 • fax: +86-10-5814-3980 • [cn.restek.com](http://cn.restek.com)

**France** • phone: +33 (0)1 60 78 32 10 • fax: +33 (0)1 60 78 70 90 • [www.restek.fr](http://www.restek.fr)

**Germany** • phone: +49 (0)6172 2797 0 • fax: +49 (0)6172 2797 77 • [www.restekgmbh.de](http://www.restekgmbh.de)

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