RESTEK®

Pure Chromatography

30 YEARS

1985–2015

What do you do for a living?

How do you usually answer that question? While some of our customers are true kindred spirits specializing in LC or GC, we have found that a majority do not consider themselves "chromatographers." In fact, few people in our customer database have provided a job title that even references the technique.

Chemist, analyst, technician, researcher, lab manager, director, buyer, method developer... For whatever it is that you are and do, chromatography is just as likely a means to an end as an area of focus. And either way, it is a technique that needs to work now, needs to work the right way, and needs to generate indisputable results. That is where Restek can help you.

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Restek creates and supports innovative, integrated chromatographic solutions for the global scientific community and makes them work in your lab for your analyses. We are dedicated to understanding your technical, procurement, and troubleshooting problems like no one else, and we apply our chromatographic expertise to solve them. In short, we will help you do your job better, faster, and easier. This catalog is packed with industry-leading products backed by optimized applications, real-world achievement, and an unrivaled Plus 1 experience to do just that.

From sample prep to columns, reference standards to accessories, Restek is your first and best choice for chromatography.

Restek is Pure Chromatography.

As we enter our 30th year, we invite you to turn the page and turn to us, your personal support network of colleagues and experts. Whether your LC or GC is out-of-date or state-of-the-art, we will help keep it performing with the highest accuracy, precision, and speed possible—no matter what your title, skill level, or location.

Your work touches people's lives every day. Eliminate your risk and find peace of mind by putting Restek® Pure Chromatography to work so that you can get back to concentrating on what it is that you do for a living.

Bryan Wolcott
President

RESTEK®
Pure Chromatography

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- Purchase order and/or invoice number.
- Detailed description of the problem.

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important **note**

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  or e-mail **returns@restek.com**

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Important Notes

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- Returns made due to error by the customer placing the order may be charged a 10% restocking fee.
- To qualify for credit in the event of an order error, you must notify Restek within ten (10) days of shipment. Product must also be returned unused and in restockable condition.
- Restek will honor the original warranty of resale electronics; however, if the item is not under warranty, you are responsible for all repair costs.
- Returned columns and consumables will normally be evaluated within seven (7) working days after receipt.
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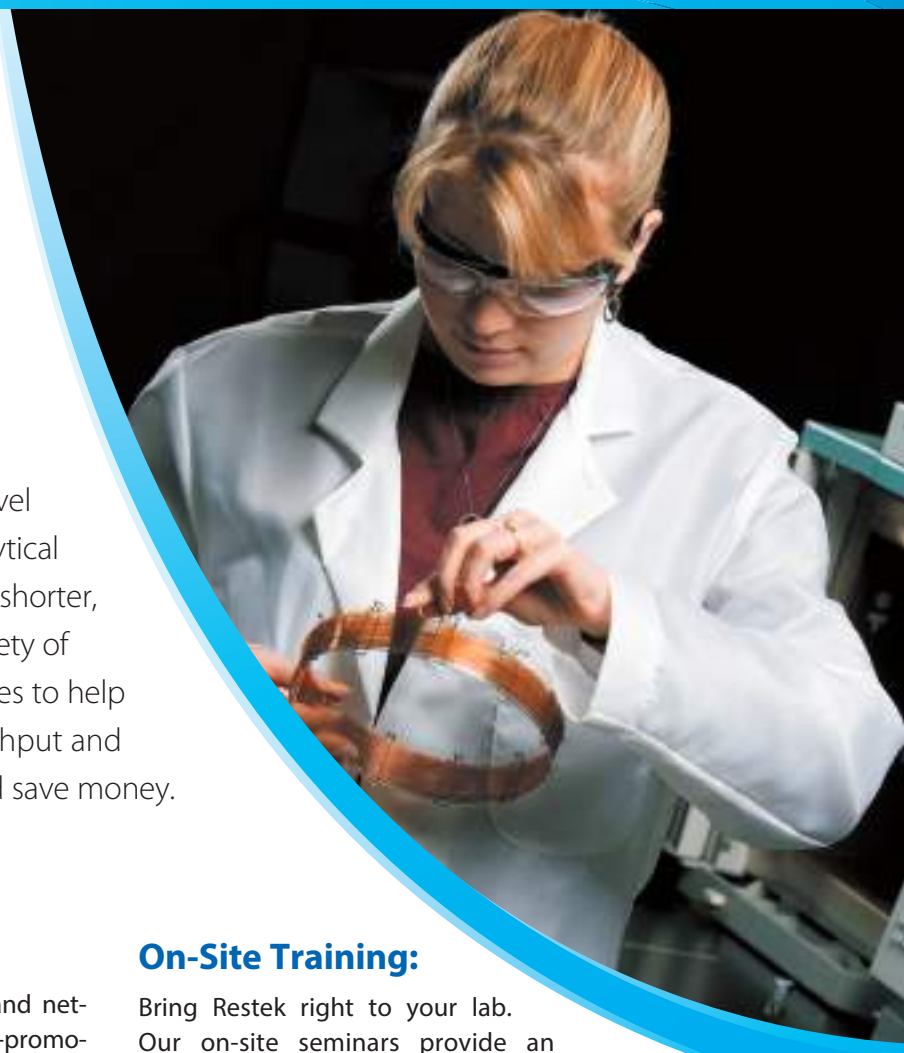

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At Restek, we are dedicated to your success.

Selecting a GC Column

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

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

A measure of **Efficiency**. This term is affected by:	A measure of **Retention**. This term is affected by:	A measure of **Peak Separation**. This term is affected by:
• Length • Inner diameter • Carrier gas type and linear velocity	• Inner diameter • Film thickness • Temperature	• Stationary phase composition • Temperature

N = L/H = Effective theoretical plate number
L = Column length
H = HETP = Height equivalent to a theoretical plate

k = Retention factor
α = Separation factor
Baseline resolution (R = 1.5) is the goal.

Separation Factor (α)

Choosing the right stationary phase is the first step toward optimizing your GC separation. It is the most important decision you will make because separation factor (α) has the greatest impact on resolution, and it is strongly affected by stationary phase polarity and selectivity.

Stationary phase polarity is determined by the type and amount of functional groups in the stationary phase. Structures for Restek stationary phases are presented in order of polarity on page 15. When choosing a column, consider the polarity of both the stationary phase and your target analytes. If the stationary phase and analyte polarities are similar, then the attractive forces are strong and more retention will result. Greater retention often results in increased resolution. Stationary phase polarity strongly influences column selectivity and separation factor, making it a useful consideration when selecting a column.

Stationary phase selectivity is defined by IUPAC as the extent to which other substances interfere with the determination of a given substance. Selectivity is directly related to stationary phase composition and how it interacts with target compounds through intermolecular forces (e.g., hydrogen bonding, dispersion, dipole-dipole interactions, and shape selectivity). As methyl groups in the stationary phase are replaced by different functionalities, such as phenyl or cyanopropyl pendant groups, compounds that are more soluble with those functional groups (e.g., aromatics or polar compounds, respectively) will interact more and be retained longer, often leading to better resolution and increased selectivity. In another example of the effect of stationary phase-analyte interactions, an Rtx®-200 stationary phase is highly selective for analytes containing lone pair electrons, such as halogen, nitrogen, or carbonyl groups, due to interactions with the fluorine pendant group in this phase. Selectivity can be approximated using existing applications or retention indices (Table I), making these useful tools for comparing phases and deciding which is most appropriate for a specific analysis.

Table I: Retention Indices for Restek Phases

Phase	Benzene	Butanol	Pentanone	Nitropropane
Rtx-1	651	651	667	705
Rtx-5/Rtx-5MS	667	667	689	743
Rtx-20	711	704	740	820
Rtx-1301/Rtx-624	689	729	739	816
Rtx-35	746	733	773	867
Rtx-200	738	758	884	980
Rtx-50	778	769	813	921
Rtx-1701	721	778	784	881
Rtx-65TG	794	779	825	938
Rtx-225	847	937	958	958
Stabilwax	963	1,158	998	1,230

Stationary phase polarity and selectivity also affect how much sample loading capacity the column will have for a particular analyte; the more soluble an analyte is in the stationary phase, the greater the sample loading capacity will be for that analyte. For example, a nonpolar stationary phase will have higher sample loading capacity for a nonpolar compound (e.g., pentane) than for a polar compound (e.g., ethanol).

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The relationship between polarity, selectivity, and sample loading capacity can be illustrated using an example. Consider the analysis of benzene and butanol, which have nearly the same boiling point, on an Rtx®-20 column (diphenyl dimethyl polysiloxane stationary phase). Since the benzene molecule is structurally more similar to the diphenyl phase than butanol is, benzene will solvate into the stationary phase more readily than butanol based on the concept that "like dissolves like." Since benzene solvates more readily with the stationary phase, it has more interaction with the stationary phase as it elutes through the column and will be retained longer. Since butanol solvates less with the stationary phase, it has fewer interactions with the stationary phase and less will be retained. Therefore, the elution order of these two compounds on an Rtx®-20 column will be butanol first and benzene second. In addition, since benzene is more soluble in the diphenyl phase, the column has more capacity for benzene. This results in a more symmetrical peak shape for benzene than for butanol. A more polar column, such as a polyethylene glycol (PEG) column, will provide retention and better peak shape for butanol compared to benzene.

Due to their influence on separation factor, polarity and selectivity are primary considerations when selecting a column. However, temperature limits must also be considered. In general, highly polar stationary phases have lower maximum operating temperatures, so choosing a column with the appropriate maximum operating temperature, as well as optimal polarity and selectivity for the type of compounds being analyzed, is crucial.

Retention Factor (k)

The retention factor (k) of a column is based on the time an analyte spends in the stationary phase relative to the time it spends in the carrier gas. It is influenced primarily by column inner diameter (ID), phase film thickness, and temperature. Retention factor is sometimes referred to as capacity factor, which should not be confused with sample loading capacity. As a general rule, the thicker the film and the smaller the inner diameter, the more an analyte will be retained. Note that as temperature increases, k decreases; therefore, at higher temperatures analytes stay in the carrier gas longer and are less retained.

Chromatogram Search Tool

Search by **compound name**, **synonym**, **CAS #**, or **keyword**

www.restek.com/**chromatograms**

When selecting column ID, consider the type of injection, the detector being used, and the concentration of sample (amount on-column). The injection technique is important because the column ID may need to be selected based on whether a split, splitless, direct, cool on-column injection, or other sample transfer method is being used. For example, 0.53 mm ID columns are ideal for cool on-column injections since the syringe needle (26 gauge) will fit into the large column ID. In addition to column ID, the detector and its flow requirements must be considered. For example, some MS detectors can only operate under column flow rates of up to 1.5 mL/min; therefore, a 0.53 mm ID column, which requires higher flows for proper chromatography, is not an option for MS work. Table II shows typical column characteristics for columns of various inner diameters.

Table II: General Column Characteristics Based on ID

	Column Inner Diameter (mm)					
Characteristic	**0.10**	**0.15**	**0.18**	**0.25**	**0.32**	**0.53**
Nitrogen flow (mL/min)	0.2	0.3	0.3	0.4	0.6	0.9
Helium flow (mL/min)	0.6	0.8	1.0	1.4	1.8	3.0
Hydrogen flow (mL/min)	0.7	1.1	1.3	1.8	2.3	3.7
Sample loading capacity (ng)	2.5	10	20	50	125	500
Theoretical plates/meter	11,000	7,000	6,000	4,000	3,000	2,000

Note: Flows listed are for maximum efficiency. Sample loading capacities are estimates only. Actual sample loading capacity varies with film thickness and analyte.

Film thickness has a direct effect on the retention and elution temperature for each sample component. Extremely volatile compounds should be analyzed on thick film columns to increase the time the compounds spend in the stationary phase, which allows them to better separate. High molecular weight compounds must be analyzed on thinner film columns. This reduces the length of time that the analytes stay in the column and minimizes phase bleed at higher elution temperatures. Film thickness also affects the amount of material that can be injected onto the column without overloading it. A thicker film column can be used for higher concentration samples.

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

Technical Service

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
e-mail: support@restek.com

Hours of operation (Eastern Time):
Monday - Thursday, 8:00 a.m. to 6:00 p.m.
Friday, 8:00 a.m. to 5:00 p.m.

Outside the U.S.

Contact International Technical Service at intltechsupp@restek.com or find a local distributor at **www.restek.com/distributor**

Film thickness also directly affects phase ratio (β), which must be accounted for when changing to a column with a different inner diameter. When inner diameter increases, film thickness (d_f) must also increase in order to provide comparable resolution and retention. Table III shows β values for common column dimensions; similar values indicate similar separations on different ID columns.

Checking for leaks, using a Restek® electronic leak detector, is an easy way to protect your instrument and column from damage.

Table III: Phase Ratio (β) Values for Common Column Dimensions*

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

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

Efficiency (N)

Column efficiency (N) is the column length divided by the height equivalent of a theoretical plate (HETP). The effective number of theoretical plates is affected by how well the phase has been coated onto the column walls, and it is measured by how narrow the peaks are when they elute out of the column. Higher column efficiency (N) results in greater resolution between peaks. Inner diameter also influences efficiency; a simple rule of thumb is the smaller the column ID, the more efficient the column.

Capillary columns are made in various lengths, typically 10, 15, 30, 60, and 105 meters. Longer columns provide more resolving power, but will also increase analysis time and cost more. When column length is doubled, analysis time will increase by as much as a factor of two. However, doubling the column length increases resolution by only approximately 40% since the column length term is under the square root function in the resolution equation. When selecting column length, the increase in resolution obtained in a longer column must be weighed against the increase in cost and analysis time.

Conclusion

A basic understanding of the resolution equation allows analysts to make more effective column choices. Phase choice should be influenced primarily by separation factor, which can be approximated by considering the structures of both the phase and the analyte, as well as by referencing retention indices or existing applications. Retention factor and efficiency also affect peak separations and should be considered when choosing column inner diameter, film thickness, and length. By better understanding these factors, analysts can simplify the column selection process, optimize separations, and increase lab productivity.

What Do the Temperature Limits Mean?

All Restek columns have published minimum and maximum operating temperatures that establish the working range for the stationary phase. Note that these ranges vary with the thickness of the coating.

Rxi®-5Sil MS Columns (fused silica)

ID	d_f (µm)	temp. limits
0.25 mm	0.25	-60 to 320/350 °C
0.32 mm	0.50	-60 to 320/350 °C
0.53 mm	1.50	-60 to 320/330 °C

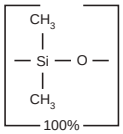
The second temperature is the **maximum temperature-programmed operating temperature**, the temperature to which the column can be heated for short periods of time (i.e., during a temperature-programmed analysis). If only one temperature is listed, it is both the isothermal and the maximum temperature.

The **minimum operating temperature** defines the lowest usable temperature before the stationary phase solidifies. Operating the column below the minimum temperature will not harm the phase, but poor peak shape and other chromatography problems may occur.

Many phases list two maximum operating temperatures. The first temperature is the **maximum isothermal operating temperature**. This is the temperature to which the columns are guaranteed to meet the minimum bleed specification (i.e., lowest bleed level).

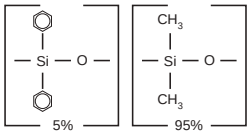
Structures, Polarities, Properties, and Uses for Restek® Capillary Column Phases, in Order of Increasing Polarity

Rxi®-1ms, Rxi®-1HT, Rtx®-1
Dimethyl polysiloxane



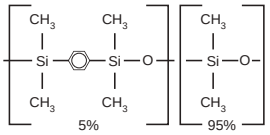
Similar to: (100%-methyl)-polysiloxane
Polarity: nonpolar
Uses: solvents, petroleum products, pharmaceutical samples, waxes
[G1] [G2] [G38]

Rxi®-5ms, Rxi®-5HT, Rtx®-5, Rtx®-5MS
Diphenyl dimethyl polysiloxane



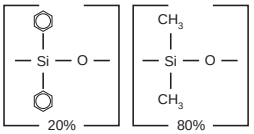
Similar to: (5%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: flavors, environmental, aromatic hydrocarbons
[G27] [G36]

Rxi®-5Sil MS
1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane



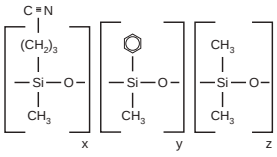
Similar to: (5%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

Rtx®-20
Diphenyl dimethyl polysiloxane



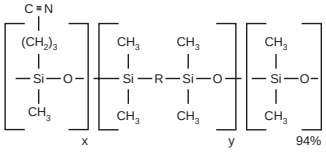
Similar to: (20%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: volatile compounds, alcohols
[G28] [G32]

Rtx®-1301, Rtx®-624, Rtx®-G43
Cyanopropylmethyl phenylmethyl polysiloxane



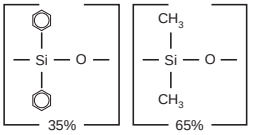
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides
[G43]

Rxi®-624Sil MS



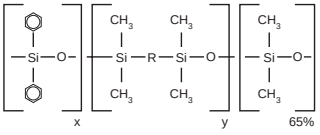
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products

Rtx®-35
Diphenyl dimethyl polysiloxane



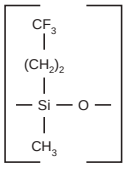
Similar to: (35%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides
[G42]

Rxi®-35Sil MS



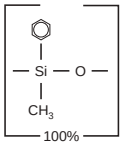
Similar to: (35%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides

Rtx®-200
Trifluoropropylmethyl polysiloxane



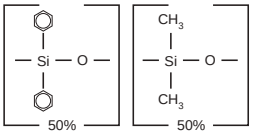
Similar to: (trifluoropropyl)-methylpolysiloxane
Polarity: selective for lone pair electrons
Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols
[G6]

Rtx®-50
Phenyl methyl polysiloxane



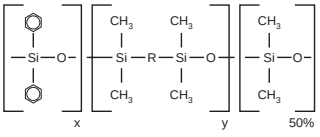
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: FAMEs, carbohydrates
[G3]

Rxi®-17
Diphenyl dimethyl polysiloxane



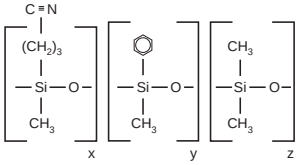
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols
[G3]

Rxi®-17Sil MS



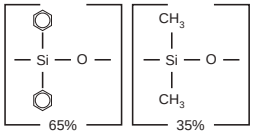
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols
[G3]

Rtx®-1701
Cyanopropylmethyl phenylmethyl polysiloxane



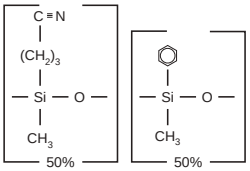
Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, alcohols, oxygenates
[G46]

Rtx®-65, Rtx®-65TG
Diphenyl dimethyl polysiloxane



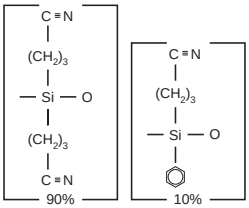
Similar to: (65%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, rosin acids, free fatty acids
[G17]

Rtx®-225
Cyanopropylmethyl phenylmethyl polysiloxane



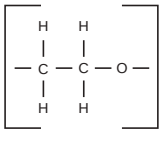
Similar to: (50%-cyanopropylmethyl)-methylphenylpolysiloxane
Polarity: polar
Uses: FAMEs, carbohydrates
[G7] [G19]

Rtx®-2330
Biscyanopropyl cyanopropylphenyl polysiloxane



Similar to: (95%-cyanopropyl)-phenyl polysiloxane
Polarity: polar
Uses: *cis/trans* FAMEs, dioxin isomers, rosin acids
[G8] [G48]

Stabilwax®, Rtx®-Wax, Stabilwax®-MS
Polyethylene glycol



Polarity: polar
Uses: FAMEs, flavors, acids, amines, solvents, xylene isomers
[G14] [G15] [G16] [G20] [G39]

note

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

Columns by Phase

Restek	Phase Description	USP Nomenclature*	Agilent	SGE	Phenomenex	Macherey-Nagel	Supelco	Alltech	Quadrex
Rtx-1 (p. 41) MXT-1 (p. 107)	dimethyl polysiloxane	G1, G2, G38	HP-1, DB-1, CP-Sil 5 CB	BP1	ZB-1	OPTIMA 1	SPB-1	AT-1, EC-1	007-1
Rxi-1HT (p. 39)	dimethyl polysiloxane		DB-1ht		ZB-1HTinferno			AT-1ht	
Rxi-1ms (p. 29)	dimethyl polysiloxane (low bleed)	G1, G2, G38	HP-1ms, HP-1msUI, DB-1ms, DB-1msUI, VF-1ms, Ultra 1	BP1	ZB-1, ZB-1ms	OPTIMA 1 MS, OPTIMA 1 MS Accent	SPB-1, Equity-1	AT-1ms	007-1
Rtx-5MS (p. 44) Rtx-5 (p. 42-43, 96) MXT-5 (p. 108)	diphenyl dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP-Sil 8 CB	BP5	ZB-5	OPTIMA 5	SPB-5	EC-5, AT-5	007-5
Rxi-5HT (p. 39)	diphenyl dimethyl polysiloxane		DB-5ht, VF-5ht	HT5	ZB-5HTinferno	OPTIMA 5HT			
Rxi-5ms (p. 30)	diphenyl dimethyl polysiloxane (low bleed)	G27, G36	HP-5msSV, HP-5ms, HP-5msUI, DB-5, Ultra-2, CP-Sil 8 CB	BP5ms	ZB-5, ZB-5msi	OPTIMA 5, OPTIMA 5 MS	SPB-5, Equity-5	AT-5ms	007-5
Rxi-5Sil MS (p. 32, 67, 75, 77, 85)	1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane		DB-5ms, DB-5msUI, VF-5ms	BPX5	ZB-5ms, ZB- SemiVolatiles	OPTIMA 5MS Accent	SLB-5ms		007-5MS
Rxi-XLB (p. 31, 71)	proprietary phase		DB-XLB, VF-Xms		MR1, ZB-XLB	OPTIMA XLB			
Rtx-20 (p. 45)	diphenyl dimethyl polysiloxane	G28, G32					SPB-20	EC-20, AT-20	007-20
Rtx-35 (p. 46)	diphenyl dimethyl polysiloxane	G42	HP-35, DB-35	BPX35, BPX608	ZB-35		SPB-35, SPB-608	AT-35, AT-35ms	007-35
Rxi-35Sil MS (p. 34, 82)	proprietary phase		DB-35ms, DB35msUI, VF-35ms	BPX35	MR2	OPTIMA 35 MS			
Rtx-50 (p. 47) MXT-50 (p. 109)	phenyl methyl polysiloxane	G3	HP-50+, CP-Sil 24 CB				SPB-50	AT-50	007-17
Rxi-17 (p. 35)	diphenyl dimethyl polysiloxane	G3	HP-17, DB-17, DB-17ht, DB-608		ZB-50	OPTIMA 17	SPB-17		
Rxi-17Sil MS (p. 36, 76)	proprietary phase	G3	DB-17ms, VF-17ms	BPX50		OPTIMA 17 MS			
Rtx-65 (p. 47)	diphenyl dimethyl polysiloxane								007-65HT
Rxi-624Sil MS (p. 38, 81, 87, 94)	proprietary phase	G43	DB-624, VF-624ms, CP-Select 624 CB	BP624		OPTIMA 624 LB			
Rtx-1301 (p. 51) Rtx-624 (p. 52) MXT-1301 (p. 109)	cyanopropylmethyl phenylmethyl polysiloxane	G43	DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301	BP624	ZB-624	OPTIMA 1301, OPTIMA 624	SPB-624	AT-624, AT-1301	007-1301, 007-624
Rtx-1701 (p. 53) MXT-1701 (p. 109)	cyanopropylmethyl phenylmethyl polysiloxane	G46	DB-1701P, DB-1701, CP-Sil 19 CB, VF-1701ms, VF-1701 Pesticides	BP10	ZB-1701, ZB-1701P	OPTIMA 1701	Equity-1701	AT-1701	007-1701
Rtx-200 (p. 48) MXT-200 (p. 110)	trifluoropropylmethyl polysiloxane	G6	DB-210, DB-200, VF-200ms			OPTIMA 210		AT-210	
Rtx-200MS (p. 48–49)	trifluoropropylmethyl polysiloxane (low bleed)	G6	VF-200ms						
Rtx-225 (p. 54)	cyanopropylmethyl phenylmethyl polysiloxane	G7, G19	DB-225ms, CP-Sil 43 CB	BP225		OPTIMA 225	SPB-225	AT-225	007-225
Rtx-440 (p. 50)	proprietary phase		**Restek innovation**						
Rtx-2330 (p. 55)	biscyanopropyl cyanopropylphenyl polysiloxane	G8, G48	VF-23ms	BPX70			SP-2330, SP-2331, SP-2380	AT-Silar90	007-23
Rt-2560 (p. 56, 83)	bicyanopropyl polysiloxane		HP-88, CP-Sil 88				SP-2560		
Rtx-Wax (p. 57)	polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax, CP-Wax 52 CB	BP20	ZB-Wax	OPTIMA WAX		AT-WAXms, EC-WAX	007-CW
Stabilwax (p. 58, 95) Stabilwax-MS (p. 59) MXT-WAX (p. 110)	polyethylene glycol	G14, G15, G16, G20, G39	HP-INNOWax, CP-Wax 52 CB, VF-WAX MS		ZB-WAXplus	OPTIMA WAXplus	Supelcowax-10	AT-WAX	

See page 117 for Restek PLOT Column Phase Cross-Reference chart.

*See page 147 for our USP Liquid Phase and Solid Support Cross-Reference.

Application-Specific Columns by Industry

Restek	Applications	Agilent	Supelco	Macherey-Nagel	SGE	Alltech	Phenomenex
Chiral Columns							
Rt-βDEXm, Rt-βDEXsm, Rt-βDEXse, Rt-βDEXsp, Rt-βDEXsa, Rt-βDEXcst, Rt-γDEXsa (p. 103)	Chiral compounds						
Clinical, Forensic, & Toxicology							
Rtx-BAC Plus 1 (p. 65)	Blood alcohol testing	DB-ALC1					ZB-BAC1
Rtx-BAC Plus 2 (p. 65)		DB-ALC2					ZB-BAC2
Environmental							
Rxi-5Sil MS (p. 67, 75, 77)	Semivolatiles - EPA Methods 8270, 625, 525	DB-5ms, DB-5msUI, VF-5ms	SLB-5ms	OPTIMA 5MS Accent	BPX5		ZB-5ms, ZB-SemiVolatiles
Rtx-VMS (p. 78)	Volatiles - EPA Methods 8260, 624, 524	Restek innovation					
Rxi-624Sil MS (p. 81)	Volatiles - EPA Method 624	DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		
Rtx-502.2 (p. 80)	Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602	DB-502.2	VOCOL			AT-502.2	
Rtx-Volatiles (p. 80)			VOCOL				
Rtx-VRX (p. 79)		DB-VRX					
Rtx-CLPesticides (p. 72)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	DB-CLP1					ZB-CLP1
Rtx-CLPesticides2 (p. 72)		DB-CLP2					ZB-CLP2
Rtx-1614 (p. 66)	Brominated flame retardants	Restek innovation					
Rtx-PCB (p. 70)	Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners	Restek innovation					
Rxi-XLB (p. 71)		DB-XLB, VF-XMS					MR1, ZB-XLB
Rtx-OPPesticides (p. 74)	Organophosphorus pesticides - EPA Method 8141	Restek innovation					
Rtx-OPPesticides2 (p. 74)		Restek innovation					
Rtx-Dioxin2 (p. 68)	Dioxin & Furans - EPA Methods	Restek innovation					
Rtx-Mineral Oil (p. 69)	DIN EN ISO 9377-2	Select Mineral Oil					
Rxi-17Sil MS (p. 76)	Polycyclic aromatic hydrocarbons	DB-17ms, VF-17ms		OPTIMA 17 MS	BPX50		
Foods, Flavors, & Fragrances							
Rt-2560 (p. 83)	*cis*/*trans* FAMEs	HP-88	SPB-2560				
FAMEWAX (p. 83)	Marine oils	Select FAME	Omegawax			AT-AquaWax, AT-FAME	
Rxi-PAH (p. 84)	PAHs	Restek innovation					
Rtx-65 TG (p. 89)	Triglycerides	Restek innovation					
Petroleum & Petrochemical							
Rt-Alumina BOND/CFC (p. 123)	Chlorinated fluorocarbons (CFCs)						
Rtx-DHA (p. 92)	Detailed hydrocarbon analysis	HP-PONA, DB-Petro, CP-Sil PONA CB	Petrocol DH		BP1PONA		
Rtx-2887 (p. 93) MXT-2887 (p. 113)	Hydrocarbons - ASTM 2887	DB-2887	Petrocol 2887, Petrocol EX2887			AT-2887	
D3606 (p. 138)	Ethanol - ASTM 3606	Restek innovation					
Rt-TCEP (p. 90)		CP-TCEP	TCEP				
MXT-1HT SimDist (p. 114)	Simulated distillation	DB-HT-SimDis, CP-SimDist, CP-SimDst Ultimetal			BPX1	AT-3710	ZB-1XT SimDist
MXT-500 SimDist (p. 115)		Restek innovation					
Rtx-Biodiesel TG (p. 91) MXT-Biodiesel TG (p. 113)	Triglycerides in biodiesel	Biodiesel, Select Biodiesel		OPTIMA Biodiesel			ZB-Bioethanol
Pharmaceutical							
Rtx-G27 w/IntegraGuard (p. 97)	Organic volatile impurities (OVI) - USP 467						
Rtx-G43 w/IntegraGuard (p. 97)			OVI-G43				
Rxi-624Sil MS (p. 94)		DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		
Rtx-5 (G27) (p. 96)		HP-5, DB-5, CP-Sil 8 CB	SPB-5	OPTIMA 5	BP5	EC-5, AT-5	ZB-5
Stabilwax (G16) (p. 95)		HP-INNOWax, CP-Wax 52 CB, VF-WAX MS	Supelcowax-10	OPTIMA WAXplus		AT-WAX	ZB-WAXplus
Specially deactivated phases							
Rtx-Volatile Amine (p. 99)	Volatile amines	CP-Volamine					
Rtx-5Amine (p. 100)	Amines			OPTIMA 5 Amine			
Rtx-35Amine (p. 101)		Restek innovation					
Stabilwax-DB (p. 102)		CAM, CP-WAX 51 for Amines	Carbowax Amine	FS-CW 20 M-AM		AT-CAM	
Stabilwax-DA (p. 98)	Free fatty acids	HP-FFAP, DB-FFAP, CP-WAX 58 FFAP CB	NUKOL	PERMABOND FFAP, OPTIMA FFAP, OPTIMA FFAP Plus	BP-21	AT-AquaWax DA, AT-1000	ZB-FFAP

did you know?

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

please note

Having trouble making a leak-free connection? Try our "built in" Integra-Guard® columns!

See page 23 for details.

Guard Columns and Retention Gaps

Guard columns and retention gaps are widely used in gas chromatography. The concept of the guard column is to trap nonvolatile material at the head of the column, not allowing the material to reach the analytical column. The concept of the retention gap is to help focus the compounds transferred from the inlet to a small band at the head of the analytical column in order to reduce chromatographic peak broadening. Both concepts (trapping nonvolatile material and refocusing the target analytes) may take place when a piece of deactivated tubing is connected to an analytical column as in Figure 1.

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

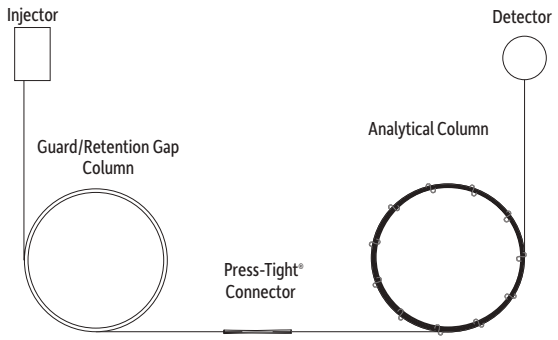


Figure 2: Retention gaps are used to focus components in a tight band at the beginning of the analytical column.

a) Sample introduction: a liquid film of solvent and sample is deposited in the first length of capillary.

b) As oven temperature increases, the solvent evaporates and the target compounds elute unretained through the retention gap until they contact the analytical column.

c) When target compounds come in contact with the stationary phase, they are refocused on the analytical column, resulting in a narrow initial band width.

Analyte Focusing

There are two injection techniques where the retention gap is used to help focus target analytes at the beginning of the analytical column: cool on-column injection and splitless injection.

For cool on-column injection, the purpose of a retention gap is to help focus the sample components when introducing a liquid sample directly into the retention gap. The cool on-column injection is performed by inserting the syringe needle into the retention gap (this can be accomplished with a 0.53 mm ID retention gap and a 26s gauge syringe) and transferring the liquid sample directly into the retention gap. The injection is made with the injector and column oven set below the boiling point of the solvent. As the solvent is evaporated, the volatile target analytes migrate in the solvent towards the analytical column, and the heavier analytes will be distributed over the retention gap. As the oven temperature increases, the target analytes vaporize and move unretained down the retention gap column until the compounds reach the liquid stationary phase of the analytical column. At this juncture, the target analytes are trapped/focused by the liquid phase forming a narrow injection band.

The retention gap may also be useful in hot vaporization injections when the transfer of the compounds from the inlet to the column does not form a focused band. Typical applications include water injections or injections using small ID columns, where split or tailing peaks would indicate an unfocused band. In these applications, the target analytes are trapped in a nonuniform or longitudinally diffuse band at the head of the retention gap (Figure 2a). As the oven temperature is increased, the solvent and target compounds are vaporized and move unretained through the retention gap (Figure 2b). When the target compounds come in contact with the stationary phase, they are refocused in a narrow band (Figure 2c), improving the chromatography.

Protecting the Analytical Column

The concept of a guard column is to protect the analytical column from becoming contaminated with nonvolatile compounds. The guard column is used to retain nonvolatile material, usually in the first 10-20 cm, and not allow it to elute onto the liquid phase of the analytical column. As the oven temperature increases, the more volatile target compounds vaporize, elute down the guard column, and refocus at the head of the analytical column without interference from the nonvolatile material left behind.

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

In summary, the retention gap and guard column are essentially the same products, but are used for different purposes. The deactivated tubing provides an inert pathway, helps focus target analytes at the head of the analytical column for on-column and splitless injections, and also prevents nonvolatile material from contaminating the head of the analytical column.

What type of guard column should be used?

When using a guard column, it is important to match the polarity of the solvent and the polarity of the surface deactivation. Rxi® guard tubing is good for a wide variety of applications and allows most common solvents (methylene chloride, hexane, isooctane, toluene) to easily wet and create a uniform film on the tubing surface.

If more polar solvents such as methanol or water are used, a polar-deactivated guard column is recommended to allow the solvent to wet the tubing surface. However, polar-deactivated guard columns are not resistant to harsh "water vaporization," which occurs when water in the liquid state is injected into the tubing and rapidly vaporizes (such as in steam cleaning). Hydroguard® deactivation is an alternative for direct aqueous injections. However, a Hydroguard®-deactivated guard column will not allow polar solvents to wet the tubing surface and may cause solvent beading if the oven temperature is 20 °C below the solvent boiling point. Base-deactivated guard columns reduce adsorption and tailing for amines and other basic compounds.

How is a guard column connected to the analytical column?

To connect the guard column to the analytical column, Vu2-Union®, Press-Tight®, and other connectors are available. MXT® unions, typically used for connecting metal columns together, are now available for fused silica columns. (See pages 227 to 233 for information about these connectors.)

it's a fact

To eliminate leaky connections and to ensure longer column lifetime, use our unique Integra-Guard® column. (See **page 23**.)

Connectors for Fused Silica Columns

Vu2 Union® Connector
(See page 229.)

Press-Tight® Connectors
(See pages 227–228.)

MXT® Union Connector Kit
for Fused Silica
(See page 231.)

GC Columns

Fused Silica Capillary Columns

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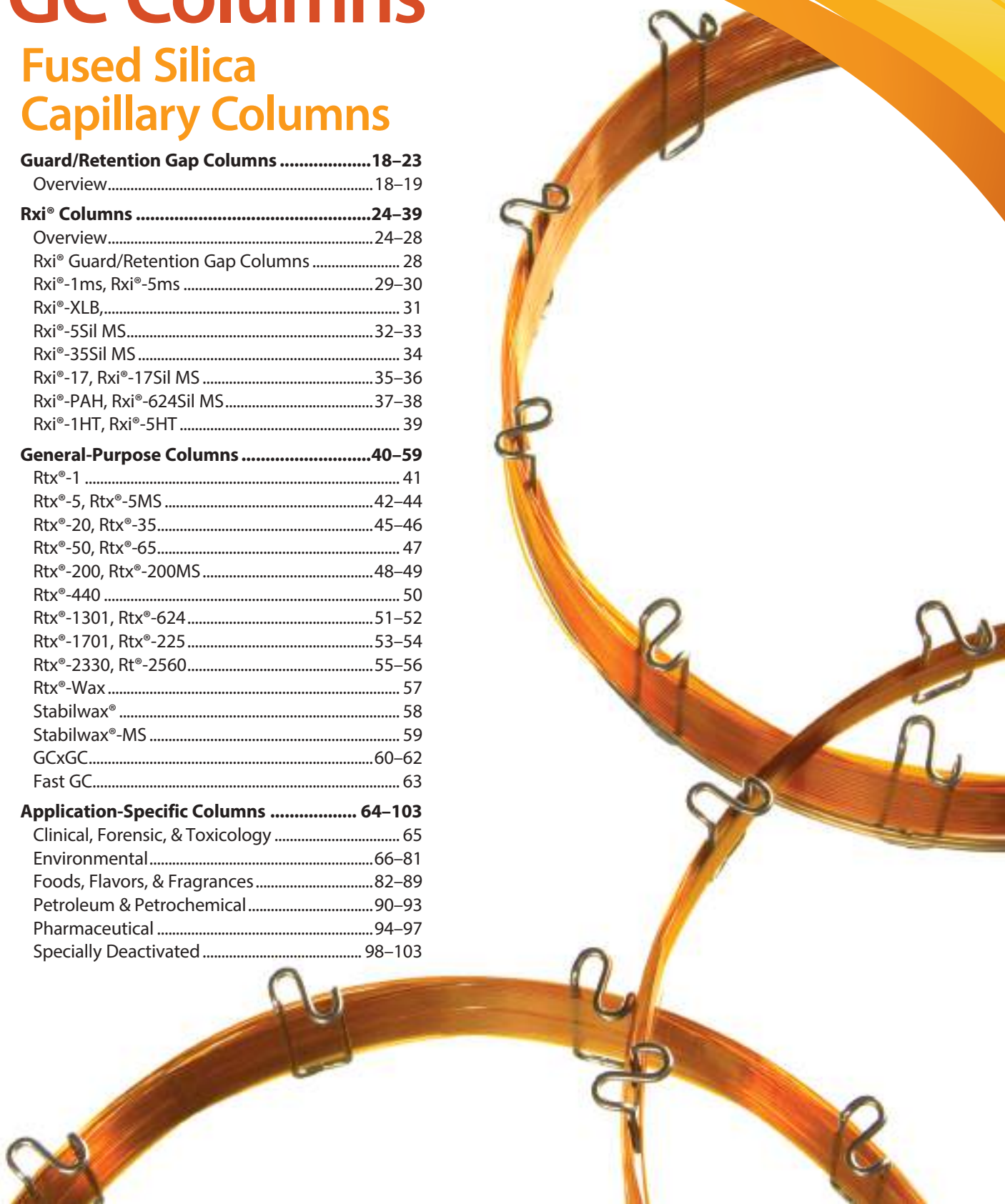


Rxi® Guard/Retention Gap Columns (fused silica)

- 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

it's a fact

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

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.

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 #.

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.

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

See **pages 193–202.**

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.

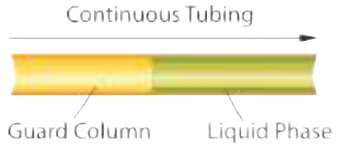
Restek innovation!

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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Rxi® GC Columns

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:

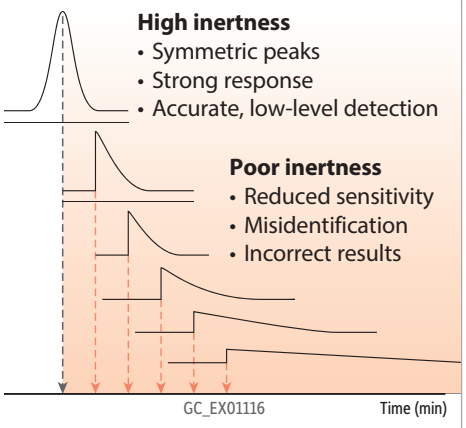
- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

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.



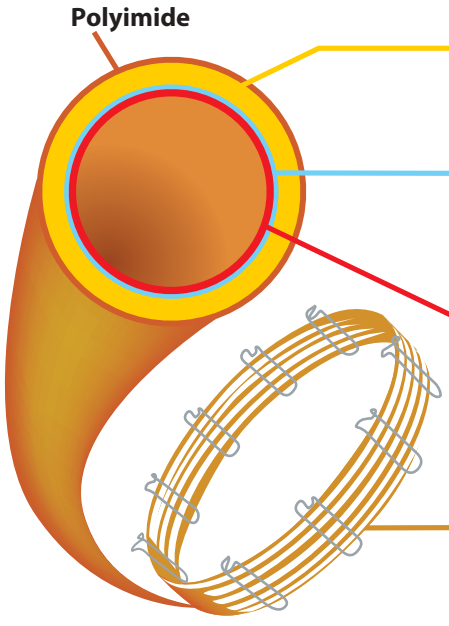
free literature
Rxi® GC Columns

To learn more, download your free copy from
www.restek.com

lit. cat.#
GNBR1843-UNV

How did we Create the *Rxi*® Column Family?

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



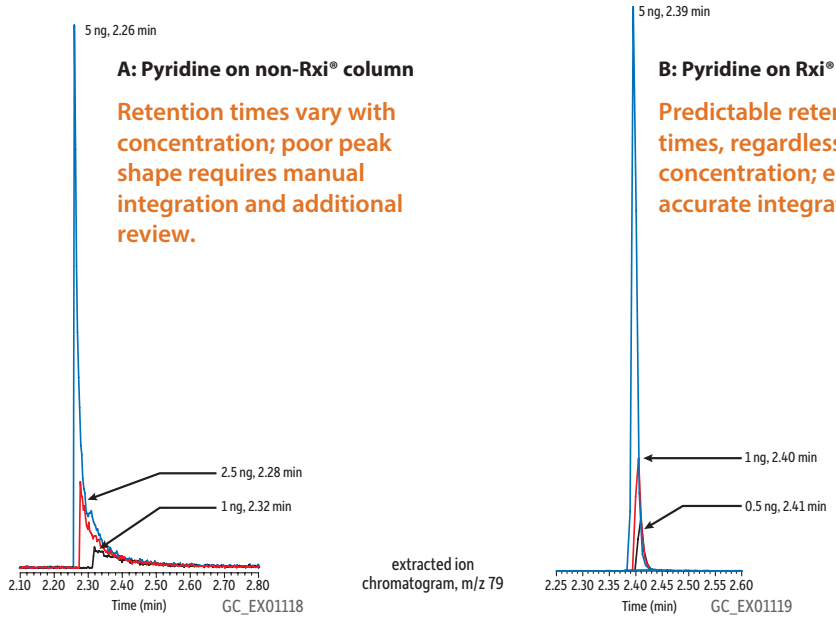
Restek® Fused Silica
We make our own tubing to ensure high quality and an uninterrupted supply!

Rxi® Deactivation
- Effectively shields reactive silanols.
- Ensures comprehensive inertness (acids, bases, and diols).
- Provides symmetric peaks for higher sensitivity.

Rxi® Phase Chemistry
- Enhances selectivity for challenging separations.
- Increases thermal stability, widening the application range.
- Lowers bleed for MS compatibility.
- Surface bonding increases durability and ensures reproducible retention times.

Rxi® Manufacturing
Tighter quality controls for better performance and reliable column-to-column reproducibility.

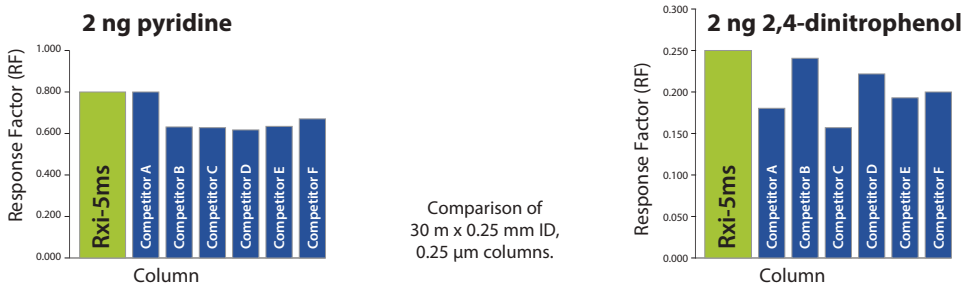
Figure 2: Compared to conventional GC columns, Rxi® columns show excellent inertness and produce good peak shape and reproducible retention for challenging compounds.



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).

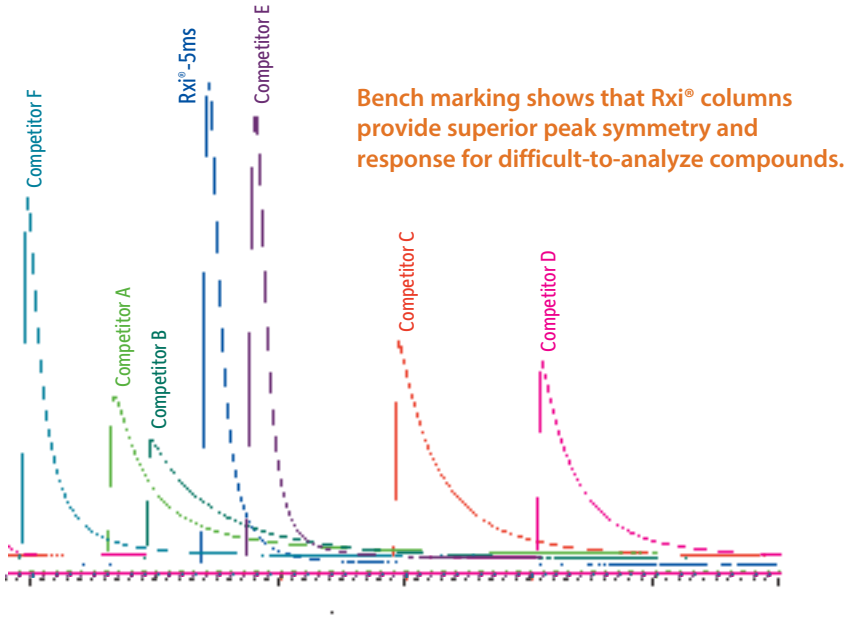
Figure 3: An Rxi® column gives the best overall performance for both basic and acidic compounds.



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.



Comparison of 30 m x 0.25 mm ID, 0.25 µm 5% diphenyl columns, 2 ng pyridine on-column, helium carrier gas, Oven temp.: 50 °C (3 min) to 180 °C @ 35 °C/min (5 min), Det.: FID @ 250 °C

Innovation & Service

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

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

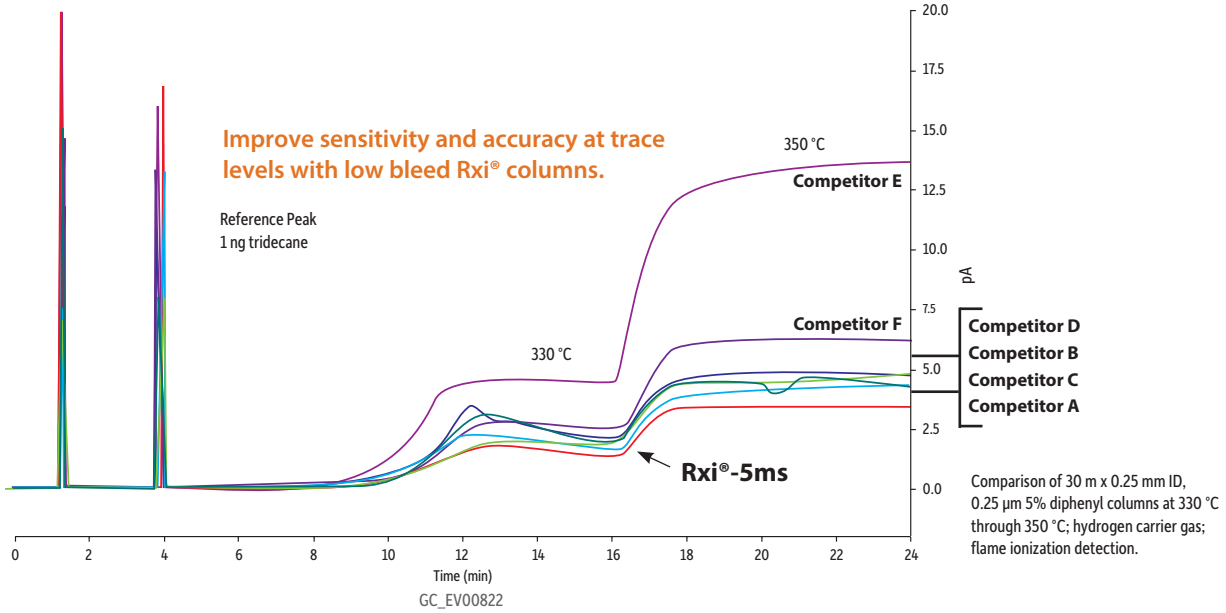
How can we help you today?
Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.

Lowest Bleed

Rxi® columns are more stable at high temperatures than 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.

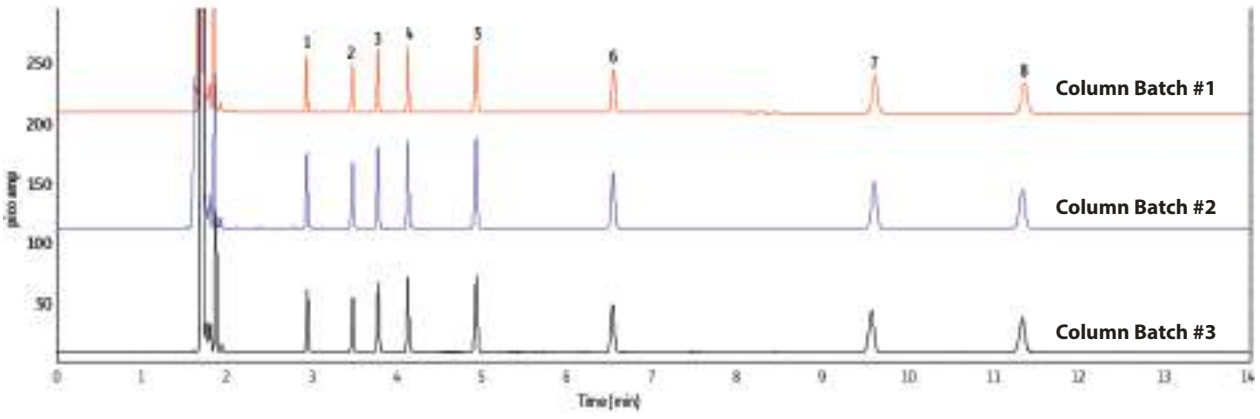


Comparison of 30 m x 0.25 mm ID, 0.25 µm 5% diphenyl columns at 330 °C through 350 °C; hydrogen carrier gas; flame ionization detection.

Exceptional Reproducibility

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

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



GC_EV00819

1. 1,6-Hexanediol
2. 4-Chlorophenol
3. Methyl nonanoate
4. 1-Decylamine
5. Tridecane
6. 1-Undecanol
7. Acenaphthylene
8. Pentadecane

Column	Rxi®-5ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13423)
Sample	Isothermal column test mix
Diluent:	Toluene
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C

Oven	
Oven Temp.:	135 °C
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	38 cm/sec @ 135 °C
Detector	FID @ 330 °C

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)

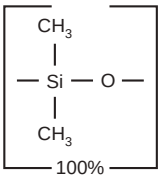
(nonpolar phase; Crossbond® dimethyl polysiloxane)

- 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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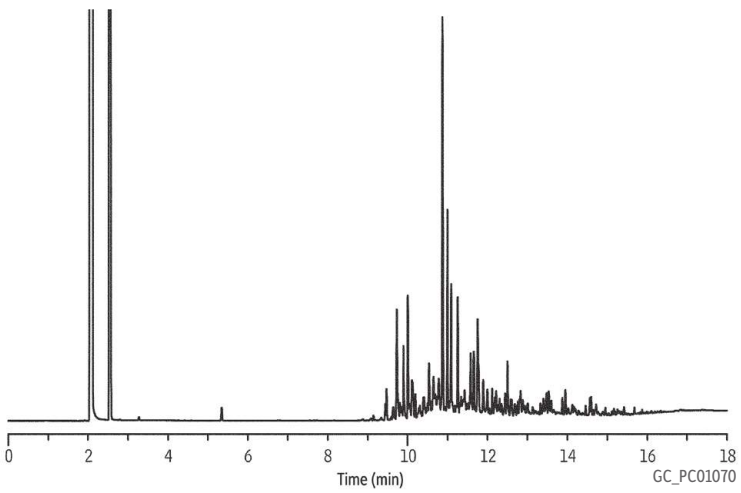
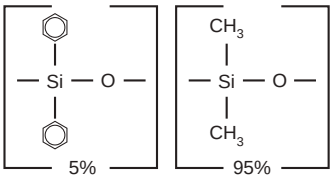
lit. cat.#
CFTS1269

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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lit. cat.# GNFL1173A

Rxi®-5ms Columns (fused silica)

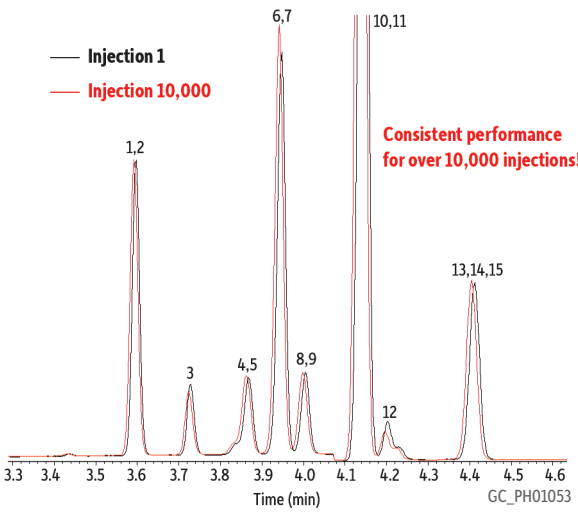
(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- 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
	0.40 µm	-60 to 330/350 °C		13481	
	0.50 µm	-60 to 330/350 °C	13435	13438	13441
	1.00 µm	-60 to 330/350 °C	13450	13453	13456
0.32 mm	0.25 µm	-60 to 330/350 °C	13421	13424	13427
	0.50 µm	-60 to 330/350 °C	13436	13439	13442
	1.00 µm	-60 to 330/350 °C	13451	13454	13457
0.53 mm	0.25 µm	-60 to 330/350 °C	13422	13425	
	0.50 µm	-60 to 330/350 °C	13437	13440	
	1.00 µm	-60 to 330/350 °C	13452	13455	
	1.50 µm	-60 to 330/350 °C	13467	13470	

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		
	0.30 µm	-60 to 330/350 °C		13409		
	0.36 µm	-60 to 330/350 °C		13411		
0.20 mm	0.33 µm	-60 to 330/350 °C	13497		13498	13499

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



	Peaks	m/z
1.	Coprostanol	370.40
2.	d5-cholestanol (IS)	220.20
3.	7α-hydroxycholesterol	456.40
4.	Cholestanol	306.30
5.	d5-epicholestanol (IS)	220.20
6.	7-Dehydrocholesterol	325.25
7.	Desmosterol	343.25
8.	Lathosterol	458.35
9.	d4-lathosterol (IS)	462.40
10.	Campesterol	382.35
11.	4-Cholestenone	382.30
12.	Stigmasterol	394.15
13.	Lanosterol	393.35
14.	β-Sitosterol	396.35
15.	d7-β-sitosterol (IS)	403.45

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

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

Rxi®-XLB Columns (fused silica)

(low-polarity proprietary phase)

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

Improvements in polymer synthesis and tubing deactivation enable us to make inert, stable Rxi®-XLB columns especially well-suited for analyzing active, high molecular weight compounds with sensitive GC-MS systems, including ion trap detectors. Excellent efficiency, coupled with inertness, low bleed, and high thermal stability, make Rxi®-XLB columns ideal for analyzing semivolatile compounds in drinking water.

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

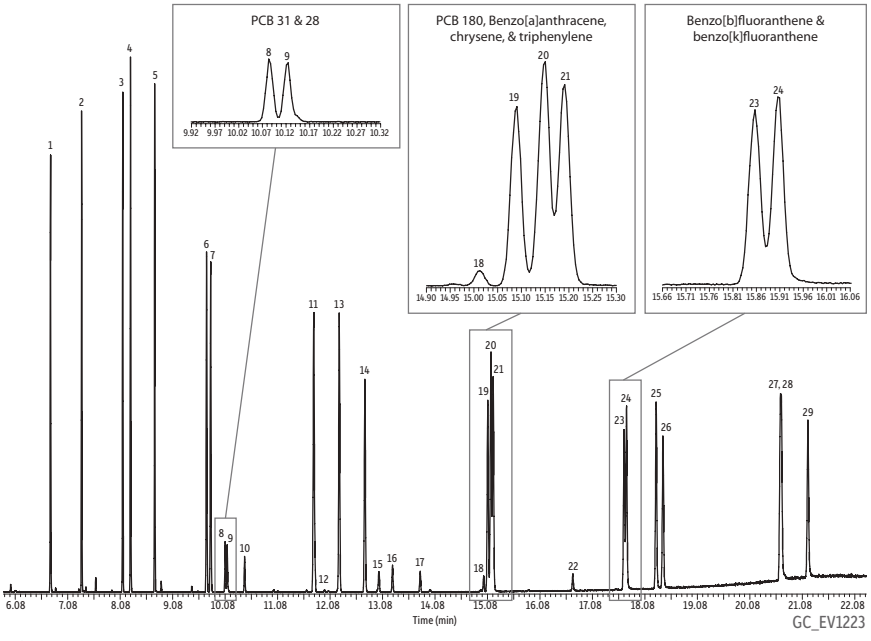
tech tip

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

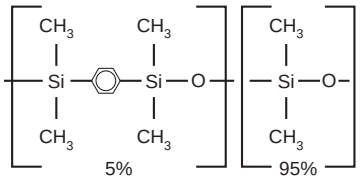


Peaks	Conc. (µg/mL)
1. Naphthalene	5
2. 2-Methylnaphthalene	5
3. Acenaphthylene	5
4. Acenaphthene	5
5. Fluorene	5
6. Phenanthrene	5
7. Anthracene	5
8. PCB 31	1
9. PCB 28	1
10. PCB 52	1
11. Fluoranthene	5
12. PCB 101	1
13. Pyrene	5
14. 2-Methylfluoranthene	5
15. PCB 118	1
16. PCB 153	1
17. PCB 138	1
18. 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)
Sample SV calibration mix #5 / 610 PAH mix (cat.# 31011)
Benzo(e)pyrene (cat.# custom)
Triphenylene (cat.# custom)
2-Methylnaphthalene (cat.# 31285)
2-Methylfluoranthene (cat.# custom)
PCB congener standard #2 (cat.# 32294)
PCB 31 (cat.# custom)
Diluent: Dichloromethane
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
Solvent Delay Time: 4 min
Tune Type: manual
Ionization Mode: EI
Scan Range: 45-550 amu
Scan Rate: 5 scans/sec
Instrument PE Clarus 500 GC & Clarus 500 MS

Rxi®-5Sil MS

Rxi®-5Sil MS Structure



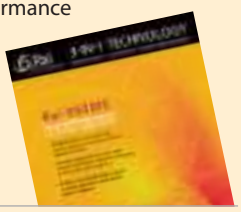
Similar to: (5%-phenyl)-methylpolysiloxane

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



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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	-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	

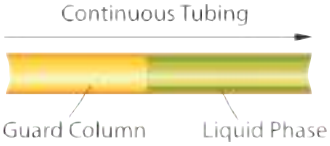
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

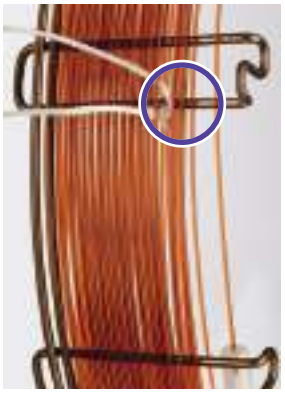
Rxi®-5Sil MS with Integra-Guard®

- 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

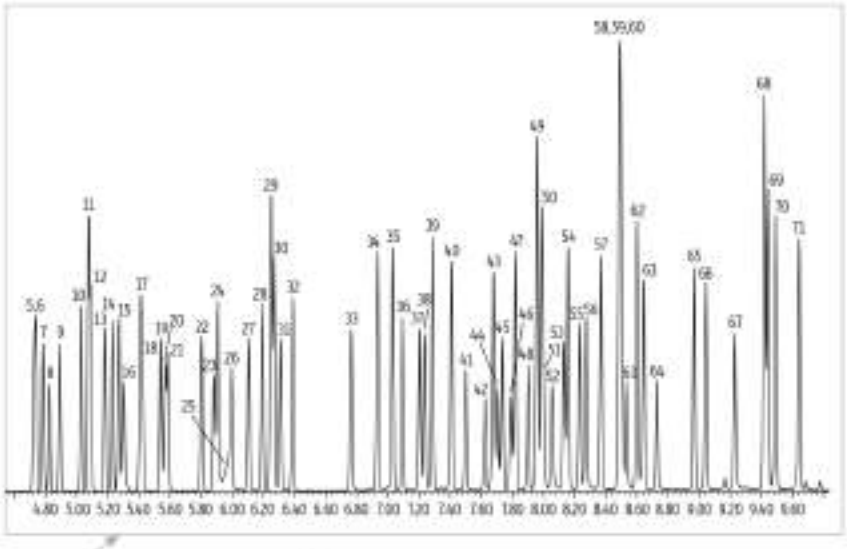


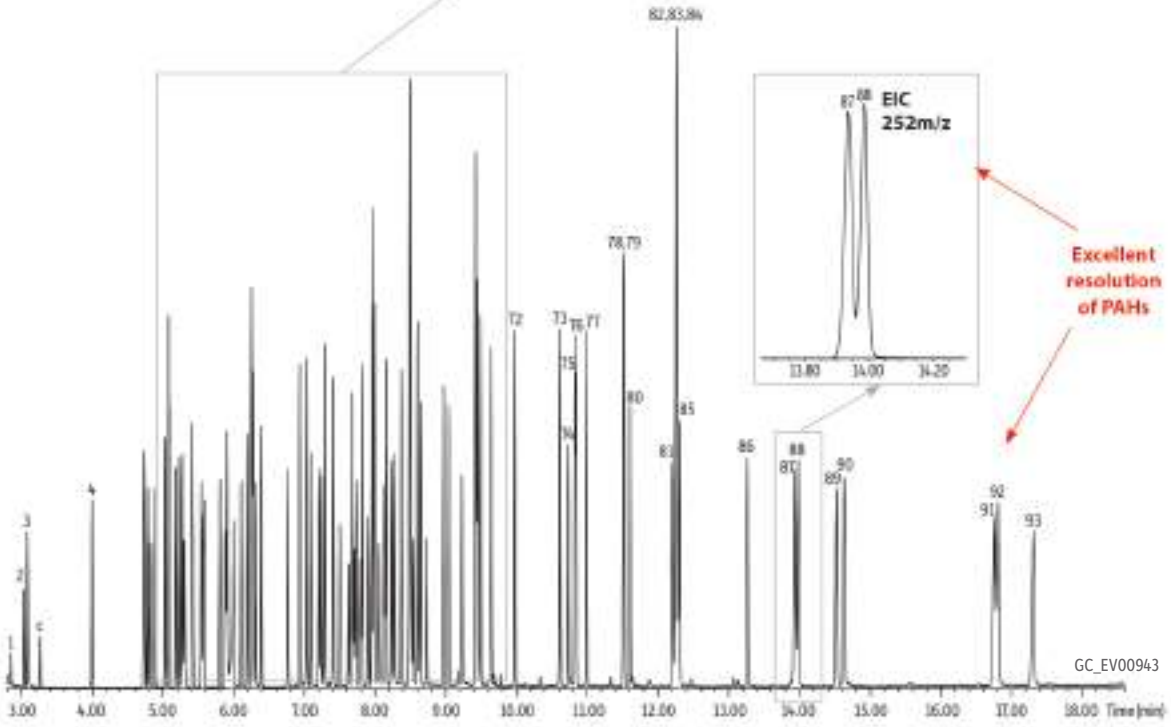


String indicates where the analytical column begins.

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

Column	Rxi®-5Sil 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)
Conc.:	10 µg/mL (IS 40 µg/mL)
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	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Ionization Mode:	EI
Scan Range:	35-550 amu



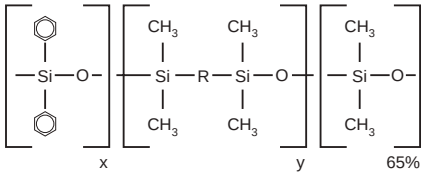


Peaks

1. 1,4-Dioxane
2. N-Nitrosodimethylamine
3. Pyridine
4. 2-Fluorophenol (SS)
5. Phenol-d6 (SS)
6. Phenol
7. Aniline
8. Bis(2-chloroethyl) ether
9. 2-Chlorophenol
10. 1,3-Dichlorobenzene
11. 1,4-Dichlorobenzene-d4 (IS)
12. 1,4-Dichlorobenzene
13. Benzyl alcohol
14. 1,2-Dichlorobenzene
15. 2-Methylphenol
16. Bis(2-chloroisopropyl) ether
17. 4-Methylphenol/3-methylphenol
18. N-Nitrosodi-N-propylamine
19. Hexachloroethane
20. Nitrobenzene-d5 (SS)
21. Nitrobenzene
22. Isophorone
23. 2-Nitrophenol
24. 2,4-Dimethylphenol
25. Benzoic acid
26. Bis(2-chloroethoxy) methane
27. 2,4-Dichlorophenol
28. 1,2,4-Trichlorobenzene
29. Naphthalene-d8 (IS)
30. Naphthalene
31. 4-Chloroaniline
32. Hexachlorobutadiene
33. 4-Chloro-3-methylphenol
34. 2-Methylnaphthalene
35. 1-Methylnaphthalene
36. Hexachlorocyclopentadiene
37. 2,4,6-Trichlorophenol
38. 2,4,5-Trichlorophenol
39. 2-Fluorobiphenyl (SS)
40. 2-Chloronaphthalene
41. 2-Nitroaniline
42. 1,4-Dinitrobenzene
43. Dimethyl phthalate
44. 1,3-Dinitrobenzene
45. 2,6-Dinitrotoluene
46. 1,2-Dinitrobenzene
47. Acenaphthylene
48. 3-Nitroaniline
49. Acenaphthene-d10 (IS)
50. Acenaphthene
51. 2,4-Dinitrophenol
52. 4-Nitrophenol
53. 2,4-Dinitrotoluene
54. Dibenzofuran
55. 2,3,5,6-Tetrachlorophenol
56. 2,3,4,6-Tetrachlorophenol
57. Diethyl phthalate
58. 4-Chlorophenyl phenyl ether
59. Fluorene
60. 4-Nitroanaline
61. 4,6-Dinitro-2-methylphenol
62. *n*-Nitroso-diphenylamine (diphenylamine)
63. 1,2-Diphenylhydrazine (as azobenzene)
64. 2,4,6-Tribromophenol (SS)
65. 4-Bromophenyl phenyl ether
66. Hexachlorobenzene
67. Pentachlorophenol
68. Phenanthrene-d10 (IS)
69. Phenanthrene
70. Anthracene
71. Carbazole
72. di-*n*-Butyl phthalate
73. Fluoranthene
74. Benzidine
75. Pyrene-d10 (SS)
76. Pyrene
77. *p*-Terphenyl-d14 (SS)
78. 3,3'-Dimethylbenzidine
79. Butyl benzyl phthalate
80. Bis(2-ethylhexyl) adipate
81. 3,3'-Dichlorobenzidine
82. Benzo[a]anthracene
83. Bis(2-ethylhexyl)phthalate
84. Chrysene-d12 (IS)
85. Chrysene
86. Di-*n*-octyl phthalate
87. Benzo[b]fluoranthene
88. Benzo[k]fluoranthene
89. Benzo[a]pyrene
90. Perylene-d12 (IS)
91. Indeno[1,2,3-cd]pyrene
92. Dibenzo[a,h]anthracene
93. Benzo[ghi]perylene

c = contaminant (toluene)

Rxi®-35Sil MS Structure



Similar to: (35%-phenyl)-methylpolysiloxane

similar phases

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

Rxi®-35Sil MS Columns (fused silica)

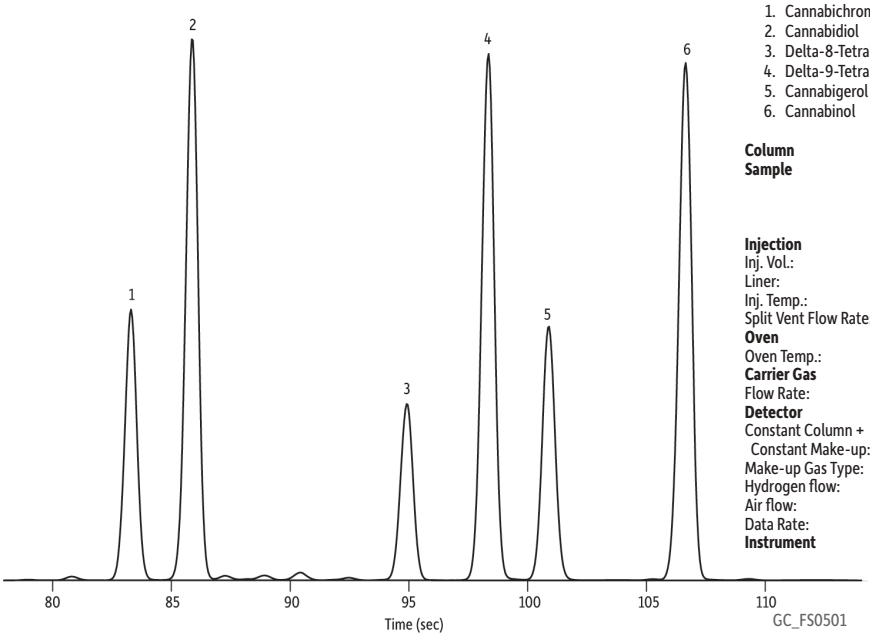
(midpolarity Crossbond® phase)

- 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.

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

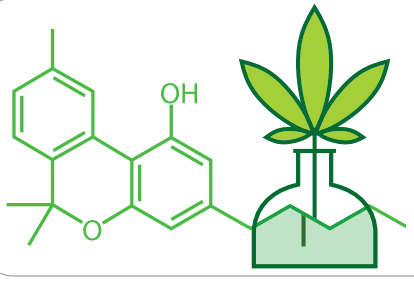
*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

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

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	H_2, constant flow
Flow Rate:	2.5 mL/min
Detector	FID @ 350 °C
Constant Column + Constant Make-up:	50 mL/min
Make-up Gas Type:	N_2
Hydrogen flow:	40 mL/min
Air flow:	450 mL/min
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC



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Rxi®-17 Columns (fused silica)

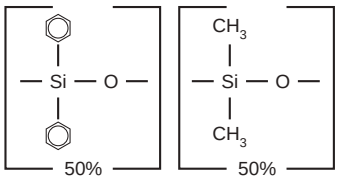
(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

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

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
	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		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	13552	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

Rxi®-17 Structure



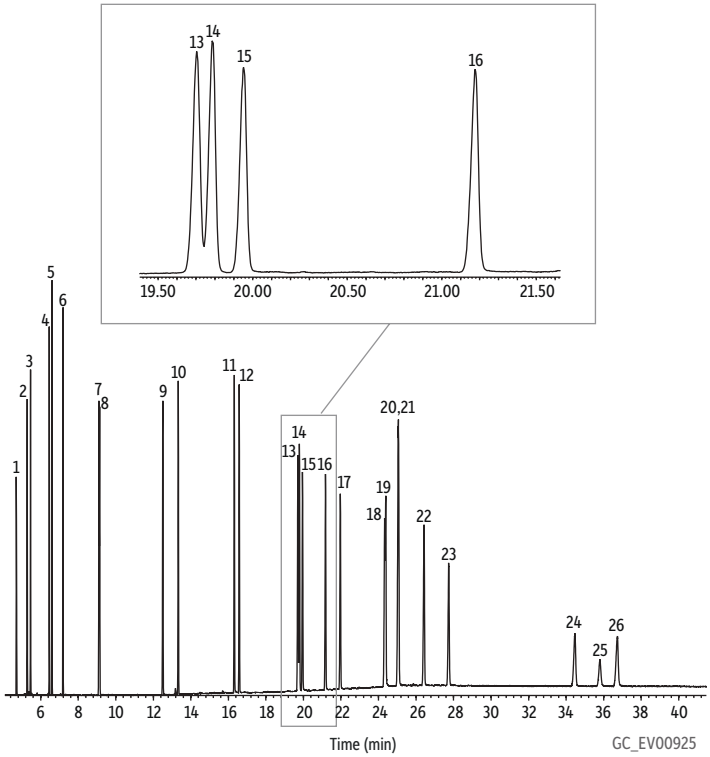
Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

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

Polycyclic Aromatic Hydrocarbons on Rxi®-17 column

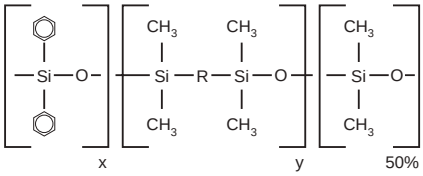
Completely resolve benzo(j)fluoranthene.



Column	Rxi®-17, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13523)
Sample	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)
Conc.:	20 µg/mL each component
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	He, constant flow
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)				
1. Naphthalene	4.70	9. Fluoranthene	12.50	18. Dibenz(a,h)acridine	24.33
2. 1-Methylnaphthalene	5.28	10. Pyrene	13.33	19. Dibenz[a,j]acridine	24.39
3. 2-Methylnapthalene	5.46	11. Benz[a]anthracene	16.32	20. Indeno(1,2,3-cd)pyrene	25.04
4. Acenaphthylene	6.45	12. Chrysene	16.58	21. Dibenz[a,h]anthracene	25.07
5. Acenaphthene	6.60	13. Benzo[b]fluoranthene	19.70	22. Benzo[ghi]perylene	26.43
6. Fluorene	7.18	14. Benzo[k]fluoranthene	19.78	23. 7H-Dibenzo(c,g)carbazole	27.75
7. Phenanthrene	9.10	15. Benzo(j)fluoranthene	19.95	24. Dibenzo(a,E)pyrene	34.46
8. Anthracene	9.14	16. Benzo[a]pyrene	21.17	25. Dibenzo(a,i)pyrene	35.80
		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)

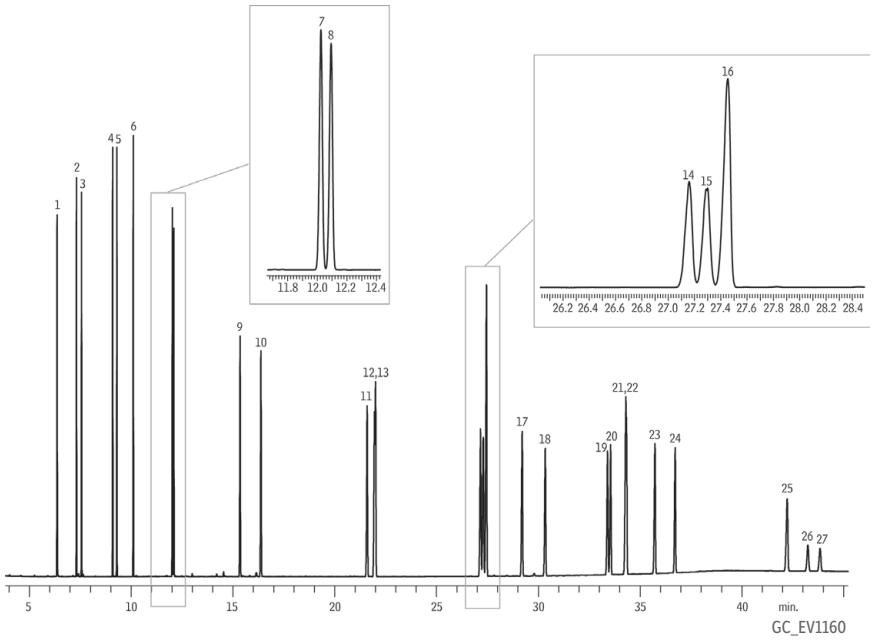
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Low bleed for use with sensitive detectors, such as MS.
- 340/360 °C upper temperature limits.
- Equivalent to USP phase G3.

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

Column	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)

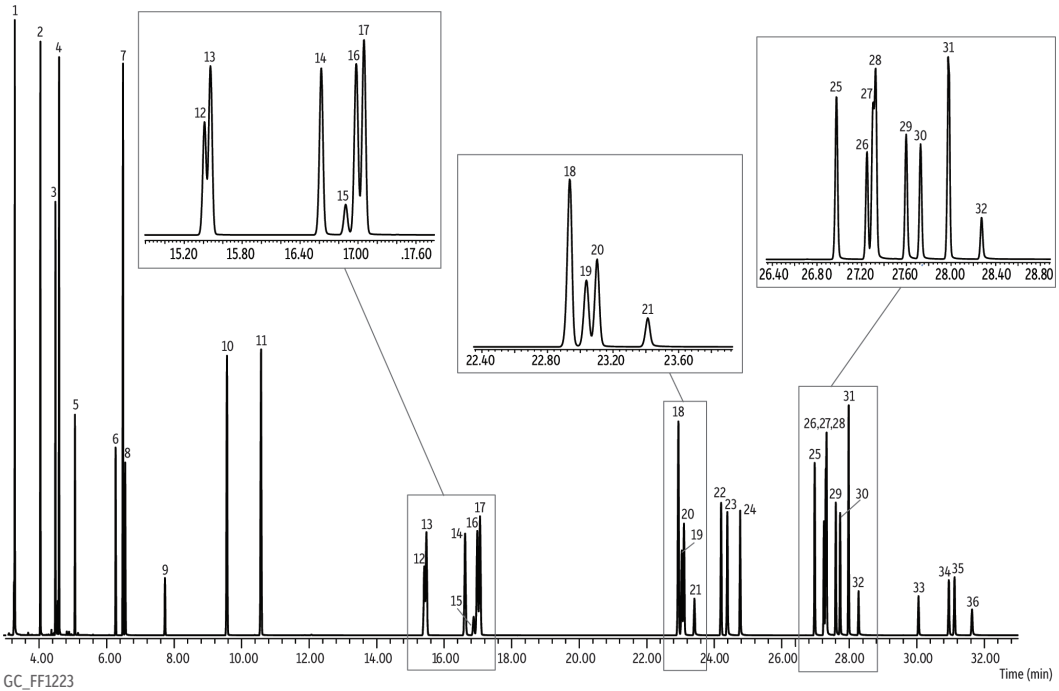
(midpolarity proprietary phase)

- 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

See **pages 193–202.**

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

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 He, constant flow
Flow Rate: 1.4 mL/min

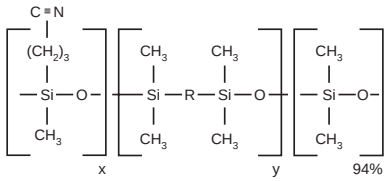
Detector MS
Mode: SIM
SIM Program:

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

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

free literature

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

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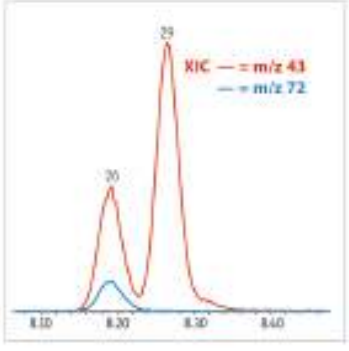
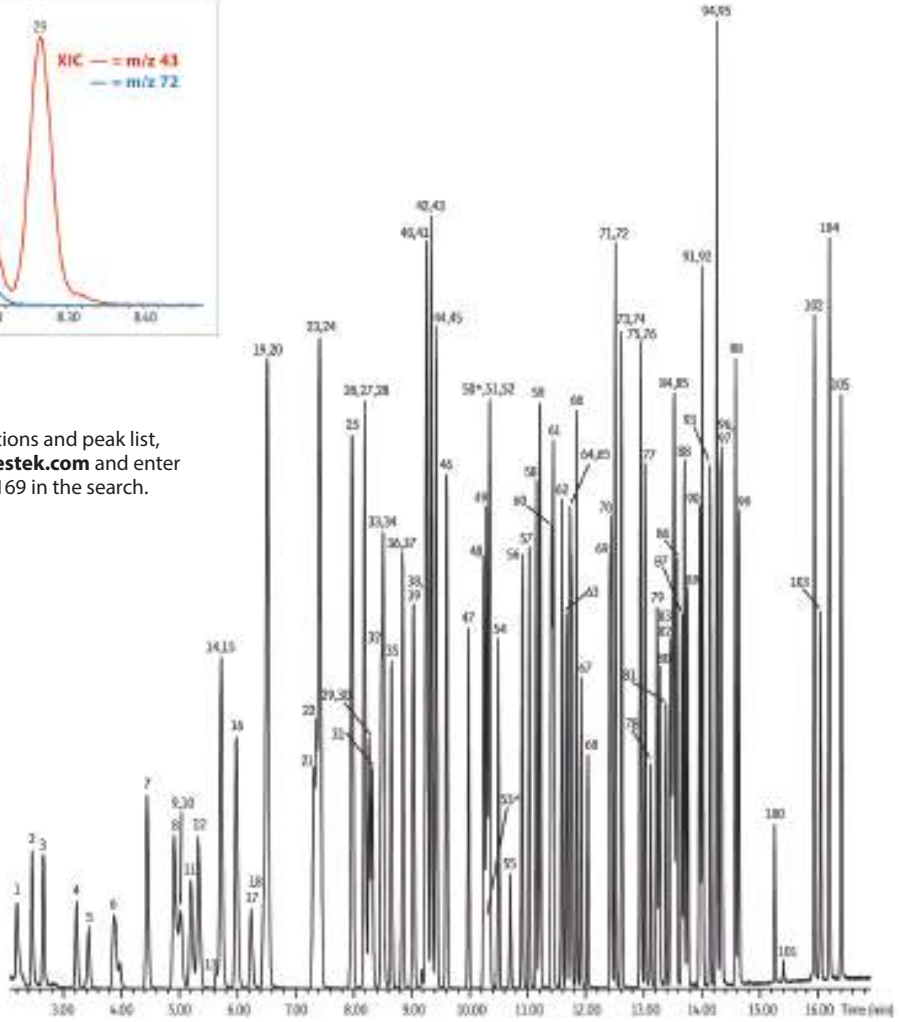
lit. cat.# GNBR1334A-UNV

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

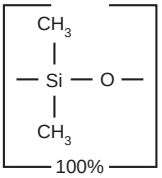
Rxi®-1HT Columns (fused silica)

(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

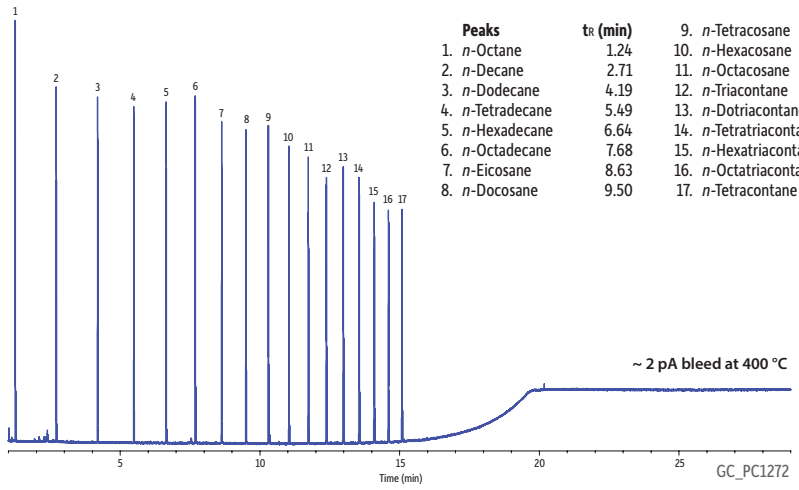


Similar to: (100%-methyl)-polysiloxane

similar phases

DB-1ht, ZB-1HTinferno

Florida TRPH Standard Mix on Rxi®-1HT



Peaks	tR (min)		
1. *n*-Octane	1.24	9. *n*-Tetracosane	10.30
2. *n*-Decane	2.71	10. *n*-Hexacosane	11.04
3. *n*-Dodecane	4.19	11. *n*-Octacosane	11.73
4. *n*-Tetradecane	5.49	12. *n*-Triacontane	12.38
5. *n*-Hexadecane	6.64	13. *n*-Dotriacontane	12.98
6. *n*-Octadecane	7.68	14. *n*-Tetratriacontane	13.55
7. *n*-Eicosane	8.63	15. *n*-Hexatriacontane	14.09
8. *n*-Docosane	9.50	16. *n*-Octatriacontane	14.60
		17. *n*-Tetracontane	15.08

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

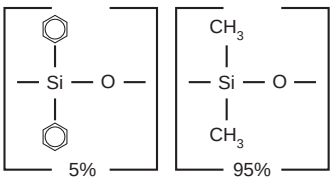
Rxi®-5HT Columns (fused silica)

(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

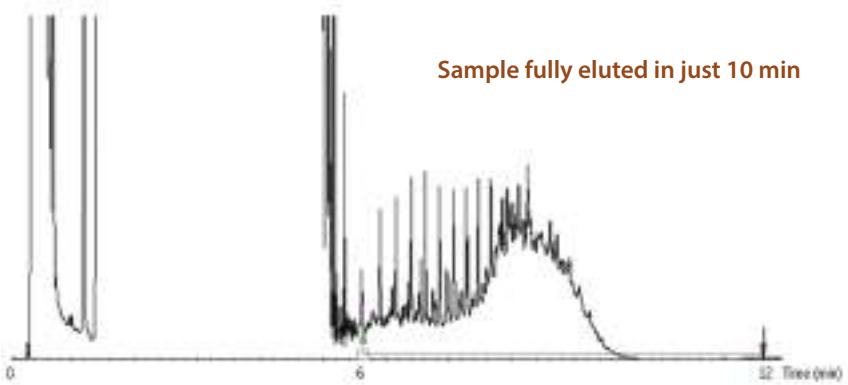


Similar to: (5%-phenyl)-methylpolysiloxane

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

Rtx®-1 41
Rtx®-5, Rtx®-5MS 42–44
Rtx®-20, Rtx®-35 45–46
Rtx®-50, Rtx®-65 47
Rtx®-200, Rtx®-200MS 48–49
Rtx®-440 50
Rtx®-1301, Rtx®-624 51–52
Rtx®-1701, Rtx®-225 53–54
Rtx®-2330, Rt®-2560 55–56
Rtx®-Wax 57
Stabilwax® 58
Stabilwax®-MS 59
GCxGC 60–62
Fast GC 63

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	

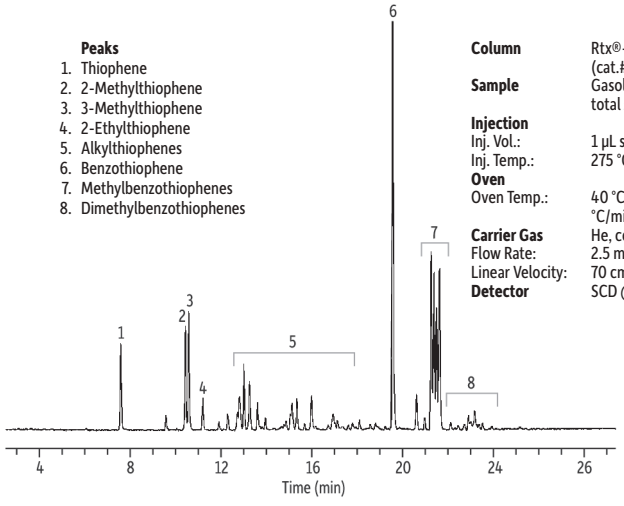
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 330/350 °C	40101	40102	40103
	0.40 µm	-60 to 330/340 °C	40110	40111	40112

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

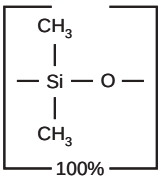
Rtx®-1 with Integra-Guard® Column

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

Sulfur in Gasoline on Rtx®-1



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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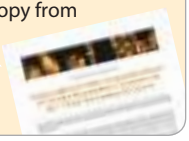
lit. cat.# PCAN1499-UNV



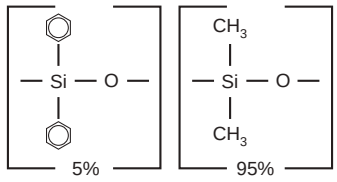
crossbond® technology

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

Rtx®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

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

also available

Metal MXT® Columns

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

MXT®-5 columns .....page 108

also available

Rtx®-5 Amine columns.....page 100

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.

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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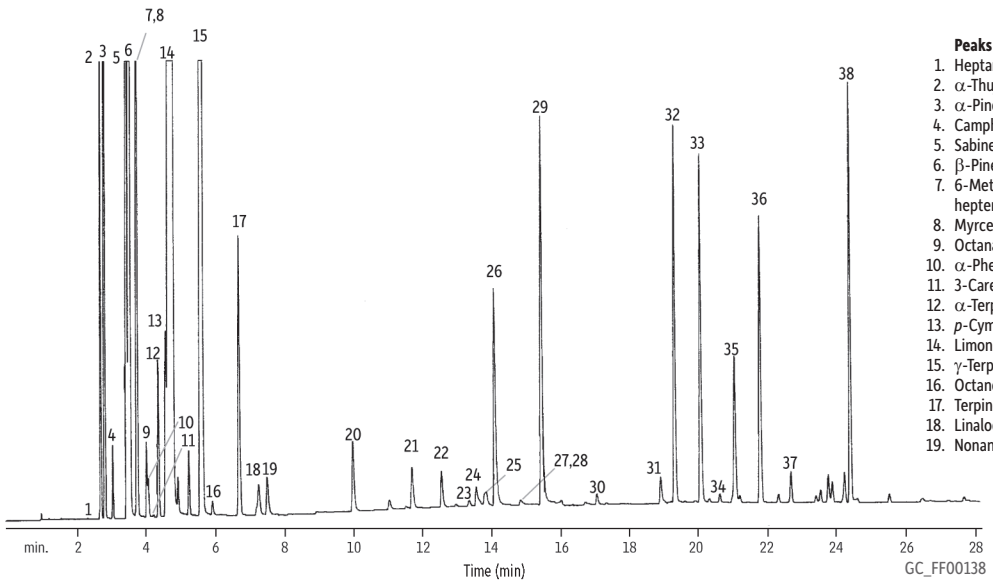
Lemon Oil on Rtx®-5



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

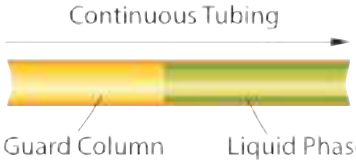
Column	Rtx®-5, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10224)	**Carrier Gas**	H_2, constant flow
Sample	Wet needle split injection of a neat lemon oil	Flow Rate:	3.2 mL/min
Injection	Split (split ratio 100:1)	Linear Velocity:	40 cm/sec
Inj. Temp.:	250 °C	**Detector**	FID @ 250 °C
Oven		**Notes**	FID sensitivity: 2 x 10^{-11} AFS
Oven Temp.:	75 °C (hold 8 min) to 250 °C at 4 °C/min		

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 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

Integra-Guard® Built-In Guard Column



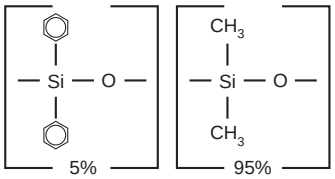
Get the protection without the connection!

Chromatogram Search Tool

Search by **compound name**, **synonym**, **CAS #**, or **keyword**

www.restek.com/**chromatograms**

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.

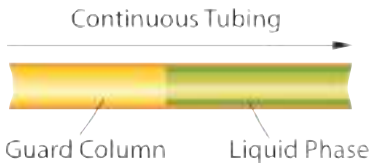
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	12605	12608	12611
	0.25 µm	-60 to 330/350 °C	12620	12623	12626
	0.50 µm	-60 to 330/350 °C	12635	12638	12641
	1.00 µm	-60 to 325/350 °C	12650	12653	
0.32 mm	0.10 µm	-60 to 330/350 °C	12606	12609	
	0.25 µm	-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

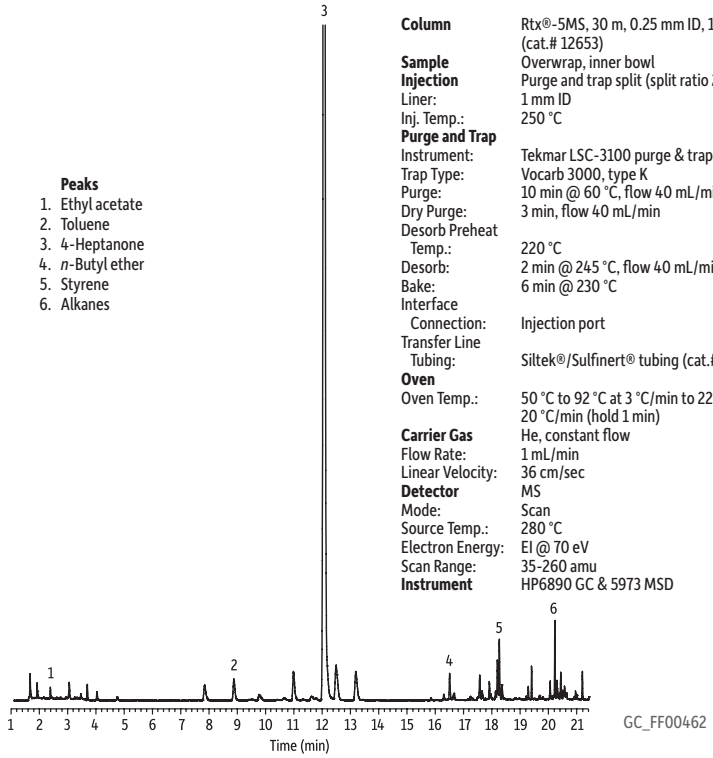
Integra-Guard® Built-In Guard Column



Get the protection without the connection!

We carefully manage inventory so we have what you need when you need it.

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



Rtx®-20 Columns (fused silica)

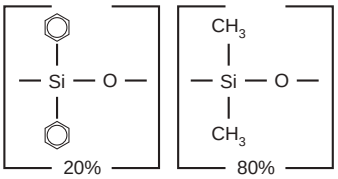
(low- to midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- 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

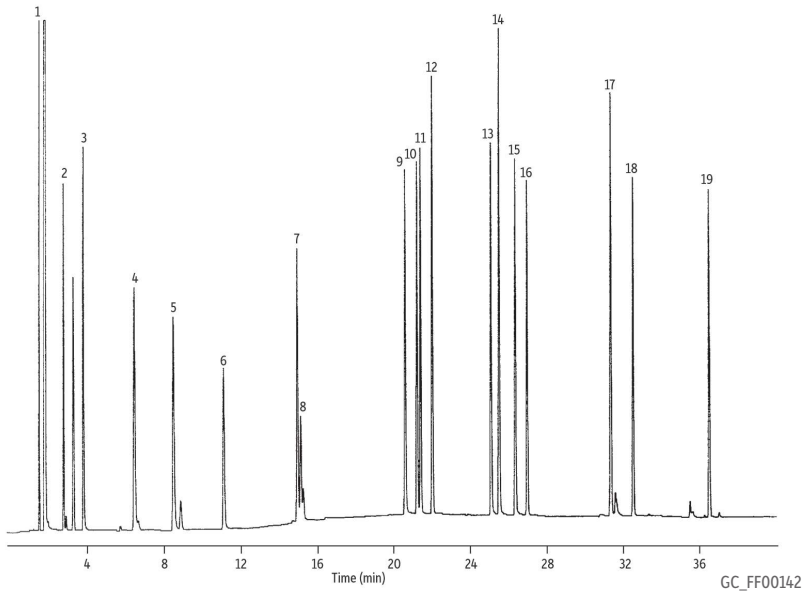


Similar to: (20%-phenyl)-methylpolysiloxane

similar phases

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

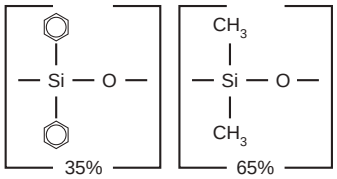
Mushroom Aroma (Synthetic) on Rtx®-20



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

Rtx®-35 Structure



Similar to: (35%-phenyl)-methylpolysiloxane

similar phases

HP-35, DB-35, ZB-35

also available

Rtx®-35 Amine columns .....page 101

Rtx®-35 Columns (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

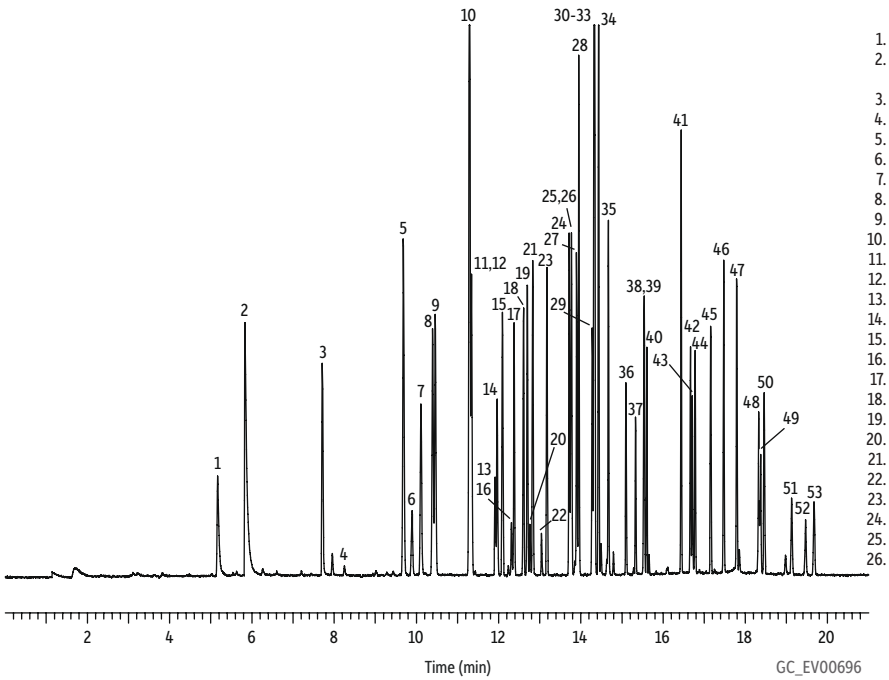
- General-purpose columns for organochlorine pesticides, PCB congeners (e.g., Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G42 phase.

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

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
2. Hexamethyl phosphoramide
3. Mevinphos
4. Trichlorfon
5. Tributyl phosphate (SS)
6. Demeton-o
7. TEPP
8. Thionazin
9. Ethoprop
10. Sulfotepp
11. Naled
12. Phorate
13. Dicrotophos
14. Demeton-S
15. Terbufos
16. Monocrotophos
17. Diazinon
18. Fonophos
19. Disulfoton
20. Dioxathion
21. Dimethoate
22. Phosphamidon isomer
23. Dichlorofenthion
24. Chlorpyrifos methyl
25. Phosphamidon
26. Ronnel
27. Methyl parathion
28. Aspon
29. Trichloronate
30. Chlorpyrifos
31. Fenitrothion
32. Merphos
33. Malathion
34. Parathion-ethyl
35. Fenthion
36. Chlorfenvinphos
37. Crotoxyphos
38. Merphos oxone
39. Prothiofos
40. Stirofos
41. Ethion
42. Sulprofos
43. Fensulfothion
44. Carbofenothion
45. Famphur
46. Triphenyl phosphate (SS)
47. Epn
48. Phosmet
49. Leptophos
50. Tri-*o*-cresyl phosphate
51. Azinphos-methyl
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)
Conc.: 0.1µg/mL US EPA Method 8141A Custom Standard Mixes (100ng/mL)
Injection
Inj. Vol.: 0.5 µL splitless (hold 5 min)
Liner: Drilled Uniliner (hole near top) (cat.# 21054-214.1)
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)

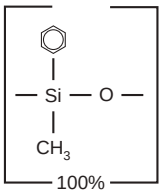
- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, sterols.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G3 phase.

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®-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 columns .....page 109

Rtx®-65 Columns (fused silica)

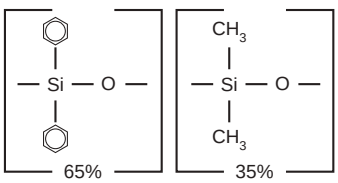
(mid- to high-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- 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

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.

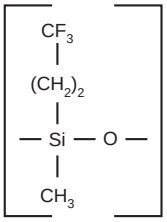
also available

Rtx®-65TG Columns

Tested specifically for triglycerides.

See **page 89.**

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
	1.50 µm	-20 to 280/300 °C	15066	15069	15072	15075
0.53 mm	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.

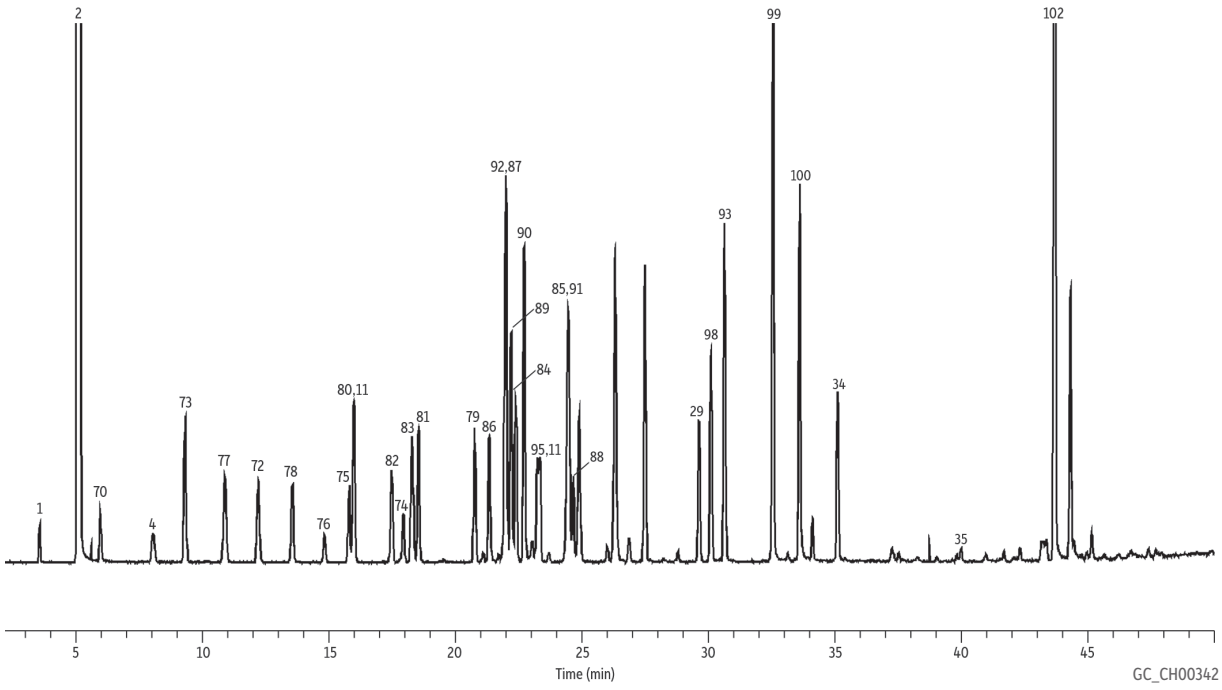
also available

Metal MXT® Columns

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

MXT®-200 columns..... page 110

Solvent Mixture #3 on Rtx®-200



Column	Rtx®-200, 60 m, 0.53 mm ID, 3.00 µm (cat.# 15088)
Sample	Solvent mix #3
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	275 °C
Split Vent	
Flow Rate:	50 mL/min
Oven	
Oven Temp.:	40 °C (hold 5 min) to 285 °C at 5 °C/min
Carrier Gas	He, constant flow
Linear Velocity:	40 cm/sec
Detector	MS
Mode:	Scan
Source Temp.:	285 °C

Peaks

1. Pentane
2. Methylene chloride
3. Ethylene glycol
4. Heptane
5. Cyclopentanol
6. 3-Hexanol
7. Acetamide
8. 2-Methyl-1-pentanol
9. Furfuryl alcohol
10. Butyl ether
11. Nonane
12. Cumene
13. Ethyl amyl ketone
14. Heptanol
15. Butyl butanoate
16. Unknown
17. Benzyl alcohol
18. Dipropylene glycol
19. Benzene, diethyl-
20. Unknown
21. Unknown
22. Hexachloroethane
23. Undecane
24. 1-Nonanol
25. *p*-Methoxyphenol
26. Triethylene glycol
27. Dodecane
28. Undecanal
29. Tridecane
30. Unknown
31. Dodecanal
32. Dicyclohexylamine
33. bis(2,2-methoxy)ethyl ether
34. Pentadecane
35. Heptadecane
36. Octadecane
37. Nonadecane
38. Eicosane
39. Acetyl tributyl citrate
40. 2-Buten-1-ol
41. Formamide
42. 3-Pentanol
43. 1-Nitropropane
44. Dimethylformamide
45. 2-Methyl-3-pentanol
46. Toluene
47. Ethyl chloroacetate
48. Dimethylacetamide
49. *p*-Xylene
50. *sec*-tetrachloroethane
51. Benzaldehyde
52. α-Chlorotoluene
53. 2,6-Dimethyl-4-heptanone
54. 2-Octanone
55. *o*-Cresol
56. α-Methylbenzyl alcohol
57. 5-Nonanone
58. Nonanal
59. Decanal
60. Unknown
61. 1-Decanol
62. 1-Undecanol
63. 2-Dodecanone
64. 1-Dodecanol
65. Tetraethylene glycol
66. Dibenzyl
67. Diethyl Phthalate
68. Tributyl phosphate
69. Diphenyl sulfone
70. Allyl alcohol
71. Unknown
72. Isopropyl acetate
73. Benzene
74. 2-Nitropropane
75. Nitroethane
76. Pentanal
77. 2-Bromobutane
78. 1-Chloropentane
79. Cyclopentanone
80. 2-Hexanol
81. Butyl acetate
82. 2-Ethyl-1-butanol
83. 3-Ethyl-3-pentanol
84. 1,4-Dichlorobutane
85. 2-Methyl-2,4-pentanediol
86. Butoxyethanol
87. 1,2,3-Trichloropropane
88. 1,4-Butanediol
89. Methyl hexanoate
90. 1,2,4-Trimethylbenzene
91. 2-Ethyl-1-hexanol
92. Dipentene/Limonene
93. Tetrahydrofurfuryl acetate
94. Unknown
95. Decahydronaphthalene
96. Unknown
97. Unknown
98. 2-Decanol
99. 1,2-Bis(2-methoxyethoxy) ethane
100. 2-Phenoxyethanol
101. Unknown
102. Benzyl ether

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)

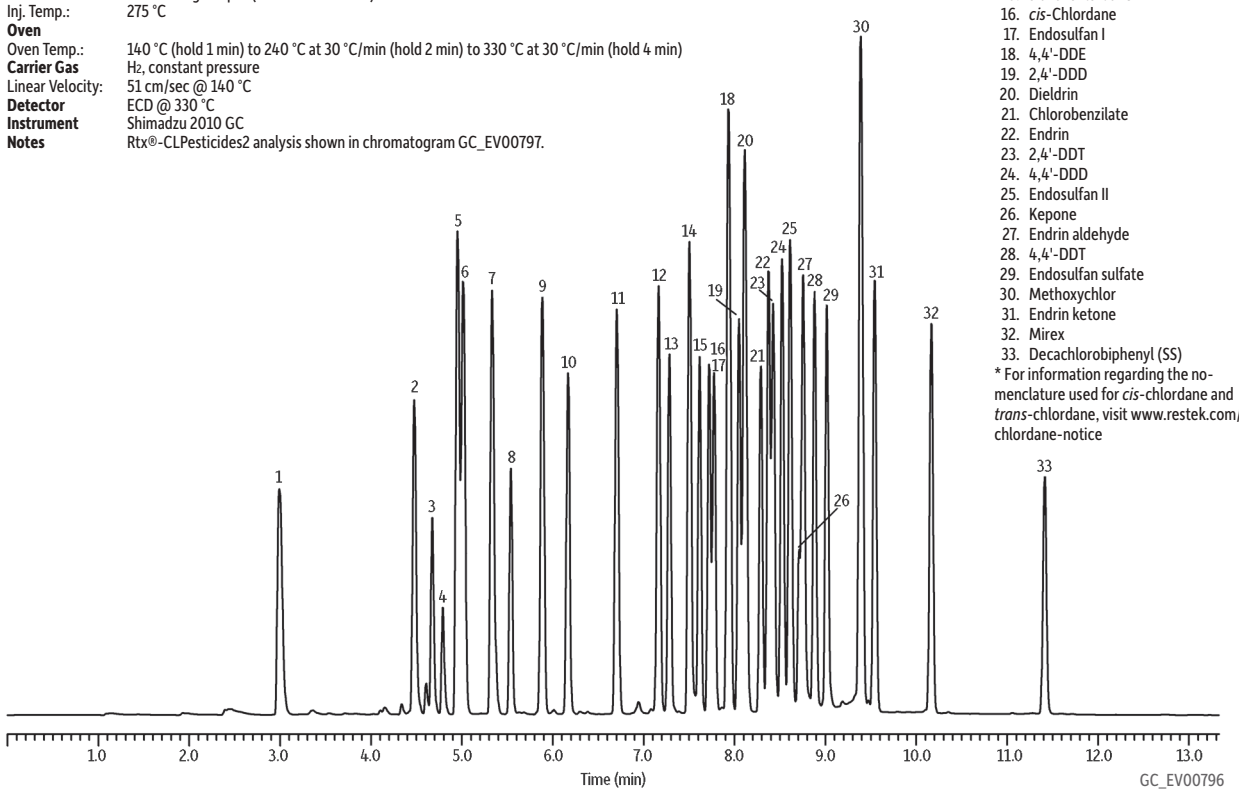
- General-purpose columns with unique selectivity for pesticides, PAHs, or other semivolatiles. Ideal for low/trace-level analyses.
- Low-bleed, high-resolution columns with unique selectivity.
- Wide temperature range: 20 °C to 340 °C.

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)
Diallate (*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 H_2, 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*-Diallate
4. *trans*-Diallate
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

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

(low- to midpolarity phase)

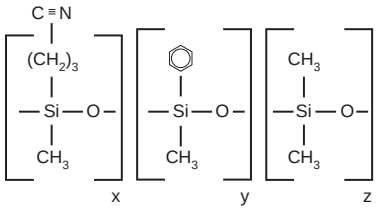
- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.

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 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.

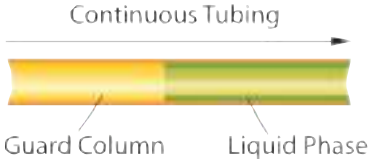
MXT®-1301 columns .....page 109

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.

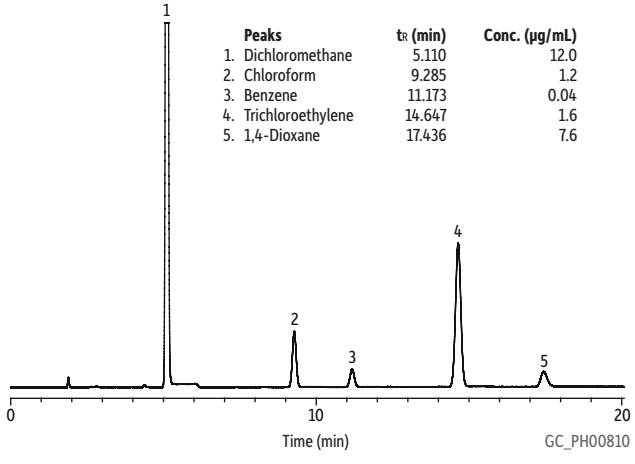
Description	qty.	cat.#
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126

Integra-Guard® Built-In Guard Column



Get the protection without the connection!

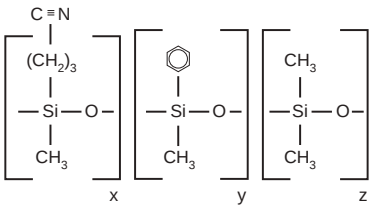
USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace



Peaks	tR (min)	Conc. (µg/mL)
1. Dichloromethane	5.110	12.0
2. Chloroform	9.285	1.2
3. Benzene	11.173	0.04
4. Trichloroethylene	14.647	1.6
5. 1,4-Dioxane	17.436	7.6

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.
Injection	headspace-loop split (split ratio 2:1)
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	
Oven Temp.:	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

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.

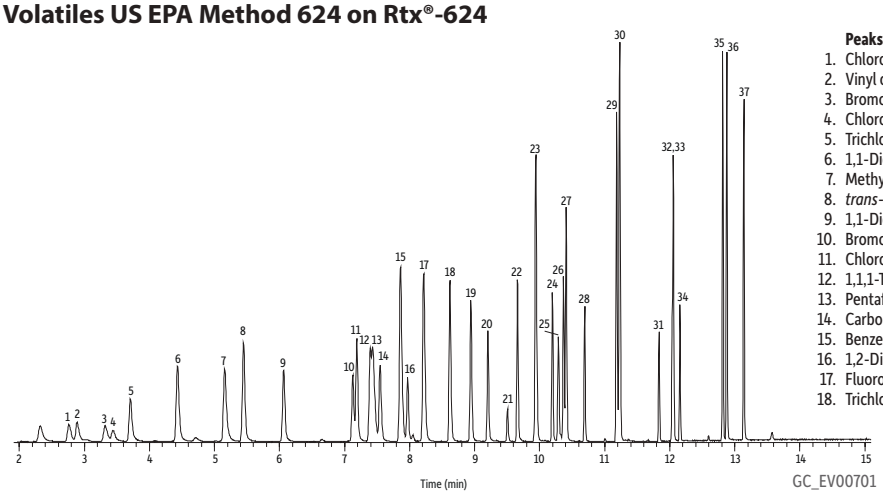
The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first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



Peaks

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)
Conc.:	compounds at 50 ppb (IS @ 40ppb) in 5mL of RO water
Injection	purge and trap split (split ratio 40:1)
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	He, constant flow
Flow Rate:	1.1 mL/min
Dead Time:	2.06 min @ 50 °C
Detector	Agilent 5971A GC/MS
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.

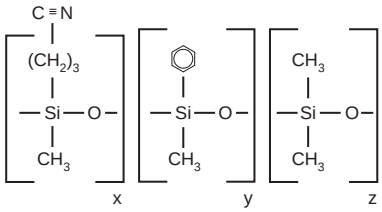
Rtx®-1701 is one of the more popular stationary phases used in capillary GC. The mix of cyano and phenyl functional groups increases the polarity and offers a different elution order relative to less polar Rtx®-1 or Rtx®-5 columns. An Rtx®-1701 column is ideal for confirmation analysis in combination 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 Structure



Similar to: (14%-cyanopropylphenyl)-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

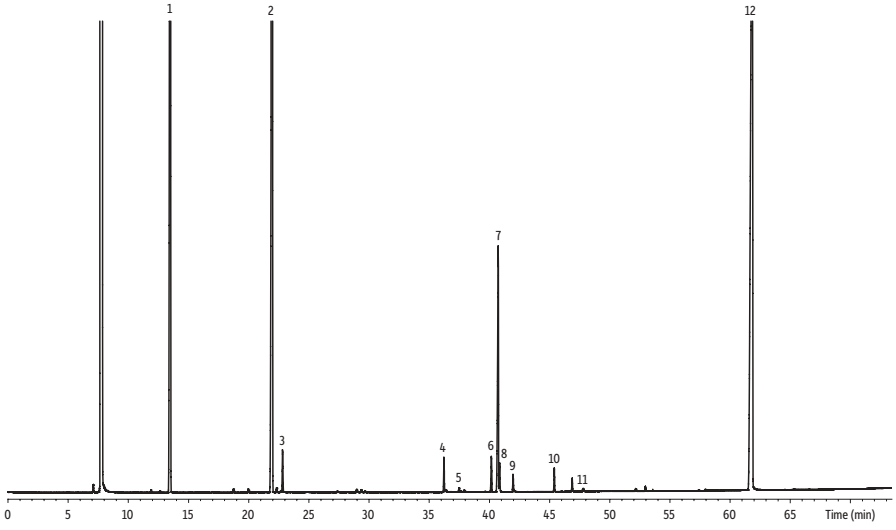
Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1701 columns .....page 109

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

5% Fragrance Materials Association Mix on Rtx®-1701

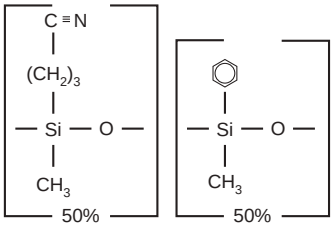


GC_FF00658

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.

Our personal commitment to your satisfaction drives everything we do from innovative product development to speedy service and shipping.

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.

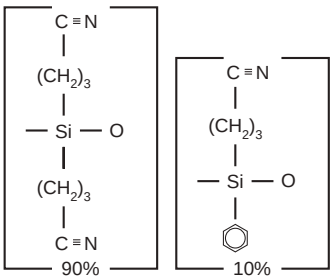
Rtx®-2330 is one of the most polar capillary column stationary phases. Cyano groups on both sides of the polymer backbone give the phase a strong dipole moment and high selectivity for *cis*/*trans* compounds or compounds with conjugated double bonds. Highly polar columns typically exhibit poor column 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.

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.

Rtx®-2330 Structure



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

similar phases

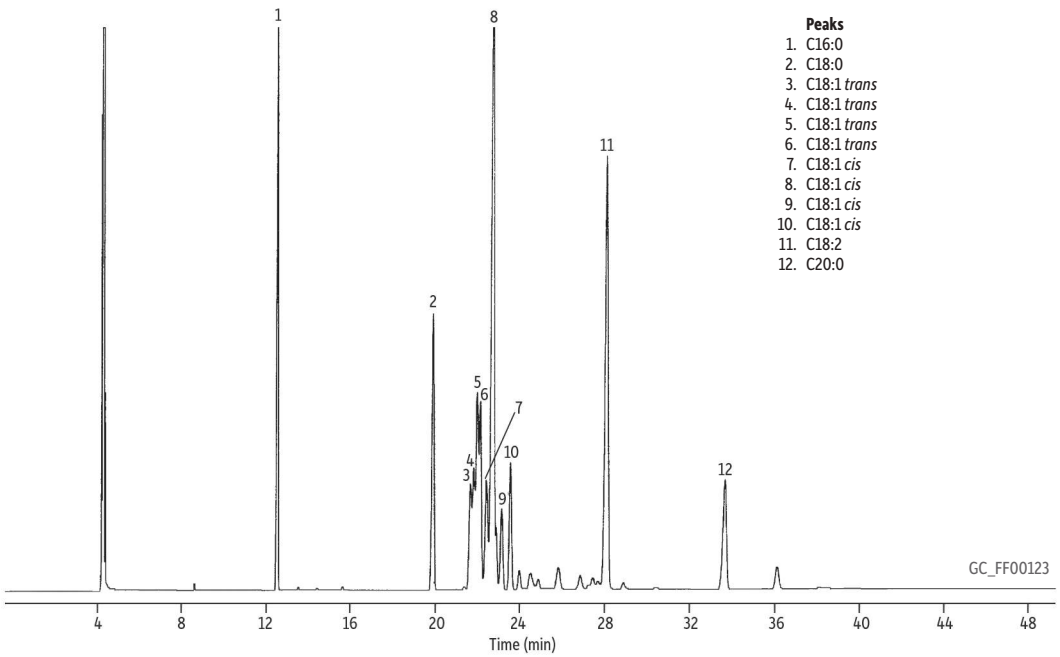
VF-23ms

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.

FAMEs (Commercial Margarine) on Rt®-2330

(split injection)



Peaks
1. C16:0
2. C18:0
3. C18:1 *trans*
4. C18:1 *trans*
5. C18:1 *trans*
6. C18:1 *trans*
7. C18:1 *cis*
8. C18:1 *cis*
9. C18:1 *cis*
10. C18:1 *cis*
11. C18:2
12. C20:0

Column	Rt®-2330, 105 m, 0.25 mm ID, 0.20 µm (cat.# 10729)	**Oven**	
Sample	Commercial margarine mixture	Oven Temp.:	165 °C
Conc.:	Approximately 5 µg	**Carrier Gas**	H_2, constant pressure
Injection		Linear Velocity:	40 cm/sec
Inj. Vol.:	1.0 µL split (split ratio 50:1)	**Detector**	FID @ 275 °C
Inj. Temp.:	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)

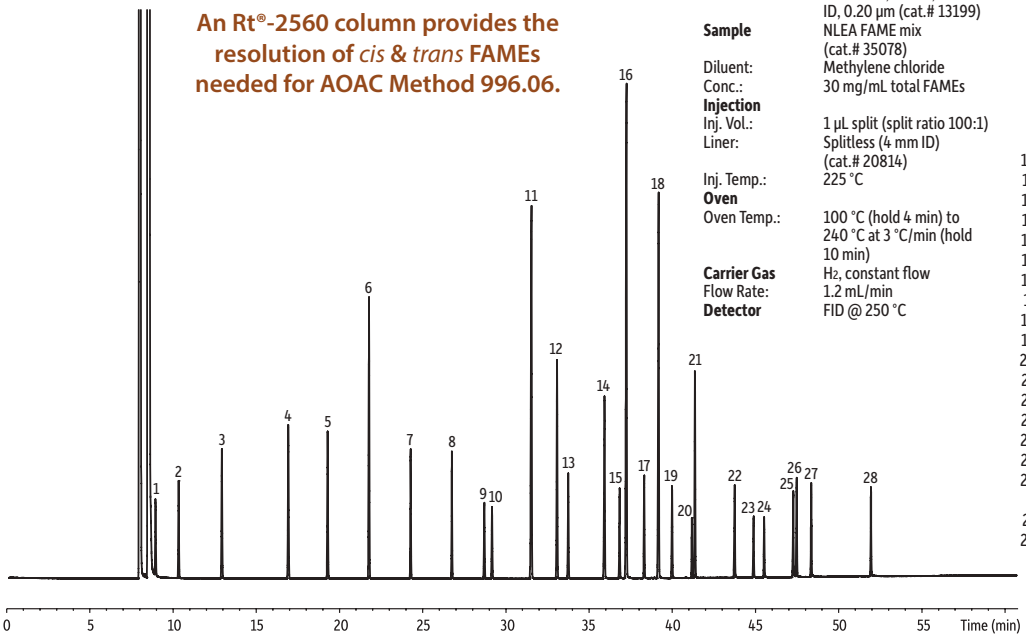
- Application-specific column for *cis*/*trans* FAMEs.
- Stable to 250 °C.

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.



GC_FF00651

Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	NLEA FAME mix (cat.# 35078)
Diluent:	Methylene chloride
Conc.:	30 mg/mL total FAMEs
Injection	
Inj. Vol.:	1 µL split (split ratio 100:1)
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

Peaks

1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

Rtx®-Wax Columns (fused silica)

(polar phase; Crossbond® polyethylene glycol)

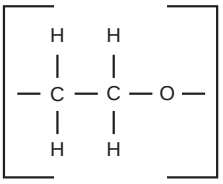
- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Temperature range: 20 °C to 250 °C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

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.

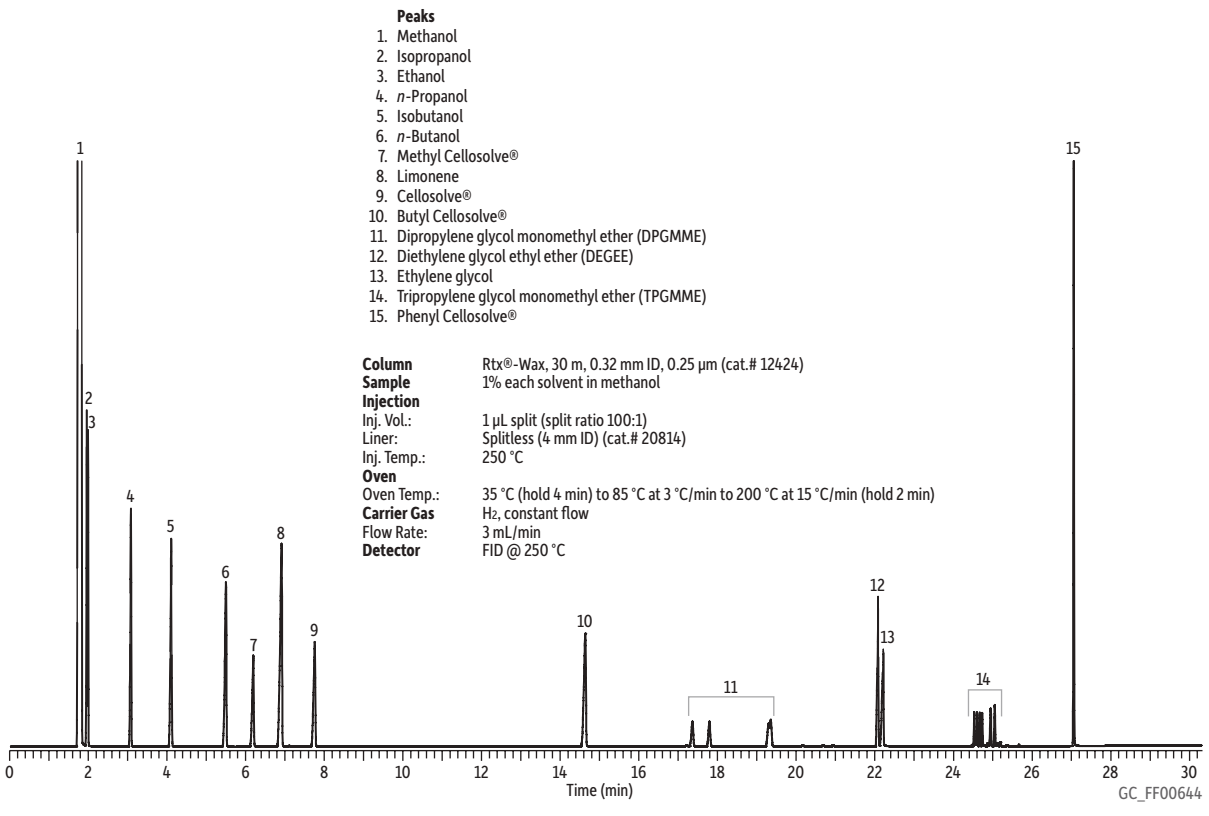
Rtx®-Wax Structure



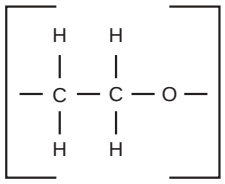
similar phases

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

Cleaning Solvents on Rtx®-Wax



Stabilwax® Structure



similar phases

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

Six columns for the price of five!

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

also available

Metal MXT® Columns

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

MXT®-WAX columns .....page 110

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.

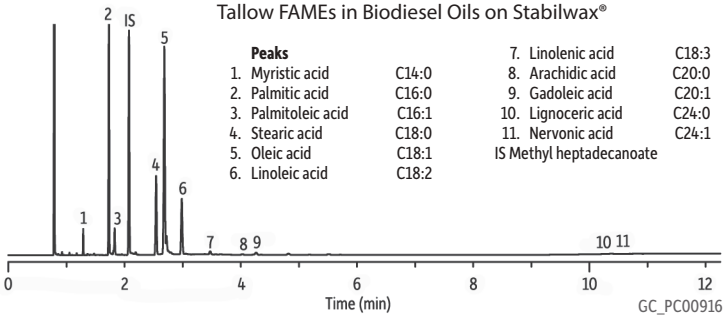
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 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.

FAMEs in Biodiesel Oils on Stabilwax®

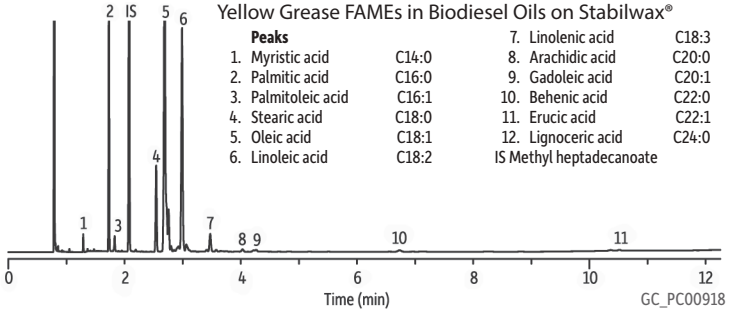
Tallow FAMEs in Biodiesel Oils on Stabilwax®



Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Lignoceric acid	C24:0	
11.	Nervonic acid	C24:1	
IS	Methyl heptadecanoate		

GC_PC00916

Yellow Grease FAMEs in Biodiesel Oils on Stabilwax®



Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Behenic acid	C22:0	
11.	Erucic acid	C22:1	
12.	Lignoceric acid	C24:0	
IS	Methyl heptadecanoate		

GC_PC00918

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

Injection
Inj. Vol.: 1.0 µL split (split ratio 100:1)
Liner: Cyclosplitter® (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 H_2, 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)

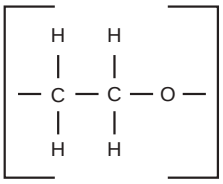
NEW!

- 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.

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

Stabilwax®-MS Structure

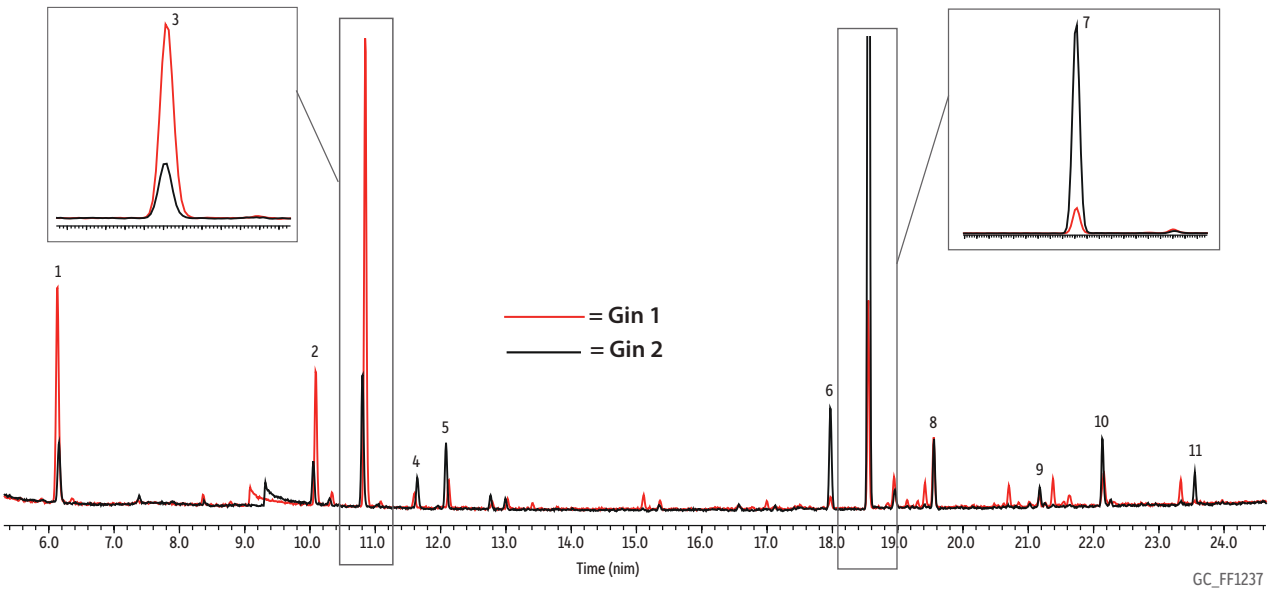


also available

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:

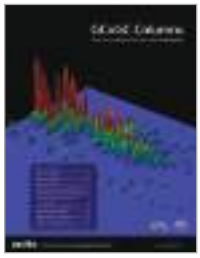
Group	Start Time (min)	Scan Range (amu)	Scan Rate (scans/sec)
1	0.5	40-550	2

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	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.

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



free literature

GCxGC Columns: Your One Source for 2D Gas Chromatography

Download your free copy from **www.restek.com**

lit. cat.# GNBR1585-UNV

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.

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

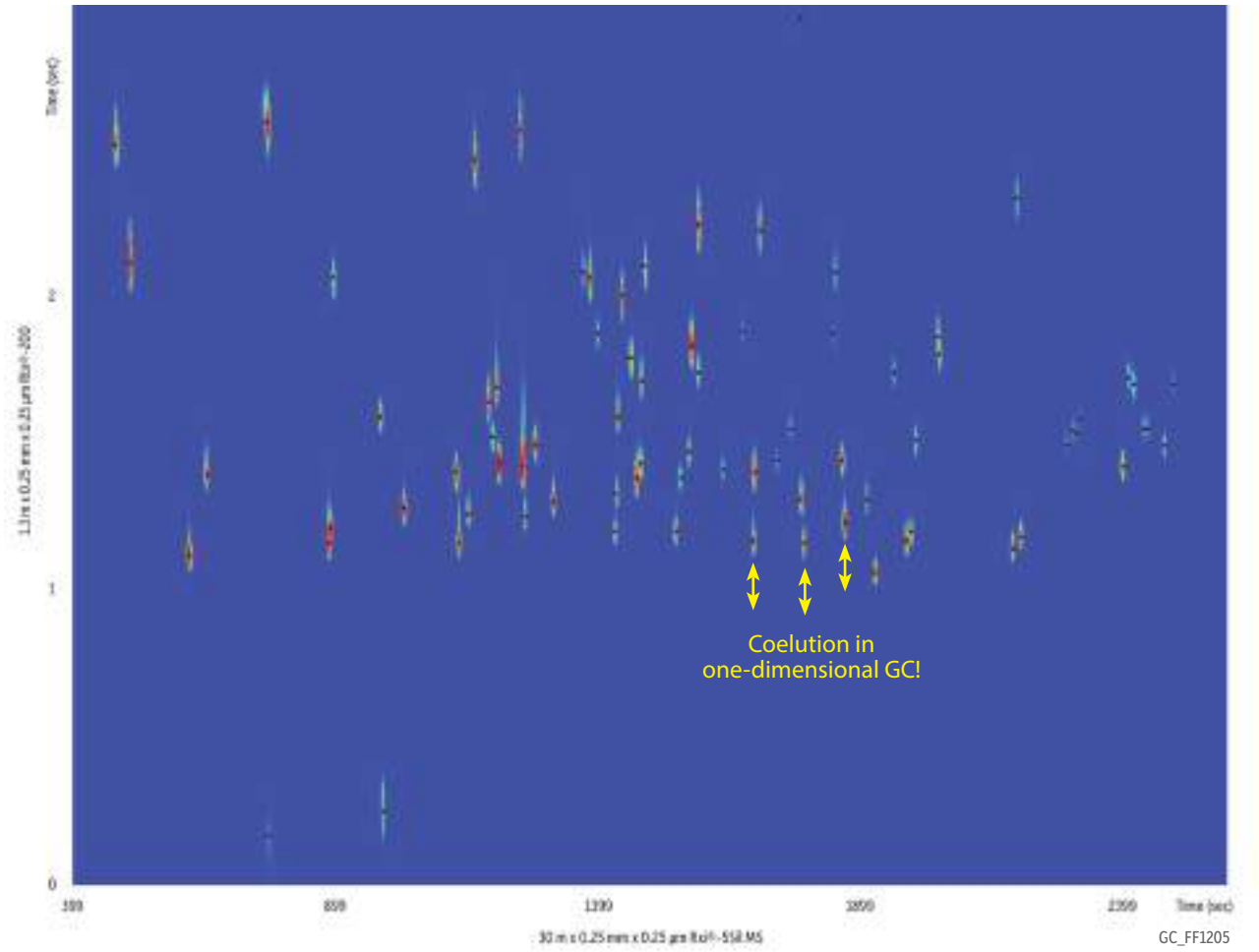
To get additional assistance in choosing a column pair, visit **www.restek.com/gcxgc**

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.

	Primary Column		Secondary Column	
Application Area	**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

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!

Primary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	30 m	0.25 mm	0.25 µm	-60 to 330/350 °C	13323
Rxi-5Sil MS	30 m	0.25 mm	0.25 µm	-60 to 320/350 °C	13623
Rxi-XLB	30 m	0.25 mm	0.25 µm	30 to 340/360 °C	13723
Rxi-17Sil MS	30 m	0.25 mm	0.25 µm	40 to 340/360 °C	14123
Rtx-200	30 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15023
Stabilwax	30 m	0.25 mm	0.25 µm	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 µm	-60 to 330/350 °C	15114
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15120
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15127
Rxi-5Sil MS	2 m	0.15 mm	0.15 µm	-60 to 330/350 °C	15113
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15119
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15126
Rxi-XLB	2 m	0.15 mm	0.15 µm	30 to 340/360 °C	15115
	2 m	0.18 mm	0.18 µm	30 to 340/360 °C	15121
	2 m	0.25 mm	0.25 µm	30 to 340/360 °C	15128
Rxi-17Sil MS	2 m	0.15 mm	0.15 µm	40 to 340/360 °C	15110
	2 m	0.18 mm	0.18 µm	40 to 340/360 °C	15116
	2 m	0.25 mm	0.25 µm	40 to 340/360 °C	15123
Rtx-200	2 m	0.15 mm	0.15 µm	-20 to 320/340 °C	15111
	2 m	0.18 mm	0.18 µm	-20 to 320/340 °C	15117
	2 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15124
Stabilwax	2 m	0.15 mm	0.15 µm	40 to 250/260 °C	15112
	2 m	0.18 mm	0.18 µm	40 to 250/260 °C	15118
	2 m	0.25 mm	0.25 µm	40 to 250/260 °C	15125

GCxGC Secondary Column Selectivity Kits

- 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.

Description		qty.	cat.#
GCxGC (0.15 mm) Selectivity Kit		kit	15129
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.15 mm x 0.15 µm	ea.	15114
Rxi-5Sil MS	2 m x 0.15 mm x 0.15 µm	ea.	15113
Rxi-XLB	2 m x 0.15 mm x 0.15 µm	ea.	15115
Rxi-17Sil MS	2 m x 0.15 mm x 0.15 µm	ea.	15110
Rtx-200	2 m x 0.15 mm x 0.15 µm	ea.	15111
Stabilwax	2 m x 0.15 mm x 0.15 µm	ea.	15112
Universal Press-Tight Connectors	Deactivated	5-pk.	20429

Description		qty.	cat.#
GCxGC (0.18 mm) Selectivity Kit		kit	15130
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.18 mm x 0.18 µm	ea.	15120
Rxi-5Sil MS	2 m x 0.18 mm x 0.18 µm	ea.	15119
Rxi-XLB	2 m x 0.18 mm x 0.18 µm	ea.	15121
Rxi-17Sil MS	2 m x 0.18 mm x 0.18 µm	ea.	15116
Rtx-200	2 m x 0.18 mm x 0.18 µm	ea.	15117
Stabilwax	2 m x 0.18 mm x 0.18 µm	ea.	15118
Universal Press-Tight Connectors	Deactivated	5-pk.	20429

Description		qty.	cat.#
GCxGC (0.25 mm) Selectivity Kit		kit	15131
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.25 mm x 0.25 µm	ea.	15127
Rxi-5Sil MS	2 m x 0.25 mm x 0.25 µm	ea.	15126
Rxi-XLB	2 m x 0.25 mm x 0.25 µm	ea.	15128
Rxi-17Sil MS	2 m x 0.25 mm x 0.25 µm	ea.	15123
Rtx-200	2 m x 0.25 mm x 0.25 µm	ea.	15124
Stabilwax	2 m x 0.25 mm x 0.25 µm	ea.	15125
Universal Press-Tight Connectors	Deactivated	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		43817

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.

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.

similar phases

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

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

free literature

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

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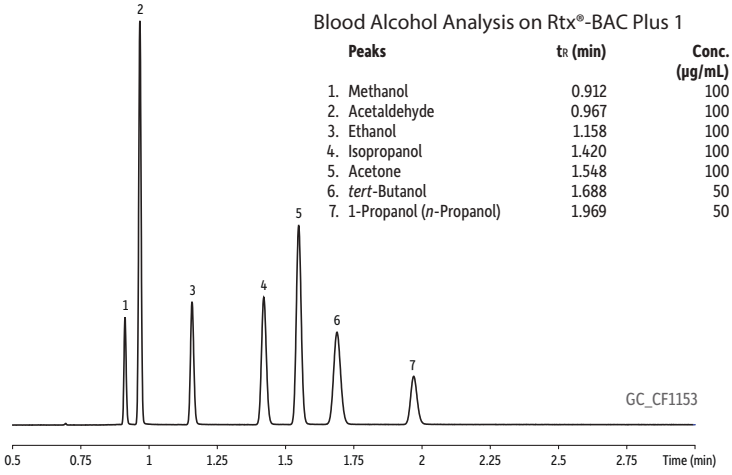
www.restek.com

lit. cat.#
CFBR1538-UNV

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

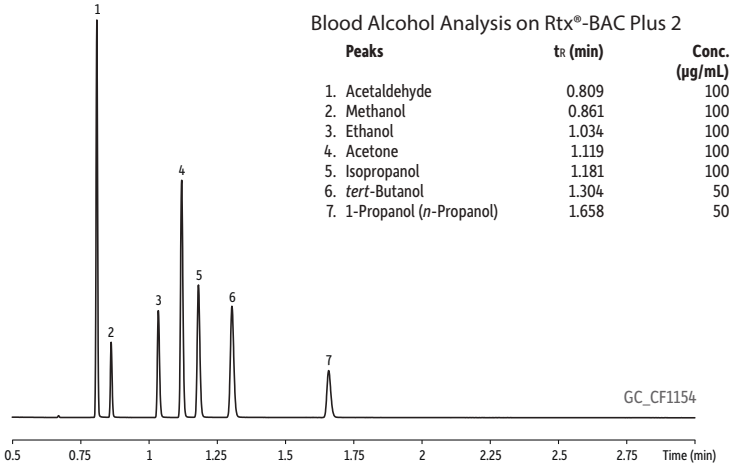
Blood Alcohol Analysis on Rtx®-BAC Plus 1

Peaks	t_R (min)	Conc. (µg/mL)
1. Methanol	0.912	100
2. Acetaldehyde	0.967	100
3. Ethanol	1.158	100
4. Isopropanol	1.420	100
5. Acetone	1.548	100
6. *tert*-Butanol	1.688	50
7. 1-Propanol (*n*-Propanol)	1.969	50



Blood Alcohol Analysis on Rtx®-BAC Plus 2

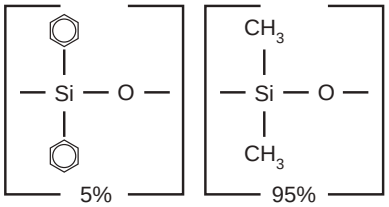
Peaks	t_R (min)	Conc. (µg/mL)
1. Acetaldehyde	0.809	100
2. Methanol	0.861	100
3. Ethanol	1.034	100
4. Acetone	1.119	100
5. Isopropanol	1.181	100
6. *tert*-Butanol	1.304	50
7. 1-Propanol (*n*-Propanol)	1.658	50



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	Headspace-loop split (split ratio 50:1)
Liner:	1 mm ID straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	200 °C
Instrument:	Tekmar HT3
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	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Brominated Flame Retardants Analysis

Rtx®-1614 Structure

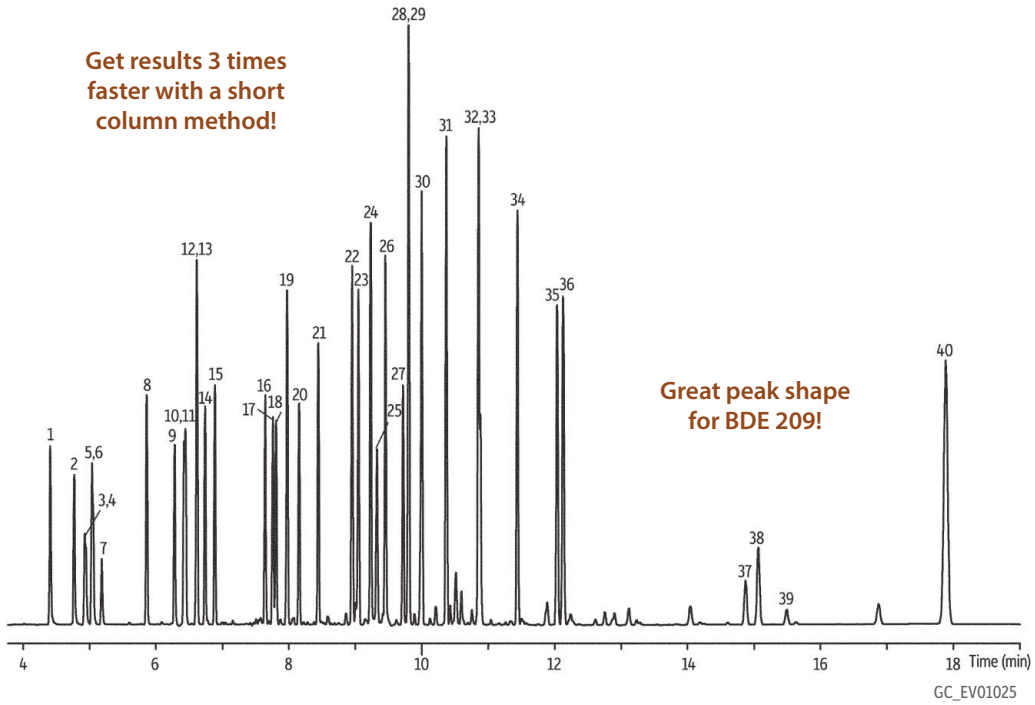


Rtx®-1614 Columns (fused silica)
(5% diphenyl, 95% dimethyl polysiloxane)

- 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



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	He, constant linear velocity
Linear Velocity:	60 cm/sec @ 120 °C
Detector	µ-ECD @ 345 °C

Dioxin & Furan Analysis

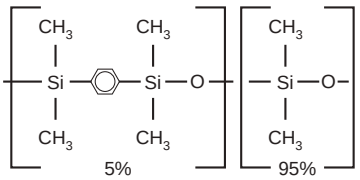
Rxi®-5Sil MS Columns (fused silica)
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- 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

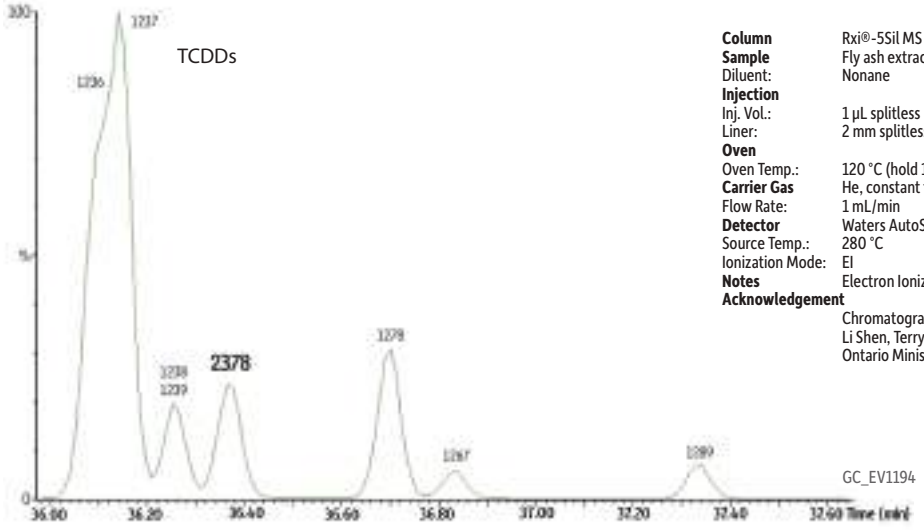


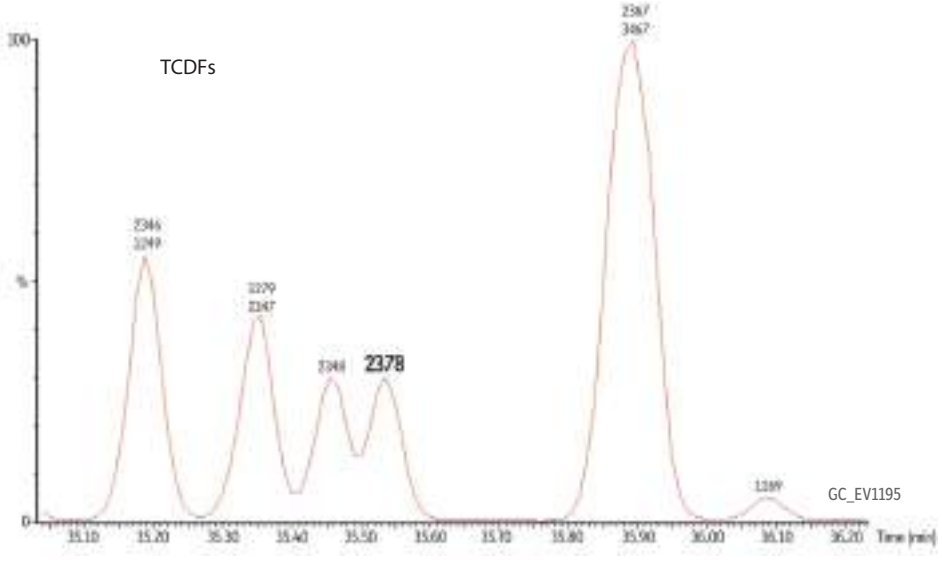
Similar to: (5%-phenyl)-methylpolysiloxane

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

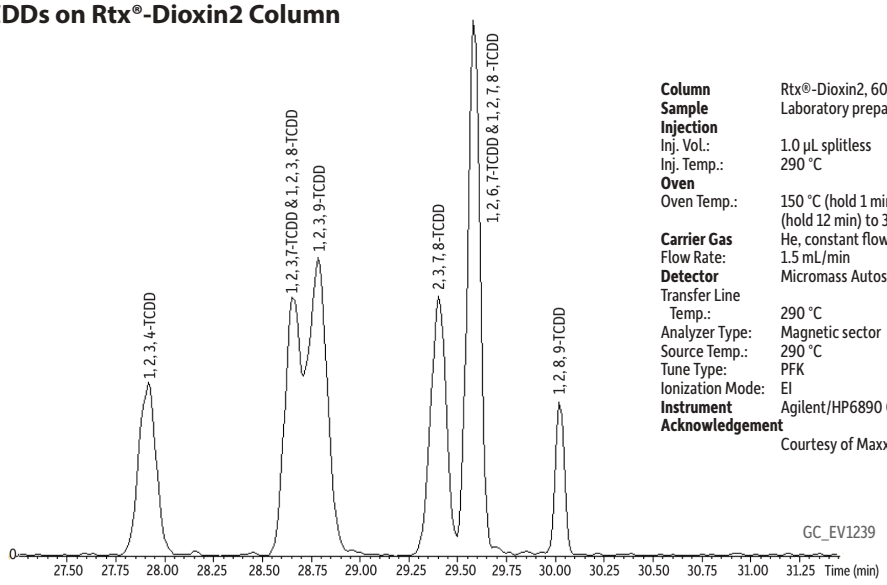
Dioxin & Furan Analysis

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.

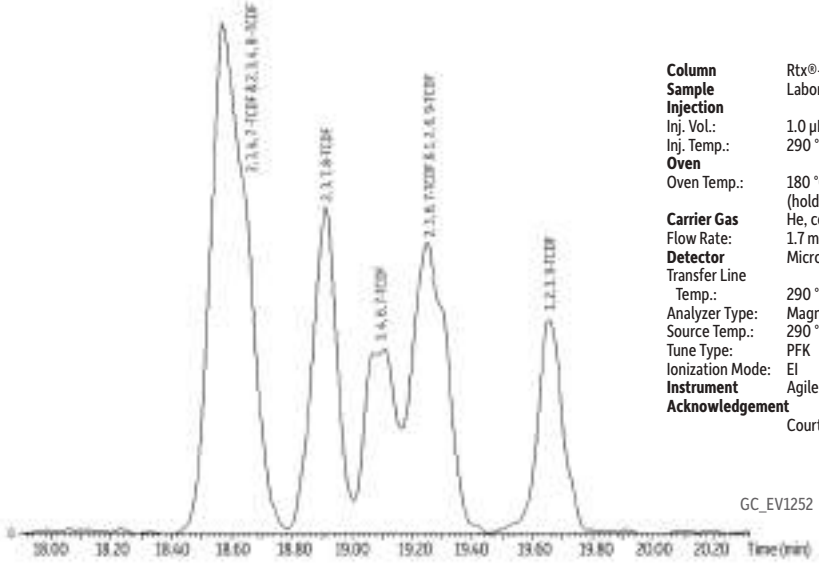
ID	df	temp. limits	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	20 to 320/340 °C	10759	
0.25 mm	0.25 µm	20 to 320/340 °C		10758

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 He, constant flow
Flow Rate: 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 He, constant flow
Flow Rate: 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

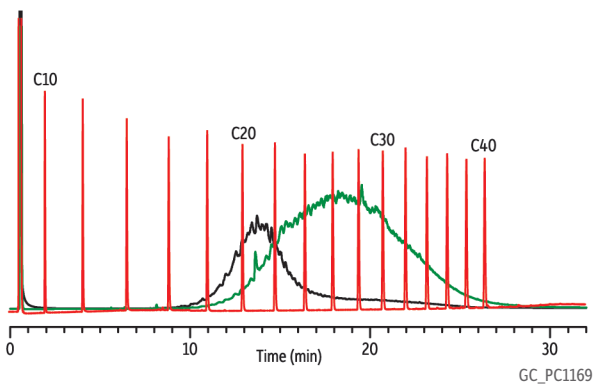
similar phases

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



GC_PC1169

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	H_2, 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:	N_2
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.

Restek innovation!

See **pages 193–202**.

PCB Congeners Analysis

Rtx®-PCB Columns (fused silica)
(proprietary Crossbond® phase)

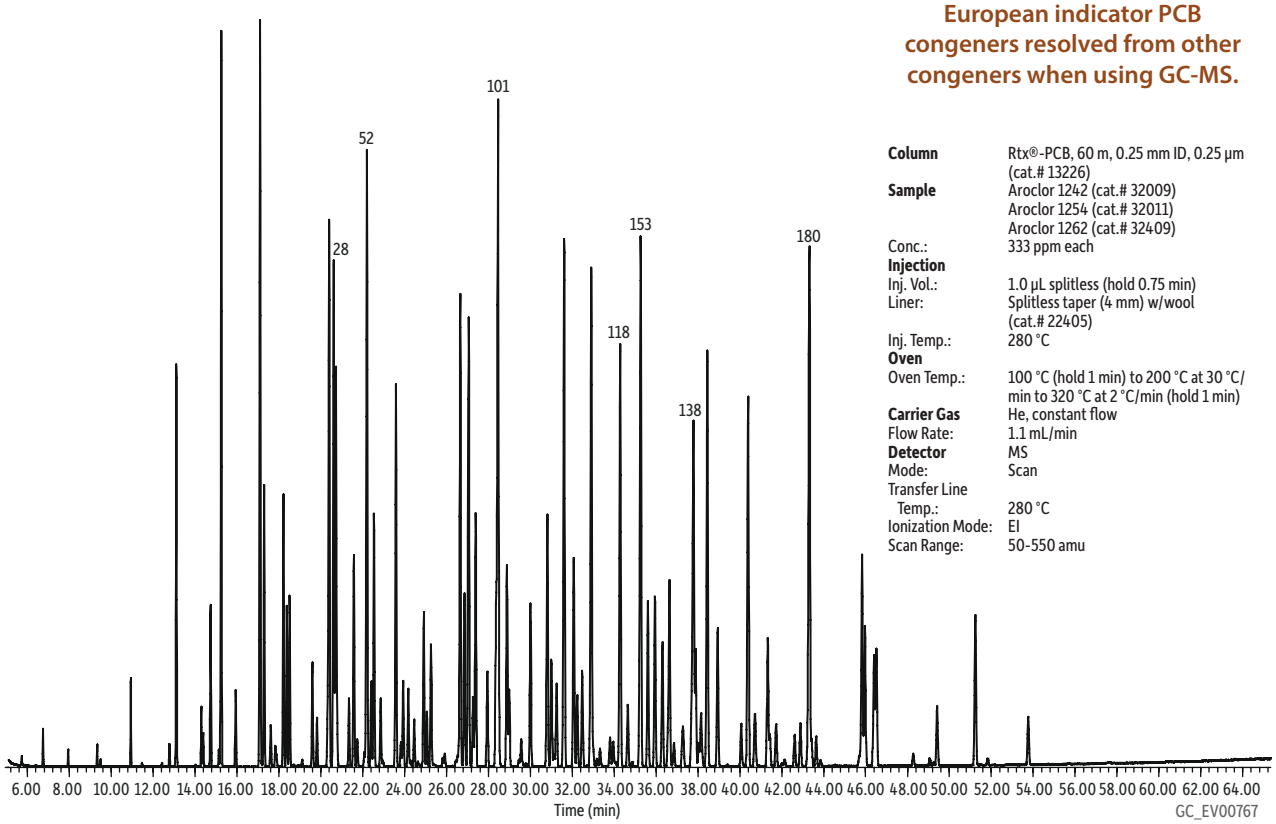
- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Stable to 340 °C.

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

European indicator PCB congeners resolved from other congeners when using GC-MS.



Column	Rtx®-PCB, 60 m, 0.25 mm ID, 0.25 µm (cat.# 13226)
Sample	Aroclor 1242 (cat.# 32009) Aroclor 1254 (cat.# 32011) Aroclor 1262 (cat.# 32409)
Conc.:	333 ppm each
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	280 °C
Oven	
Oven Temp.:	100 °C (hold 1 min) to 200 °C at 30 °C/min to 320 °C at 2 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.1 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Ionization Mode:	EI
Scan Range:	50-550 amu

Peaks identified with PCB congener numbers.

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

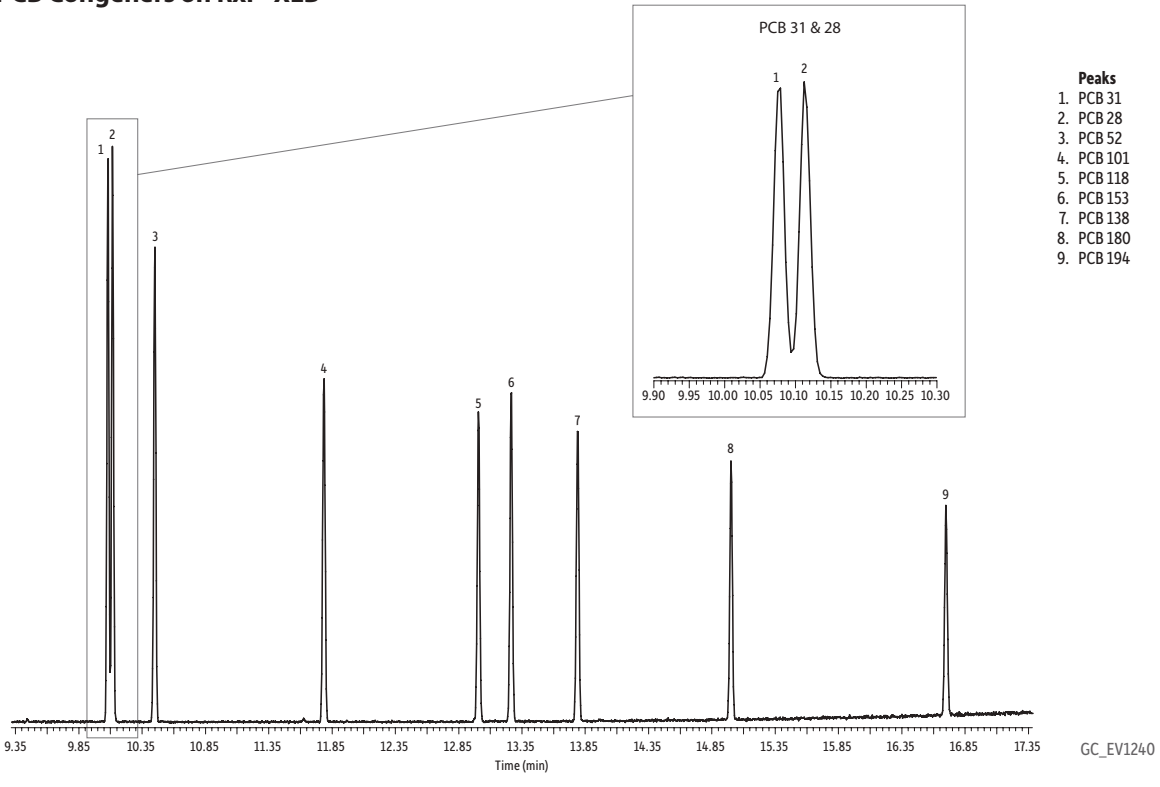
DB-XLB, VF-Xms, MR1, ZB-XLB

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



Peaks
1. PCB 31
2. PCB 28
3. PCB 52
4. PCB 101
5. PCB 118
6. PCB 153
7. PCB 138
8. PCB 180
9. PCB 194

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!

also available

Column connectors

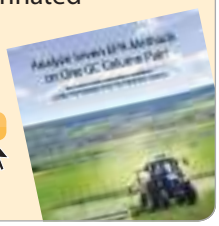
See **pages 227–233** for a wide selection.

free literature

Analyze Chlorinated Pesticides, PCBs and Chlorinated Herbicides

Download your free copy from **www.restek.com**

lit. cat.# EVBR1013D-UNV



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.

kit

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

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

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

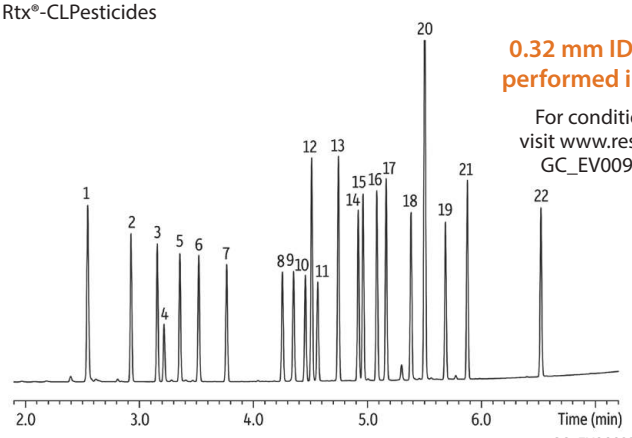
Rtx®-CLPesticides Column Kit (0.53 mm ID)

(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

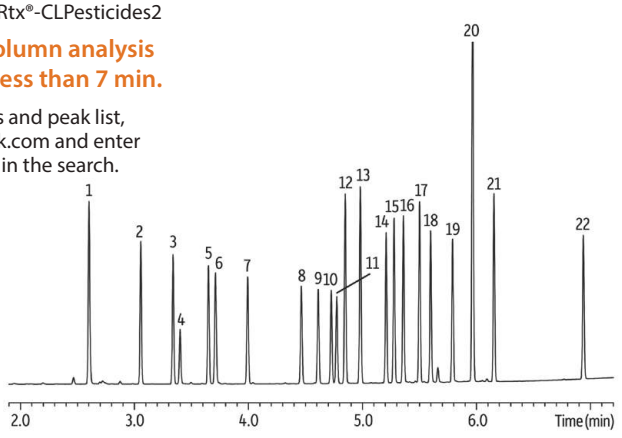
Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.32 mm ID column set)

Rtx®-CLPesticides



GC_EV00933

Rtx®-CLPesticides2



GC_EV00933A

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.

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**

Pesticides Analysis (Organophosphorus)

FAST efficient analysis of OPPs in EPA Method 8141

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.

Restek innovation!
- Better separations
- Faster analyses

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

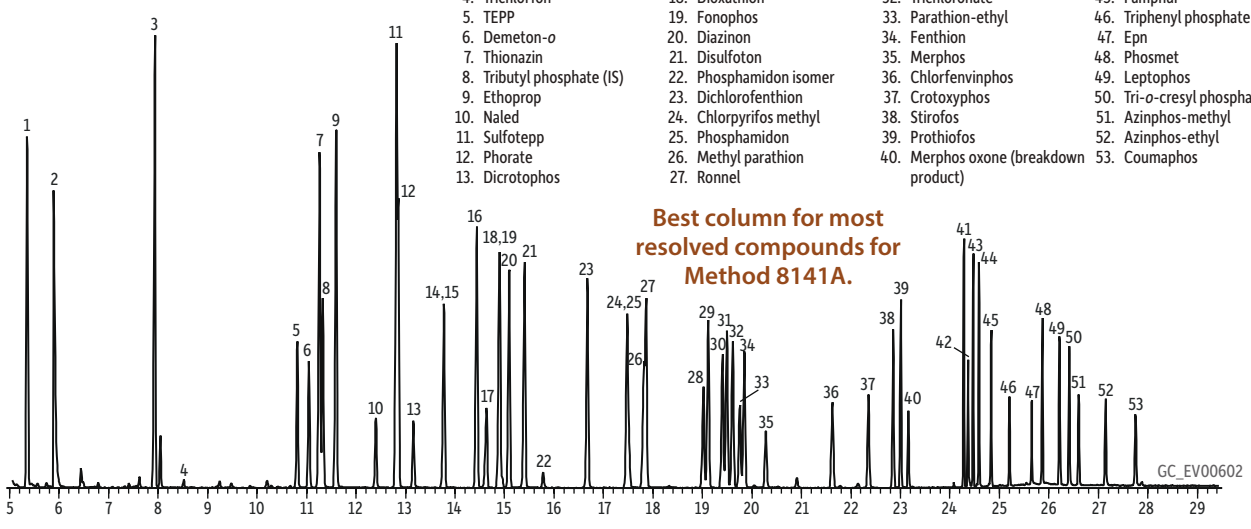
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-20 to 310/330 °C	11223
0.32 mm	0.50 µm	-20 to 310/330 °C	11239
0.53 mm	0.83 µm	-20 to 310/330 °C	11240

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

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



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	
Inj. Vol.:	1.0 µL splitless (hold 0.4 min)
Liner:	Double taper splitless (4 mm) (cat.# 20785)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	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

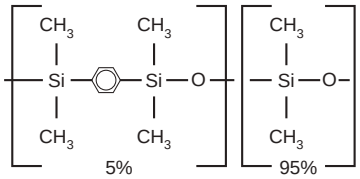
Rxi®-5Sil MS Columns (fused silica)
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- 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

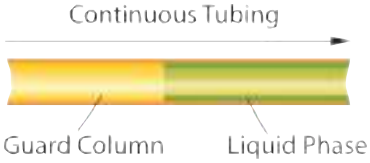


Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

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

Integra-Guard® Built-In Guard Column

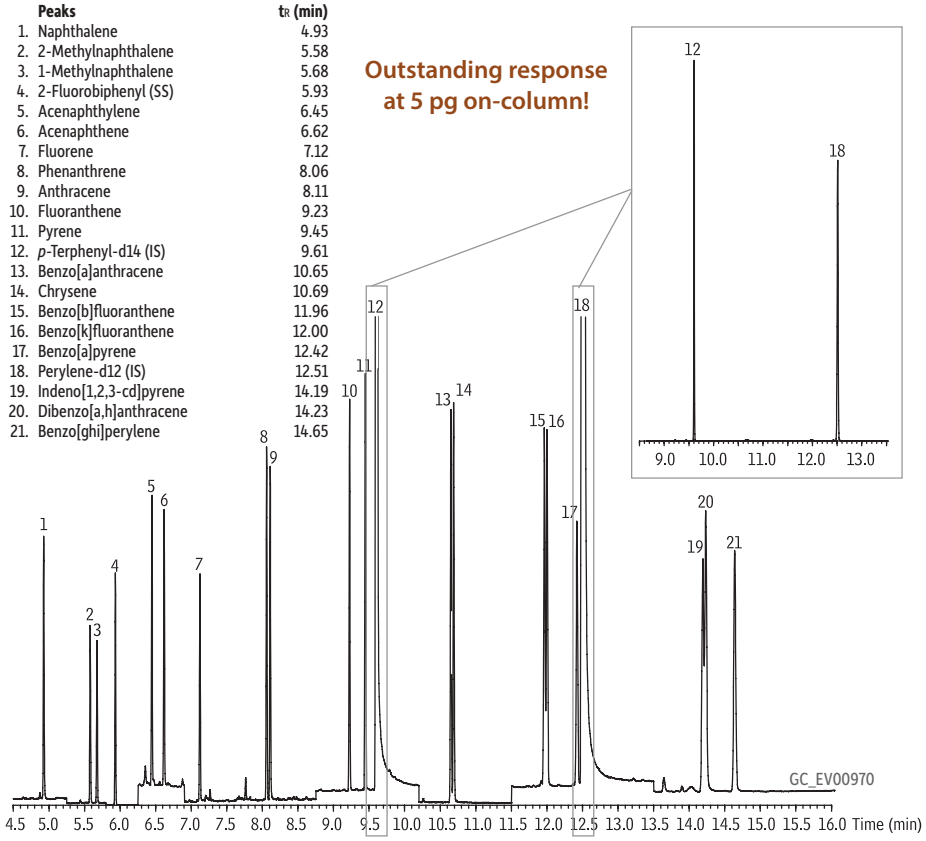


Get the protection without the connection!
See **page 23** for Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns.

Polycyclic Aromatic Hydrocarbons on Rxi®-5Sil MS

Peaks		t_R (min)
1.	Naphthalene	4.93
2.	2-Methylnaphthalene	5.58
3.	1-Methylnaphthalene	5.68
4.	2-Fluorobiphenyl (SS)	5.93
5.	Acenaphthylene	6.45
6.	Acenaphthene	6.62
7.	Fluorene	7.12
8.	Phenanthrene	8.06
9.	Anthracene	8.11
10.	Fluoranthene	9.23
11.	Pyrene	9.45
12.	*p*-Terphenyl-d14 (IS)	9.61
13.	Benzo[a]anthracene	10.65
14.	Chrysene	10.69
15.	Benzo[b]fluoranthene	11.96
16.	Benzo[k]fluoranthene	12.00
17.	Benzo[a]pyrene	12.42
18.	Perylene-d12 (IS)	12.51
19.	Indeno[1,2,3-cd]pyrene	14.19
20.	Dibenzo[a,h]anthracene	14.23
21.	Benzo[ghi]perylene	14.65

Outstanding response at 5 pg on-column!



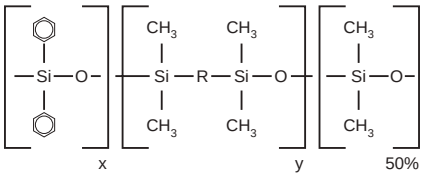
Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	PAH mix, 1 µL of 0.005 µg/mL (IS 2 µg/mL) SV Calibration mix #5 / 610 PAH Mix (cat.# 31011) 1-Methylnaphthalene (cat.# 31283) 2-Methylnaphthalene (cat.# 31285) 2-Fluorobiphenyl (cat.# 31091)
Conc.:	5 pg on-column
Injection	
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.15 min)
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.

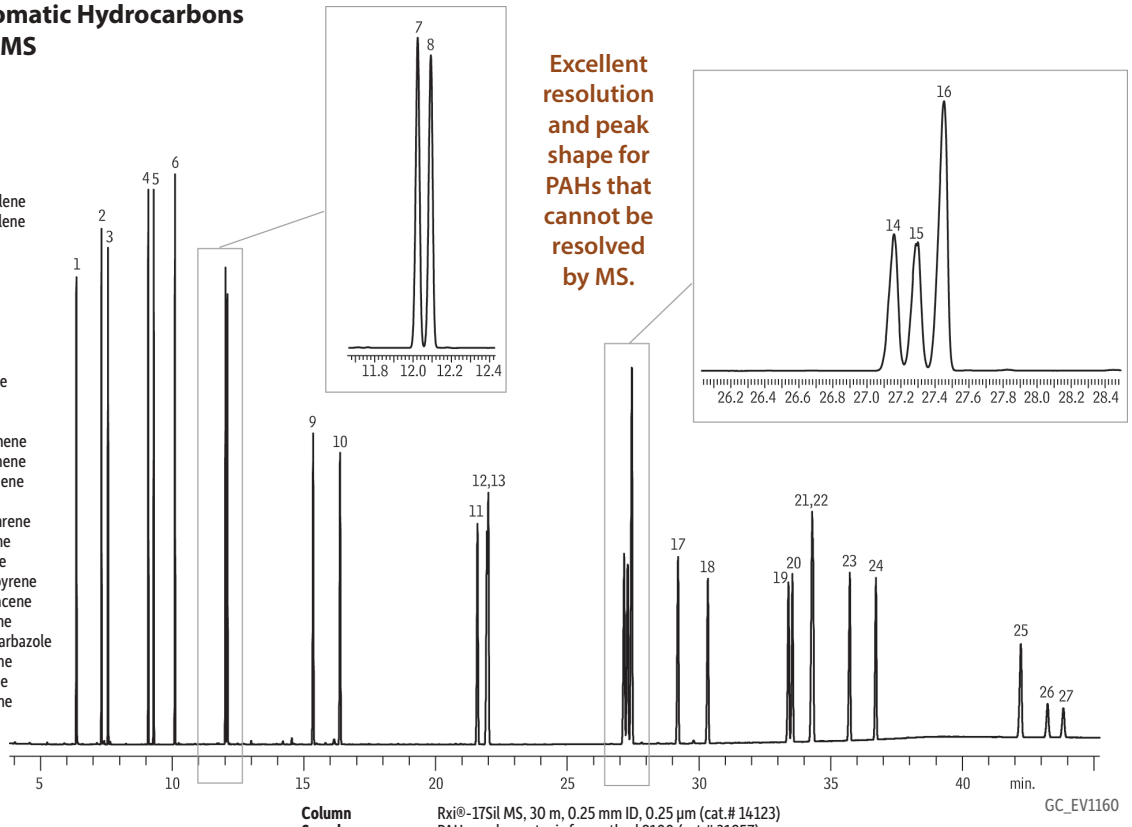
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 340/360 °C	14120	14123	14126
0.32 mm	0.25 µm	40 to 340/360 °C	14121	14124	

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.

GC_EV1160

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

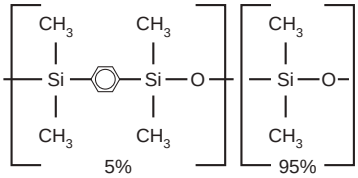
Semivolatiles Analysis

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.

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

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

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	

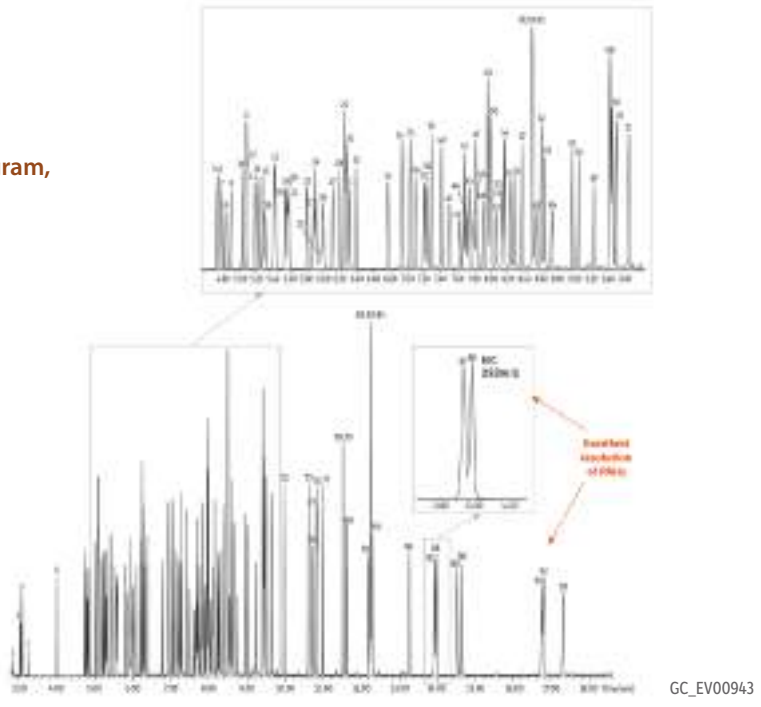
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

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.



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

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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

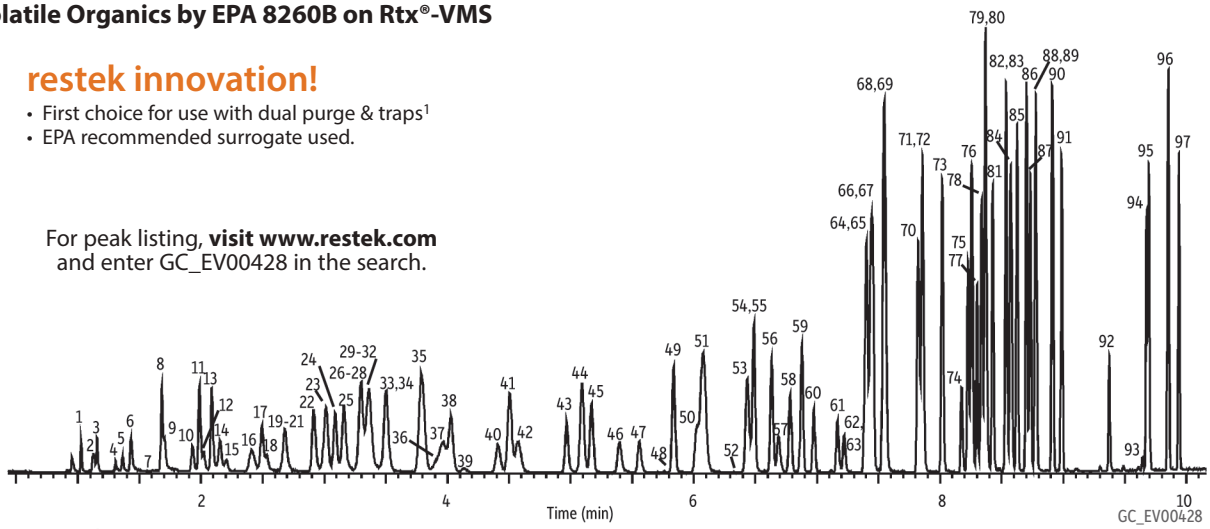
ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-40 to 240/260 °C	49914	49915

Volatile Organics by EPA 8260B on Rtx®-VMS

restek innovation!

- First choice for use with dual purge & traps[1]
- EPA recommended surrogate used.

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



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

[1]A.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.

similar phases

DB-VRX

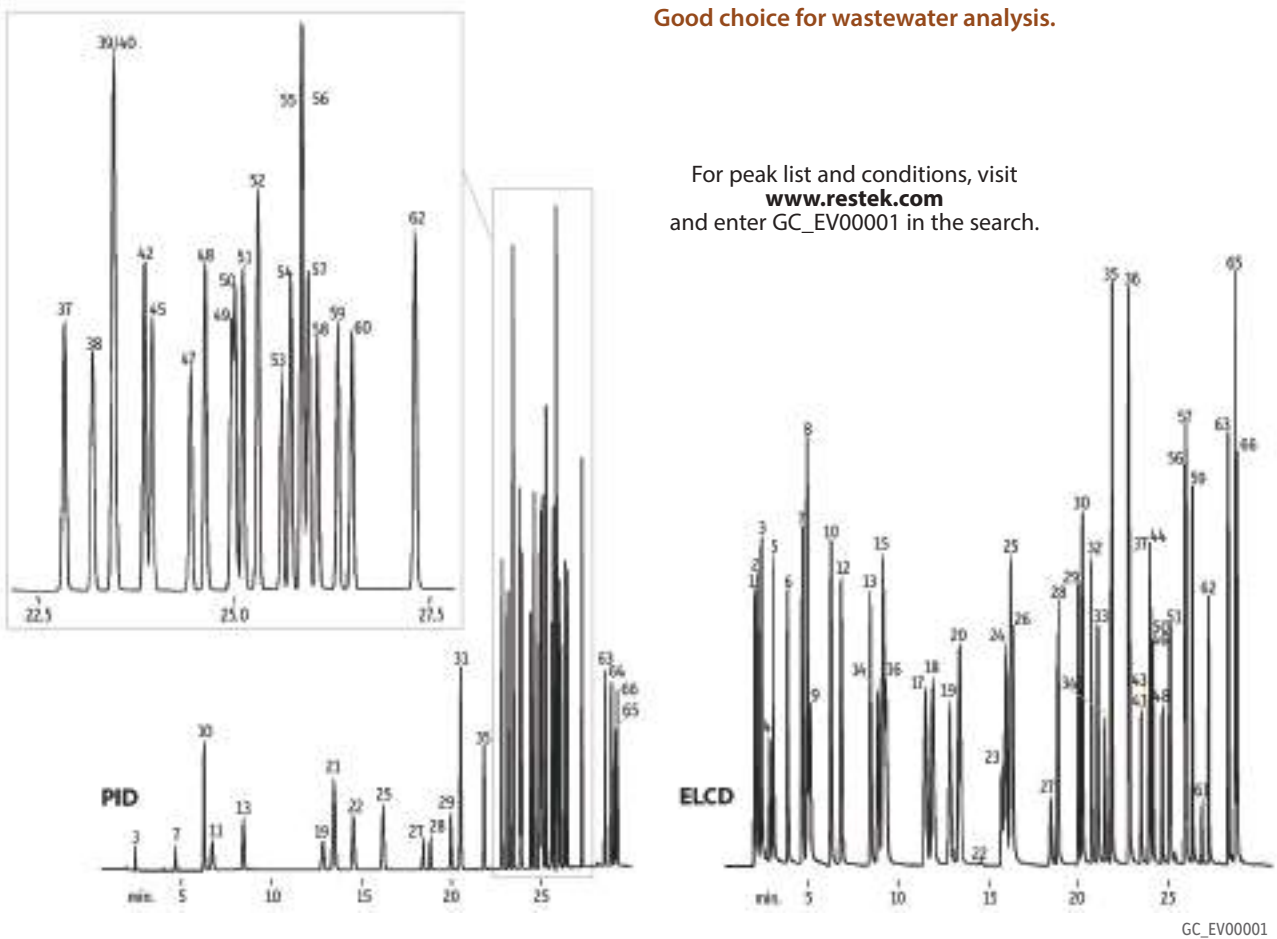
ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#
0.25 mm	1.40 µm	-40 to 240/260 °C	19315	19316	
0.32 mm	1.80 µm	-40 to 240/260 °C	19319	19320	
0.45 mm	2.55 µm	-40 to 240/260 °C	19308		19309
0.53 mm	3.00 µm	-40 to 240/260 °C	19385	19388	

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

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.



Volatile Organics Analysis

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 columns .....page 111
MXT®-Volatiles .....page 111

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.

similar phases
VOCOL

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.

Volatile Organics Analysis

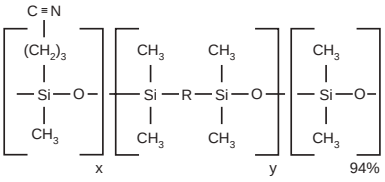
Rxi®-624Sil MS Columns (fused silica)

(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.

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

Rxi®-624Sil MS (G43) Structure

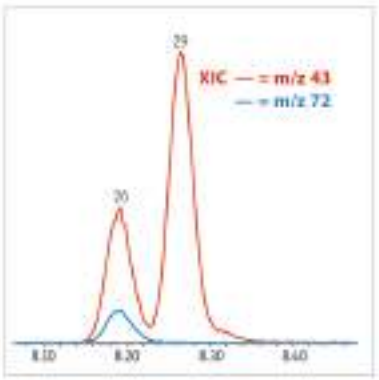


Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

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

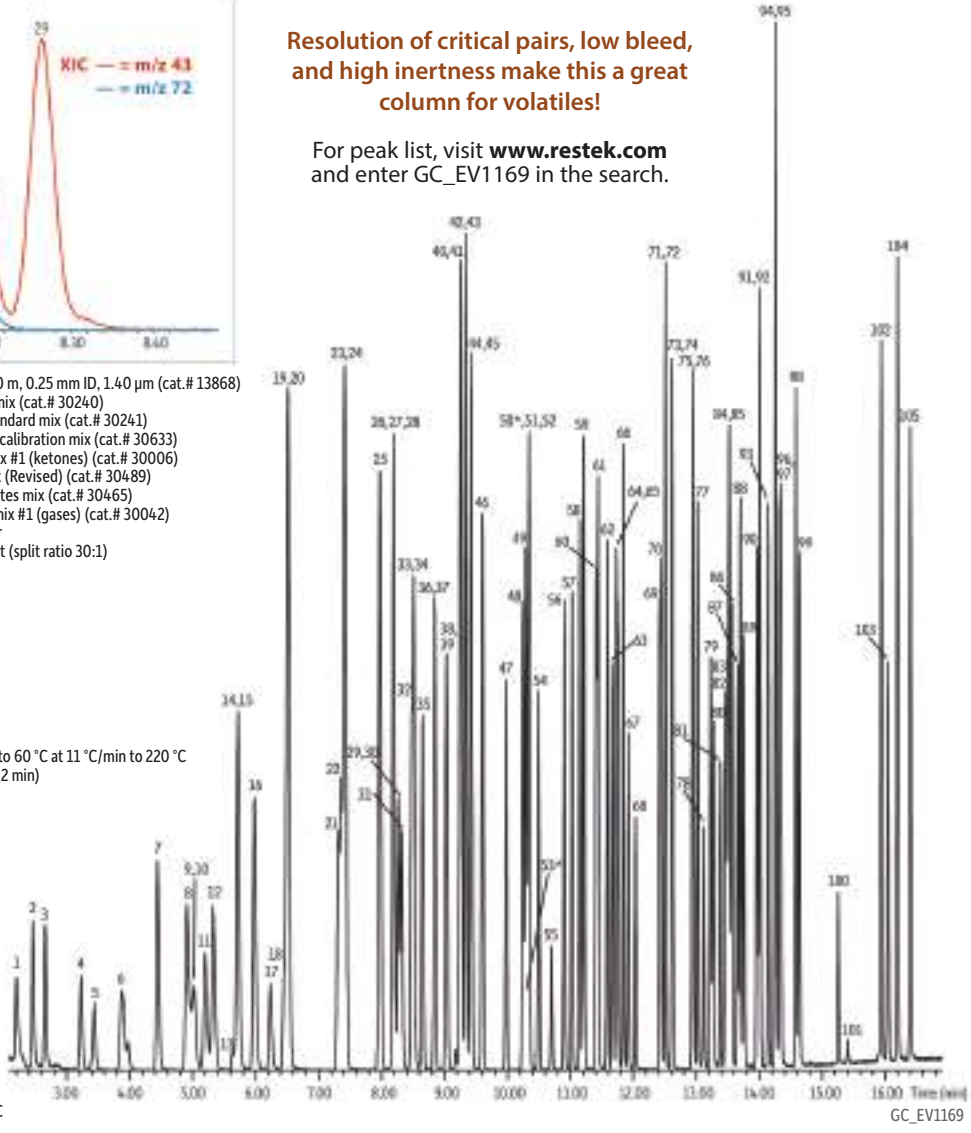
Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



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

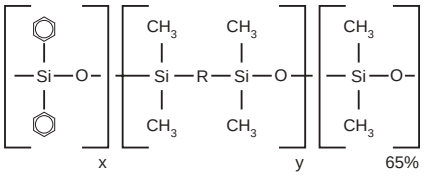
For peak list, visit **www.restek.com** and enter GC_EV1169 in the search.

Column	Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
Sample	8260A surrogate mix (cat.# 30240) 8260A internal standard mix (cat.# 30241) 8260B MegaMix® calibration mix (cat.# 30633) VOA calibration mix #1 (ketones) (cat.# 30006) 8260B acetate mix (Revised) (cat.# 30489) California oxygenates mix (cat.# 30465) 502.2 calibration mix #1 (gases) (cat.# 30042)
Conc.:	25 ppb in RO water
Injection	Purge and trap split (split ratio 30:1)
Inj. Temp.:	225 °C
Purge and Trap	
Instrument:	OI Analytical 4660
Trap Type:	10 Trap
Purge:	11 min @ 20 °C
Desorb Preheat Temp.:	180 °C
Desorb:	0.5 min @ 190 °C
Bake:	5 min @ 210 °C
Interface Connection:	Injection port
Oven	
Oven Temp.:	35 °C (hold 5 min) to 60 °C at 11 °C/min to 220 °C at 20 °C/min (hold 2 min)
Carrier Gas	He, constant flow
Flow Rate:	1.0 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	230 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Electron Energy:	70 eV
Solvent Delay Time:	1.5 min
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	36-260 amu
Instrument	Agilent 7890A GC & 5975C MSD
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)

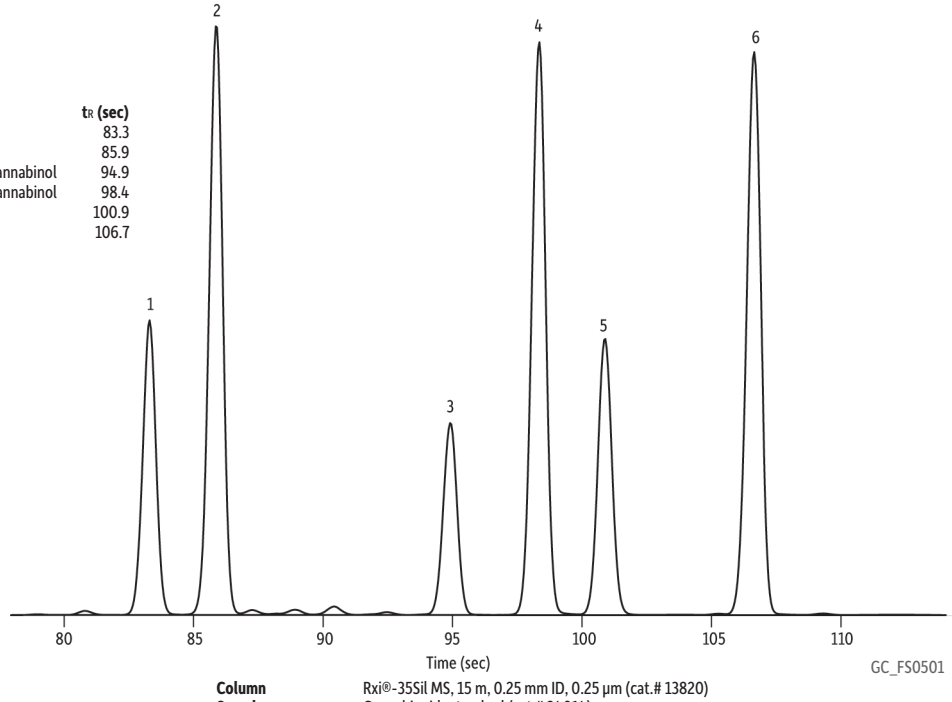
(midpolarity Crossbond® phase)

- 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	t_R (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	H_2, constant flow
Flow Rate:	2.5 mL/min
Detector	FID @ 350 °C
Constant Column + Constant Make-up:	50 mL/min
Make-up Gas Type:	N_2
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.

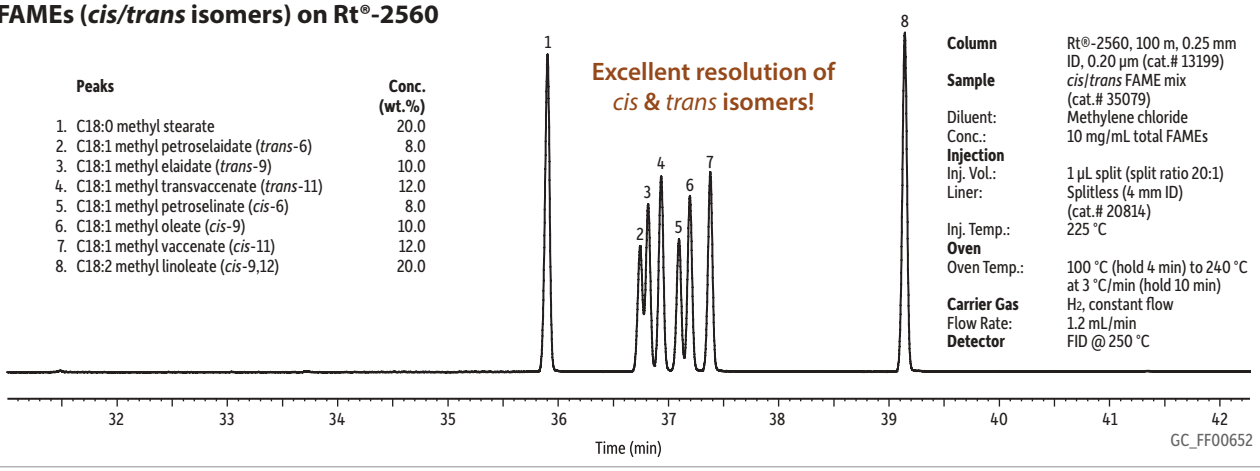
ID	df	temp. limits	100-Meter cat.#
0.25 mm	0.20 µm	20 to 250 °C	13199

similar phases

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

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

Peaks	Conc. (wt.%)
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselaidate (*trans*-6)	8.0
3. C18:1 methyl elaidate (*trans*-9)	10.0
4. C18:1 methyl transvaccenate (*trans*-11)	12.0
5. C18:1 methyl petroselinate (*cis*-6)	8.0
6. C18:1 methyl oleate (*cis*-9)	10.0
7. C18:1 methyl vaccenate (*cis*-11)	12.0
8. C18:2 methyl linoleate (*cis*-9,12)	20.0



Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	*cis*/*trans* 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	
Flow Rate:	H_2, constant flow 1.2 mL/min
Detector	FID @ 250 °C

GC_FF00652

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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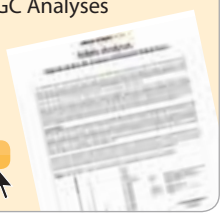
lit. cat.# 59584B

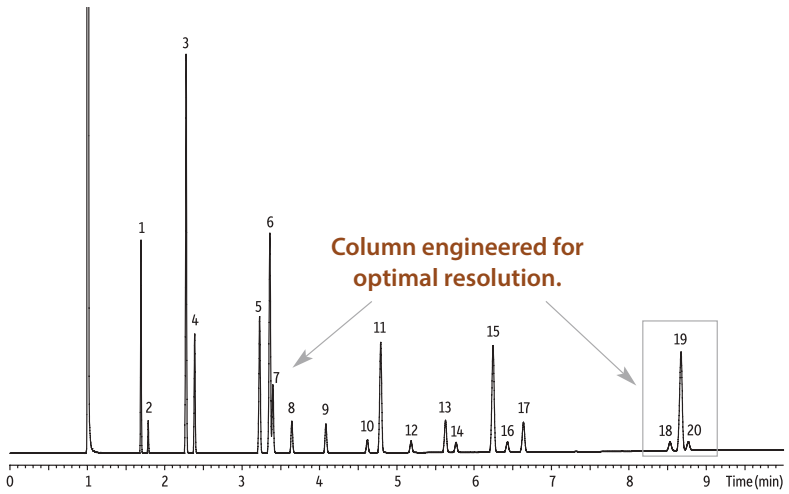


similar phases

Select FAME, Omegawax

FAMEs (Marine Oil Standard) on FAMEWAX

Peaks	Conc. (µg/mL)		
1. C14:0	600	10. C20:0	100
2. C14:1	100	11. C20:1	900
3. C16:0	1,600	12. C20:2	100
4. C16:1	500	13. C20:4	300
5. C18:0	800	14. C20:3	100
6. C18:1 (oleate)	1,300	15. C20:5	1,000
7. C18:1 (vaccenate)	400	16. C22:0	100
8. C18:2	200	17. C22:1	300
9. C18:3	200	18. C24:0	100
		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	
Flow Rate:	H_2, constant flow 3 mL/min
Detector	FID @ 275 °C

GC_FF00499

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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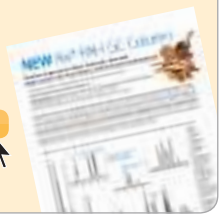


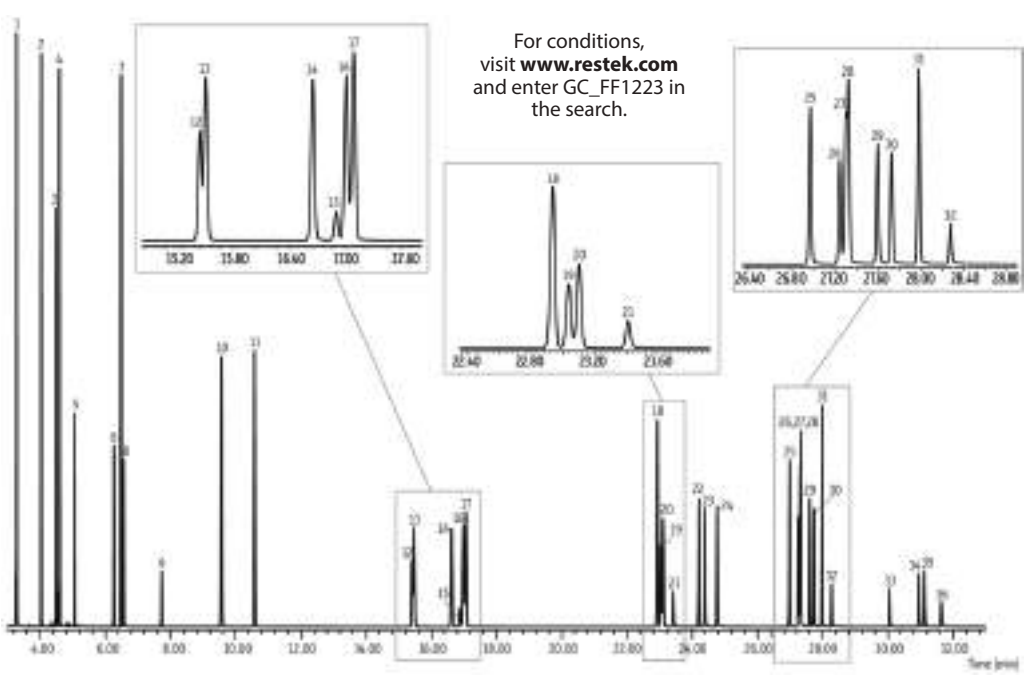
Rxi®-PAH Columns (fused silica)
(midpolarity proprietary phase)

- 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.

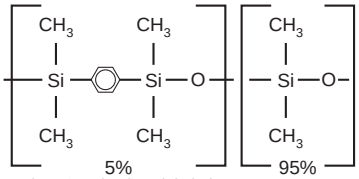
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-60 to 320/350 °C	13623
	0.50 µm	-60 to 320/350 °C	13638

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, 0.50 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

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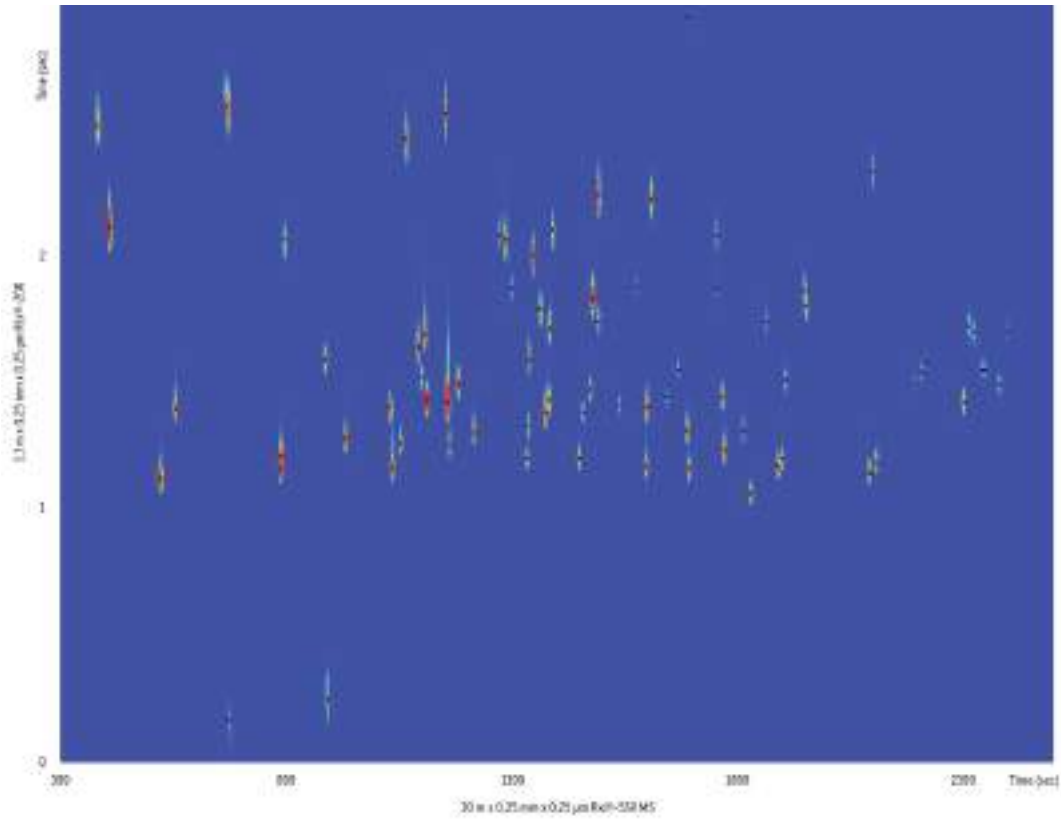
Marijuana Pesticides by GCxGC on Rxi®-5Sil MS and Rtx®-200



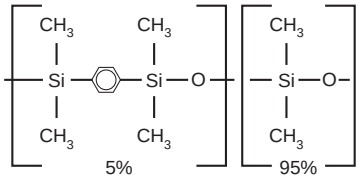
GC_FF1205

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.

Pesticide Residues in Food Analysis

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.**

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.

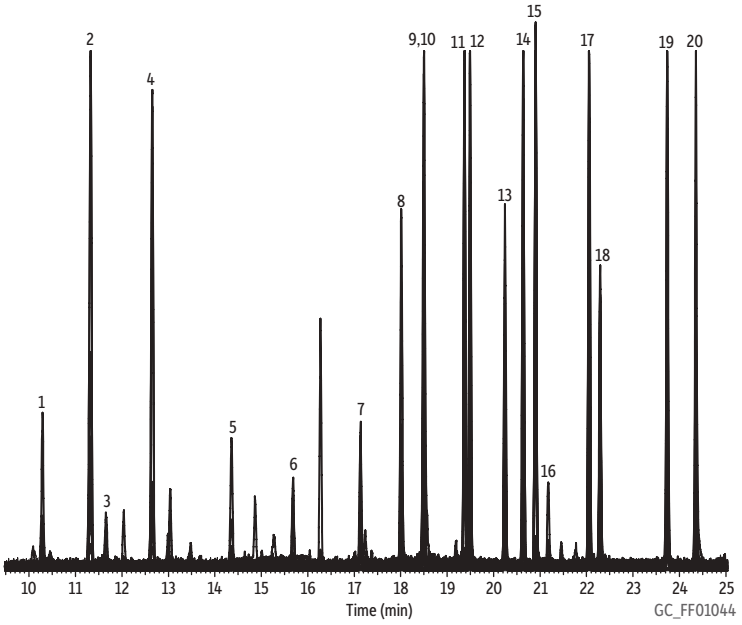
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60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

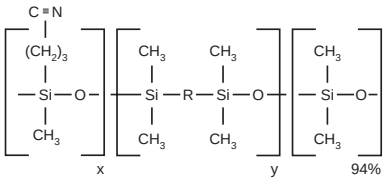
Residual Solvent Analysis for Cannabis Concentrates

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.

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

Rxi®-624Sil MS (G43) Structure



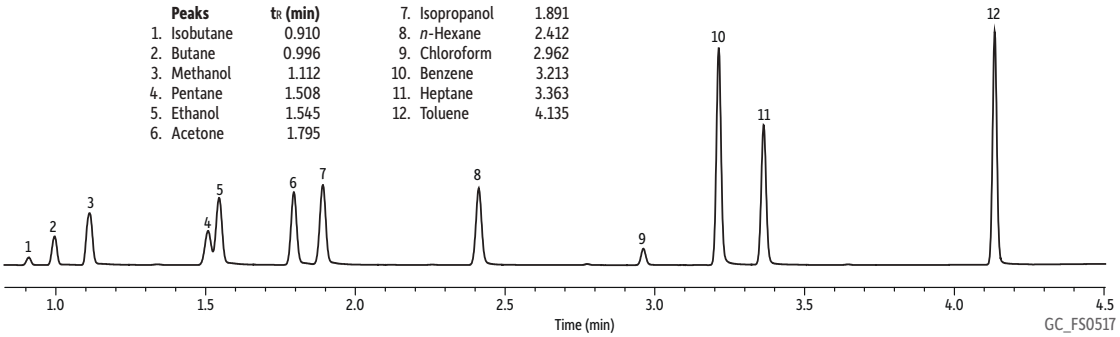
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

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

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

Peaks	t_R (min)		
1. Isobutane	0.910	7. Isopropanol	1.891
2. Butane	0.996	8. *n*-Hexane	2.412
3. Methanol	1.112	9. Chloroform	2.962
4. Pentane	1.508	10. Benzene	3.213
5. Ethanol	1.545	11. Heptane	3.363
6. Acetone	1.795	12. Toluene	4.135



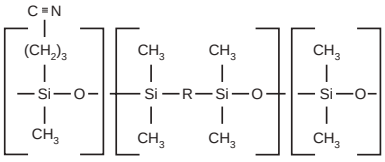
Column	Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
Sample	Residual solvent mix
Diluent:	Dimethyl sulfoxide (DMSO)
Conc.:	500 ppm (For the HS-FET technique, 10 µL of a 1,000 µg/mL standard was placed into a 20 mL headspace vial to represent a 500 ppm sample concentration, assuming a 20 mg 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:	N_2
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.

ChromaBLOGraphy
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

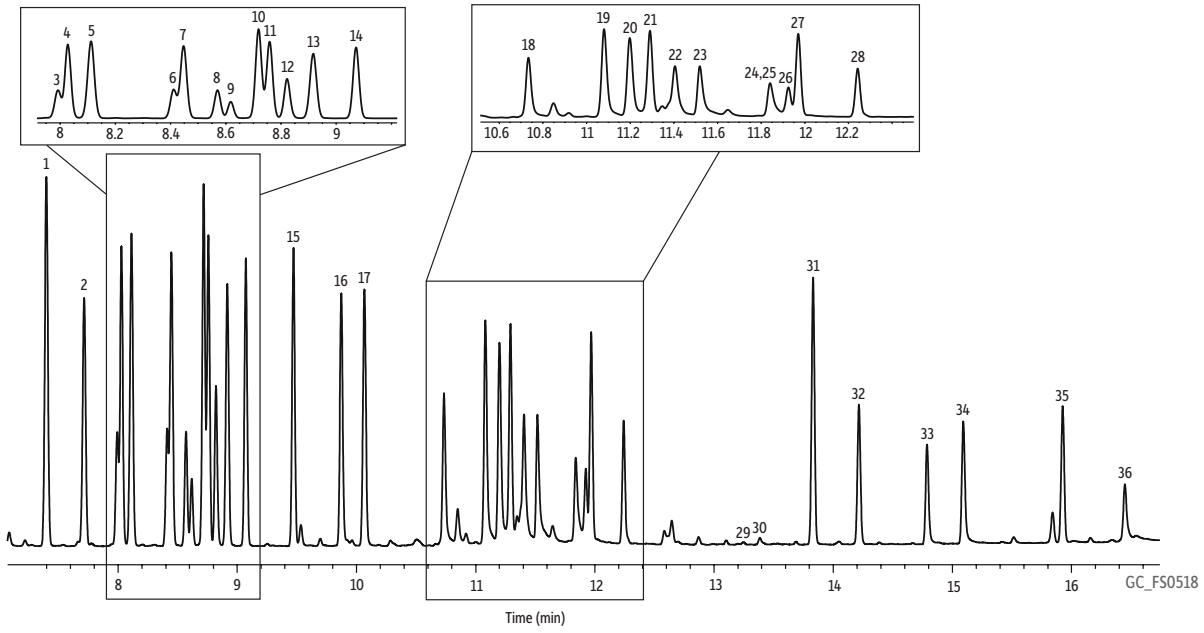
Rxi®-624Sil MS Columns (fused silica)

(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	t_R (min)						
1. α-Pinene	7.39	10. Limonene	8.71	20. Borneol	11.19	30. Citral 4	13.43
2. Camphene	7.71	11. *p*-Cymene	8.75	21. α-Terpineol	11.29	31. β-caryophyllene	13.83
3. β-Myrcene	7.98	12. β-Ocimene	8.82	22. Dihydrocarveol	11.40	32. α-Humulene	14.21
4. Sabinene	8.02	13. Eucalyptol	8.91	23. Citronellol	11.51	33. Nerolidol 1	14.78
5. β-Pinene	8.11	14. γ-Terpinene	9.06	24. Geraniol	11.82	34. Nerolidol 2	15.08
6. α-Phellandrene	8.4	15. Terpinolene	9.47	25. 2-Piperidinone	11.88	35. Caryophyllene oxide	15.92
7. δ 3-Carene	8.44	16. Linalool	9.87	26. Citral 1	11.92	36. α-Bisabolol	16.43
8. α-Terpinene	8.57	17. Fenchone	10.06	27. Pulegone	11.97		
9. Ocimene	8.61	18. Isopulegol	10.73	28. Citral 2	12.24		
		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:	N_2
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.

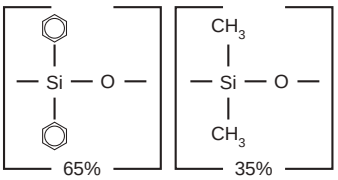
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	40 to 370 °C	17005	17008
0.32 mm	0.10 µm	40 to 370 °C	17006	17009
0.53 mm	0.10 µm	40 to 370 °C	17007	17010

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

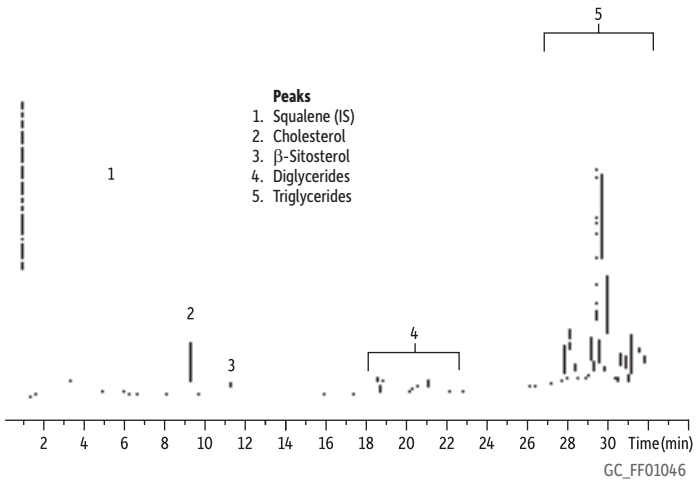


Similar to: (65%-phenyl)-methylpolysiloxane

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 ptv 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 H_2, 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

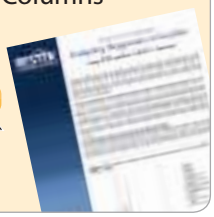
SPB-TCEP, CP-TCEP

free literature

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

Download your free copy from **www.restek.com**

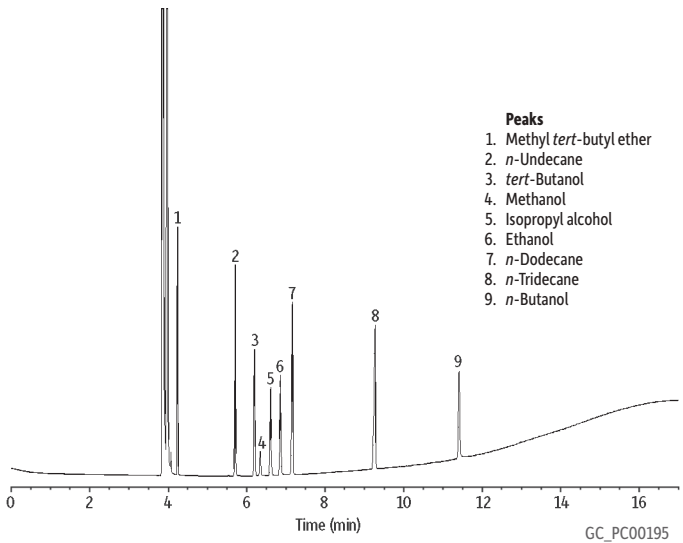
lit. cat.# 59587A



Save money!

Get six columns for the price of five. **Call 800-356-1688, ext. 3**, or your Restek representative for details!

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

free literature
Biodiesel Solutions
Innovative Products for Simple, Reliable Biodiesel Analysis
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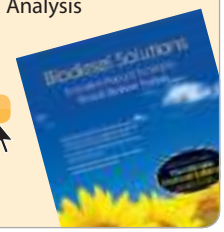
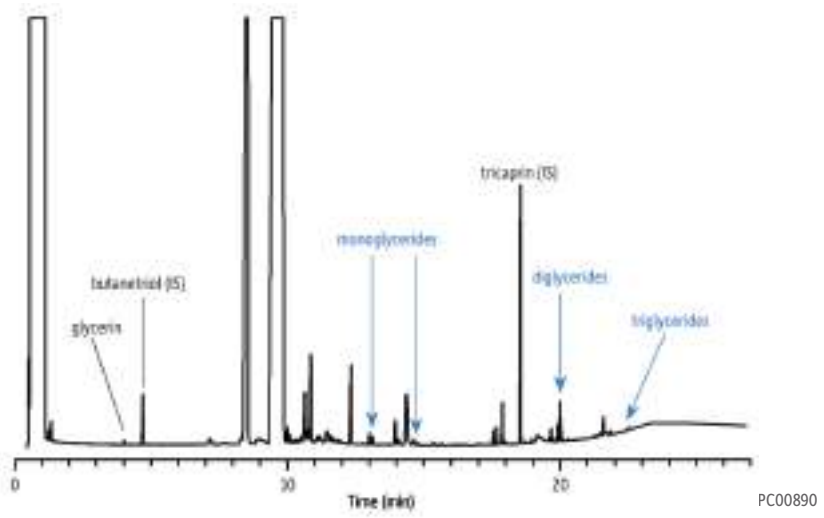
PCFL1409-UNV



Glycerin in Biodiesel on Rtx®-Biodiesel TG



PC00890

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	Biodiesel (B100) plus monoolein, diolein, triolein, glycerin, butanetriol, tricaprin
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	
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

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

free literature

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.

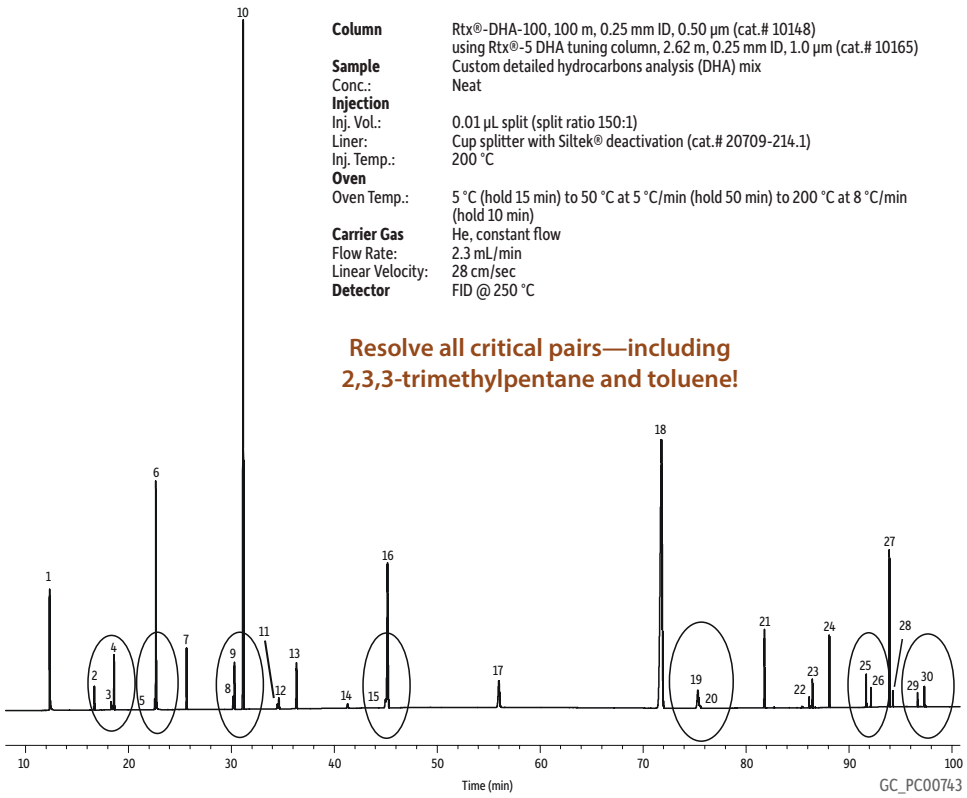
Gasolines are complex mixtures of hundreds of compounds. Information about concentrations of the individual components is important for evaluating raw materials and for controlling refinery processes. ASTM D6730-01 outlines a high-resolution GC method for detailed hydrocarbon analysis (DHA) of gasolines. 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 µm	-60 to 300/340 °C	10147		
0.25 mm	0.50 µm	-60 to 300/340 °C		10148	
	1.00 µm	-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 µm	-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 µm (cat.# 10148)
using Rtx®-5 DHA tuning column, 2.62 m, 0.25 mm ID, 1.0 µm (cat.# 10165)
Sample Custom detailed hydrocarbons analysis (DHA) mix
Conc.: Neat
Injection
Inj. Vol.: 0.01 µL 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

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

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)

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

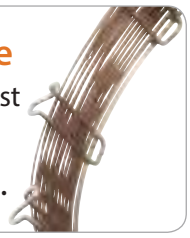
similar phases

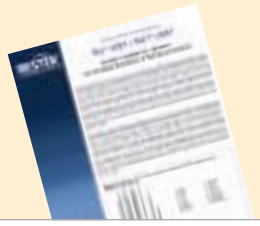
DB-2887, Petrocol 2887, Petrocol EX2887

also available

MXT®-1HT SimDist
and more simulated distillation products

See **pages 113–115.**





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Rtx®-2887/MXT®-2887
Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions

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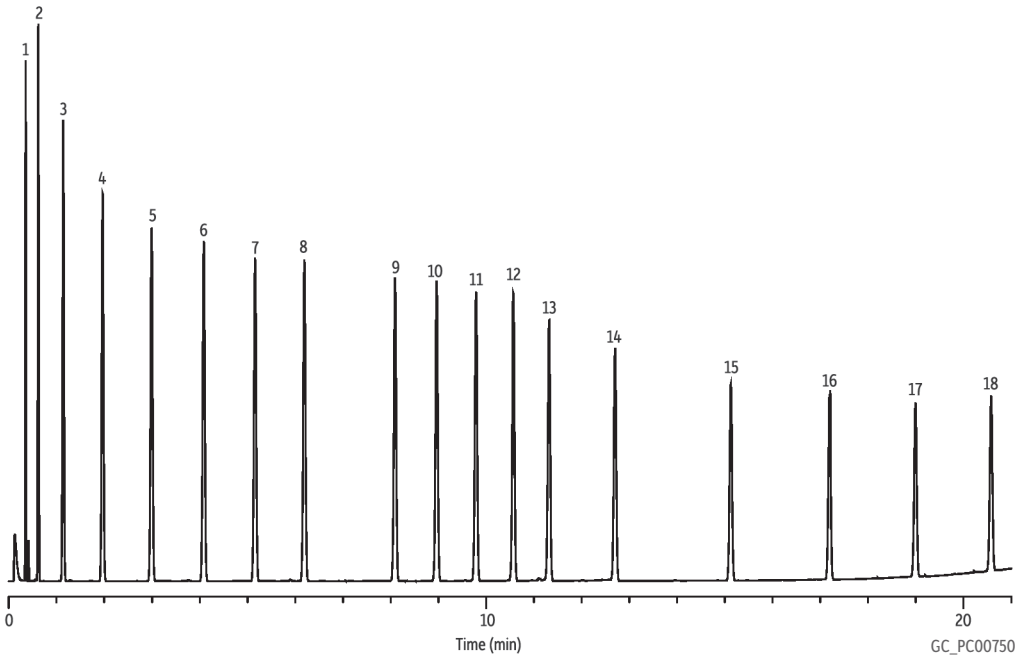
Simulated Distillation (C5-C44) on Rtx®-2887



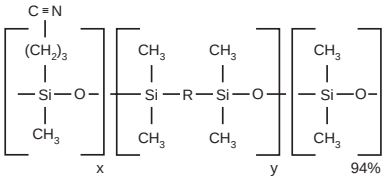
Peaks
1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

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

Organic Volatile Impurities (OVI) Analysis

G43 phase

Rxi®-624Sil MS Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

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

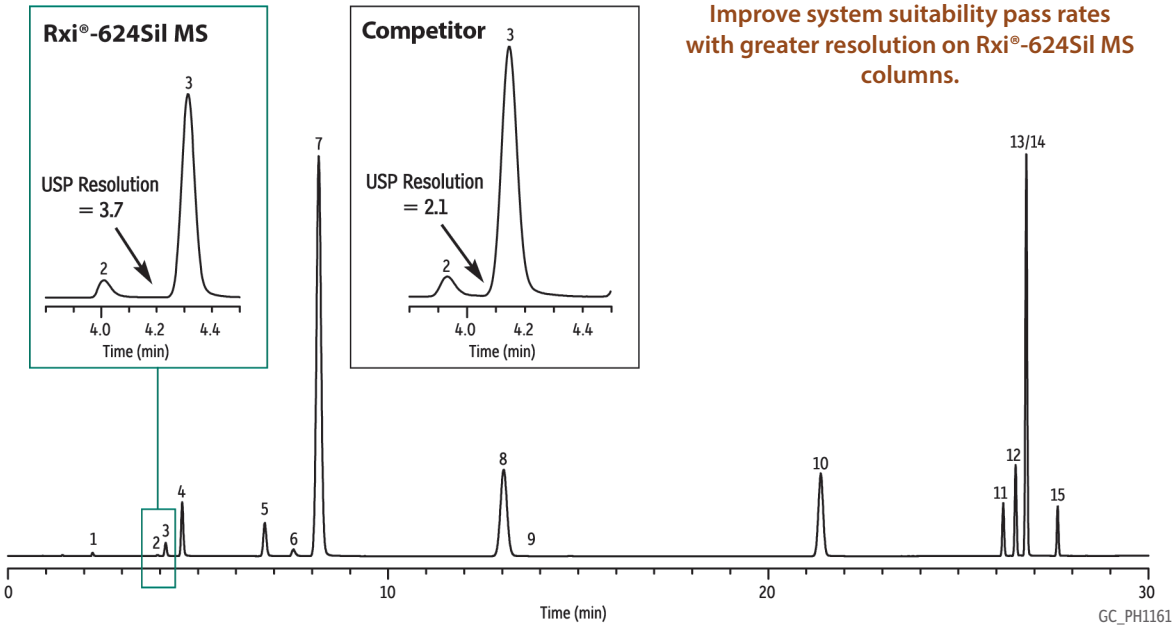
Rxi®-624Sil MS Columns (fused silica)
(midpolarity Crossbond® phase)

- 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

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.



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. *trans*-1,2-Dichloroethene	4.798	7.83
5. *cis*-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. *m*-Xylene	27.147	10.85
14. *p*-Xylene	27.147	2.53
15. *o*-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.

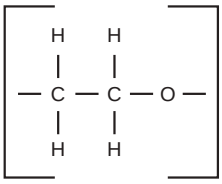
Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. 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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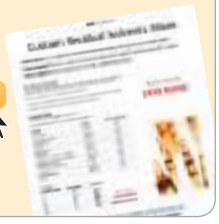
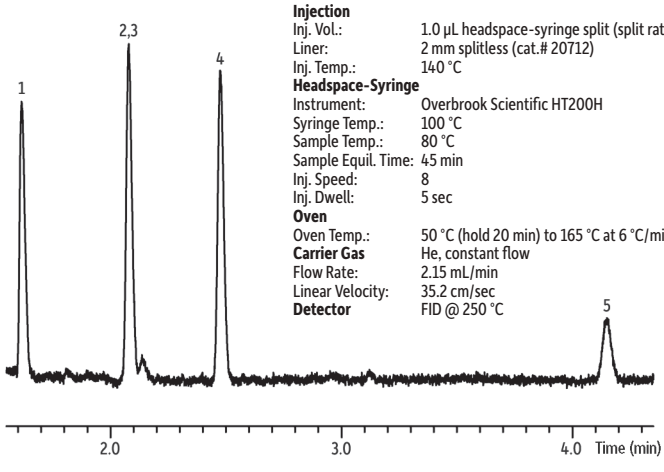
lit. cat.#
PHTS1212



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

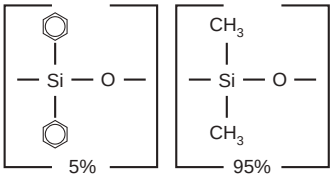
Peaks
1. 1,1-Dichloroethene
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

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.

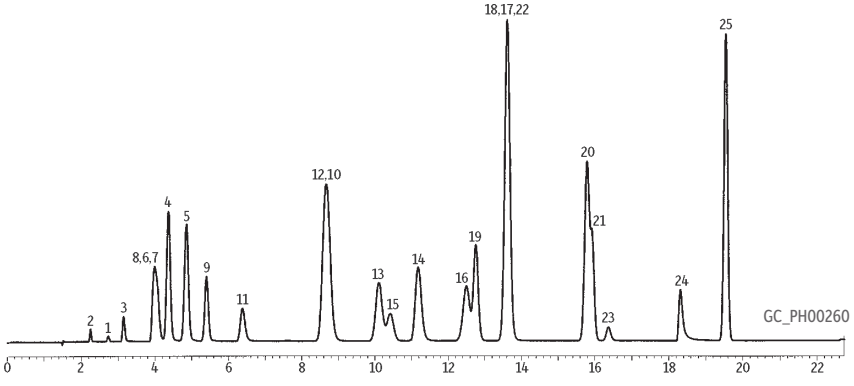
The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

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.

			30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
ID	df	temp. limits	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.

			30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
ID	df	temp. limits	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

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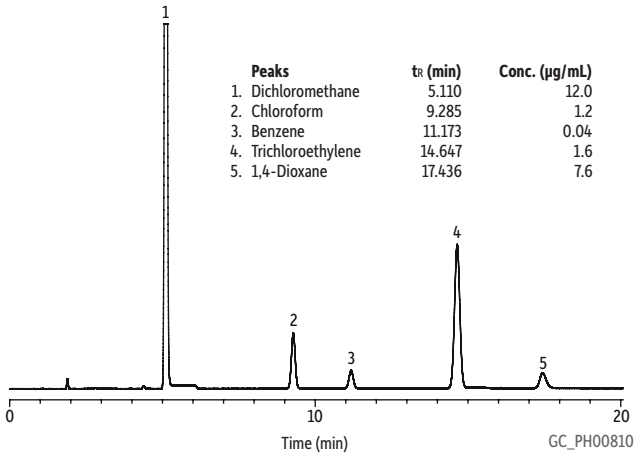
USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace



Peaks	tR (min)	Conc. (µg/mL)
1. Dichloromethane	5.110	12.0
2. Chloroform	9.285	1.2
3. Benzene	11.173	0.04
4. Trichloroethylene	14.647	1.6
5. 1,4-Dioxane	17.436	7.6

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.
Injection	headspace-loop split (split ratio 2:1)
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	
Oven Temp.:	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

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.

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.

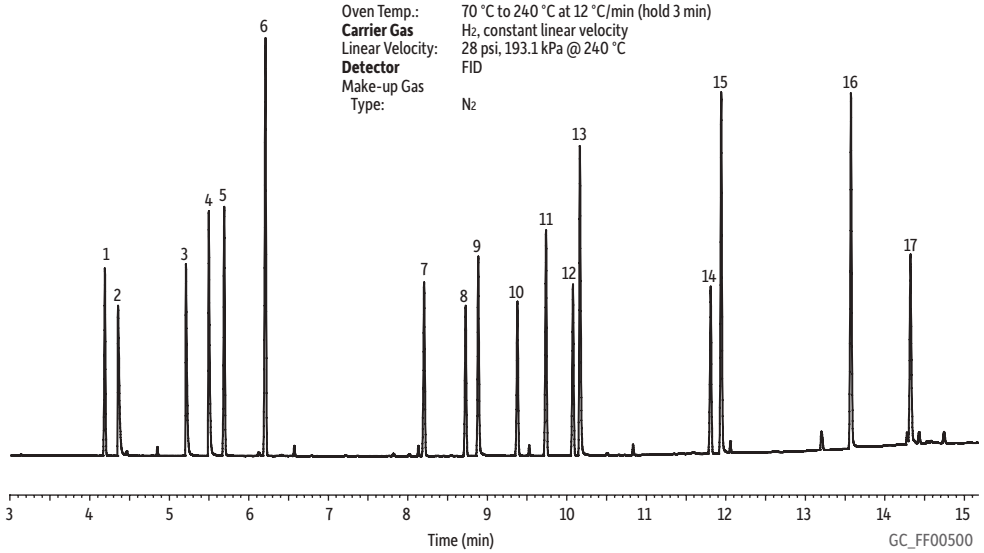
Stabilwax®-DA bonded polyethylene glycol has an acidic functionality incorporated into the polymer structure. This permits analysis of acidic compounds without derivatization, significantly reduces adsorption of acids, and increases sample capacity for volatile free acids. Stabilwax®-DA columns last 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.

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

Column Stabilwax®-DA, 30 m, 0.18 mm ID, 0.18 µm (cat.# 550752)
Sample
Diluent: Ethyl acetate
Injection
Inj. Vol.: 1 µL splitless (hold 0.5 min)
Liner: Splitless (4 mm ID) w/glass wool (cat.# 20814-202.1)
Inj. Temp.: 240 °C
Oven
Oven Temp.: 70 °C to 240 °C at 12 °C/min (hold 3 min)
Carrier Gas
Linear Velocity: H_2, constant linear velocity
28 psi, 193.1 kPa @ 240 °C
Detector FID
Make-up Gas Type: N_2



Peaks	Conc. (µg/mL)
1. Ethyl octanoate	100
2. Acetic acid	100
3. Propionic acid	100
4. Isobutyric acid	100
5. 3-Decanol	50
6. Ethyl decanoate	50
7. Ethyl laurate	50
8. *cis*-Lactone	100
9. 2-Phenylethanol	50
10. *trans*-Lactone	100
11. Methyl myristate	50
12. Ethyl myristate	50
13. Octanoic acid	100
14. Ethyl palmitate	50
15. Decanoic acid	100
16. Dodecanoic acid	100
17. Vanillin	100

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

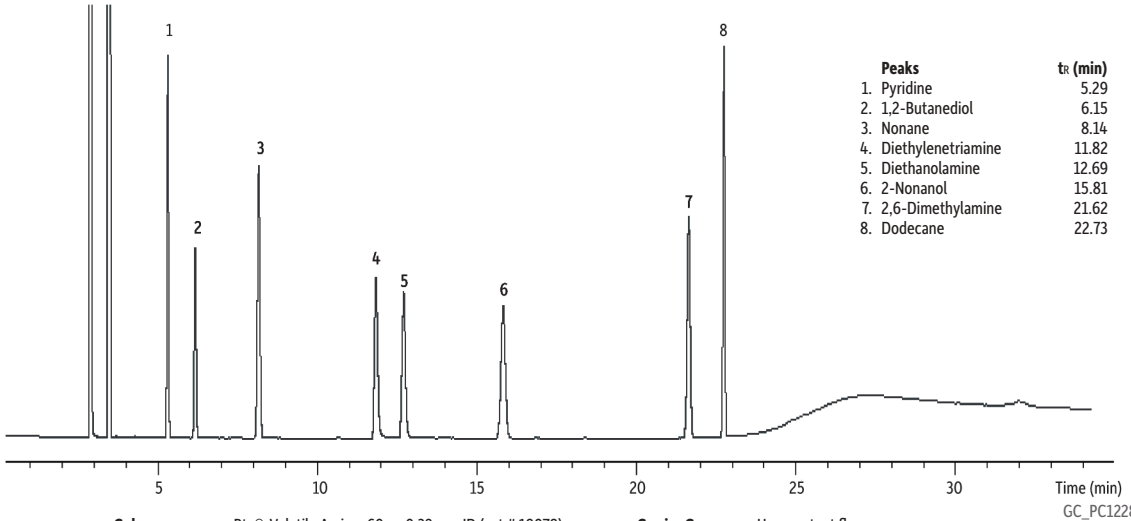
CP-Volamine

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)



Peaks	t_R (min)
1. Pyridine	5.29
2. 1,2-Butanediol	6.15
3. Nonane	8.14
4. Diethylenetriamine	11.82
5. Diethanolamine	12.69
6. 2-Nonanol	15.81
7. 2,6-Dimethylamine	21.62
8. Dodecane	22.73

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:	N_2
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC

Restek innovation!

similar phases
Optima-5Amine

please note
We recommend using base-deactivated fused silica guard columns **(page 22)** and base-deactivated liners (**page 203**) with Rtx®-5 Amine columns.

Basic Compounds Analysis

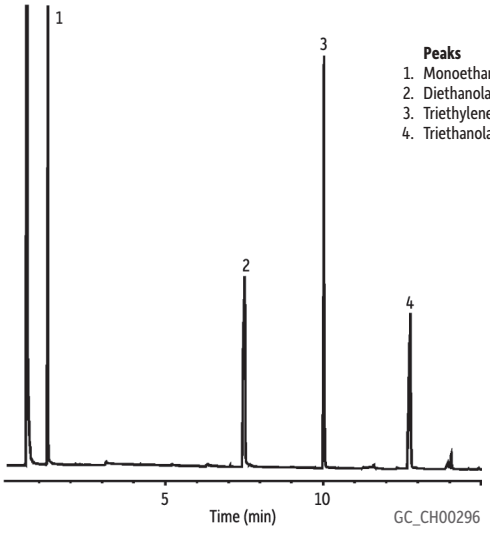
Rtx®-5 Amine Columns (fused silica)
(low-polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- 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

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	H_2, 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.

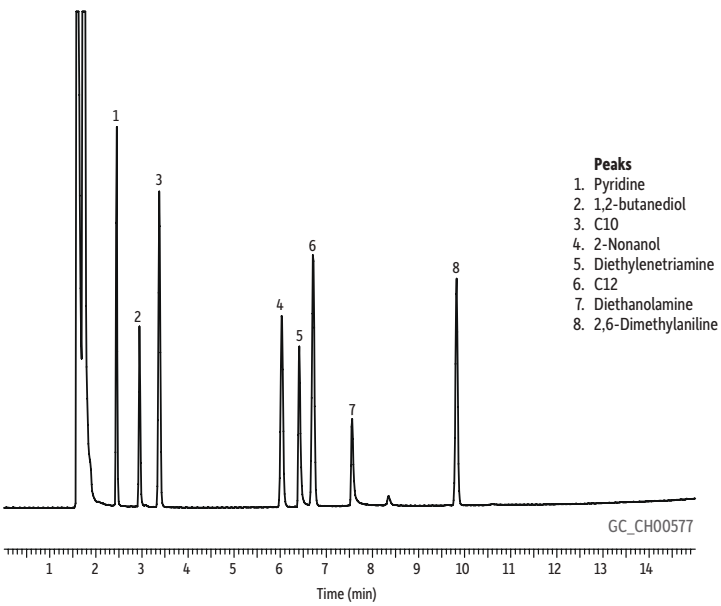
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.50 µm	0 to 220 °C	11335	11338
	1.00 µm	0 to 220 °C	11350	11353
0.32 mm	1.00 µm	0 to 220 °C	11351	11354
	1.50 µm	0 to 220 °C	11366	11369
0.53 mm	1.00 µm	0 to 220 °C	11352	11355
	3.00 µm	0 to 220 °C		11385

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.

Amine Test Mix Rtx®-35 Amine



Peaks
1. Pyridine
2. 1,2-butanediol
3. C10
4. 2-Nonanol
5. Diethylenetriamine
6. C12
7. Diethanolamine
8. 2,6-Dimethylaniline

Column	Rtx®-35 Amine, 30 m, 0.53 mm ID, 1.00 µm (cat.# 11355)
Sample	Amine column test mix (cat.# 35002)
Diluent:	Methanol/methylene chloride
Conc.:	450-900 ppm
Injection	
Inj. Vol.:	1.0 µL split (split ratio 10:1)
Liner:	Splitless taper (4 mm), base deactivated (cat.# 20798-210.1)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	110 °C (hold 4 min) to 200 °C at 8 °C/min (hold 5 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec
Detector	FID @ 300 °C

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

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.

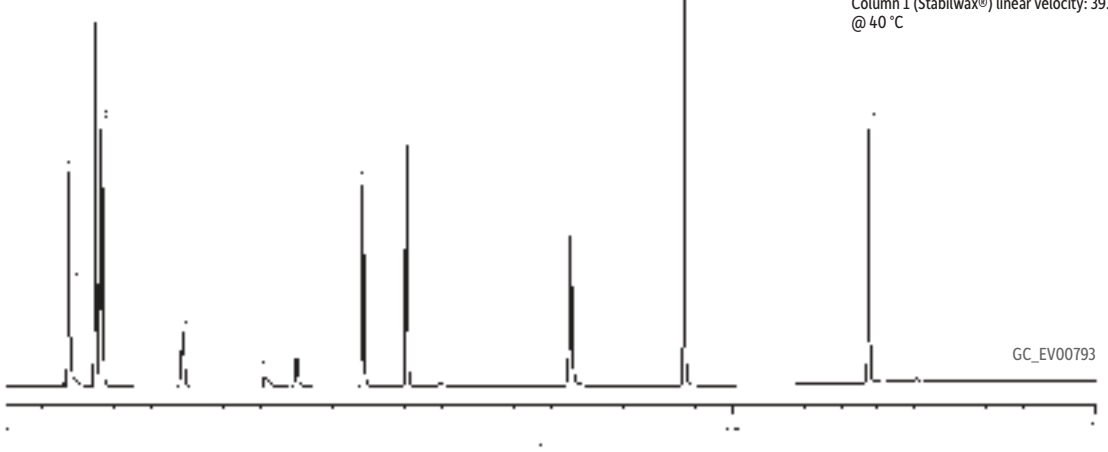
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 210/220 °C	10820	10823	
	0.50 µm	40 to 210/220 °C		10838	
0.32 mm	0.25 µm	40 to 210/220 °C	10821	10824	
	0.50 µm	40 to 210/220 °C		10839	
	1.00 µm	40 to 210/220 °C	10851	10854	10857
0.53 mm	0.50 µm	40 to 210/220 °C		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	t_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. *n*-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®-γDEXsa 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 µm	40 to 230 °C	13113
0.32 mm	0.25 µm	40 to 230 °C	13112

Rt®-βDEXm 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 µm	40 to 230 °C	13100
0.32 mm	0.25 µm	40 to 230 °C	13101

Rt®-βDEXsm 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 µm	40 to 230 °C	13105
0.32 mm	0.25 µm	40 to 230 °C	13104

Rt®-βDEXse 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-βDEXsm but provides better resolution for limonene, linalool, linalyl acetate, ethyl-2-methylbutyrate, 2,3-butane diol, and styrene oxides.

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

Rt®-βDEXsp 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-βDEXsm column, for complex enantiomeric separations.

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

Rt®-βDEXsa 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 µm	40 to 230 °C	13109
0.32 mm	0.25 µm	40 to 230 °C	13108

Rt®-βDEXcst Columns (fused silica)

(Proprietary cyclodextrin material added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

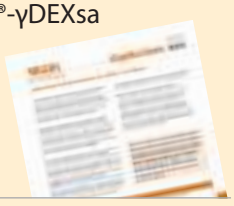
Uses: Proprietary stationary phase, developed specifically for the fragrance industry. Also used for pharmaceutical applications.

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

free literature

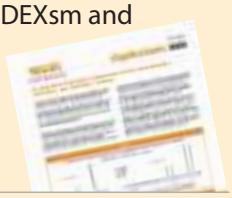
Grape Flavor Analysis, Using an Rt®-γDEXsa GC Column

lit. cat.# 59553



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

lit. cat.# 59546



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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.

GC Columns

Metal MXT® Capillary Columns

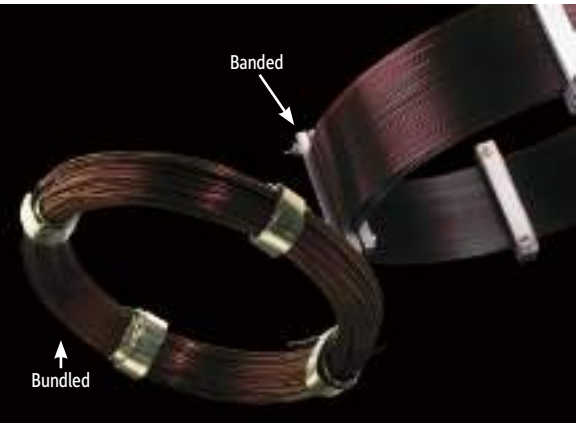
MXT® Columns Overview 105
Guard/Retention Gap Columns 106
General-Purpose Columns 107–110
MXT®-1 ..... *107*
MXT®-5 ..... *108*
MXT®-50 ..... *109*
MXT®-1301 ..... *109*
MXT®-1701 ..... *109*
MXT®-200 ..... *110*
MXT®-WAX *110*
Application-Specific Columns 111–115
Environmental *111*
MXT®-502.2, MXT®-Volatiles, MXT®-624
Foods, Flavors, & Fragrances *112*
MXT®-65TG
Petroleum & Petrochemical *113–115*
MXT®-Biodiesel TG, MXT®-2887,
MXT®-1HT SimDist, MXT®-500 SimDist

What is an MXT® column?

MXT® columns are wall coated open tubular (WCOT) columns made from stainless steel tubing that has had the internal surface treated with an exclusive Siltek® treatment. This treatment makes the surface as inert as deactivated fused silica, and it allows us to treat the tubing with a wide variety of polymer phases. The unique Siltek® treatment also enables us to offer MXT® columns in a wide range of internal diameters, including 0.18 mm, 0.25 mm, 0.28 mm, 0.32 mm, and 0.53 mm. Because the Siltek® treatment permeates the stainless steel surface, rather than simply coating it, the layer is exceptionally flexible, so the tubing can be coiled to very small diameters. The standard coil diameter for most MXT® columns is 4.5", but they also are available in 3.5" and 6" coil diameters.

Whether you're using them in a process GC or a benchtop GC, our MXT® columns will be a perfect fit. Just add the proper suffix number in the table to the column part number when you order!

Coil Diameter	Suffix Number	Configuration
3.5"	-273	Bundled
4.5"	None	Standard Banded
6.0"	-276	Bundled

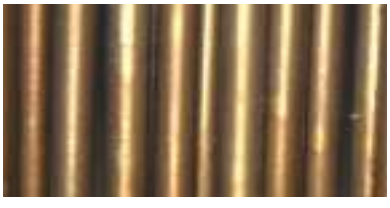


Additional sizes and configurations may be available; call for details.
Note that the minimum coil diameter for 0.53 mm ID columns is 2.5 inches, and the minimum coil diameter for 0.25 mm ID columns is 1.5 inches.

MXT® columns are your best choice for high temperature analyses and situations in which the potential for column breakage is high. Here's why:

- Metal tubing allows MXT® comlumns to be used to higher temperatures (430 °C) than fused silica columns (standard rating is 360 °C). This is because the polyimide resin that encases the fused silica becomes brittle over time at high temperatures. MXT® columns do not become brittle or break.
- Inertness of MXT® columns and fused silica columns is similar, due to the unique properties of the Siltek® surface treatment.
- Metal columns can be coiled under 4.5 inches without breaking, making them ideal for small instruments.
- Coating efficiency (plates/meter) of MXT® columns is similar to that of fused silica.
- MXT® columns will not break under stress, making them perfect for process GCs and field instruments.

MXT®-Biodiesel TG columns are undamaged by high thermal cycles compared to high-temperature (HT) fused silica columns, which break down under the same conditions.



MXT®-Biodiesel TG columns are undamaged by high thermal cycles.

HT fused silica columns, labeled as stable to 430 °C, show pitting and breakdown.

100 temperature cycles to 430 °C totaling 500 minutes at maximum temperature.

MXT ideal for high-temperature analyses

Custom MXT® columns are also available.

If you do not see the column you need listed in the following pages, contact Customer Service and we will be happy to help.

Connect MXT® columns using an MXT® low dead volume connector!

Connect transfer lines or guard columns directly to your MXT® columns without compromising your data.

Rugged MXT® low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns! They can be used at temperatures up to 430 °C without degrading the deactivated layer, and their low thermal mass tracks rapid oven temperature programming. Kits are available for 0.28 mm, 0.32 mm, and 0.53 mm ID columns in a standard configuration for column-to-column connections and a "Y" configuration for connecting two columns to one inlet or one column to two detectors. In addition to the MXT® union, each kit also contains stainless steel 1/32-inch ferrules and nuts. (See page 232 for more details.)

Intermediate-Polarity Deactivated MXT® Guard/Retention Gap Columns/ Transfer Lines (passivated stainless steel)

- Useful for a wide range of applications.
- Compatible with most common solvents.
- Maximum temperature: 325 °C.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter (6-pk.) cat.#	10-Meter cat.#
0.28 mm	0.56 ± 0.025 mm	70044	70044-600	70046
0.53 mm	0.74 ± 0.025 mm	70045	70045-600	70047

did you know?

Certificates of analysis for 5 m and 10 m Restek® guard columns are 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 #.

Hydroguard®-Treated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Extend analytical column lifetime by preventing degradation from harsh "steam-cleaning" water injections.
- 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:

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

Nominal ID	Nominal OD	5-Meter cat.#	10-Meter cat.#	30-Meter* cat.#
0.28 mm	0.56 ± 0.025 mm	70080	70083	70086
0.53 mm	0.74 ± 0.025 mm	70081	70084	70087

*30-meter lengths are banded in 5-meter sections.
Diameters greater than 0.10 mm are tested with the Grob test mix to ensure high inertness.

also available

Column connector kits & ferrules

See **page 232.**

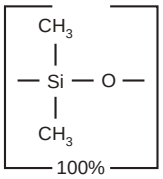
MXT®-1 Columns (Siltek®-treated stainless steel)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G1, G2, G38 phases.
- 4.5" standard coil diameter.

MXT®-1 columns exhibit long lifetime and very low bleed at high operating temperatures. A proprietary synthesis process eliminates residual catalysts that could cause degradation and increase bleed.

MXT®-1 Structure



Similar to: (100%-methyl)-polysiloxane

similar phases

DB-PS1, UAC-1, UAC-1MS

ID	df	temp. limits*	6-Meter cat.#	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 360/430 °C		70105	70116	70117	70114
	0.25 µm	-60 to 360/430 °C		70120	70123	70126	70129
	0.50 µm	-60 to 330/400 °C		70135	70138		
	1.00 µm	-60 to 320/360 °C		70150	70153	70156	70159
0.28 mm	0.10 µm	-60 to 360/430 °C	70102	70106	70109		
	0.25 µm	-60 to 360/430 °C		70121	70124	70127	
	0.50 µm	-60 to 400 °C			70139	70142	
	1.00 µm	-60 to 320/360 °C		70151	70154	70157	
	3.00 µm	-60 to 285/360 °C		70181	70184	70187	
0.53 mm	0.15 µm	-60 to 360/430 °C	70101	70107			
	0.25 µm	-60 to 360/430 °C		70122	70125	70128	
	0.50 µm	-60 to 330/400 °C		70137	70140	70143	
	1.00 µm	-60 to 320/360 °C		70152	70155	70158	
	1.50 µm	-60 to 310/360 °C		70167	70170	70173	
	3.00 µm	-60 to 285/360 °C		70182	70185	70188	70189
	5.00 µm	-60 to 270/360 °C		70177	70179	70183	
	7.00 µm	-60 to 240/360 °C		70191	70192	70193	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 330/430 °C	71811	71812	71813
	0.40 µm	-60 to 320/400 °C		71815	71816

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

free literature

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

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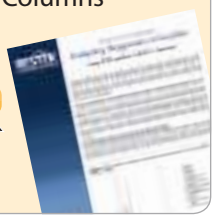
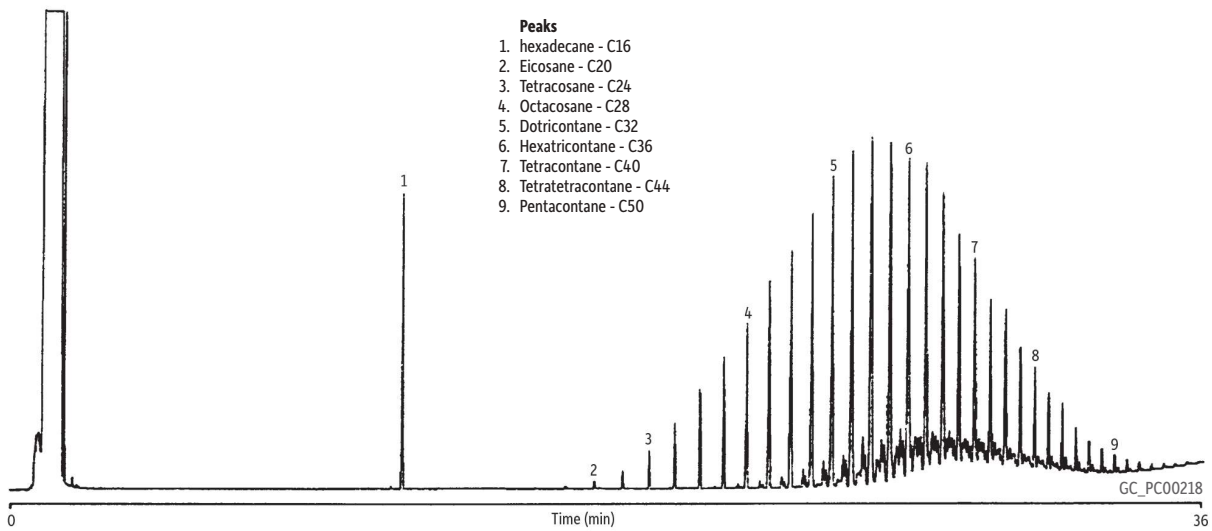
lit. cat.# 59587A

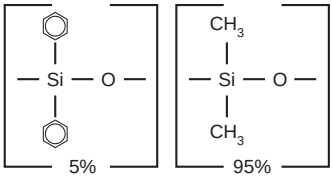


Petroleum Wax on MXT®-1



Column	MXT®-1, 30 m, 0.28 mm ID, 0.25 µm (cat.# 70124)	**Oven**	
Sample	Petroleum wax	Oven Temp.:	50 °C to 400 °C at 10 °C/min (hold 10 min)
Diluent:	cyclohexane	**Carrier Gas**	H_2, constant flow
Conc.:	0.1% w/w	Linear Velocity:	60 cm/sec @ 50 °C
Injection		**Detector**	FID @ 400 °C
Inj. Vol.:	1.0 µL cold on-column	**Notes**	FID sensitivity: 64 x 10^{-11} AFS

MXT®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-PS5, VF-5ht UltiMetal, UAC-5, UAC-5MS

also available

Metal MXT® PLOT Columns

See **page 129.**

MXT®-5 Columns (Siltek®-treated stainless steel)
(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semivolatiles.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G27, G36 phases.
- 4.5" standard coil diameter.

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 MXT®-5 polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/430 °C	70205	70208	
	0.25 µm	-60 to 360/430 °C	70220	70223	70226
	0.50 µm	-60 to 330/360 °C	70235	70238	70241
	1.00 µm	-60 to 310/340 °C	70250	70253	
0.28 mm	0.25 µm	-60 to 340/430 °C	70221	70224	70227
	0.50 µm	-60 to 315/400 °C	70236	70239	
	1.00 µm	-60 to 310/360 °C	70251	70254	70257
	3.00 µm	-60 to 290/360 °C	70281	70284	
0.53 mm	0.25 µm	-60 to 340/430 °C	70222	70225	70228
	0.50 µm	-60 to 330/400 °C	70237	70240	
	1.00 µm	-60 to 310/360 °C	70252	70255	70258
	1.50 µm	-60 to 300/360 °C	70267	70270	
	3.00 µm	-60 to 290/360 °C	70282	70285	70288
	5.00 µm	-60 to 270/360 °C	70277	70279	70283

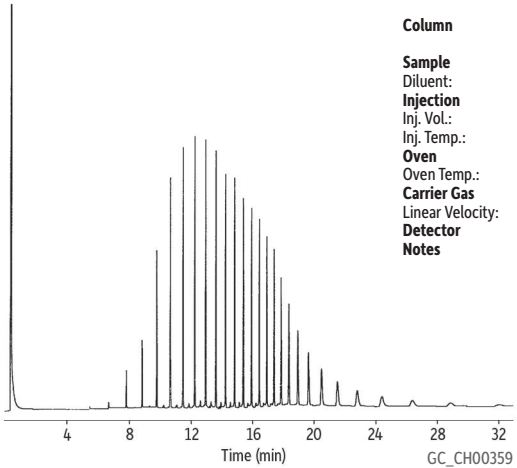
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/430 °C	71821	71822	71823
	0.40 µm	-60 to 315/400 °C	71824	71825	

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

MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

Siloxane (Polysiloxane 20) on MXT®-5



Column	MXT®-5, 15 m, 0.28 mm ID, 0.25 µm (cat.# 70221)
Sample	Polysiloxane 20
Diluent:	Pentane
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	75 °C to 340 °C at 15 °C/min
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec
Detector	FID @ 340 °C
Notes	FID sensitivity: 16 x 10^{-11} AFS

MXT®-50 Columns (Siltek®-treated stainless steel)

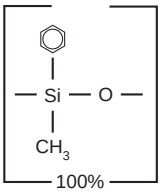
(midpolarity phase; Crossbond® phenyl methyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, and sterols.
- Temperature range: 0 °C to 300 °C.
- Equivalent to USP G3 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.53 mm	0.83 µm	0 to 280/300 °C		70569	
	1.00 µm	0 to 260/280 °C	70552	70555	70558
	1.50 µm	0 to 250/280 °C		70570	

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

MXT®-50 Structure



Similar to: (50%-phenyl)-methylpolysiloxane

MXT®-1301 Columns (Siltek®-treated stainless steel)

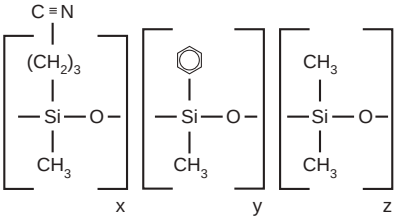
(low- to midpolarity phase)

- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.53 mm	1.00 µm	-20 to 260/280 °C		76055	
	3.00 µm	-20 to 240/280 °C	76082	76085	76088

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

MXT®-1301 Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

MXT®-1701 Columns (Siltek®-treated stainless steel)

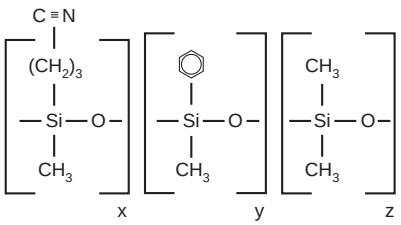
(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), and pesticides.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G46 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	-20 to 280 °C	72020	72023	
	1.00 µm	-20 to 260 °C		72053	
0.28 mm	1.00 µm	-20 to 260 °C	72051		
	1.50 µm	-20 to 250 °C	72066		
0.53 mm	0.50 µm	-20 to 270/280 °C		72040	
	1.00 µm	-20 to 260 °C	72052	72055	
	1.50 µm	-20 to 250 °C		72070	
	3.00 µm	-20 to 240 °C	72082	72085	72088

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

MXT®-1701 Structure



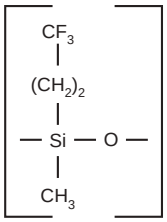
Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-PS1701

General-Purpose Columns

MXT®-200 Structure



Similar to: (trifluoropropyl)-methylpolysiloxane

MXT®-200 Columns (Siltek®-treated stainless steel)

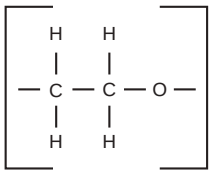
(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General-purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, and glycols. Excellent confirmation column with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20 °C to 400 °C.
- Equivalent to USP G6 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.50 µm	-20 to 400 °C		75038	
	1.00 µm	-20 to 310/360 °C		75053	
0.53 mm	1.00 µm	-20 to 290/360 °C	75052	75055	75058
	1.50 µm	-20 to 280/360 °C		75070	75073
	3.00 µm	-20 to 260/360 °C	75082	75085	75088

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

MXT®-WAX Structure



similar phases

DB-PSWAX, UAC-CW

MXT®-WAX Columns (Siltek®-treated stainless steel)

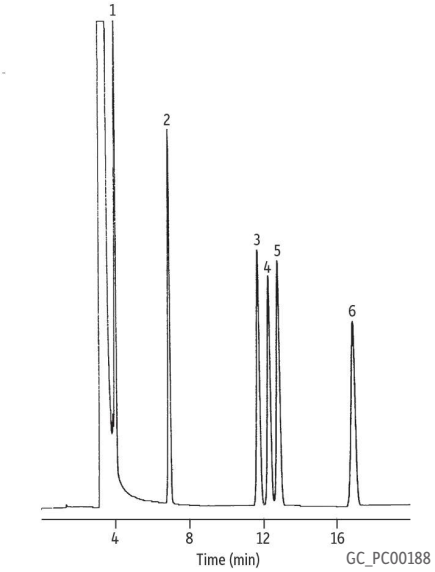
(polar phase; Crossbond® Carbowax® polyethylene glycol—provides oxidation resistance)

- General-purpose columns for FAMEs, flavor compounds, essential oils, amines, solvents, xylene isomers, and U.S. EPA Method 603 (acrolein/acrylonitrile).
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.
- 4.5" standard coil diameter.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 250/260 °C	70620	70623	
	0.50 µm	40 to 260 °C		70638	
0.28 mm	0.25 µm	40 to 250/260 °C		70624	
	0.50 µm	40 to 250/260 °C		70639	70642
	1.00 µm	40 to 240/250 °C	70651	70654	70657
0.53 mm	0.25 µm	40 to 250/260 °C	70622	70625	
	0.50 µm	40 to 250/260 °C	70637	70640	
	1.00 µm	40 to 240/250 °C	70652	70655	70658
	1.50 µm	40 to 230/250 °C	70666	70669	70672
	2.00 µm	40 to 220/250 °C	70667	70670	

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

Aromatics (Benzene/Toluene/Xylene) on MXT®-WAX



Peaks
1. Benzene
2. Toluene
3. Ethylbenzene
4. *p*-Xylene
5. *m*-Xylene
6. *o*-Xylene

Column	MXT®-WAX, 30 m, 0.28 mm ID, 1.00 µm (cat.# 70654)
Sample	BTEX Standard (cat.# 30051)
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Inj. Temp.:	260 °C
Oven	
Oven Temp.:	60 °C
Carrier Gas	H_2, constant flow
Linear Velocity:	38 cm/sec
Detector	FID @ 260 °C
Notes	FID sensitivity: 3.2 x 10^{-11} AFS

also available

Metal MXT® PLOT Columns

See **page 129.**

Volatile Organics Analysis

MXT®-502.2 Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants, cited in 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.
- Temperature range: -20 °C to 320 °C.
- 4.5" standard coil diameter.

An MXT®-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 MXT®-502.2 stationary phase provides low bleed and thermal stability to 320 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling.

ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 270/320 °C		70916	
0.28 mm	1.60 µm	-20 to 250/320 °C	70919		
0.53 mm	3.00 µm	-20 to 250/320 °C	70908	70909	70910

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

similar phases

DB-PS502.2

MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

MXT®-Volatiles Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Temperature range: -20 °C to 320 °C.
- 4.5" standard coil diameter.

MXT®-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 MXT®-Volatiles stationary phase provides low bleed and thermal stability to 320 °C.

ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#
0.28 mm	1.25 µm	-20 to 280/320 °C	70924	70926
0.53 mm	2.00 µm	-20 to 280/320 °C	70925	70927
	3.00 µm	-20 to 250/320 °C	70922	

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

also available

Column connector kits & ferrules

See **page 232.**

MXT®-624 Columns (Siltek®-treated stainless steel)

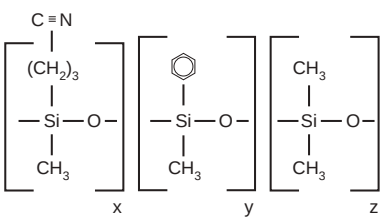
(low- to midpolarity phase)

- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.
- 4.5" standard coil diameter.

The unique polarity of "624" columns makes them ideal for analyses of volatile organic pollutants. Although the MXT®-502.2 column is recommended in many methods, MXT®-624 columns offer the best separation of the early-eluting gases.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#
0.25 mm	1.40 µm	-20 to 240/280 °C	70968	70969
0.53 mm	3.00 µm	-20 to 240/280 °C	70971	70973

MXT®-624 Structure



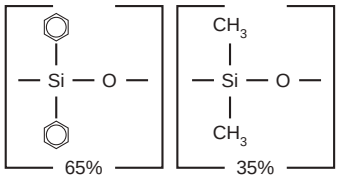
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-PS624, UAC-624

Triglycerides in Foods Analysis

MXT®-65TG Structure



Similar to: (65%-phenyl)-methylpolysiloxane

similar phases

UAC-65HT

MXT®-65TG Columns (Siltek®-treated stainless steel)
(high-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.
- 4.5" standard coil diameter.

The MXT®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370 °C thermal stability, an MXT®-65TG column should not be used for analyses of compounds that contain active oxygenated groups.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	20 to 370 °C	77005	77008
0.53 mm	0.10 µm	20 to 370 °C	77007	77010

free literature

MXT® Capillary Columns: Ideal for High Temperature GC Analysis

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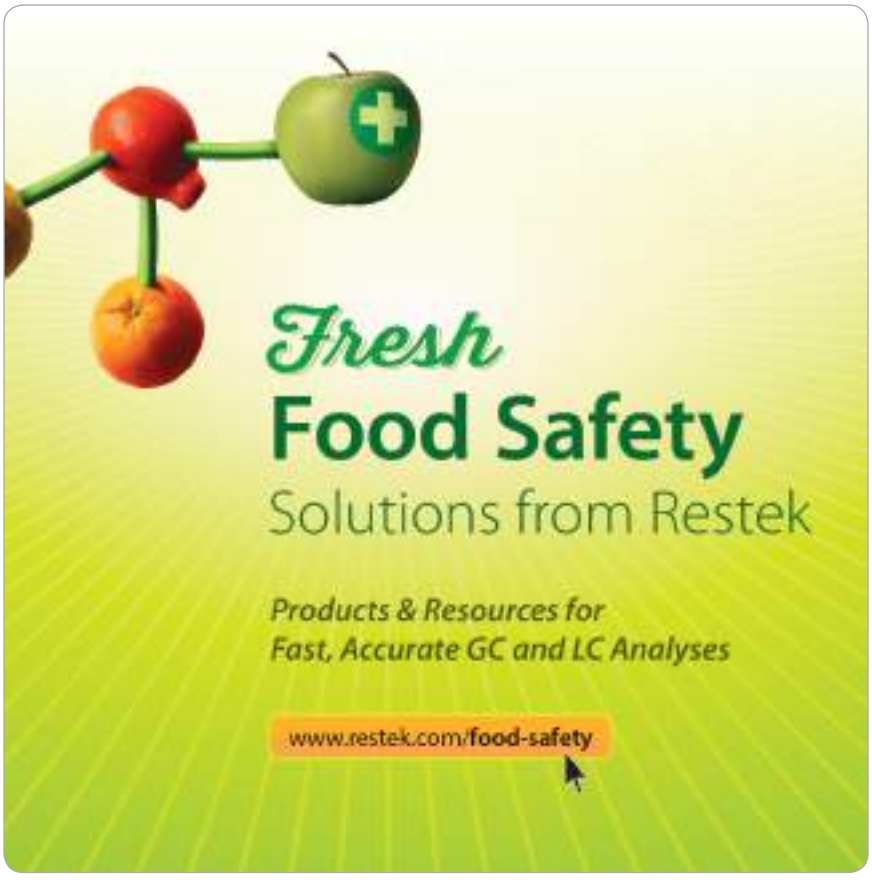
lit. cat.# GNTS1368A

MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8



Biodiesel Fuels Analysis

MXT®-Biodiesel TG Columns (Siltek®-treated stainless steel)

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430 °C for reliable, consistent performance.

Description	temp. limits	3.5" Coil cat.#	7" diameter 11-pin cage cat.#
14 m, 0.53 mm ID, 0.16 µm with 2 m Integra-Gap*	-60 to 380/430 °C	70289-273	70289
10 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C	—	70292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	—	70290
15 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C	—	70293
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	—	70291
2 m x 0.53 mm MXT Biodiesel TG Retention Gap	-60 to 430 °C	—	70294

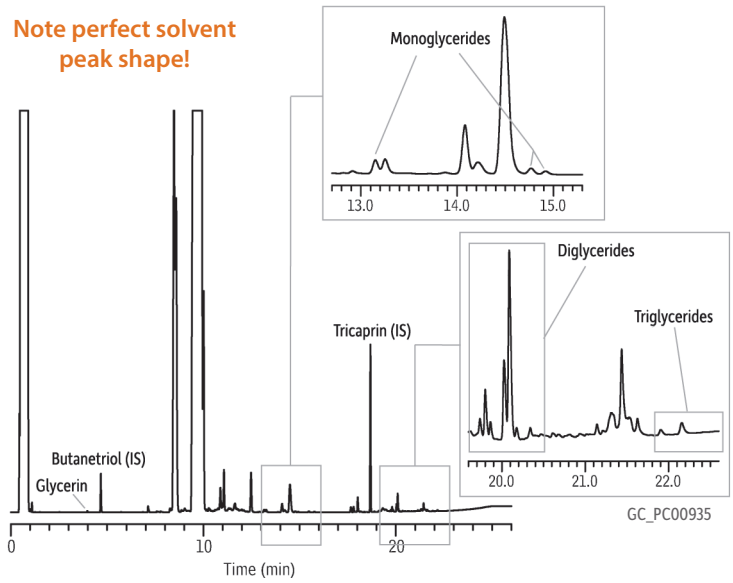
*Total column length = 16 meters.
**Connected with low dead volume MXT connector.

similar phases

MET-Biodiesel

ASTM D6584 Derivatized B100 and Internal Standards on MXT®-Biodiesel TG

Note perfect solvent peak shape!



Column MXT®-Biodiesel TG w/2 m x 0.53 mm retention gap, 10 m, 0.32 mm ID, 0.10 µm (cat.# 70290)
Sample B100 + IS butanetriol & tricaprin derivatized with MSTFA as per ASTM D6584
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 to 230 °C at 7 °C/min to 430 °C at 30 °C/min (hold 5 min)
Carrier Gas H_2, constant flow
Flow Rate: 4 mL/min
Detector FID @ 430 °C

free literature

Biodiesel Solutions: Innovative Products for Simple, Reliable Biodiesel Analysis

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lit. cat.# PCFL1409-UNV

Simulated Distillation Analysis (C5-C44)

MXT®-2887 Column (Siltek®-treated stainless steel)
(nonpolar phase; Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

- Application-specific columns for simulated distillation.
- Stable to 400 °C.
- 4.5" standard coil diameter.

MXT®-2887 columns' stationary phase, column dimensions, and film thicknesses 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. Manufactured from Siltek®-treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available.

ID	df	temp. limits	10-Meter cat.#
0.53 mm	2.65 µm	-60 to 360/400 °C	70199

similar phases

DB-PS2887

free literature

Rtx®-2887/ MXT®-2887 Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions

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lit. cat.# 59567B

Simulated Distillation Analysis (C5-C110)

similar phases

DB-HT SimDis ProSteel, CP-SimDist UltiMetal, ZB-1X SimDist

Method Recommended Columns

ASTM Method	Hydrocarbon Range	cat. #	Configuration
D2887	C5–C44	70131	5 m x 0.53 mm, 0.88 µm
		70132	10 m x 0.53 mm, 2.65 µm
D7213 (D2887-ext)	C5–C60	70131	5 m x 0.53 mm, 0.88 µm
		70115	5 m x 0.53 mm, 0.20 µm
		70112	5 m x 0.53 mm, 0.10 µm
D5307	crude up to C42	70115	5 m x 0.53 mm, 0.20 µm
D6352	C10–C90	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7096	gasoline up to C14	70132	10 m x 0.53 mm, 2.65 µm
		10177	15 m x 0.53 mm, 5 µm
D7500	C7–C110	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7169	C5–C100	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm

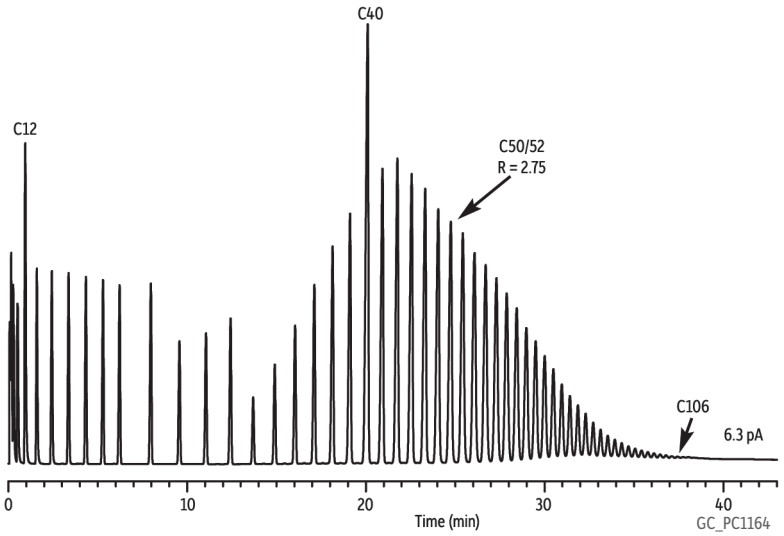
MXT®-1HT SimDist Column (Siltek®-treated stainless steel)
(nonpolar phases)

- Stable up to 450 °C—lowest bleed for longest column lifetime.
- Reliably meets all ASTM D6352, D7169, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.
- Individually tested for guaranteed performance.
- 7" coil diameter.

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation.

ID	df	temp. limits	5-Meter cat.#	10-Meter cat.#
0.53 mm	0.10 µm	-60 to 430/450 °C	70112	
	0.20 µm	-60 to 400/430 °C	70115	
	0.21 µm	-60 to 400/430 °C		70118
	0.88 µm	-60 to 380/430 °C	70131	70134
	1.00 µm	-60 to 380/400 °C		70130
	1.20 µm	-60 to 380/380 °C		70119
	2.65 µm	-60 to 360/400 °C		70132
	5.00 µm	-60 to 360/400 °C		70133

Hydrocarbons (C5-C106) on MXT®-1HT SimDist at 450 °C



Peaks	t_R (min)
1. C5	—
2. C6	—
3. C7	—
4. C8	—
5. C9	—
6. C10	—
7. C11	—
8. C12	0.938
9. C13	1.586
10. C14	2.425
11. C15	3.365
12. C16	4.332
13. C17	5.290
14. C18	6.217
15. C20	7.966
16. C22	9.566
17. C24	11.051
18. C26	12.426
19. C28	13.689
20. C30	14.897
21. C32	16.035
22. C34	17.110
23. C36	18.133
24. C38	19.108
25. C40	20.096
26. C42	20.923
27. C44	21.759
28. C46	22.556
29. C48	23.317
30. C50	24.051
31. C52	24.752
32. C54	25.422
33. C56	26.079
34. C58	26.701
35. C60	27.305
36. C62	27.878
37. C64	28.439
38. C66	28.975
39. C68	29.499
40. C70	30.002
41. C72	30.489
42. C74	30.906
43. C76	31.414
44. C78	31.862
45. C80	32.294
46. C82	32.719
47. C84	33.132
48. C86	33.529
49. C88	33.927
50. C90	34.310
51. C92	34.689
52. C94	35.059
53. C96	35.423
54. C98	35.773
55. C100	36.120
56. C102	36.463
57. C104	36.793
58. C106	37.118

Column	MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.10 µm (cat.# 70112)
Sample	Custom C5-C106 hydrocarbon standard
Diluent:	Carbon disulfide
Conc.:	1%
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 450 °C at 10 °C/min (hold 5 min)
Oven	
Oven Temp.:	50 °C to 450 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	18 mL/min
Detector	FID @ 450 °C
Make-up Gas Flow Rate:	24 mL/min
Constant Column + Constant Make-up:	42 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Shimadzu 2010 GC

MXT®-500 SimDist Column (Siltek®-treated stainless steel)
(nonpolar phase)

- Application-specific columns in unbreakable Siltek® treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation.
- Stable to 430 °C.
- 4.5" standard coil diameter.

ID	df	temp. limits	6-Meter cat.#
0.53 mm	0.15 µm	-60 to 420/430 °C	70104

Polywax® Calibration Materials

Description	qty.	cat.#
Polywax 655 calibration material	1 g	36225
Polywax 1,000 calibration material	1 g	36227

similar phases

UAC-DX30

free literature

GC Analysis of Petroleum Products by Simulated Distillation, Using MXT® SimDist Columns

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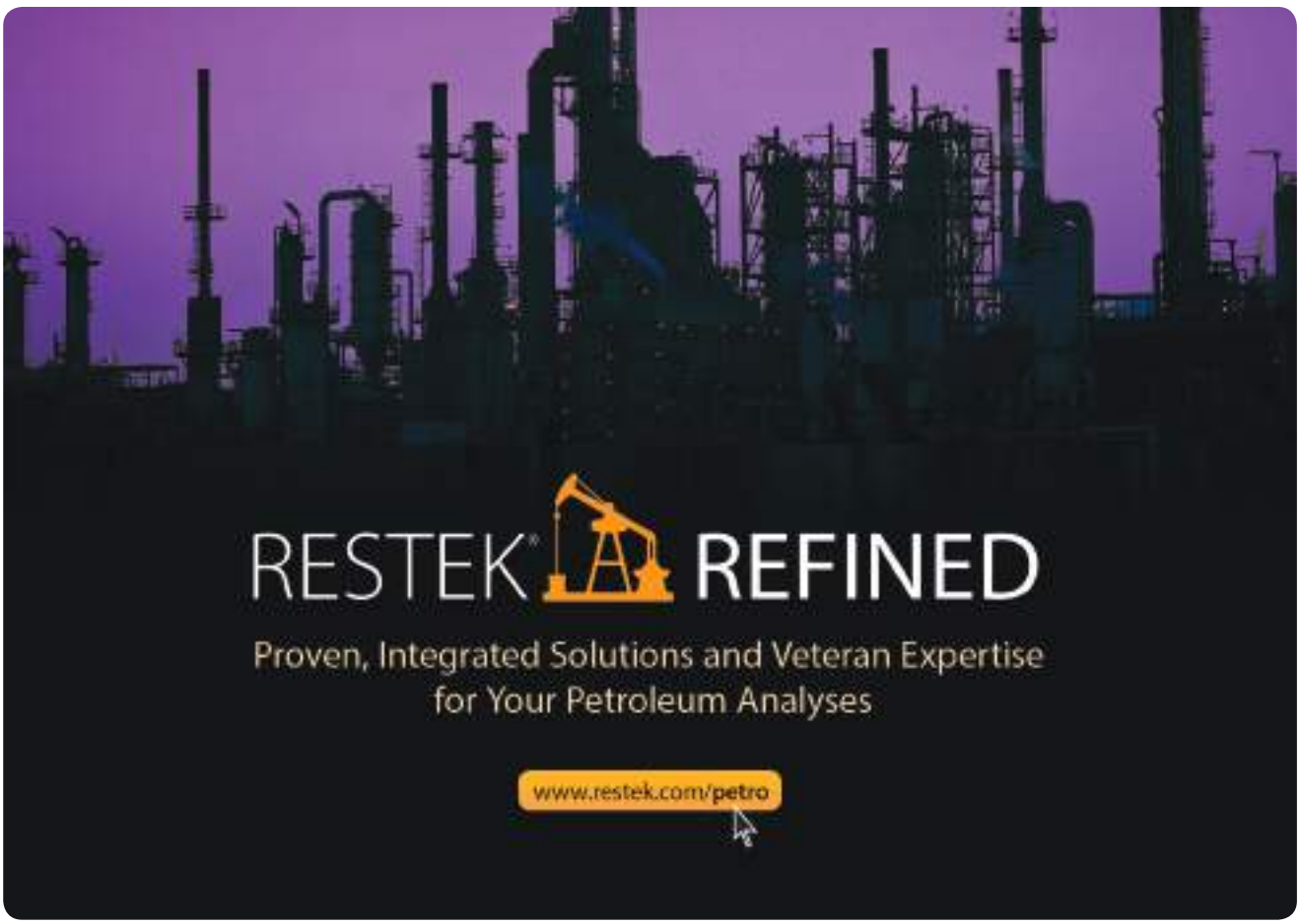
lit. cat.# 59551A



GC Columns

PLOT Columns

PLOT Column Selection 117–119
Fused Silica Silica BOND Columns 120
Fused Silica Alumina BOND Columns 121–124
Fused Silica Molecular Sieve 5A Columns 125
Fused Silica Porous Polymer Columns 126–128
Particle Trap 128
Metal MXT® PLOT Columns 129

Stable Bonded GC PLOT Columns

- Innovative bonding process minimizes particle release, reducing column blockage and protecting instrument parts.
- More consistent flow means stable retention times in Deans and related flow switching techniques.
- Outstanding peak symmetry improves impurity analysis for gases, solvents, and hydrocarbons.

Quick Reference Chart

PLOT Column	Description/Application
Rt-Silica BOND (p. 120)	Bonded silica Light hydrocarbons, sulfur gases, carbon dioxide, and halocarbons
Rt-Alumina BOND/Na_2SO_4 (p. 121) MXT-Alumina BOND/Na_2SO_4 (p. 129)	C1–C5 hydrocarbons Purity analysis of ethylene, propylene, butenes, butadiene
Rt-Alumina BOND/KCl (p. 122)	C1-C10 hydrocarbons, C1-C5 isomers Purity analysis of ethylene, propylene, butene, butadiene.
Rt-Alumina BOND/CFC (p. 123)	Multi-halogenated alkanes, C1-C-5 range Chlorofluorocarbons (CFCs)
Rt-Alumina BOND/MAPD (p. 124) MXT-Alumina BOND MAPD (p. 129)	Trace analysis of methylacetylene, propadiene, acetylene
Rt-Msieve 5A (p. 125) MXT-Msieve 5A (p. 129)	Permanent gas analysis He, Ne, Ar, O_2, N_2, Xe, Rn, CH_4, and CO
Rt-Q-BOND (p. 126) MXT-Q-BOND (p. 129)	Nonpolar porous polymer High retention for solvents, alcohols, polar volatiles, CO_2, sulfur, and ppm water in solvents
Rt-QS-BOND (p. 127)	Intermediate polarity porous polymer (polarity between Q-BOND and S-BOND) Neutral solvents, ketones, esters, hydrocarbons, and baseline separation of ethane, ethene, acetylene
Rt-S-BOND (p. 127) MXT-S-BOND (p. 129)	Intermediate polarity porous polymer Light gases in ethylene and propylene, ketones, esters, hydrocarbons
Rt-U-BOND (p. 128)	Polar porous polymer More retention for polar compounds

PLOT Column Phase Cross-Reference: Similar Selectivity

Restek® Rt® and MXT® Columns	Porous Layer	Supelco	Alltech	Agilent (J&W, Varian, Chrompack)	Quadrex
Silica BOND	Bonded silica	———	———	CP Silica PLOT, GS-GasPro	———
Alumina BOND/Na_2SO_4	Aluminum oxide	Alumina-Sulfate	AT-Alumina	GS-Alumina ,CP-Al_2O_3/NA_2SO_4	———
Alumina BOND/KCl	Aluminum oxide	Alumina-Chloride	———	GS-Alumina KCl, HP PLOT Al_2O_3, CP-Al_2O_3/KCl	———
Alumina BOND/CFC	Aluminum oxide	**unique** product			
Alumina BOND/MAPD	Aluminum oxide	———	———	Select Al_2O_3 MAPD	———
Msieve 5A	Molecular sieve 5A	Molsieve 5A	AT-Molesieve	HP PLOT Molesieve, CP-Molsieve 5A	PLT-5A
Q-BOND	100% Divinylbenzene	Supel-Q-PLOT	AT-Q	HP PLOT Q ,CP-PoraPLOT Q, CP-PoraBOND Q	———
QS-BOND	Intermediate polarity porous polymer	———	———	GS-Q	———
S-BOND	DVB vinylpyridine polymer	———	———	CP-PoraPLOT S	———
U-BOND	DVB ethylene glycol-dimethylacrylate polymer	———	———	HP PLOT U, CP-PoraPLOT U, CP-PoraBOND U	———

Stable Bonded Porous Layer Open Tubular (PLOT) Columns

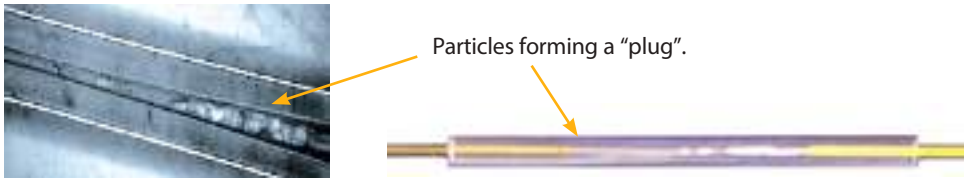
- Stabilized particle layers improve robustness and reproducibility of retention and flow.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- Innovative manufacturing procedure reduces particle generation and improves performance of porous polymer and molecular sieve PLOT columns.

Porous layer open tubular (PLOT) columns are very beneficial for solving application problems, especially for the analysis of volatile compounds. PLOT columns have a unique selectivity, allowing for the separation of gaseous compounds at room temperature. Due to the adsorption mechanism of the supports used in PLOT columns, permanent gases and light hydrocarbons can be resolved at room temperature; columns can then be programmed to higher temperatures to elute higher boiling compounds.

Traditional PLOT Columns Offer Poor Stability

The traditional PLOT column is built with a 5–50 µm layer of particles adhered to the tubing walls. Because this layer of particles generally lacks stability, PLOT columns must be used very carefully, as particle release is common and can cause unpredictable changes in retention time and flow behavior. Traditional PLOT columns also must generally be used in conjunction with particle traps to prevent the contamination of valves, injectors, and GC detectors. Detectors contaminated with particles typically generate electronic noise, which shows up chromatographically as a spike in the baseline. In extreme cases, detector flow can be obstructed by particle buildup. Particles can also affect valves by becoming lodged in the valve and causing leaks or restricting flow. Figure 1 shows an example of blockage caused by particle accumulation inside a press-fit connector.

Figure 1: Particles released from traditional PLOT columns can cause blockages.



Restek® PLOT Columns Offer Improved Stability to Minimize Particle Release

Restek has developed technology and procedures to manufacture PLOT columns with concentric stabilized adsorption layers. These next generation PLOT columns show a constant flow behavior (permeability) and have significantly improved mechanical stability, resulting in easier operation, better chromatography, and reduced particle release. Greater particle stability means more reproducible retention times, virtually no spiking, and longer column lifetimes. This innovative Restek® stabilization chemistry is currently applied to all fused silica and metal PLOT columns.

Consistent Flow Restriction Factor (F) Guarantees Reproducible Flow

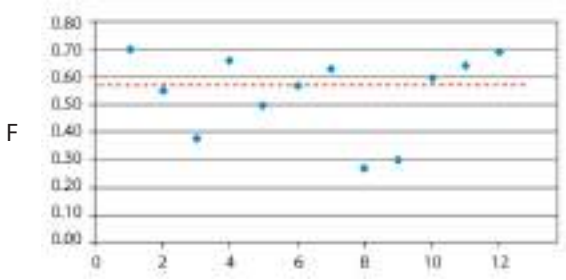
Thick layers of particles are difficult to deposit in a homogeneous layer, and in traditionally manufactured PLOT columns, this results in variable coating thicknesses. The positions where the layer is thicker act as restrictions and affect flow (Figure 2). Depending on the number and intensity of these restrictions, traditional PLOT columns often show greater variation in flow restriction than wall coated open tubular (WCOT) columns. In practice, conventional PLOT columns with the same dimensions can differ in flow by a factor of 4 to 6 when operated at the same nominal pressure. For applications where flow is important, such as with Deans switching, the nonreproducible flow behavior of most commercially available PLOT columns is a problem.

Figure 2: Inconsistent coating thicknesses result in restrictions that cause significant variation in flow.

In order to measure flow restriction reproducibility, Restek introduced a new factor: the flow restriction factor (F). This factor is based on the retention time of an unretained marker compound, as measured on both coated and uncoated tubing using the same backpressure setting (Equation 1). For quality control purposes, methane is used as the marker when evaluating porous polymer columns, and helium is used for testing molecular sieve 5A columns.

Flow restriction factor determination can be used to assess both the degree of column restriction and the reproducibility of the column coating process. Flow restriction can also be calculated (Equation 2). Figure 3 shows typical results for PLOT columns manufactured using a conventional process. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns made using our Rt®-QS-BOND (bonded porous polymer) PLOT column process. Clearly, Restek's manufacturing process results in greater consistency in both column coating thickness and flow restriction, which results in more stable retention times and better performance in Deans and related flow switching techniques. Flow restriction factors are specified on the certificate of analysis (CofA) included with every Restek® PLOT column, and the values are listed on the report.

Figure 3: Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses.



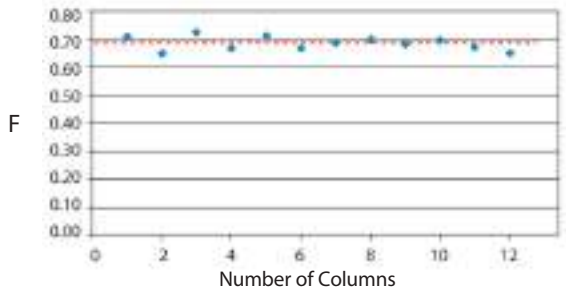
Equation 1: Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

t_R = retention time

Note: F values will always be <1 as the coated column always has more restriction than the uncoated column.

Figure 4: PLOT columns from Restek offer consistent flow restriction, giving more reproducible results column-to-column.



Equation 2: Percent flow restriction of coated column.

$$\% \text{ restriction} = (1 - F) \times 100$$

See what makes Restek's new **Rt®-Silica BOND** column the best on the market! .....**page 120**

Restek's PLOT columns are exceptionally robust, featuring concentric stabilized coating layers. They allow for more consistent gas flows and are recommended for applications sensitive to variation in retention time or flow. These PLOT columns are a significant advance in technology and are ideal for efficient, reproducible analyses of permanent gases, solvents, and hydrocarbons.

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

free literature
Restek's PLOT Column Family
The New Benchmark For Performance!
Download your free copy from www.restek.com
lit. cat.# PCBR1163D-UNV

similar phases

GS-GasPro, CP-SilicaPLOT

NEW!

Rt®-Silica BOND Columns (fused silica PLOT)

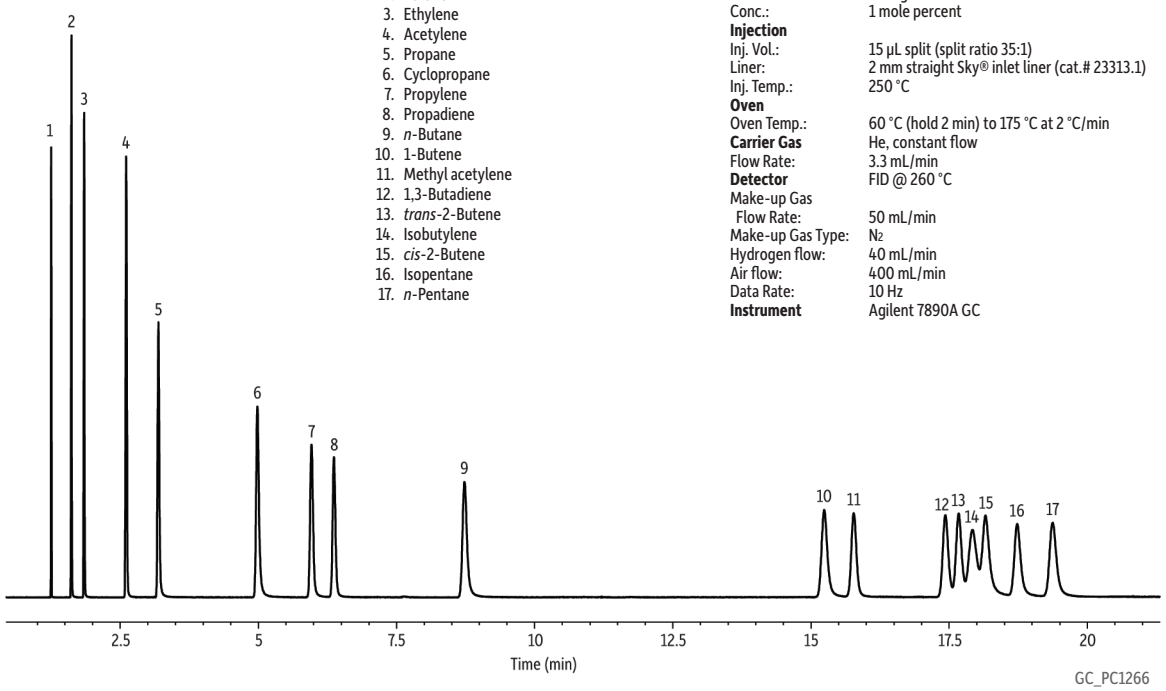
- Versatile column ideal for analysis of light hydrocarbons, sulfur gases, halocarbons, and carbon dioxide.
- Individually QC tested with sensitive C4 probes to ensure consistent selectivity.
- Proprietary manufacturing process practically eliminates particle release, reducing downtime due to obstructed FID jets.
- Bonded silica stationary phase minimizes impact of water, resulting in reproducible retention times for water-containing samples.
- Stable to 260 °C.

Restek's Rt®-Silica BOND columns are robust, versatile, selective PLOT columns that offer excellent performance for the analysis of light hydrocarbons, sulfur gases, and halocarbons above ambient temperature. In addition, carbon dioxide and other gases can be retained at ambient temperature on this silica-based column. High loadability, inertness, and consistent selectivity, as well as unmatched robustness at a maximum temperature of 260 °C, make the Rt®-Silica BOND column ideal for the analysis of active unsaturated hydrocarbons.

Rigorous C4 selectivity testing and additional testing to confirm efficiency and inertness ensure good separations are achieved with optimal peak shape and response for active analytes. As with all Restek® PLOT columns, our proprietary manufacturing process minimizes particle generation, which reduces the problems commonly associated with released particles (signal spikes, valve damage, and obstructed FID jets).

ID	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.32 mm	-80 to 260 °C	19784	19785	19786

Saturated and Unsaturated Hydrocarbons on Rt®-Silica BOND PLOT Column



Peaks
1. Methane
2. Ethane
3. Ethylene
4. Acetylene
5. Propane
6. Cyclopropane
7. Propylene
8. Propadiene
9. *n*-Butane
10. 1-Butene
11. Methyl acetylene
12. 1,3-Butadiene
13. *trans*-2-Butene
14. Isobutylene
15. *cis*-2-Butene
16. Isopentane
17. *n*-Pentane

Column	Rt®-Silica BOND, 30 m, 0.32 mm ID (cat.# 19785)
Sample	Custom DCG gas standard
Diluent:	Nitrogen
Conc.:	1 mole percent
Injection	
Inj. Vol.:	15 µL split (split ratio 35:1)
Liner:	2 mm straight Sky® inlet liner (cat.# 23313.1)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	60 °C (hold 2 min) to 175 °C at 2 °C/min
Carrier Gas	He, constant flow
Flow Rate:	3.3 mL/min
Detector	FID @ 260 °C
Make-up Gas Flow Rate:	50 mL/min
Make-up Gas Type:	N_2
Hydrogen flow:	40 mL/min
Air flow:	400 mL/min
Data Rate:	10 Hz
Instrument	Agilent 7890A GC

Rt®-Alumina BOND Columns

Restek® Rt®-Alumina BOND columns are highly selective for C1–C5 hydrocarbons and separate all saturated and unsaturated hydrocarbon isomers above ambient temperatures. The reactivity of the aluminum oxide stationary phase is minimized to improve column response for polar unsaturates, such as dienes, and the column's sensitivity (or response) ensures linear and quantitative chromatographic analysis for these compounds. Strong bonding prevents particle generation and release, which allows valve switching without harming the injection or detection systems. And because they are stable up to at least 200 °C, Rt®-Alumina BOND columns can be regenerated to restore full efficiency and selectivity by conditioning at their maximum temperature if water is adsorbed. High capacity and loadability give you exceptionally symmetrical peaks, making these columns ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations. Restek® Rt®-Alumina BOND PLOT columns are manufactured on fused silica tubing; select phases are also available on metal MXT® tubing.

To ensure reproducible retention times and predictable flow behavior column-to-column, each Rt®-Alumina BOND column is extensively tested. A hydrocarbon test mix confirms proper phase retention and selectivity. To calculate k (retention or capacity factor), which is a measure of phase retention, 1,3-butadiene is used, while selectivity is measured using retention indices for propadiene and methyl acetylene. The resolution of *trans*-2-butene and 1-butene is also verified and, to measure efficiency, plates per meter are checked using 1,3-butadiene.

similar phases

GS-Alumina, CP-Al_2O_3/Na_2SO_4, Alumina-Sulfate

tech tip

Trace Water in the Carrier Gas

Traces of water in the carrier gas and samples will affect the retention and the selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15–30 minutes at 200 °C under normal carrier gas flow. Periodic conditioning ensures excellent run-to-run retention time reproducibility.

Unless noted, the maximum programmable temperature for an Rt®-Alumina BOND column is 200 °C. Temperatures higher than the stated maximum temperature can cause irreversible changes to the porous layer adsorption properties.

Rt®-Alumina BOND/Na_2SO_4 Columns (fused silica PLOT)

(Na_2SO_4 deactivation)

- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.
- Stable to 200 °C.

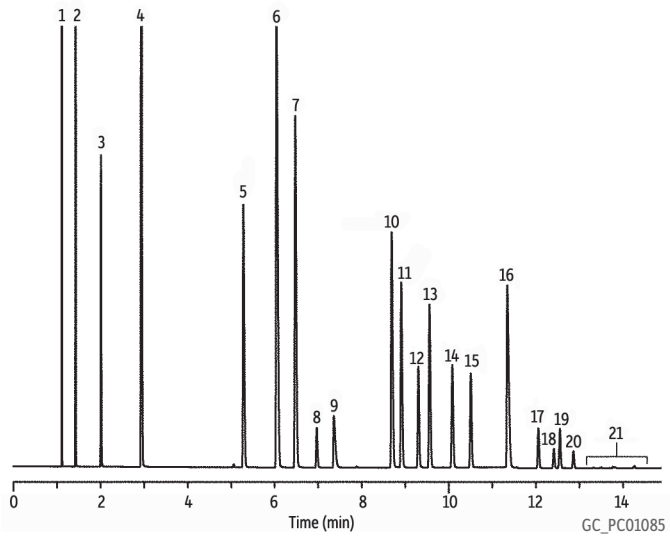
ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 200 °C	19775	—
0.32 mm	5 µm	to 200 °C	19757	19758
0.53 mm	10 µm	to 200 °C	19755	19756

also available

Metal MXT® PLOT Columns

See **page 129.**

Refinery Gas on Rt®-Alumina BOND (Na_2SO_4)



Peaks

1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane
8. Propadiene
9. Acetylene
10. *trans*-2-Butene
11. 1-Butene
12. Isobutylene
13. *cis*-2-Butene
14. iso-Pentane
15. *n*-Pentane
16. 1,3-Butadiene
17. *trans*-2-Pentene
18. 2-Methyl-2-butene
19. 1-Pentene
20. *cis*-2-Pentene
21. Hexanes

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Refinery gas
Injection	
Inj. Vol.:	10 µL split
Liner:	Taper (2 mm) (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp.:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	74 cm/sec @ 45 °C
Detector	FID @ 200 °C

similar phases

GC-Alumina KCl, HP-PLOT Al_2O_3/KCl, CP-Al_2O_3/KCl, Alumina-Chloride

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

(KCl deactivation)

- Restek's lowest polarity alumina column.
- Low moisture sensitivity reduces the need for frequent regeneration.
- Acetylene elutes before *n*-butane.
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.
- Stable to 200 °C.

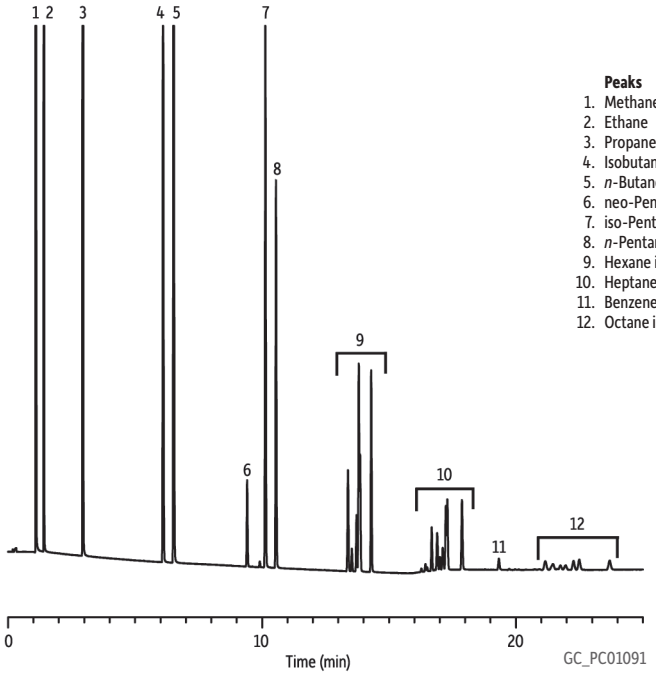
ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 200 °C	19776	—
0.32 mm	5 µm	to 200 °C	19761	19762
0.53 mm	10 µm	to 200 °C	19759	19760

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

We pack Restek quality into each and every column we ship.

Natural Gas on Rt®-Alumina BOND/KCl



Column	Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)
Sample	Natural gas
Injection	
Inj. Vol.:	500 µL split
Liner:	2.0 mm ID single taper (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	50 mL/min
Oven	
Oven Temp.:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	45 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

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

- Improved inertness for chlorofluorocarbon (CFC) compounds.
- Highly selective alumina-based column, separates most CFCs.
- High retention and capacity for CFCs.
- Stable to 200 °C.

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

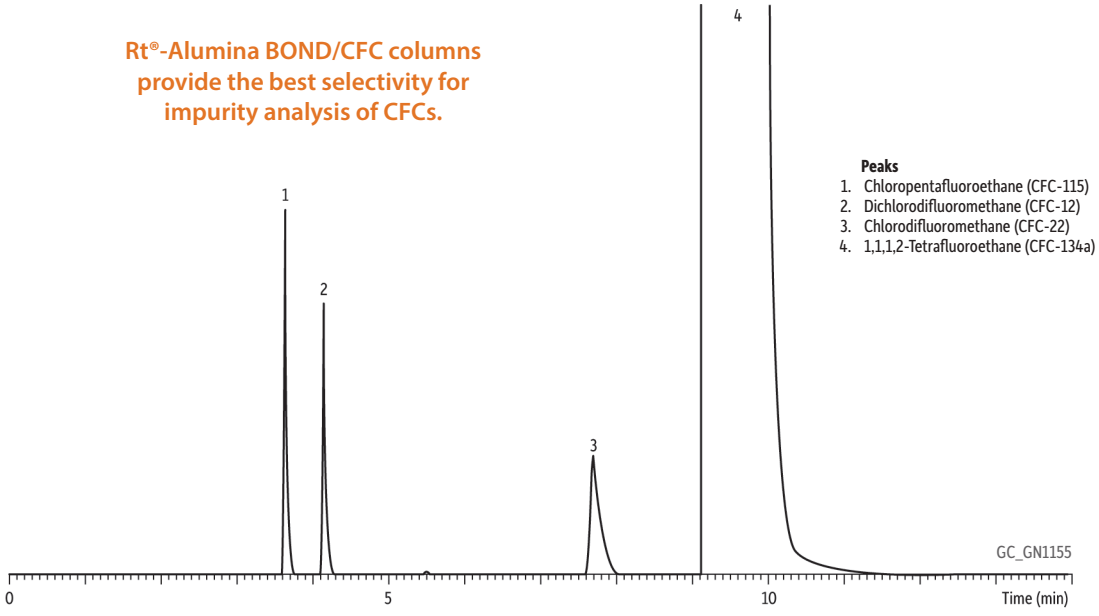
ID	df	temp. limits	30-Meter cat.#
0.53 mm	10 µm	to 200 °C	19763

did you know?

All Restek PLOT columns come standard on a 7"-diameter, 11-pin cage.

Impurity Analysis of 1,1,1,2-Tetrafluoroethane (CFC-134a) on Rt®-Alumina BOND/CFC

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



Column	Rt®-Alumina BOND/CFC, 30 m, 0.53 mm ID (cat.# 19763)
Sample	1,1,1,2-Tetrafluoroethane
Conc.:	Neat
Injection	
Inj. Vol.:	500 µL split
Oven	
Oven Temp.:	80 °C (hold 6 min) to 140 °C at 10 °C/min (hold 2 min)
Carrier Gas	He
Detector	FID
Notes	Gas sampling, purity analysis

Note that tailing peaks are common in CFC analyses due to overloading normally employed for this type of work.

similar phases

Select Al_2O_3 MAPD

free literature

Analyze Trace Polar Hydrocarbons More Accurately and Reliably With New Alumina BOND/MAPD PLOT Columns

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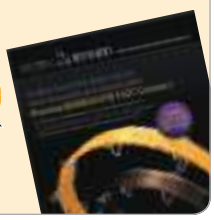
lit. cat.# PCBR1412A-UNV



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

- Optimized deactivation produces maximum response when analyzing trace levels of acetylene, methyl acetylene, and propadiene.
- Stable response factors make this column ideal for process-type applications where recalibration must be minimized.
- High loadability reduces peak tailing and improves separations.
- Extended temperature range up to 250 °C for fast elution of high molecular weight (HMW) hydrocarbons and accelerated column regeneration following exposure to water.
- Stable to 250 °C.

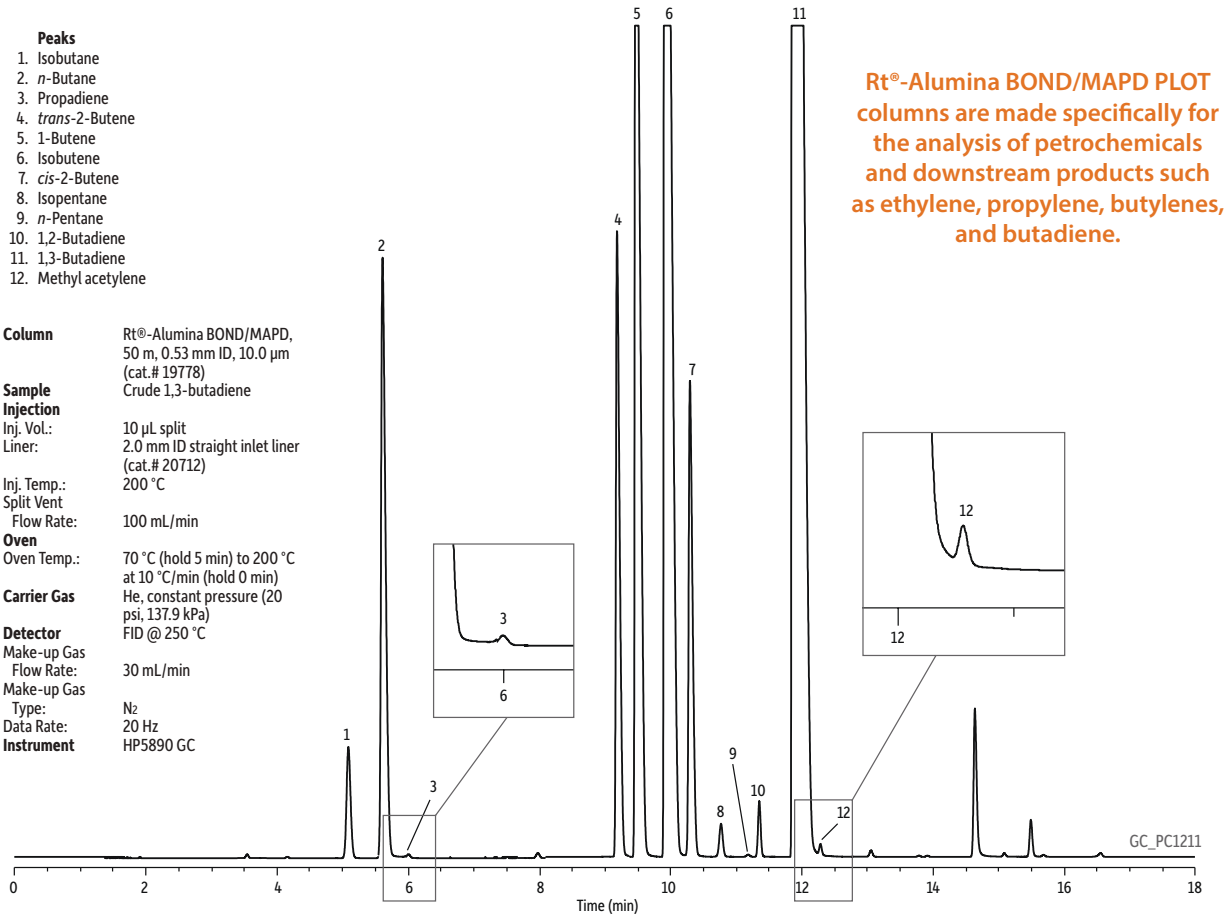
Restek's R&D chemists have optimized the deactivation technology applied to our Rt®-Alumina BOND/MAPD column for improved analysis of trace concentrations of polar hydrocarbons like acetylene, methyl acetylene, and propadiene in hydrocarbon streams containing higher levels of C1-C5 hydrocarbons. Our alumina PLOT deactivation produces an incredibly inert column that offers superior reproducibility and stable response factors to maximize the number of analyses before recalibration is required. Its high sample capacity reduces peak tailing, thereby improving the separation of target compounds. In addition, a 250 °C maximum operating temperature lets you more quickly elute hydrocarbons up to dodecane and reduces regeneration time when the column is exposed to water from samples or carrier gases.

ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 250 °C	19781	—
0.32 mm	5 µm	to 250 °C	19779	19780
0.53 mm	10 µm	to 250 °C	19777	19778

1,3-Butadiene on Rt®-Alumina BOND/MAPD (Purity Analysis)

Peaks
1. Isobutane
2. *n*-Butane
3. Propadiene
4. *trans*-2-Butene
5. 1-Butene
6. Isobutene
7. *cis*-2-Butene
8. Isopentane
9. *n*-Pentane
10. 1,2-Butadiene
11. 1,3-Butadiene
12. Methyl acetylene

Column	Rt®-Alumina BOND/MAPD, 50 m, 0.53 mm ID, 10.0 µm (cat.# 19778)
Sample	Crude 1,3-butadiene
Injection	
Inj. Vol.:	10 µL split
Liner:	2.0 mm ID straight inlet liner (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp.:	70 °C (hold 5 min) to 200 °C at 10 °C/min (hold 0 min)
Carrier Gas	He, constant pressure (20 psi, 137.9 kPa)
Detector	FID @ 250 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC



Rt®-Alumina BOND/MAPD PLOT columns are made specifically for the analysis of petrochemicals and downstream products such as ethylene, propylene, butylenes, and butadiene.

Molecular Sieve 5A PLOT Columns

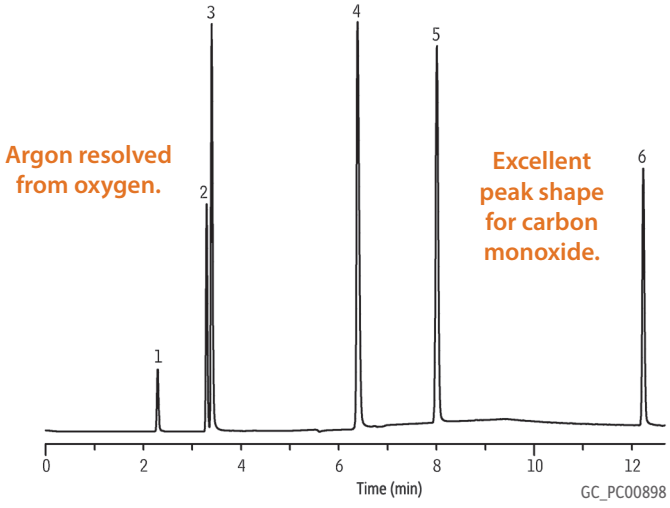
Restek's molecular sieve 5A PLOT columns are designed for efficient separation of argon/oxygen and other permanent gases, including carbon monoxide. Special coating and deactivation procedures ensure chromatographic efficiency and the integrity of the porous layer coating. Molecular sieves have very high retention, allowing separations of permanent gases at temperatures above ambient. Our deactivation technology also allows carbon monoxide to elute as a sharp peak. Additionally, our unique immobilization process guarantees that the uniform particles remain adhered to the tubing—even after continuous valve-cycling.

Rt®-Msieve 5A Columns (fused silica PLOT)

- Improve accuracy with sharp, symmetrical peaks for argon, oxygen, and carbon monoxide.
- Easily separate permanent gases at temperatures above ambient.
- Restek® PLOT technology reduces particle release, improving flow reproducibility and reducing downtime for maintenance.
- Stable to 300 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	20 µm	to 300 °C	19773	—
0.32 mm	30 µm	to 300 °C	19720	19722
0.53 mm	50 µm	to 300 °C	19721	19723

Separation of Argon/Oxygen and Other Permanent Gases on Rt®-Msieve 5A



Peaks	Conc. (µg/mL)
1. Hydrogen	40
2. Argon	30
3. Oxygen	50
4. Nitrogen	50
5. Methane	40
6. Carbon monoxide	50

Column	Rt®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
Sample	Permanent gases
Injection	Sample valve
Sample Loop Vol.:	5 µL
Valve Name:	6-port Valco® valve
Inj. Temp.:	200 °C
Valve Temp.:	Ambient
Oven	
Oven Temp.:	27 °C (hold 5 min) to 100 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	5.0 mL/min
Detector	Valco® helium ionization detector @ 150 °C

did you know?

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O_2 and other permanent gases, including CO.

similar phases

HP PLOT Molesieve, CP-Molsieve 5A, Molsieve 5A, AT-Molsieve, PLT-5A

tech tip

Molecular sieve materials are very hydrophilic

Because molecular sieve materials are very hydrophilic, they will adsorb water from the sample or carrier gas. Water contamination can have a detrimental effect on peak symmetry and can reduce the resolution of all compounds. If water contamination occurs, reactivate your Rt®-Msieve 5A PLOT column by conditioning at 300 °C with dry carrier gas flow for 3 hours.

also available

Metal MXT® PLOT Columns

See **page 129.**

Fused Silica Porous Polymer Columns

Porous Polymer Columns

Porous polymers are unique, highly retentive stationary phases with a wide application range that are able to elute both polar and nonpolar compounds. They are very hydrophobic, so water has no impact on retention times and even elutes as a good chromatographic peak. The Q-BOND is our most nonpolar and widely used porous polymer column; functional groups can be added to increase polarity (i.e., QS-, S-, and U-BOND). The process used to manufacture porous polymer PLOT columns causes the particles to adhere strongly to the walls of the tubing, so there is virtually no particle generation. You get reproducible performance from column to column, including selectivity and flow.

similar phases

HP PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q, Supel-Q-PLOT, AT-Q

Our porous polymer PLOT columns are not moisture sensitive, making them ideal for applications where moisture is of major concern.

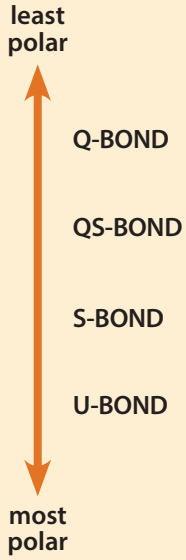
Rt®-Q-BOND Columns (fused silica PLOT)

100% divinylbenzene

- Nonpolar PLOT column incorporating 100% divinylbenzene.
- Excellent for analysis of C1 to C3 isomers and alkanes up to C12.
- High retention for CO_2 simplifies gas analysis; CO_2 and methane separated from O_2/N_2/CO. (Note: O_2/N_2/CO not separated at room temperature.)
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 300 °C.

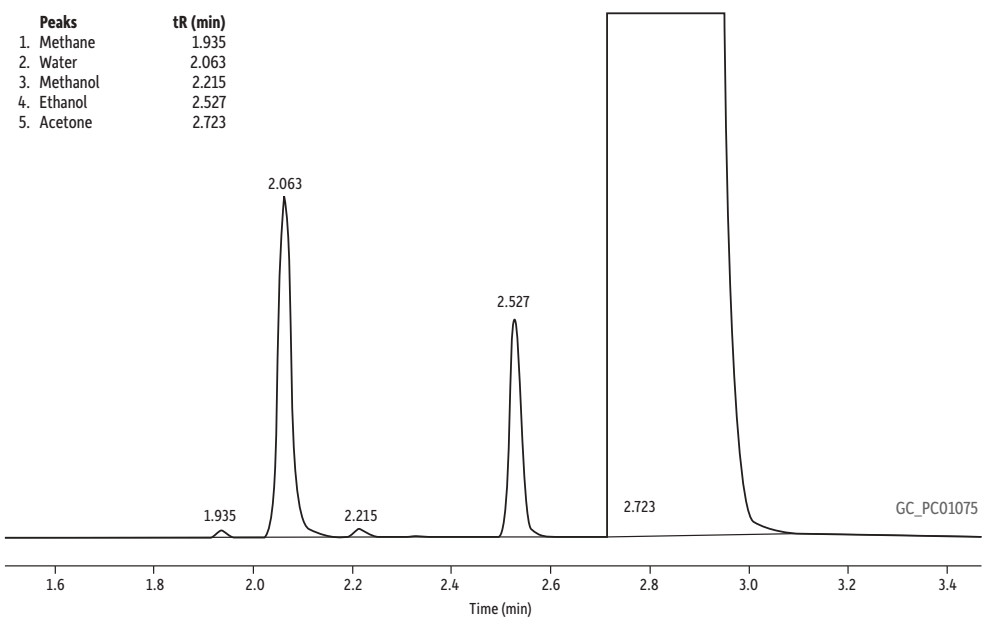
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 280/300 °C	19764	19765
0.32 mm	10 µm	to 280/300 °C	19743	19744
0.53 mm	20 µm	to 280/300 °C	19741	19742

Restek porous polymer PLOT columns cover a wide range of polarities



Water and Ethanol in Acetone on Rt®-Q-BOND

Peaks	tR (min)
1. Methane	1.935
2. Water	2.063
3. Methanol	2.215
4. Ethanol	2.527
5. Acetone	2.723



Column	Rt®-Q-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19742)
Sample	
Diluent:	Acetone
Conc.:	0.5% Water and ethanol
Injection	
Inj. Vol.:	3 µL split (split ratio 11:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	200 °C (hold 4 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	28.7 cm/sec @ 200 °C
Detector	TCD @ 260 °C

Rt®-QS-BOND Columns (fused silica PLOT)

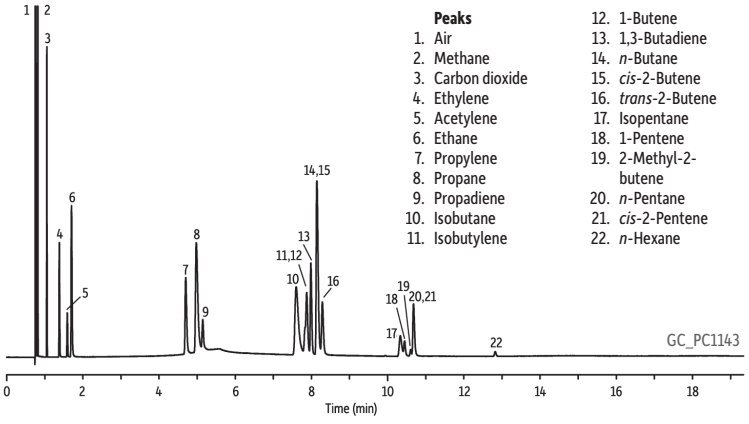
porous divinylbenzene homopolymer

- Intermediate polarity PLOT column incorporating low 4-vinylpyridine.
- Separates ethane, ethylene, and acetylene to baseline.
- Designed for the best possible separation between all C2 isomers.
- Stable to 250 °C.

similar phases
GS-Q

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 250 °C	19767	19768
0.32 mm	10 µm	to 250 °C	19739	19740
0.53 mm	20 µm	to 250 °C	19737	19738

Refinery Gas Mixture on Rt®-QS-BOND



Peaks
1. Air
2. Methane
3. Carbon dioxide
4. Ethylene
5. Acetylene
6. Ethane
7. Propylene
8. Propane
9. Propadiene
10. Isobutane
11. Isobutylene
12. 1-Butene
13. 1,3-Butadiene
14. *n*-Butane
15. *cis*-2-Butene
16. *trans*-2-Butene
17. Isopentane
18. 1-Pentene
19. 2-Methyl-2-butene
20. *n*-Pentane
21. *cis*-2-Pentene
22. *n*-Hexane

Column	Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)
Sample	Refinery gas standard
Injection	
Inj. Vol.:	20 µL split
Liner:	2 mm (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	35 mL/min
Oven	
Oven Temp.:	40 °C (hold 2 min) to 225 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant pressure (11.5 psi, 79.3 kPa)
Linear Velocity:	68 cm/sec @ 40 °C
Detector	TCD @ 225 °C
Make-up Gas Type:	He
Data Rate:	20 Hz
Sensitivity Mode:	He/H_2
Instrument	HP5890 GC

Rt®-S-BOND Columns (fused silica PLOT)

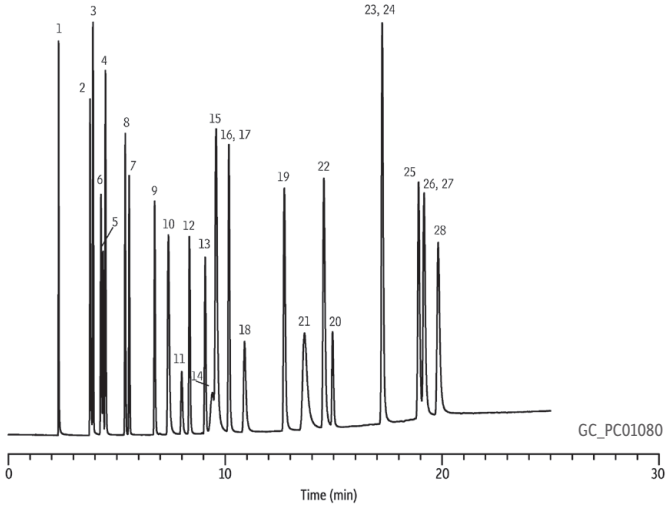
porous divinylbenzene homopolymer

- Midpolarity PLOT column, incorporating high 4-vinylpyridine.
- Use for the analysis of nonpolar and polar compounds.
- Stable to 250 °C.

similar phases
CP-PoraPLOT S

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 250 °C	19769	19770
0.32 mm	10 µm	to 250 °C	19747	19748
0.53 mm	20 µm	to 250 °C	19745	19746

Solvent Mixture on Rt®-S-BOND



Peaks
1. Methanol
2. Ethanol
3. Acetonitrile
4. Acetone
5. Dichloromethane
6. 1,1-Dichloroethene
7. Nitromethane
8. *trans*-1,2-Dichloroethylene
9. *cis*-1,2-Dichloroethylene
10. Tetrahydrofuran
11. Chloroform
12. Ethyl acetate
13. 1,2-Dichloroethane
14. 1,1,1-Trichloroethane
15. Benzene
16. 1,2-Dimethoxyethane
17. Trichloroethylene
18. 1,4-Dioxane
19. Pyridine
20. Dimethylformamide
21. Methylcyclohexane
22. Toluene
23. 2-Hexanone
24. Chlorobenzene
25. Ethylbenzene
26. *m*-Xylene
27. *p*-Xylene
28. *o*-Xylene

Column	Rt®-S-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19746)
Sample	Solvent mixture
Injection	
Inj. Vol.:	1.0 µL split
Liner:	Taper (4 mm) (cat.# 20798)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp.:	120 °C to 220 °C at 5 °C/min (hold 5.0 min)
Carrier Gas	H_2, constant pressure (4.2 psi, 29.0 kPa)
Linear Velocity:	40 cm/sec @ 120 °C
Detector	FID @ 220 °C

Fused Silica Porous Polymer Columns, Particle Trap

similar phases

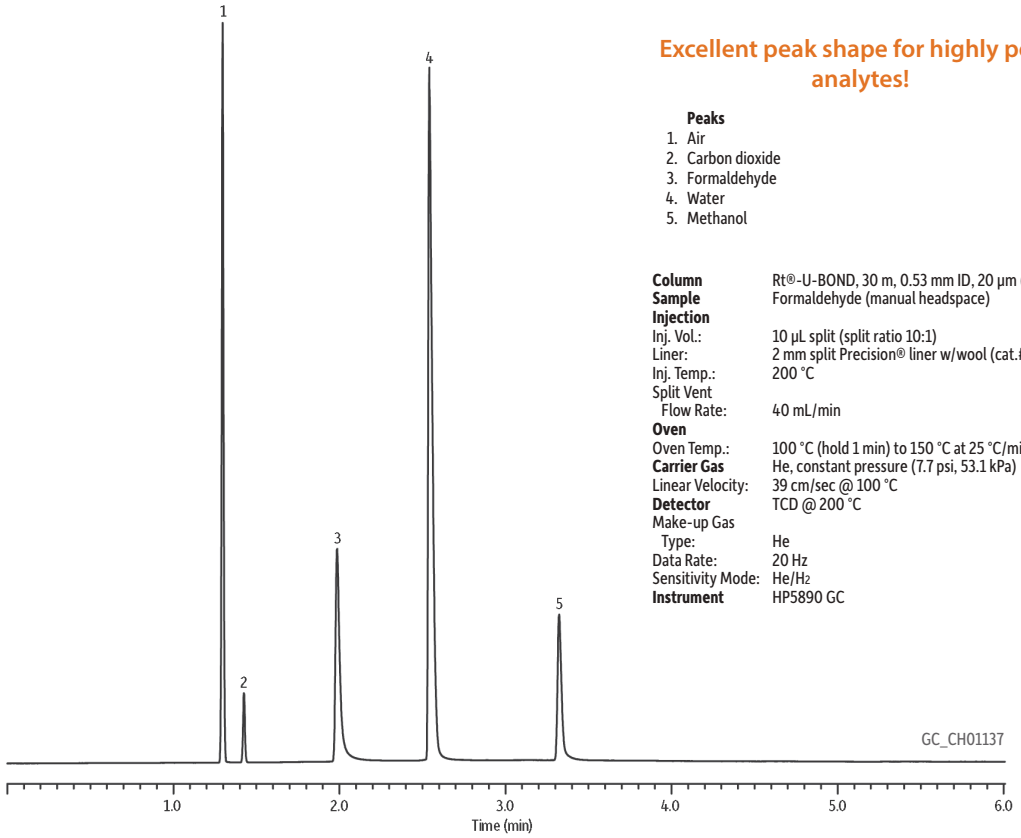
HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U

Rt®-U-BOND Columns (fused silica PLOT)
divinylbenzene ethylene glycol/dimethylacrylate

- Restek's highest polarity porous polymer column.
- Polar PLOT column, incorporating divinylbenzene ethylene glycol/ dimethylacrylate.
- Highly inert for the analysis of polar and nonpolar compounds.
- Stable to 190 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 190 °C	19771	19772
0.25 mm	12 µm	to 190 °C	19782	—
0.32 mm	10 µm	to 190 °C	19751	19752
0.53 mm	20 µm	to 190 °C	19749	19750

Formaldehyde on Rt®-U-BOND



Excellent peak shape for highly polar analytes!

Peaks
1. Air
2. Carbon dioxide
3. Formaldehyde
4. Water
5. Methanol

Column	Rt®-U-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19750)
Sample	Formaldehyde (manual headspace)
Injection	
Inj. Vol.:	10 µL split (split ratio 10:1)
Liner:	2 mm split Precision® liner w/wool (cat.# 20823)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	40 mL/min
Oven	
Oven Temp.:	100 °C (hold 1 min) to 150 °C at 25 °C/min (hold 3 min)
Carrier Gas	He, constant pressure (7.7 psi, 53.1 kPa)
Linear Velocity:	39 cm/sec @ 100 °C
Detector	TCD @ 200 °C
Make-up Gas Type:	He
Data Rate:	20 Hz
Sensitivity Mode:	He/H_2
Instrument	HP5890 GC

19754

PLOT Column Particle Trap

- Includes two Press-Tight® connectors and a 2.5 m column.
- Protects detector and valves; connects between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.

The technology used to adhere particles in PLOT columns is excellent; however, it is still possibile for particles to dislodge when extreme pressure shocks and gas flow changes occur. This sometimes happens when valve switching or backflushing is used. In those cases, using particle traps is recommended.

Description	qty.	cat.#
PLOT Column Particle Trap, 2.5 m, 0.32 mm ID with 2 Press-Tight Connectors	ea.	19753
PLOT Column Particle Trap, 2.5 m, 0.53 mm ID with 2 Press-Tight Connectors	ea.	19754

Metal MXT® PLOT Columns

Advantages of metal MXT® PLOT columns include:

- Can be made in small coil diameters—perfect for tight spaces.
- Rugged material withstands rough handling and shock.
- Designed for robust performance in process GCs and field instruments.
- Available in 3.5"-coil diameter or 7"-diameter, 11-pin cage.

Restek® chemists have developed technology that allows many of our popular PLOT columns to be made on Siltek®-treated stainless steel. These columns have the same characteristics and performance as fused silica PLOT columns, but offer additional benefits for process GCs and field applications as they are virtually unbreakable and can be coiled into very small diameters.

ID	df	temp. limits	3.5" coil 15-Meter cat.#	7" diameter 11-pin cage 15-Meter cat.#	3.5" coil 30-Meter cat.#	7" diameter 11-pin cage 30-Meter cat.#
MXT-Msieve 5A						
0.25 mm	20 µm	to 300 °C	79717-273	79717	—	—
0.53 mm	50 µm	to 300 °C	—	—	79723-273	79723
MXT-Alumina BOND/Na_2SO_4						
0.53 mm	10 µm	to 200 °C	—	—	79714-273	79714
MXT-Alumina BOND/MAPD						
0.53 mm	10 µm	to 250 °C	—	—	79728-273	79728
MXT-Q-BOND						
0.25 mm	8 µm	to 300 °C	79718-273	79718	—	—
0.53 mm	20 µm	to 280/300 °C	—	—	79716-273	79716
MXT-S-BOND						
0.53 mm	20 µm	to 250 °C	—	—	79712-273	79712

MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

free literature
Restek's PLOT Column Family
The New Benchmark For Performance!
Download your free copy from
www.restek.com
lit. cat.# PCBR1163D-UNV

GC Columns

Packed/Micropacked Columns

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Packed Columns Overview

Put the power of Restek® packed columns to work for you.

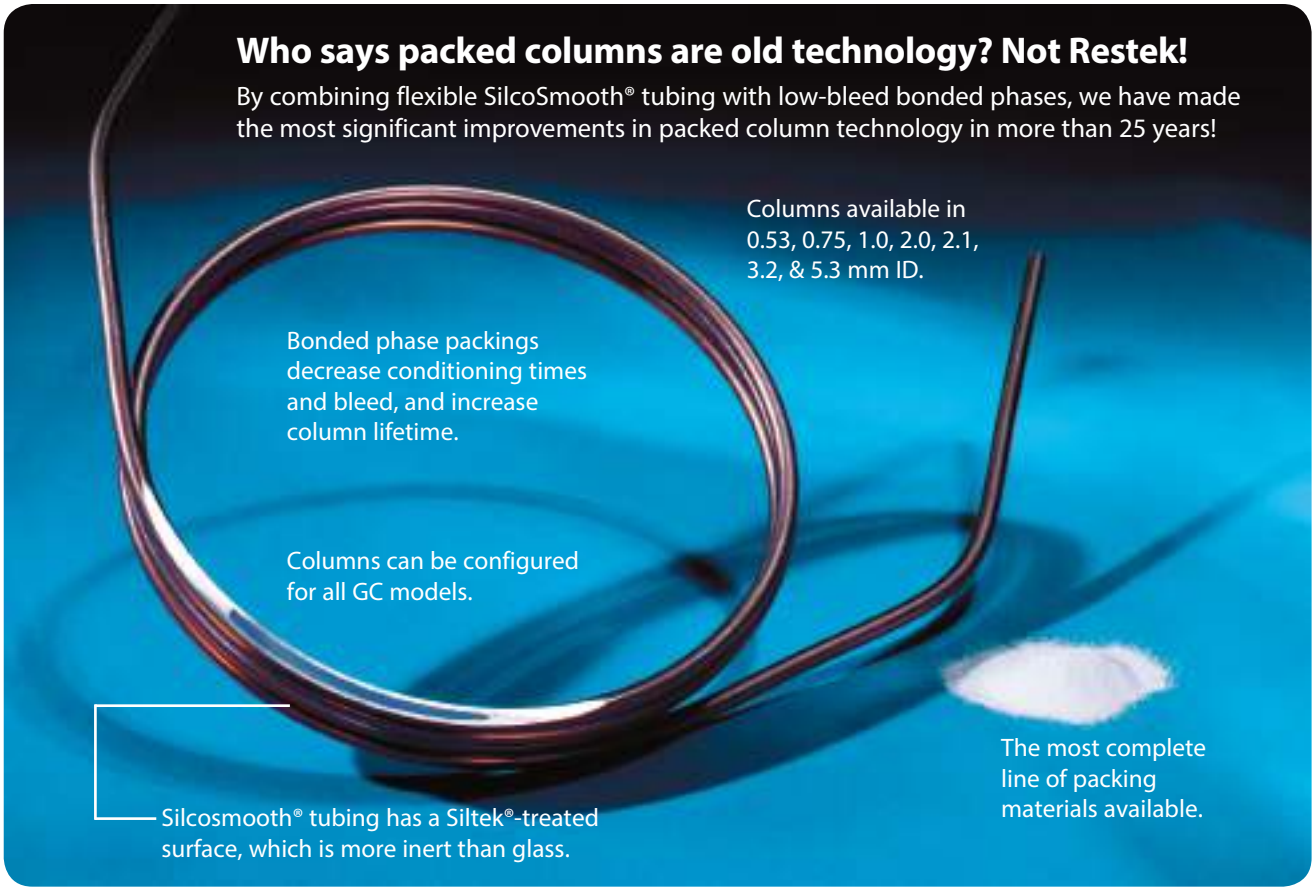
- SilcoSmooth® tubing provides the inertness of glass and the durability of stainless steel, so you get accurate results for a wide range of active compounds.
- Stable bonded stationary phases mean short conditioning times, low bleed, and long column lifetimes.
- Excellent retention time reproducibility delivers reliable, consistent results.

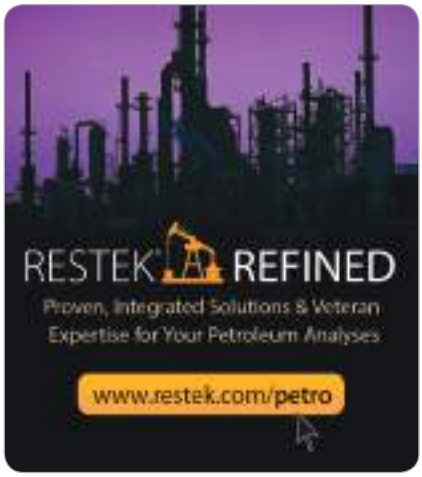
Packed columns offer large sample capacity and often can retain and separate compounds that cannot be analyzed by other techniques. While these advantages have resulted in their use in a wide range of GC applications, traditional packed columns are limited by unstable phases that break down easily, producing high column bleed and short column lifetimes. In addition, the tubing used for packed columns can present challenges; columns packed in glass tubing are inflexible and break easily, whereas columns made with metal tubing typically are not inert, meaning active compounds cannot be analyzed accurately as they react with metal tubing.

Restek® packed columns overcome these problems and are preferred over conventional packed columns, because they are exceptionally rugged and inert. You can generate accurate data quickly and reliably with less downtime for column changes with Restek® packed columns since they combine high-quality SilcoSmooth® tubing with stable bonded phase technology. SilcoSmooth® tubing is rugged, ultra-smooth seamless 304 stainless steel tubing that is deactivated with an innovative Siltek® treatment. This process results in packed columns that have both the inertness of glass and the strength and flexibility of stainless steel. In addition, our bonded phase technology features a coated support that is extremely stable and results in longer column lifetimes, lower bleed, and excellent reproducibility.

Put the power of Restek® packed columns to work in your lab today. We offer a broad range of common phases, as well as application-specific products developed for light hydrocarbon analysis, sulfurs, permanent gases, and ASTM Method D3606.

- Know which Restek® packed column you need? Find it on the following pages and order by web, phone, or fax today.
- Looking for an application-specific column? See what we recommend for your work on the following page.
- Need a custom column? Complete our custom product form on page 150 and we will send you a quote within two business days!





Bonded Stationary Phases

We combined our stationary phase synthesis experience with our unique Silcoport® packing deactivation process to create bonded phase packings that provide longer lifetimes, lower bleed, and shorter conditioning times.

Bonded methyl silicone phases (Rtx®-1 and Rtx®-5 columns) and bonded Carbowax® phase (Stabilwax® columns) are completely cross-linked on Silcoport® packing. We have evaluated Rtx®-1 and Rtx®-5 bonded packed column phases side-by-side with nonbonded phases of comparable polarity; the bonded phases last longer than the equivalent nonbonded packing materials. Table I shows that retention times on an Rtx®-1 bonded packed column are highly repeatable after only 30 minutes of conditioning.

Table I: Retention data shows the perfect reproducibility of the bonded phase packed columns with respect to retention times.

	Retention Time			
Hydrocarbon	**Min.**	**Max.**	**Mean**	**Stand. Dev.**
C5	0.241	0.243	0.242	0.001
C6	0.493	0.497	0.495	0.002
C10	5.746	5.765	5.752	0.005
C20	18.482	18.491	18.486	0.004
C28	25.093	25.103	25.098	0.004
C40	32.160	32.171	32.166	0.004
C44	34.316	34.328	34.326	0.007

n = 9 columns

Quick Reference Chart

For specific applications, Restek recommends using these optimized columns for better method performance.

Application	Column	Feature	Benefit
ASTM Method D3606	D3606 Application Column Set, p. 138 (Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, Rtx-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material)	Excellent separation of ethanol and benzene.	Reliably meets method requirements.
Refinery gases	2abc Refinery Gas Column Set , p. 139 Backflush Column	Optimized three-column set. (Backflush column sold separately.)	Elutes C5 hydrocarbons before C1-C4 hydrocarbons for optimized resolution.
Unsaturated light hydrocarbons	*n*-Octane on Res-Sil C Column, p. 139	Unique selectivity for unsaturated hydrocarbons.	Excellent resolution of unsaturated light hydrocarbons gives increased data accuracy.
cis-2-Butene and 1,3-butadiene	OPN on Res-Sil C Column, p. 139	Optimized selectivity for *cis*-2-butene and 1,3-butadiene resolution.	Increases data accuracy.
Permanent gases	Shincarbon ST Columns, p. 140 Packed or micropacked	Optimized selectivity for permanent gas resolution without cryogenic cooling. Preconditioned.	Increases productivity.
Low-level sulfurs	Rt-XLSulfur Columns, p. 141 Packed or micropacked	Highly inert for ppbv levels of sulfur. Eliminates need for PTFE tubing.	Increases data accuracy for low-level sulfur analysis. Eliminates need for a special GC setup.

Bonded Packed Column Stationary Phases

- Short conditioning times.
- Reproducible bonded phase selectivity.
- Low bleed levels.
- Longer column lifetimes.
- Unsurpassed inertness for active compounds.

Bonded phases are used in capillary columns because they provide a dramatic increase in column quality. To truly bridge the gap between traditional packed columns and capillary columns, it was necessary to develop bonded liquid phases for packed columns. Packed column chromatographers can expect shorter conditioning times, lower bleed, and longer column lifetimes by using Restek bonded phase packed columns.

Bonded phases also last much longer than nonbonded phases. Bonded phases are more resistant to oxidation than nonbonded phases because of the stronger intermolecular forces produced by cross-linking. Because the material is thoroughly cross-linked, the phase will not migrate or puddle, as often happens with nonbonded phases. Figure 1 shows a comparison of a bonded and a nonbonded methyl silicone column after 170 temperature cycles. The results show the impressive durability of bonded phases.

Restek's packed columns deliver the

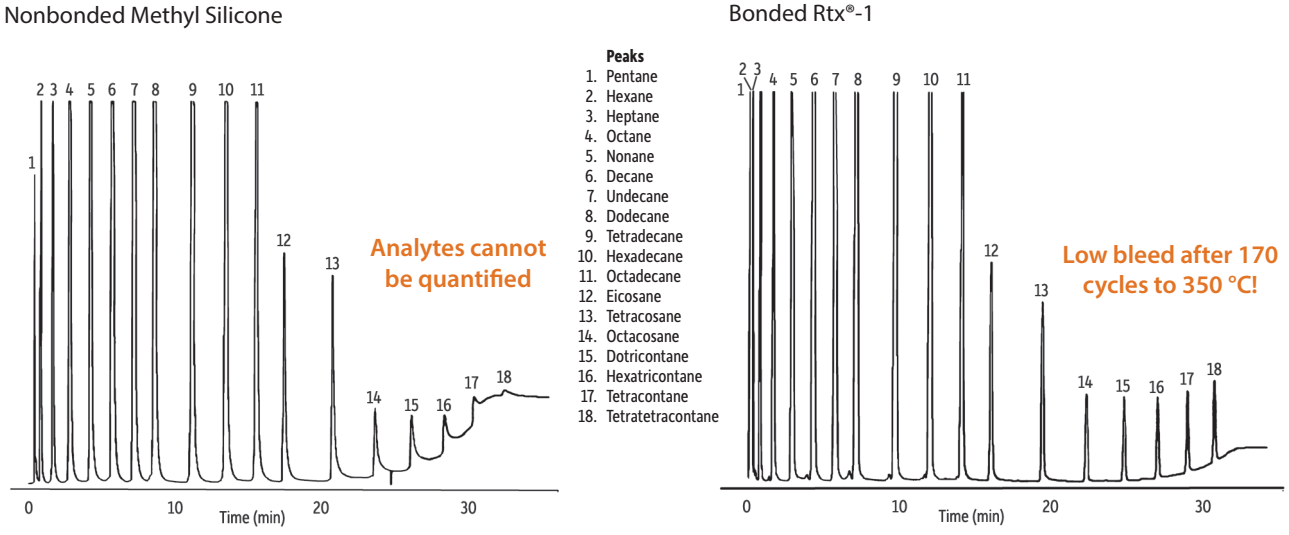
1-2-3 PUNCH!

1. Bonded stationary phases mean short conditioning times, low bleed, and unsurpassed column lifetimes.
2. SilcoSmooth® tubing provides the inertness of glass and the durability of stainless steel.
3. Excellent retention time reproducibility for reliable, consistent results!

Equivalent Liquid Phases

Rtx-1	BP-1, CC-1, CP-Sil 5CB, DB-1, DC-200, GE-SF-96, HP-1, HP-101, OV-1, OV-101, RSK-150, RH-1, SE-30, SP-2100, SPB-1, UCC W-98, G2, G1
Rtx-5	BP-5, CB-5, CC-5, CP-Sil 8CB, DB-5, HP-5, OV-73, SE-52, SE-54, SPB-5, Ultra-5, G27, G36
Stabilwax	BP-20, CP-Wax, CW-20, DB-Wax, HP-Innowax, PE-Wax, Supelcowax-10, G16

Figure 1: Bonded packed columns exhibit longer lifetime than nonbonded packed columns.



GC_PC00369

Column	Rtx®-1 Sim Dist 2887, SilcoSmooth® Tubing, 25 inches, 1/8 in. OD, 2 mm ID (cat.# 80000-800)
Sample	1-12% (w/w) each component ASTM D2887-01 calibration mix (1% each listed analyte in CS_2) (cat.# 31674) ASTM D2887-01 calibration mix (5% each, neat) (cat.# 31675)
Injection	
Inj. Vol.:	1.0 µL packed not on-column
Inj. Temp.:	350 °C
Oven	
Oven Temp.:	35 °C to 350 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	25 mL/min
Detector	FID @ 350 °C
Notes	FID sensitivity: 256 x 10^{-11} AFS

Packed Column Tubing

did you know?

Restek's advanced packed column technology provides columns with unmatched inertness and efficiency.

Packed Column Reduction Fittings

We will weld tubing reducers or VCR fittings to your column. Call Customer Service (ext. 3) or your Restek representative for pricing and availability.

Welded Tubing Reducers

Welded VCR Fittings

also available

For more information on micropacked columns, see **page 137.**

Packed Column Tubing

Restek offers a wide range of tubing choices for our packed columns, including SilcoSmooth® (Siltek®-treated stainless steel), stainless steel, PTFE, nickel, copper, and Hastelloy® tubing. SilcoSmooth® and stainless steel tubing are our two most popular column materials. SilcoSmooth® tubing is an excellent replacement for fragile glass columns. Stainless steel tubing works well with most applications for nonreactive compounds.

SilcoSmooth® Tubing

If your analysis involves reactive compounds, you can use SilcoSmooth® tubing, which combines the inertness of glass with the strength and flexibility of stainless steel. Made from ultra-smooth, seamless 304 stainless steel and treated with the innovative Siltek® process, SilcoSmooth® tubing can replace glass columns for virtually any application.

Stainless Steel Tubing

If you are analyzing hydrocarbons or nonreactive compounds, you can use our rugged, flexible, and economical stainless steel columns. Restek® stainless steel columns are made from high-quality welded and drawn tubing.

Hastelloy® Tubing

Hastelloy® tubing is a nickel-chromium alloy with excellent inertness. It is normally used only for highly corrosive or oxidizing compounds or gases.

Nickel Tubing

Nickel tubing is often used for analyses of caustic or oxidizing compounds or gases.

Copper Tubing

Copper is a general-purpose tubing that is only recommended for inactive compounds.

PTFE Tubing

PTFE tubing is often used for reactive compounds or other special applications. Note that this tubing is permeable to gases.

Table I: Packed and Micropacked Column Tubing Dimensions

	Packed				Micropacked		
Material	**1/4-inch OD x 5.3 mm ID**	**3/16-inch OD x 3.2 mm ID[1]**	**1/8-inch OD x 2.0 mm ID[2]**	**1/8-inch OD x 2.1 mm ID**	**1/16-inch OD x 1.0 mm ID[3]**	**0.95 mm OD x 0.75 mm ID[4]**	**0.74 mm OD x 0.53 mm ID**
SilcoSmooth	✓	✓	✓		✓	✓	✓
Stainless Steel	✓	✓		✓	✓	✓	
Hastelloy				✓			
Nickel				✓			
Copper	✓			✓			
PTFE				✓			

[1] 3/16-inch OD x 3.2 mm ID replaces 1/4-inch OD x 4 mm ID glass columns.
[2] 1/8-inch OD x 2.0 mm ID replaces 1/4-inch OD x 2 mm ID glass columns.
[3] 1/16-inch OD x 1.0 mm ID micropacked columns are designed for packed column injection systems.
[4] 0.95 mm OD x 0.75 mm ID micropacked columns are designed for capillary injection systems.

please note

We do not offer glass packed columns. SilcoSmooth® columns offer the inertness of glass, without the breakage problems.

Chromosorb® Diatomaceous Earth Packed Columns

Bonded Stationary Phase Packed Columns

- Low bleed levels.
- Longer column lifetimes.
- Short conditioning times.

	Stainless Steel Tubing				SilcoSmooth Tubing**			
Bonded Phase on 100/120 Silcoport W* **	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
3% Rtx-1	6	1/8	2.1	80441-	2	1/8	2.0	80401-
10% Rtx-1	6	1/8	2.1	80442-	2	1/8	2.0	80405-
20% Rtx-1	6	1/8	2.1	80443-	2	1/8	2.0	80409-
3% Rtx-5	6	1/8	2.1	80444-	2	1/8	2.0	80477-
10% Rtx-5	6	1/8	2.1	80445-	2	1/8	2.0	80478-
20% Rtx-5	6	1/8	2.1	80446-	2	1/8	2.0	80479-
5% Rtx-Stabilwax	6	1/8	2.1	80447-	2	1/8	2.0	80415-
10% Rtx-Stabilwax	6	1/8	2.1	80448-	2	1/8	2.0	80416-
20% Rtx-Stabilwax	6	1/8	2.1	80449-	2	1/8	2.0	80417-
Rtx-1 SimDist 2887****	25"	1/8	2.1	80450-	25"	1/8	2.0	80000-

Non-Bonded Stationary Phase Packed Columns

	Stainless Steel Tubing				SilcoSmooth Tubing**			
On 100/120 Silcoport W* **	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
3% Rt-101	6	1/8	2.1	80461-	2	1/8	2.0	80400-
5% Rt-1200/1.75% Bentone 34	6	1/8	2.1	80463-	2	1/8	2.0	80125-
5% Rt-1200/5% Bentone 34	6	1/8	2.1	80464-	2	1/8	2.0	80129-

		Stainless Steel Tubing				SilcoSmooth Tubing**			
On Chromosorb PAW	**Mesh**	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
10% TCEP	100/120	8	1/8	2.1	80465-	2.5	1/8	2.0	80126-
23% Rt-1700	80/100	30	1/8	2.1	80466-	9.2	1/8	2.0	80128-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.
***Modified version of Chromosorb W; highest inertness, most consistent performance.
****Application-specific column.

Porous Polymer Packed Columns

Restek offers a full range of porous polymers, including HayeSep® and Porapak polymer packings for analyses of volatile compounds and light solvents.

	Stainless Steel Tubing				SilcoSmooth Tubing**			
Porous Polymers 80/100 Mesh	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
HayeSep Q	6	1/8	2.1	80467-	2	1/8	2.0	80433-
Porapak Q	6	1/8	2.1	80468-	2	1/8	2.0	80427-
Porapak QS	6	1/8	2.1	80469-	2	1/8	2.0	80426-
Porapak R	6	1/8	2.1	80470-	2	1/8	2.0	80425-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.

please note

Stock packed columns are designed with a 2" void on the inlet end for on-column injections. For column configurations containing no void, add suffix -901 to the part number.

please note

Temperature limits for stationary phases are listed on **page 146**.

also available

Porapak, HayeSep®, and Tenax® packing materials.

See **page 145.**

Customized Solutions

Restek builds to your exact specifications.

Request columns at

www.restek.com/**packed**

also available

CarboBlack packing materials. See **page 143**.

Column Instrument Configurations

General Configuration
Suffix -800

Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*

Bruker 430, 3700, Vista Series, FID:
Suffix -820

PE 900-3920, Sigma 1,2,3:
Suffix -830

PE Auto System 8300, 8400, 8700
Suffix -840

See page 151 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1 1/2" void on detector side.
Note: Standard micropacked columns fit all instruments. No special instrument configuration suffix is required.

CarboBlack Packed Columns

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbopack™ and Carbograph supports.

		Stainless Steel Tubing				SilcoSmooth Tubing**			
On CarboBlack B	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
5% Carbowax 20M	80/120	—	—	—	—	2	1/8	2.0	80105-
5% Carbowax 20M	60/80	6	1/8	2.1	88012-	1.8	1/8	2.0	80106-
6.6% Carbowax 20M	80/120	6	1/8	2.1	80451-	2	1/8	2.0	80107-
4% Carbowax 20M/ 0.8% KOH	60/80	—	—	—	—	2	1/8	2.0	80116-
1% Rt-1000	60/80	8	1/8	2.1	88013-	2.4	1/8	2.0	80206-
1% Rt-1000	60/80	6	1/8	2.1	80452-	2	1/8	2.0	80207-
3% Rt-1500	80/120	10	1/8	2.1	80453-	3.05	1/8	2.0	80211-
1% Rt-1510	60/80	10	1/8	2.1	80454-	3.05	1/8	2.0	80216-
1.5% XE-60/1% H_3PO_4	60/80	6	1/8	2.1	80455-	1.8	1/8	2.0	80305-

		Nickel 200 Tubing			
On CarboBlack B	Mesh	L (m)	OD (in)	ID (mm)	cat.#*
5% Krytox (Ni 200 tubing)	60/80	3.05	1/8	2.1	80127-

		Stainless Steel Tubing				SilcoSmooth Tubing**			
On CarboBlack C	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
0.2% Carbowax 1500	60/80	6	1/8	2.1	80456-	2	1/8	2.0	80121-
0.2% Carbowax 1500	80/100	6	1/8	2.1	80457-	2	1/8	2.0	80122-
0.1% Rt-1000	80/100	6	1/8	2.1	80458-	1.8	1/8	2.0	80205-
0.19% picric acid	80/100	6	1/8	2.1	80459-	2	1/8	2.0	80311-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Siltek-treated stainless steel.

Molecular Sieve Packed Columns

Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. Restek's R&D chemists have developed a process for preparing molecular sieve packings, which results in excellent batch-to-batch reproducibility. In addition, our molecular sieves are preactivated and ready to use. Each column comes with metal end-fittings to prevent water or carbon dioxide from adsorbing into the packing during shipment.

		Stainless Steel Tubing				SilcoSmooth Tubing**			
Molecular Sieve	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
Molesieve 5A	60/80	6	1/8	2.1	80473-	2	1/8	2.0	80428-
Molesieve 5A	80/100	3	1/8	2.1	88015-	1	1/8	2.0	80440-
Molesieve 5A	80/100	6	1/8	2.1	80474-	2	1/8	2.0	80429-
Molesieve 5A	80/100	10	1/8	2.1	88014-	3.05	1/8	2.0	80430-
Molesieve 13X	60/80	6	1/8	2.1	80475-	2	1/8	2.0	80480-
Molesieve 13X	80/100	6	1/8	2.1	80476-	2	1/8	2.0	80439-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Siltek-treated stainless steel.

Micropacked GC Columns

- Increased efficiency over traditional packed columns.
- Higher capacity than PLOT columns.
- Made from inert, flexible SilcoSmooth® tubing.
- Wide range of packings available.
- Standard coils fit all instruments. No special instrument configurations required.

Made with INERT SilcoSmooth® tubing!

All micropacked columns are made with inert SilcoSmooth® tubing, which is Siltek® treated for maximum inertness. See **page 134.**

Efficient, Inert, and Flexible

Micropacked columns are highly efficient and provide good sample capacity, resulting in a powerful tool for solving many difficult application problems. The unsurpassed inertness of SilcoSmooth® tubing is based on Siltek® deactivation, which allows the column to be flexed and coiled without any fear of chipping or cracking the inert surface.

Easy to Install—Multiple Internal Diameters

Our micropacked columns are designed to fit packed and capillary injection systems. Standard wall (1/16-inch OD) micropacked columns offer improved efficiency in packed column instruments without the expense of converting to capillary injection systems. Smaller OD (0.95 mm OD) micropacked columns install easily into a capillary injector, using slightly larger ferrules. Micropacked columns operate at flows exceeding 10 cc/min for trouble-free operation.

Braided Wire End Plugs*

Restek's packed column experts insert braided wire into the column and secure it by making a small crimp near the column outlet. End plugs are Siltek® treated—the sample contacts only inert surfaces.

Micropacked GC Columns (0.53 mm ID)*

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep Q	80/100	0.53 mm	0.74 mm	up to 275 °C		19042
Molesieve 5A	80/100	0.53 mm	0.74 mm	up to 300 °C		19041
Rt-XLSulfur	100/120	0.53 mm	0.74 mm	up to 300 °C		19044
ShinCarbon ST	80/100	0.53 mm	0.74 mm	up to 300 °C	19045	19043

Micropacked GC Columns (0.75 mm ID)

	ID	OD	Temp. Range	0.56-Meter cat.#
20% TCEP on 80/100 Chromosorb PAW	0.75 mm	1/16"	0–175 °C	19040

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep R	100/120	0.75 mm	0.95 mm	up to 250 °C	19014	19015
HayeSep Q	100/120	0.75 mm	0.95 mm	up to 275 °C	19018	19019
HayeSep N	100/120	0.75 mm	0.95 mm	up to 165 °C	19022	19023
HayeSep S	100/120	0.75 mm	0.95 mm	up to 250 °C	19010	19011
Molesieve 5A	80/100	0.75 mm	0.95 mm	up to 300 °C	19002	19003
Molesieve 13X	80/100	0.75 mm	0.95 mm	up to 350 °C	19006	19007

Micropacked GC Columns (1.00 mm ID)

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep R	100/120	1.00 mm	1/16"	up to 250 °C	19012	19013
HayeSep Q	100/120	1.00 mm	1/16"	up to 275 °C	19016	19017
HayeSep N	100/120	1.00 mm	1/16"	up to 165 °C	19020	19021
HayeSep S	100/120	1.00 mm	1/16"	up to 250 °C	19008	19009
Molesieve 5A	80/100	1.00 mm	1/16"	up to 300 °C	19000	19001
Molesieve 13X	80/100	1.00 mm	1/16"	up to 350 °C	19004	19005

*Due to the small internal diameter of 0.53 mm ID columns, braided wire end plugs cannot be used; wool is inserted into the ends instead.

Customized Solutions

Restek builds to your exact specifications.

Request columns at

www.restek.com/packed

Aromatics Analysis

D3606 Application Column Set (2 column set)

- Complete resolution of benzene from ethanol—no compromising coelutions.
- Accurate quantification of benzene and toluene.
- Fully conditioned two column set—ready to use out of the box.
- Listed in the appendix of ASTM Method D3606 as an acceptable alternative to TCEP columns—get better separation of benzene and ethanol while still following ASTM method requirements.

Conforms to the specifications established in the current ASTM method D3606 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.

Description	cat.#*
D3606 Application Column (2 column set)**	
Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx-1	83606-
Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material	

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.
**The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

free literature

Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

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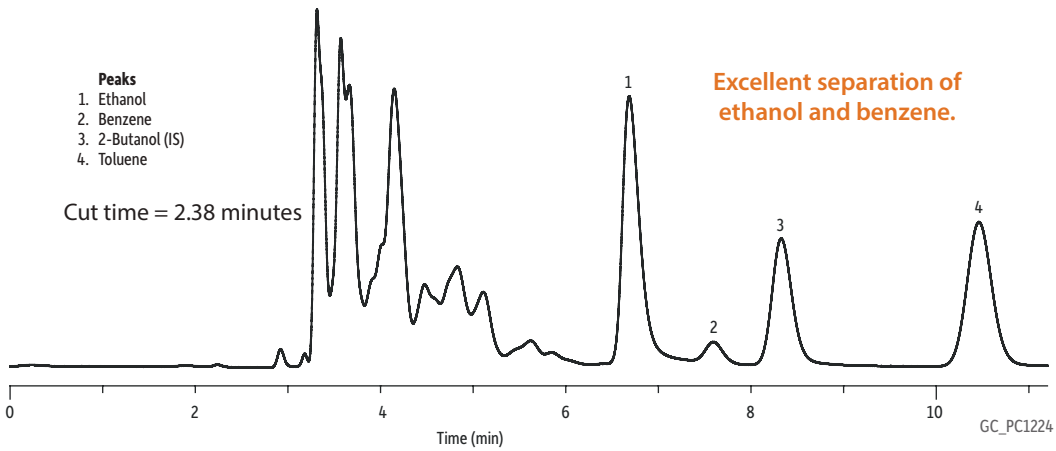
lit. cat.# PCTS1408-UNV

Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)



Column	D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800)
Sample	Ethanol-containing gasoline with internal standard (IS)
Diluent:	
Injection	Sample valve
Sample Loop Vol.:	1.5 µL
Valve Temp.:	150 °C
Oven	
Oven Temp.:	135 °C (hold 12 min)
Carrier Gas	He, constant flow
Flow Rate:	20.0 mL/min
Detector	TCD @ 200 °C
Notes	2.38 minute backflush (must be determined for each GC system).

Light Hydrocarbon Analysis

Special Columns for Unsaturated Light Hydrocarbons

- Faster separations of C1 to C4 hydrocarbons.
- Res-Sil® packing replaces Porasil materials.

n-Octane on Res-Sil® C Packed Column

This packed column has unique selectivity for resolving unsaturated light hydrocarbons (Figure 1).

OPN on Res-Sil® C Packed Column

This column separates the light hydrocarbons, and baseline resolves *cis*-2-butene from 1,3-butadiene (Figure 2).

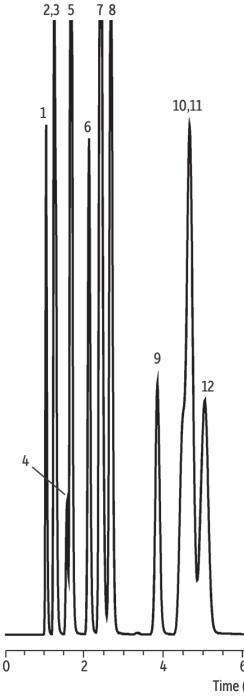
2abc Refinery Gas Column Set

This three-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons (Figure 3).

Description	cat.#*
n-Octane on Res-Sil C, 80/100 (20', 2.0 mm ID, 1/8" Silcosmooth OD)	80436-
OPN on Res-Sil C, 80/100 (12', 2.0 mm ID, 1/8" Silcosmooth OD)	80437-
2abc Refinery Gas Column Set (3 column set)**	88000-
2.1% Carbowax 1540 Porasil C (backflush column)***	88004-875

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.
**This column set is for a valving system; therefore, packing material is filled to ends of columns.
***To be used with 2abc refinery gas column set (cat.# 88000-) to backflush and prevent C6+ hydrocarbons from entering column set.

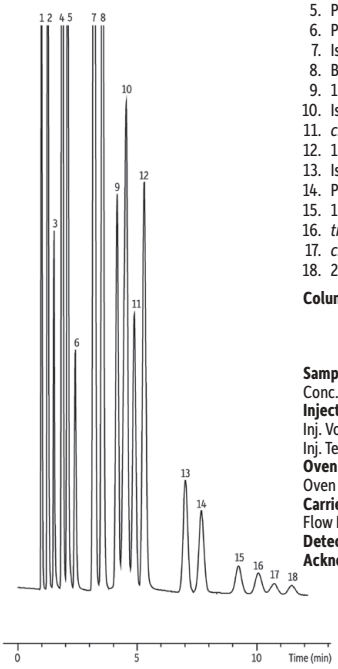
Figure 1: *n*-Octane on Res-Sil® C packing demonstrates unique selectivity for unsaturated light hydrocarbons.



Peaks	
1. Methane	9. 1-Butene
2. Ethane	10. Pentane
3. Ethylene	11. Isobutylene
4. Acetylene	12. 1,3-Butadiene
5. Propane	13. 1-Pentene
6. Propylene	14. *trans*-2-Pentene
7. Isobutane	15. *cis*-2-Pentene
8. *n*-Butane	16. 2-methylbutene-2

Column *n*-octane, SilcoSmooth® tubing, 80/100 mesh on Res-Sil® C, 20 ft, 1/8 in. OD, 2 mm ID (cat.# 80436-800)
Sample Refinery gas C1-C5
Injection
Inj. Vol.: 20 µL packed not on-column
Inj. Temp.: 150 °C
Oven
Oven Temp.: 60 °C
Carrier Gas He, constant flow
Flow Rate: 30 mL/min
Detector FID @ 150 °C

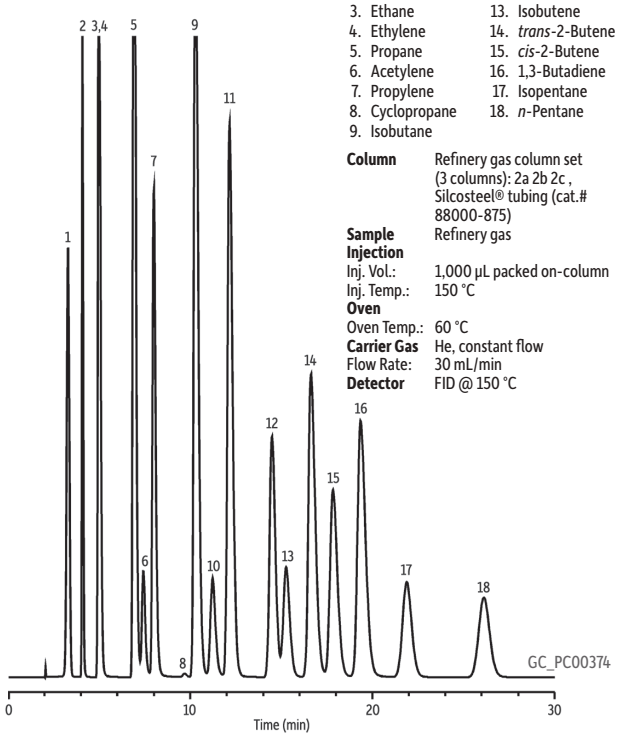
Figure 2: OPN on Res-Sil® C packing demonstrates unique selectivity for *cis*-2-butene and 1,3-butadiene.



Peaks	Retention Indices
1. Methane	100
2. Ethane/ethylene	200
3. Acetylene	260
4. Propane	300
5. Propylene	321
6. Propadiene	345
7. Isobutane	386
8. Butane	400
9. 1-Butene	422
10. Isobutylene/*trans*-2-butene	434
11. *cis*-2-Butene	443
12. 1,3-Butadiene	454
13. Isopentane	488
14. Pentane/3-methyl-1-butene	503
15. 1-Pentene	522
16. *trans*-2-Pentene	533
17. *cis*-2-Pentene	540
18. 2-Methyl-2-butene	549

Column OPN, SilcoSmooth® Tubing, 80/100 mesh on Res-Sil® C packing, 12 ft, 1/8 in. OD, 2 mm ID (cat.# 80437-800)
Sample Refinery gas
Conc.: 0.1-6 absolute mole %
Injection
Inj. Vol.: 20 µL packed on-column
Inj. Temp.: 200 °C
Oven
Oven Temp.: 50 °C
Carrier Gas He, constant flow
Flow Rate: 30 mL/min
Detector FID @ 200 °C
Acknowledgement Standard courtesy of AC Analytical Controls

Figure 3: Refinery gas calibration standard on refinery gas packed column set.



Peaks	
1. C5-C6+	10. Propadiene
2. Methane	11. *n*-Butane
3. Ethane	12. 1-Butene
4. Ethylene	13. Isobutene
5. Propane	14. *trans*-2-Butene
6. Acetylene	15. *cis*-2-Butene
7. Propylene	16. 1,3-Butadiene
8. Cyclopropane	17. Isopentane
9. Isobutane	18. *n*-Pentane

Column Refinery gas column set (3 columns): 2a 2b 2c , Silcosteel® tubing (cat.# 88000-875)
Sample Refinery gas
Injection
Inj. Vol.: 1,000 µL packed on-column
Inj. Temp.: 150 °C
Oven
Oven Temp.: 60 °C
Carrier Gas He, constant flow
Flow Rate: 30 mL/min
Detector FID @ 150 °C

for more info

See **page 144** for more information on Res-Sil® packing materials.

it's a fact

ShinCarbon ST is an ideal packing material for permanent gases, low molecular weight hydrocarbons, sulfur dioxide, and Freon® gases.

also available

Adapter kits for installing packed/micropacked columns.

See **page 142.**

19808

free literature

ShinCarbon ST
Micropacked GC Columns
Above-Ambient Analyses of
Permanent Gases and
Light Hydrocarbons

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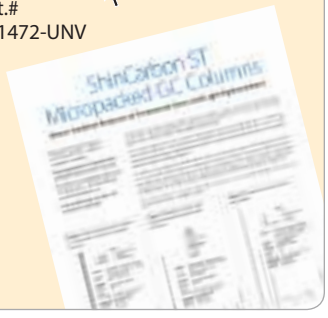
lit. cat.#
PCTS1472-UNV



Permanent Gases & Hydrocarbon Analysis

ShinCarbon ST Columns (packed & micropacked)
(SilcoSmooth® Stainless Steel)

- Separate permanent gases, including carbon monoxide and carbon dioxide, without cryogenic cooling.
- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.
- Maximum temperature of 280 °C/300 °C.

Analyze oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide with one column at room temperature. ShinCarbon ST material, a high surface area carbon molecular sieve (~1,500 m^2/g), is the ideal medium for separating gases and highly volatile compounds by gas solid chromatography (GSC). The rapid, above-ambient analyses these columns provide is a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacturing, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

ShinCarbon ST is a highly stable material. Its 300 °C upper programmed temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture-free environment for your convenience. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, reduces downtime.

ShinCarbon ST Columns (packed)*

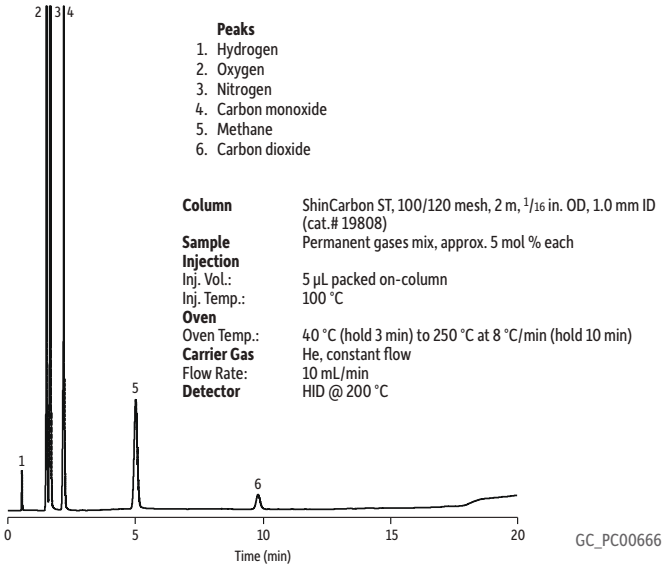
OD	ID	Mesh	2-Meter cat.#*
1/8" Silcosmooth	2.0 mm	80/100	80486-

ShinCarbon ST Columns (micropacked)

OD	ID	Mesh	1-Meter cat.#	2-Meter cat.#
1/16"	1.0 mm	100/120	19809	19808
0.95 mm	0.75 mm	100/120	19810	—
0.74 mm	0.53 mm	80/100	19045	19043

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
Note: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

Permanent Gases on ShinCarbon ST



Peaks
1. Hydrogen
2. Oxygen
3. Nitrogen
4. Carbon monoxide
5. Methane
6. Carbon dioxide

Column	ShinCarbon ST, 100/120 mesh, 2 m, 1/16 in. OD, 1.0 mm ID (cat.# 19808)
Sample	Permanent gases mix, approx. 5 mol % each
Injection	
Inj. Vol.:	5 µL packed on-column
Inj. Temp.:	100 °C
Oven	
Oven Temp.:	40 °C (hold 3 min) to 250 °C at 8 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	HID @ 200 °C

GC_PC00666

Sulfur Analysis

Rt®-XLSulfur Columns (packed & micropacked)

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end fittings are Sulfinert® treated for maximum inertness.
- Maximum temperature of 290 °C.

Sulfur analyses are traditionally performed using PTFE tubing to improve column inertness. Unfortunately, PTFE tubing is gas permeable, difficult to pack with high efficiency, prone to shrinkage, and has poor thermal stability. The Rt®-XLSulfur packed or micropacked column eliminates these problems. The packing material for Rt®-XLSulfur columns is extensively deactivated for analysis of low ppbv levels of hydrogen sulfide and methyl mercaptan. It is then treated to achieve effective separation of hydrocarbons from sulfur compounds. The interior wall and the end fittings of the Rt®-XLSulfur column are Sulfinert® treated, making the column as inert as PTFE. The extra care taken to manufacture this column ensures more accurate analyses of sulfur compounds.

Rt®-XLSulfur Columns (packed)*

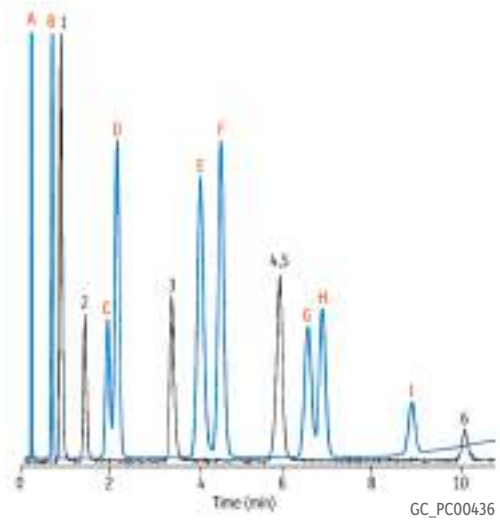
OD	ID	Mesh	1-Meter cat.#*	2-Meter cat.#*
1/8"	2.0 mm	100/120	80484-	80485-
3/16"	3.2 mm	100/120	80482-	80483-

Rt®-XLSulfur Columns (micropacked)

OD	ID	Mesh	1-Meter cat.#	2-Meter cat.#
1/16"	1.0 mm	100/120	19804	19805
0.95 mm	0.75 mm	100/120	19806	19807
0.74 mm	0.53 mm	100/120		19044

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
NOTE: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

Sulfur Compounds and Hydrocarbons on Rt®-XLSulfur



GC_PC00436

Sulfurs
1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Dimethyl disulfide

Hydrocarbons
A. Methane
B. Ethane
C. Propylene
D. Propane
E. Isobutane
F. Butane
G. Isopentane
H. Pentane
I. Hexane

Column	Rt®-XLSulfur, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample	
Conc.:	50 ppb each
Injection	packed not on-column
Oven	
Oven Temp.:	60 °C to 230 °C at 15 °C/min
Carrier Gas	He, constant flow
Flow Rate:	9 mL/min
Detector	SCD/FID
Acknowledgement	Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.

did you know?

Rt®-XLSulfur columns are optimized for low ppb-level sulfur analysis!

also available

Adapter kits for installing packed/micropacked columns.

See **page 142.**

free literature

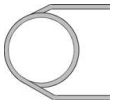
Rt®-XLSulfur Packed Column
Specialized packed and micropacked columns for eXtra-Low Sulfur analysis

Download your free copy from **www.restek.com**

lit. cat.# PCTS1500A-UNV

Column Instrument Configurations

General Configuration
Suffix -800



Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*

Bruker 430, 3700, Vista Series, FID:
Suffix -820

PE 900-3920, Sigma 1,2,3:
Suffix -830

PE Auto System 8300, 8400, 8700
Suffix -840

See page 151 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1 1/2" void on detector side.
Note: Standard micropacked columns fit all instruments. No special instrument configuration suffix is required.

Packed/Micropacked Column Installation Kits

Adaptor kit centers the packed column in the injection port, so the syringe will not scrape the sides of the column.

Packed Column Inlet Adaptor Kits

- Use 1/8" and 3/16" OD columns in 1/4" on-column injection ports.
- Centers column perfectly in injection port to eliminate bent syringe needles.
- Slotted design prevents carrier gas occlusion.
- Vespel®/graphite reducing ferrules make installation easy.
- Includes all nuts and ferrules used to attach tubing to the injector or detector.

Description	For 1/8" Columns qty.	cat.#	For 3/16" Columns qty.	cat.#
Packed Column Inlet Adaptor Kit for 1/4" Injection Ports	kit	21651	kit	21650

Installation Kits for Micropacked Columns

21065

Description	qty.	cat.#
Micropacked Column Installation Kit for 1 mm ID columns; for valve applications. Kit contains: 1/16" Valco nut (1), 1/16" stainless steel nut (1), 1/16" Vespel/graphite ferrule (1), 1/16" graphite ferrule (1), stainless steel ferrule (1), 1/16" stainless steel front ferrule (1), 1/16" stainless steel back ferrule (1).	kit	21065
Micropacked Column Installation Kit for 1 mm ID columns; for direct injections. Kit contains: 1/16" stainless steel nuts (2), 1/16" Vespel/graphite ferrules (2), 1/16" graphite ferrules (2), 1/16" stainless steel front ferrules (2), 1/16" stainless steel back ferrules (2).	kit	21066

Installation Kit for Packed Columns

21067

Description	qty.	cat.#
Packed Column Installation Kit for 2 mm ID columns; for valve applications. Kit contains: 1/8" stainless steel nut (1), stainless steel Valco nut (1), 1/8" Vespel/graphite ferrule (1), stainless steel Valco ferrule (1), 1/8" stainless steel front ferrule (1), 1/8" stainless steel back ferrule (1).	kit	21067

Micropacked Inlet Conversion Kits

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.

22429
Large-Bore Dual Vespel® Ring Inlet Seals

1/4" SS Nut
23152

Large-Bore
FID Adaptor

1/4" Vespel®/Graphite
Ferrule
20221

1/16" SS Nuts
23150

Large-Bore
Reducing Nut

1/16" Vespel®/
Graphite Ferrules
20218

22430

20772

Description	qty.	cat.#
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel ring inlet seals, large bore (2)	2-pk.	22429
Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated	ea.	22430
Replacement 4 mm Splitless Liner	ea.	20772

*For use with packed column FIDs only.

CarboBlack Packing Materials

- CarboBlack B supports up to 10% loading of a nonsilicone liquid phase.
- CarboBlack C supports up to 1% loading of a nonsilicone liquid phase.

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbopack™ and Carbograph supports.

did you know?

CarboBlack supports replace
- Carbopack™
- Carbograph

Description	Temp. Limit	Mesh	Min. Qty.	cat.#
CarboBlack B	500 °C	60/80	10 g	25500
	500 °C	80/120	10 g	25501
CarboBlack C	500 °C	60/80	10 g	25502
	500 °C	80/100	10 g	25503
CarboBlack BHT-100	150 °C	40/60	10 g	25504
CarboBlack III (F)	175 °C	80/100	10 g	25506
5% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25507
6.6% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25508
4% Carbowax 20m / 0.8% KOH on CarboBlack B	220 °C	60/80	10 g	25509
0.19% picric acid on CarboBlack C	120 °C	80/100	10 g	25510
4% Carbowax 20m on CarboBlack B-DA	200 °C	80/120	10 g	25511

Minimum order of 10 grams. Price is per gram.

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.: Phone: 1-800-356-1688, ext. 4 • e-mail: support@restek.com

Hours of operation (Eastern Time):
Monday - Thursday, 8:00 a.m. to 6:00 p.m.
Friday, 8:00 a.m. to 5:00 p.m.

Outside the U.S.: Contact International Technical Service at intltechsupp@restek.com or find a local distributor at **www.restek.com/distributor**

Packed Column Packing Materials

also available

Custom packing materials are also available.

See **page 148**.

Put our decades of experience to work for you.

did you know?

Res-Sil® replaces
- Porasil B
- Porasil C
- Durapak

Res-Sil® Packing Materials

- Unique separation of saturated and unsaturated hydrocarbons.
- Innovative bonding chemistry for batch-to-batch reproducibility, excellent thermal stability, and long life.
- Wide range of bonded phases available.
- Equivalent to Durapak and Porasil packings.

Bonded silica packings with *n*-octane or cyanopropyl (OPN) functional groups yield faster separations of C1 to C4 hydrocarbons, higher thermal stability, shorter conditioning times, and longer lifetimes than conventional packings. However, bonded silica packings have had inconsistent reproducibility and limited availability. Restek's research team has solved these age-old problems by developing Res-Sil® C packings for consistent performance.

Unique Selectivity for Process GC and High-Speed Analysis of Petrochemicals

Res-Sil® C bonded packings are ideal for fast resolution of difficult-to-separate saturated and unsaturated C4 hydrocarbons (see page 139). This unique selectivity, when combined with other columns in series, provides petroleum and petrochemical method developers with a powerful tool for fast determination of C1 to C5 hydrocarbons.[1]

Innovative Research and Stringent QC Provide Batch-to-Batch Consistency

Restek's synthesis procedure eliminates batch-to-batch variations. The amount of bonded liquid phase is precisely controlled in every batch for reproducible retention times and separations. Each production batch of Res-Sil® C packing is tested with a complex hydrocarbon mixture to meet demanding retention time and retention index specifications and to ensure there are no retention shifts. Column bleed is also evaluated to ensure that baselines remain low.

OPN on Res-Sil® C Packing—the Latest in a Line of Bonded GC Phases

Restek offers a wide range of bonded packings for packed column GC, including Rtx®-1, Stabilwax®, and Carbowax® phases. We have extended this technology to make *n*-octane on Res-Sil® C packing, and OPN on Res-Sil® C packing. Each of these packings has low bleed, conditioning times of less than 30 minutes, long lifetime, and consistent batch-to-batch reproducibility.

Description	temp. limits	Mesh	Min. Qty.	cat.#
Res-Sil C	300 °C	60/80	10 g	25400
	300 °C	80/100	10 g	25028
Res-Sil B	300 °C	60/80	10 g	25401
	300 °C	80/100	10 g	25080
1% TCEP on Res-Sil B	175 °C	80/100	10 g	25081
OPN on Res-Sil C	150 °C	80/100	10 g	25042
n-Octane on Res-Sil C	150 °C	80/100	10 g	25030
2% Carbowax 1540 on Res-Sil C	150 °C	80/100	10 g	25044

Minimum order of 10 grams. Price is per gram.

[1]N.C. Saha, S.K. Jain, and R.K. Dua. J. Chromat. Sci 1978, 323-328.

Customized Solutions

Restek builds to your exact specifications.

Request columns at

www.restek.com/**packed**

Porapak Packing Materials

Description	temp. limits	g/btl.	Mesh 50/80 cat.#	Mesh 80/100 cat.#	Mesh 100/120 cat.#
Porapak P	250 °C	20 g	25576	25577	25578
Porapak PS	250 °C	20 g	25579	25580	25581
Porapak Q	250 °C	26 g	25582	25583	25584
Porapak QS	250 °C	26 g	25585	25586	25587
Porapak R	250 °C	24 g	25588	25589	25590
Porapak S	250 °C	26 g	25591	25592	25593
Porapak N	190 °C	29 g	25594	25595	25596
Porapak T	190 °C	31 g	25597	25598	25599

also available

Custom packing materials are also available.

See **page 148**.

HayeSep® Packing Materials

Description	temp. limits	g/btl.	Mesh 60/80 cat.#	Mesh 80/100 cat.#	Mesh 100/120 cat.#
HayeSep A	165 °C	24 g	22560	25032	25033
HayeSep B	190 °C	24 g	25561	25034	25035
HayeSep C	250 °C	24 g	25562	25036	25037
HayeSep D	290 °C	24 g	25563	25038	25039
HayeSep DIP	290 °C	24 g	25564	25565	25566
HayeSep DB	290 °C	24 g	25567	25568	25569
HayeSep DOX			(Use HayeSep DB)		
HayeSep N	165 °C	24 g	25570	25045	25046
HayeSep P	250 °C	24 g	25571	25047	25048
HayeSep Q	275 °C	24 g	25572	25049	25050
HayeSep R	250 °C	24 g	25573	25051	25052
HayeSep S	250 °C	24 g	25574	25053	25054
HayeSep T	165 °C	24 g	25575	25055	25056

Tenax® Packing Materials

Description	temp. limits	Min. Qty.	Mesh 60/80 cat.#	Mesh 80/100 cat.#
Tenax-TA	350 °C	10 g	25550	25551
Tenax-GR	350 °C	10 g	25552	25553

Restek's Learning Network
Sign up for our widely acclaimed seminars today!
Learn more at www.restek.com/**seminars**

Liquid Phases for Custom Columns

We can prepare packed and micropacked columns from the extensive list of liquid phases shown here. We have many more liquid phases. If you don't see the phase you need, call Technical Service or contact your Restek representative for availability.

Phase	min./max. temp. (°C)
Apiezon L	50/300
p,p'-Azoxydiphenetole	132/140
BC-120	0/125
Bentone-34	0/180
bis (2-ethoxyethyl) adipate	0/150
bis (2-ethylhexyl) phthalate	150 max.
bis (2-methoxyethyl) adipate	20/100
n,n'-Bis(*p*-methoxylbenzylidene)-α,α'-bi-*p*-toluidine (BMBT)	189/225
Carbowax 1000	40/150
Carbowax 20M	60/225
Carbowax 20M-terephthalic acid	60/225
Carbowax 400	10/100
Carbowax 600	30/125
Cyclohexanedimethanol succinate	100/250
DC-11	0/300
DC-200	0/200
DC-550	20/250
DEGS-PS	20/200
Di(2-ethylhexyl)sebacate	0/125
Diethylene glycol succinate (DEGS)	20/200
Diethylene glycol adipate (DEGA)	0/200
Diisodecyl phthalate	0/175
2,4-Dimethylsulfolane	0/50
Di-*n*-decyl phthalate	10/175
Dinonyl phthalate	20/150
Ethylene glycol adipate	100/225
Ethylene glycol phthalate	100/200
Ethylene glycol succinate	100/200
FFAP	50/250
Fluorad FC-431, 50% solution in ethyl acetate	40/200
Hallcomid M-18-OL	8/150
Halocarbon 10-25	20/100
Halocarbon K-352	0/250
Halocarbon wax	50/150
Igepal® CO-880 (Nonoxynol)	100/200
Igepal CO-890	100/200
Krytox	-30/260
Neopentyl glycol adipate	50/225
Neopentyl glycol sebacate	50/225
Neopentyl glycol succinate	50/225
Nonoxynol (Igepal CO-880)	100/200
β,β-Oxydipropionitrile	0/75
OV-1, dimethyl (gum)	100/350
OV-1, vinyl	100/350
OV-3, phenyl methyl	0/350
OV-7, phenyl methyl dimethyl, 20% phenyl	0/350
OV-11, phenyl methyl dimethyl, 35% phenyl	0/350
OV-17, phenyl methyl, 50% phenyl	0/375

Phase	min./max. temp. (°C)
OV-22, phenyl methyl diphenyl, 65% phenyl	0/350
OV-25, phenyl methyl diphenyl, 75% phenyl	0/350
OV-61, diphenyl, 33% phenyl	0/350
OV-73, 5.5% diphenyl	0/325
OV-101, dimethyl (fluid)	0/350
OV-105, cyanopropyl methyl	0/275
OV-202, trifluoropropyl (fluid)	0/275
OV-210, trifluoropropyl (fluid)	0/275
OV-215, trifluoropropyl (gum)	0/275
OV-225, cyanopropyl methylphenyl methyl	0/265
OV-275, dicyanoallyl	25/250
OV-330, silicone - Carbowax	0/250
OV-351	50/270
OV-1701, vinyl	0/250
Phenyldiethanolamine succinate	0/230
Polethylene glycol adipate (EGA)	100/225
Polyphenyl ether (5 rings) OS-124	0/200
Polypropylene glycol	0/150
Rtx-1 (Rt-101)	0/350
Rt-1000	50/250
Rt-1200	25/200
Rt-1220	50/200
Rt-1500, Rt-1510	50/230
Rt-2100	0/350
Rt-2300	20/275
Rt-2330, Rt-2340	25/275
Rt-608Pkd	0/275
Rt-Sebaconitrile	25/110
Rt-XLSulfur	250 max.
SE-30, SE-52, SE-54	50/300
Silar 5 CP, Silar 10 CP	0/250
Sorbitol	150 max.
Squalane	20/100
Squalene	0/100
Stabilwax	40/240
Tetracyanoethylated pentaerythritol	30/175
THEED (Tetrahydroxyethlenediamine)	0/125
β,β-Thiodipropionitrile (TDPN)	100
Tricresyl phosphate	20/125
1,2,3-Tris (2-cyanoethoxy) propane (TCEP)	0/175
Triton X-100, Triton X-305	0/200
UC W982	0/300
UCON 50-HB-2000	0/200
UCON 50-HB-280-X	0/200
UCON 50-HB-5100	0/200
UCON HB-1800-X	200 max.
UCON LB-550-X	0/200
Versamid 900	190/275

Advantages of Using Restek® Packed Columns

- Reasonably priced.
- Low-bleed, long-lifetime bonded phases.
- Wide variety of supports and packings.
- Produced by experienced packed column chromatographers.

USP Liquid Phase & Solid Support Cross-Reference

Restek can meet all of your packed column needs for U.S. Pharmacopeia methods. Commonly used USP liquid phases and supports are listed below. Call Restek or your representative for a quote on your next packed column for pharmaceuticals.

USP	Phase Description	Restek-Supplied Equivalent
G1	Dimethylpolysiloxane oil	Rt-2100, OV-101, Rtx-1
G2	Dimethylpolysiloxane gum	OV-1, Rtx-1
G3	50% Phenyl-50% methylpolysiloxane	Rt-2250, OV-17
G4	Diethylene glycol succinate polyester	DEGS
G5	3-Cyanopropylpolysiloxane	Rt-2340
G6	Trifluoropropylmethylpolysiloxane	Rt-2401, OV-210
G7	50% 3-Cyanopropyl-50% phenylmethylsilicone	Rt-2300
G8	80% Bis (3-cyanopropyl)-20% phenylpolysiloxane	Rt-2330
G9	Methylvinylpolysiloxane	UCW 98
G11	Bis(2 ethylhexyl) sebecate polyester	Bis(2 ethylhexyl) sebecate polyester
G12	Phenyldiethanolamine succinate polyester	Phenyldiethanolamine succinate polyester
G13	Sorbitol	Sorbitol
G14	Polyethylene glycol (average mol. wt. 950-1050)	Carbowax 1000
G15	Polyethylene glycol (average mol. wt. 3000-3700)	Carbowax 4000
G16	Polyethylene glycol compound (average mol. wt. 15,000), a high molecular weight compound of polyethylene glycol and a diepoxide linker	Carbowax 20M
G17	75% Phenyl-25% methylpolysiloxane	OV-25
G18	Polyalkylene glycol	UCON LB 550X
G19	25% Phenyl-25% cyanopropyl-50% methylsilicone	OV 225
G20	Polyethylene glycol (average mol. wt. 380-420)	Carbowax 400
G21	Neopentyl glycol succinate	Neopentyl glycol succinate
G22	Bis(2 ethylhexyl) phthalate	Bis(2 ethylhexyl) phthalate
G23	Polyethylene glycol adipate, ethylene glycol adipate	EGA
G24	Diisodecyl phthalate	Diisodecyl phthalate
G25	Polyethylene glycol compound TPA, a high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with terephthalic acid	Carbowax 20M TPA
G26	25% 2-Cyanoethyl-75% methylpolysiloxane	XE 60
G27	5% Phenyl-95% methylpolysiloxane	SE-52, Rtx-5
G28	25% Phenyl-75% methylpolysiloxane	DC 550
G29	3,3'-Thiodipropionitrile	TDPN
G30	Tetraethylene glycol dimethyl ether	Tetraethylene glycol dimethyl ether
G31	Nonylphenoxypoly(ethyleneoxy)ethanol (average ethyleneoxy chain length is 30): nonoxynol 30	Igepal CO 880
G32	20% Phenylmethyl-80% dimethylpolysiloxane	OV-7
G33	20% Carborane®-80% methylsilicone	Dexsil 300
G34	Diethylene glycol succinate polyester stabilized with phosphoric acid	DEGS PS
G35	A high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with nitroterephthalic acid	Rt-1000
G36	1% Vinyl-5% phenylmethylpolysiloxane	SE 54, Rtx-5
G38	Phase G1 containing a small amount of tailing inhibitor	Rt-2100/0.1% Carbowax 1500
G39	Polyethylene glycol (average mol. wt. 1500)	Carbowax 1500
G40	Ethylene glycol adipate	EGA

USP	Support Description	Restek-Supplied Equivalent
S1A	Siliceous earth, see method for details on treatment	Silcoport W
S1AB	Siliceous earth, treated as S1A and both acid- and base-washed	Silcoport WBW
S1C	Crushed firebrick, calcined or burned with a clay binder >900 °C, acid-washed, may be silanized	Chromosorb PAW or PAW DMDCS
S1D	Crushed firebrick, calcined or burned with a clay binder >900 °C, not acid-washed, may be silanized	Chromosorb PNAW
S1NS	Untreated siliceous earth	Chromosorb W- Non Acid Washed
S2	Styrene-divinylbenzene copolymer with nominal surface area of less than 50 m^2/g and an average pore diameter of 0.3 to 0.4 µm	Chromosorb 101
S3	Ethylvinylbenzene-divinylbenzene copolymer with nominal surface area of 500 to 600 m^2/g and an average pore diameter of 0.0075 µm	HayeSep Q
S4	Styrene-divinylbenzene copolymer with aromatic -O and -N groups having a nominal surface area of 400 to 600 m^2/g and an average pore diameter of 0.0076 µm	HayeSep R
S5	High molecular weight tetrafluorethylene polymer, 40- to 60-mesh	Chromosorb T
S6	Styrene-divinylbenzene copolymer having a nominal surface area of 250 to 350 m^2/g and an average pore diameter of 0.0091 µm	Chromosorb 102 HayeSep P
S7	Graphitized carbon having a nominal surface area of 12 m^2/g	CarboBlack C
S8	Copolymer of 4-vinyl-pyridine and styrene-divinylbenzene	HayeSep S
S9	Porous polymer based on 2,6-diphenyl-*p*-phenylene oxide	Tenax TA
S10	Highly cross-linked copolymer of acrylonitrite and divinylbenzene	HayeSep C
S11	Graphitized carbon having a nominal surface area of 100 m^2/g, modified with small amounts of petrolatum and polyethylene glycol compound	CarboBlack B 80/120 3% Rt 1500
S12	Graphitized carbon having a nominal surface area of 100 m^2/g	CarboBlack B

Custom Coated Packing Materials

Custom Coated Packing Materials

Custom coated packing materials can be made with any of the supports listed below. The liquid stationary phases available are listed on page 146 and the coating ranges are listed in the chart. Coated packings are available in minimum orders of 20 grams.

To order, please call your Restek representative for pricing and specify the following:

1) Stationary phase and stationary phase concentration.

2) Support and support mesh size.

3) Amount of packing needed.

Ordering Example: (1%) (XE-60) (CarboBlack B (80/120) (20 g)

Support	Max. Coating %	Mesh Sizes
CarboBlack B	1–10%*	60/80, 80/120
CarboBlack B HT	1–10%	40/60
CarboBlack C	0.1–1%*	60/80, 80/100
HayeSep	15%	60/80, 80/100, 100/120
Porapak	15%	50/80, 80/100, 100/120

ordering note

Mesh Size

When ordering a packed column solid support, please specify mesh size. Refer to this chart to convert microns to mesh size.

Example:

150–180 micron particles = 80/100 mesh

(µm)	Mesh Size
850	20
710	25
600	30
500	35
425	40
355	45
300	50
250	60
212	70
180	80
150	100
125	120
106	140
90	170
75	200
63	230
53	270

ordering note

Special phases that require a surcharge:

OV®-275, OV®-330, OV®-225, BMBT, 2,4-dimethylsulfolane, OV®-1701, and XE-60. Call your Restek representative for pricing.

Customized Solutions

Restek builds to your exact specifications.

Request columns at

www.restek.com/**packed**

Custom Packed Columns

To order, specify the following:

1) Column dimensions (length, ID) and tubing material.
2) Packing description (percent coating and phase, support mesh size, and treatment).
3) Column configuration (instrument manufacturer, model number, on-column injection or not) and with or without nuts and ferrules.

Ordering Example: (6' x 1/8") (stainless steel) (1%) (XE-60) (CarboBlack B 80/120) (Agilent 6890) (on-column injection) (fittings kit)

Please use the custom order form on page 150 or visit
www.restek.com/packed

did you know?

Packing material in packed and micropacked columns is secured using wire braids or frits. This prevents packing material from exiting the column.

Custom Micropacked Columns

To order, contact your Restek representative and specify the following:

1) Physical dimensions (length, OD, ID, and tubing material).
2) Packing description (percent coating and phase, support mesh size).
3) Installation kit (see page 142), frit type.

Ordering Example: (2 m x 1/16" OD x 1.00 mm ID) (Siltek®-treated tubing) (5%) (Carbowax® 20M) (CarboBlack B) (80/120) (installation kit for valve applications, cat. #21065) (Siltek® frits)

Please use the custom order form on page 150 or visit
www.restek.com/packed

ordering note

For international pricing on custom packed or micropacked columns, please contact your Restek representative.

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.: Phone: 1-800-356-1688, ext. 4 • e-mail: support@restek.com

Hours of operation (Eastern Time):
Monday - Thursday, 8:00 a.m. to 6:00 p.m.
Friday, 8:00 a.m. to 5:00 p.m.

Outside the U.S.: Contact International Technical Service at intltechsupp@restek.com or find a local distributor at **www.restek.com/distributor**

Packed/Micropacked Column Custom Order Form

Order: _____ Quote: _____ Reference # from previous order (if available): _____

Date: _____

Restek Account #: _____

Contact: _____

Company: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Restek Use Only:

Custom No.: _____

Stock No.: _____

Price: _____

Fitting Costs: _____

Authorization: _____

Number of Columns: _____

1) Column Dimensions:

   Length _____ OD x ID: _____

2) Tubing (choose one): ❍ SilcoSmooth® ❍ Stainless Steel ❍ Hastelloy® ❍ Nickel ❍ Copper ❍ PTFE

3) Packing Description:

   Liquid Phase A (% + description): _____

   Liquid Phase B (% + description): _____

   Liquid Phase C (% + description): _____

   Solid Support: _____ Mesh: _____

4) Column Configuration:

   Instrument (mfr. + model): _____

   Inlet: Packed Full? ❍ Yes ❍ No, leave_____" void (for on-column injection)

   Outlet: Packed Full? ❍ Yes ❍ No, leave_____" void

   Do you want this column preconditioned? ❍ Yes (additional charge) ❍ No

   Standard configuration suffix number (next page)**:**

   Frits ❍ Hastelloy® ❍ Siltek®

   Special configuration (next page): Figure: _____ Dimensions: _____

   Welded Tubing Reducers ❍ (additional charge)

   Special Instructions: _____

Fittings (check appropriate circle)

❍ **KIT 1S**
1/4" brass nuts
1/4" to 1/8" V/G reducing ferrules
No additional charge

❍ **KIT 2S**
1/4" brass nuts
1/4" to 3/16" V/G reducing ferrules
No additional charge

❍ **KIT A**
1/8" brass nuts
1/8" V/G ferrules
No additional charge

❍ **KIT B**
1/8" brass nuts
1/8" brass front & back ferrules
No additional charge
V/G = Vespel®/graphite

❍ **KIT C**
1/8" stainless steel nuts
1/8" stainless steel front & back ferrules
Additional charge

❍ **KIT D**
1/8" stainless steel nuts
1/8" V/G ferrules
Additional charge

❍ **KIT E**
1/4" stainless steel nuts
1/4" to 1/8" V/G reducing ferrules
Additional charge

❍ **KIT F**
1/4" stainless steel nuts
1/4" to 3/16" V/G reducing ferrules
Additional charge

❍ **KIT V**
1/8" VCR fitting
check appropriate circle:
❍ Stainless Steel (additional charge)
❍ Nickel (additional charge)

for a quote:

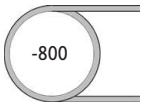
Complete this form and fax to Restek at 814-353-1309, or to your Restek representative.

This form is also available online at:

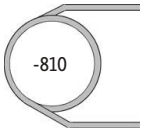
www.restek.com/**packed**

Standard Configurations (choose one)

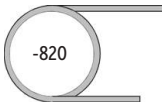
General Configuration



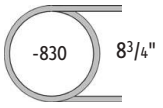
Agilent 5880, 5890, 5987, 6890, 7890



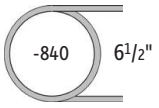
Bruker 430, 450 (Varian 3700, Vista Series, FID)



PE 900-3920, Sigma 1,2,3



PE Auto System 8300, 8400, 8700



-810	Agilent 5880, 5890, 5987, 6890, 7890
-811	Agilent 6850
-820	Scion (Bruker 430, 450) (Varian 3700,Vista Series, FID)
-821	Scion (Bruker 430, 450) (Varian 3800)
-830	PerkinElmer 900-3920, Sigma 1,2,3
-840	PerkinElmer Auto System 8300, 8400, 8700, Clarus 500 (C500)
-841	PerkinElmer Auto Sys XL
-845	ABB 3100, AAI (4" coil)
-850	Shimadzu 14A, 2014
-851	Shimadzu 8A
-852	Shimadzu 9A
-853	Shimadzu 17A, 2010
-854	Shimadzu Mini 2
-860	Thermo Scientific - TRACE 2000
-865	Carlo Erba
-870	Tremetrics/Tracor
-874	HNU 310 & 311 (4.5" coil)
-875	Analytical Controls Configuration
-880	Carle 40030
-881	Hitachi 263
-885	Pye Unicam 4500
-890	Gow Mac 590
-891	Gow Mac 550
-892	Gow Mac 750
-893	Gow Mac 816 (3" coil, 3" spread on the arms, and a total height of 5")
-894	Gow Mac 580
-895	SRI 8610C
-895R	SRI 8610C Dual GC Right Side
-895L	SRI 8610C Dual GC Left Side
-896	SRI 9300

Custom Configurations (Please provide dimensions on order form, page 150, or at **www.restek.com/packed**)

Figure 1

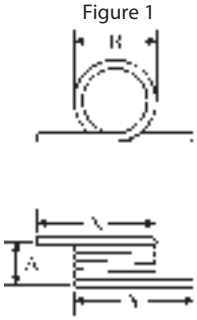


Figure 2

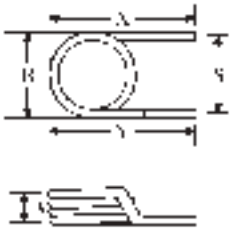


Figure 3

Figure 4

Figure 5

Figure 6

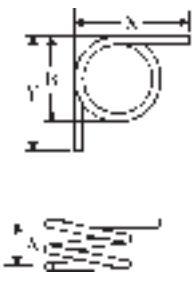


Figure 7

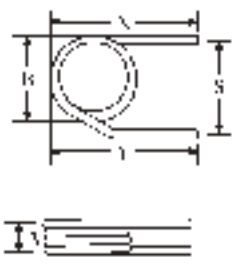


Figure 8

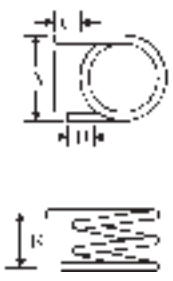


Figure 9

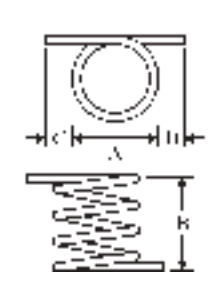


Figure 10

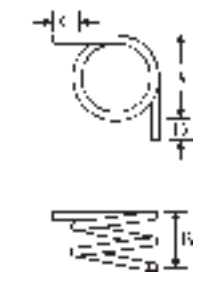


Figure 11

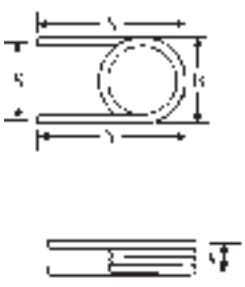


Figure 12

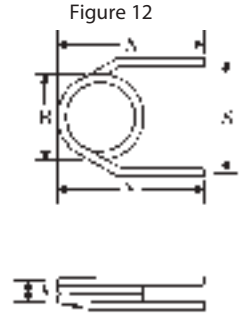


Figure 13

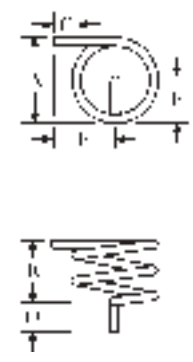


Figure 14

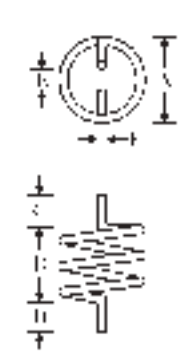


Figure 15

LC Columns

U.S. Pharmacopeia Cross-Reference.....153
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USLC® Columns.....160–162
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LC Column & Detector Test Mixes.....475

U.S. Pharmacopeia Cross-Reference

L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles; 1.7 to 10 µm in diameter or a monolithic rod. *Raptor™ ARC-18 (p. 158), Raptor™ C18 (p. 158), Pinnacle® DB Aqueous C18 (p. 163), Pinnacle® DB C18 (p. 166), Ultra Aqueous C18 (p. 169), Ultra C18 (p. 171), Viva C18 (p. 175)*
L3	Porous silica particles; 5 to 10 µm in diameter. *Pinnacle® DB Silica (p. 168), Ultra Silica (p. 174), Viva Silica (p. 177)*
L7	Octylsilane chemically bonded to totally porous silica particles; 1.7 to 10 µm in diameter. *Pinnacle® DB C8 (p. 167), Ultra C8 (p. 172), Viva C8 (p. 175)*
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support; 3 to 10 µm in diameter. *Ultra Amino (p. 174)*
L10	Nitrile groups chemically bonded to porous silica particles; 3 to 10 µm in diameter. *Pinnacle® DB Cyano (p. 167), Ultra Cyano (p. 174)*
L11	Phenyl groups chemically bonded to porous silica particles; 1.7 to 10 µm in diameter. *Raptor™ Biphenyl (p. 157), Pinnacle® DB Biphenyl (p. 165), Ultra Biphenyl (p. 170), Ultra Aromax (p. 173), Viva Biphenyl (p. 176)*
L13	Trimethylsilane chemically bonded to porous silica particles; 3 to 10 µm in diameter. *Ultra C1 (p. 173)*
L26	Butyl silane chemically bonded to totally porous silica particles; 3 to 10 µm in diameter. *Ultra C4 (p.172), Viva C4 (p.176)*
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer; 5 to 10 µm in diameter. *Pinnacle® DB PFP Propyl (p. 166), Ultra PFP Propyl (p. 171), Viva PFP Propyl (p. 176)*
L68	Spherical, porous silica; 100 µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not end-capped. *Pinnacle® DB IBD (p. 164), Ultra IBD (p. 169)*

EXP® fittings

coupler

hand-tight

Reusable fittings for easy, yet reliable HPLC & UHPLC connections

- Hand-tight fitting style achieves effortless HPLC seals—no tools needed for a 8,700+ psi seal.
- Both hand-tight and hex-head styles wrench-tighten for reliable UHPLC use up to 20,000+ psi!
- Patented ferrule can be installed repeatedly without compromising high-pressure seal.
- Hybrid design combines the durability of titanium with the sealing ability of PEEK.
- Cutting-edge system provides ZDV (zero dead volume) connection to any 10-32 female port.
- Compatible with 1/16" PEEK and stainless steel tubing.

See **page 335**.

www.restek.com/exp

hex-head

Optimal Linear Velocities

Column ID (mm)	Optimal flow rate (mL/min)* 1.9 µm dp	3 µm dp	5 µm dp	2.7 µm Raptor™	5 µm Raptor™
4.6	—	1.5	1.0	1.6	1.0
3.2	—	0.7	0.5	0.8	0.5
3.0	1.1	0.6	0.4	0.7	0.4
2.1	0.5	0.3	0.2	0.3	0.2
1.0	—	0.07	0.05	0.08	0.05

* Optimal flow rates are mobile phase dependent; table above is provided as a guide.

Common Classifications for LC Columns by Internal Diameter

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

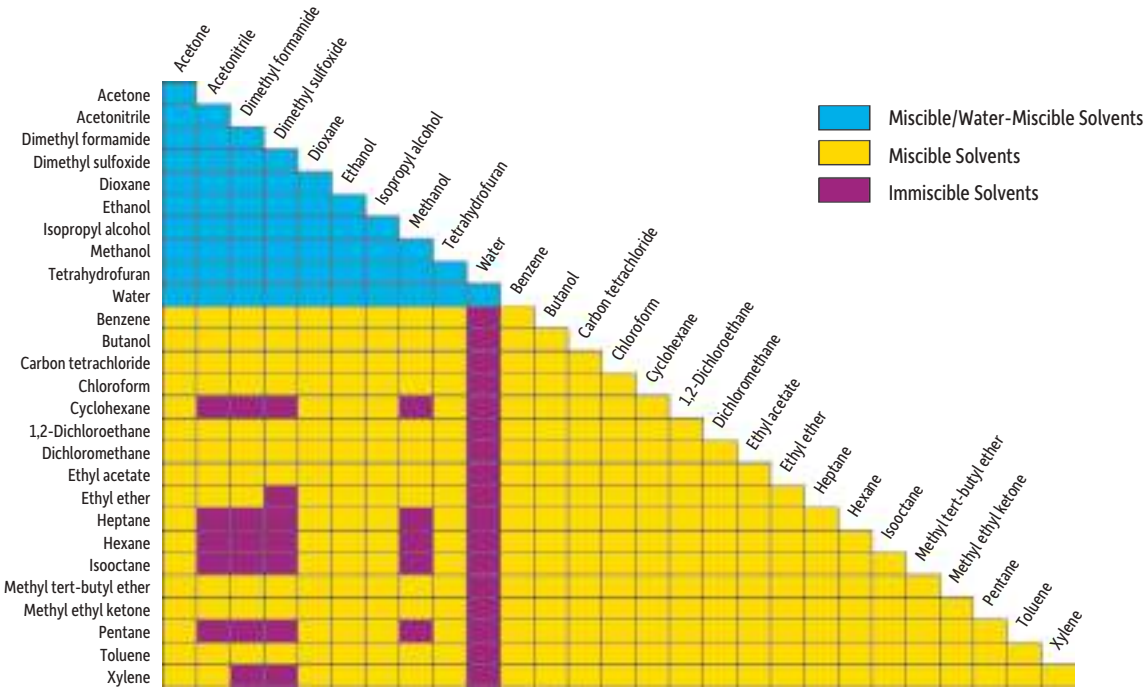
HPLC Pump Pressure Conversion Table

Pressure	psi	atm	kg/cm²	torr	kPa	bar	inches Hg
1 psi =	1	0.068	0.0703	51.713	6.8948	0.06895	2.0359
1 atm =	14.696	1	1.0332	760	101.32	1.0133	29.921
1 kg/cm² =	14.223	0.967	1	735.5	98.06	0.9806	28.958
1 torr =	0.0193	0.00132	0.00136	1	0.1330	0.00133	0.0394
1 kPa =	0.1450	0.00987	0.0102	7.52	1	0.0100	0.2962
1 bar =	14.5038	0.9869	1.0197	751.88	100	1	29.5300
1 in Hg =	0.49612	0.0334	0.0345	25.400	3.376	0.03376	1

To convert a pressure, multiply the units in the left-most column by the conversion factors listed in the columns to the right.

For example: 10 psi x 0.068 = 0.68 atm
10 bar x 29.5300 = 295.300 inches Hg

Solvent Miscibility and Solubility



Raptor™ LC Columns

NEW!

SPP speed.
USLC® resolution.

A new species of column.

Restek is excited to announce the evolution of superficially porous particles with the introduction of Raptor™ LC columns and guards.

Superficially porous particles (commonly referred to as SPP or "core-shell" particles) changed the world of LC by dramatically boosting column efficiency and reducing analysis times, but they were only the beginning. With Raptor™ LC columns, Restek chemists have combined the speed of SPP with the resolution of highly selective USLC® technology. This new species of chromatographic column allows you to more easily achieve peak separation and faster analysis times without expensive UHPLC instrumentation.

- Higher efficiency for drastically faster analysis times.
- Better selectivity for substantially improved resolution.
- Increased sample throughput with existing HPLC instrumentation.
- Long-lasting ruggedness for dependable reproducibility.

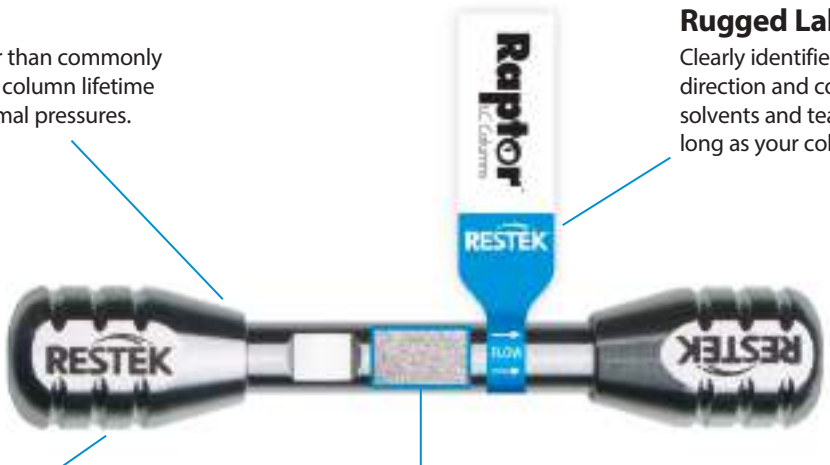
Selectivity Accelerated

Put Raptor™ LC columns and guards to the test on your most challenging workflows!

Dissecting the Raptor™ LC Column

Larger 2 µm Frit
Prevents clogging better than commonly used 0.5 µm frits; boosts column lifetime and helps maintain optimal pressures.

Rugged Label
Clearly identifies both flow direction and column; resists solvents and tearing to last as long as your column does.



Proprietary Column-Packing Technique
Provides greater pressure stability (600 bar for 2.7 µm; 400 bar for 5 µm); achieves higher linear velocities without sacrificing efficiency or lifetime.

Raptor™ SPP Particles

Robust 2.7 and 5 µm Particles
Let you run high-speed analyses without UHPLC.

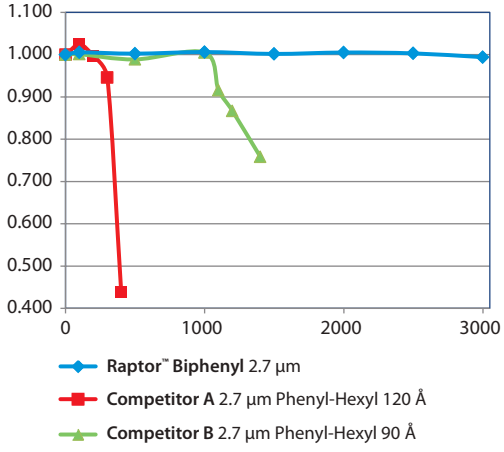
Narrow Silica Distribution
Ensures high efficiency and consistent flows.

Updated Bonding and QC
Guarantee retention time stability, run to run and column to column.

Pressure Stability

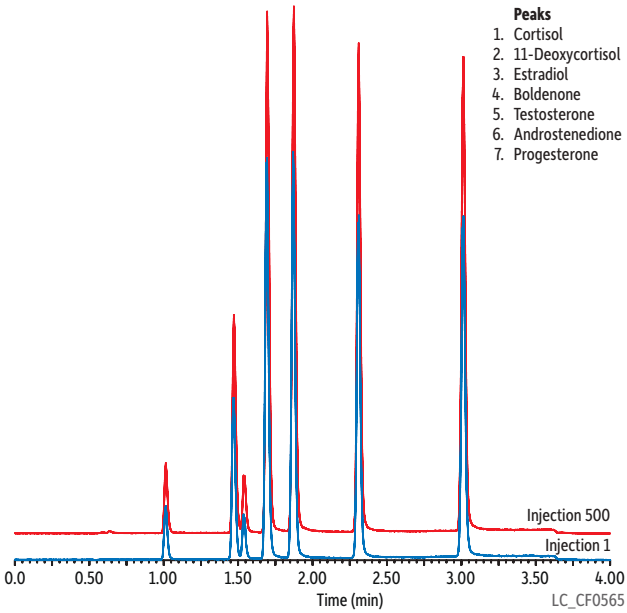
At high pressures, competitor phenyl-hexyl columns experience a quick and sharp drop-off in efficiency, but Raptor™ columns are unaffected to at least 3,000 injections.

% Efficiency vs # of Injections
Raptor™ 2.7 µm Column vs Competitor
50 x 2.1 mm Phenyl-Hexyls @ 600 bar



Reproducibility

Even after hundreds of injections, a Raptor™ column will provide consistent, reliable data.



Column: Raptor™ Biphenyl (cat.# 9309A1E); Dimensions: 100 mm x 3.0 mm ID; Particle Size: 2.7 µm; Pore Size: 90 Å; Temp.: 30 °C; **Sample:** Diluent: initial mobile phase; Conc.: 50 ng/mL; Inj. Vol.: 5 µL **Mobile Phase:** A: 0.1% formic acid in water, B: 0.1% formic acid in acetonitrile; **Gradient (%B):** 0.00 min (40%), 3.00 min (80%), 3.01 min (40%), 5.00 min (40%); **Flow:** 0.700 mL/min; **Detector:** Waters Xevo TQ-S; Ion Mode: ESI+; **Instrument:** Waters.

Raptor™ EXP® Guard Column

To help protect your investment and further extend the life of our already-rugged Raptor™ LC columns, we have mated our new superficially porous particles with patent-pending guard column hardware developed by Optimize Technologies. A Raptor™ LC guard column cartridge in an EXP® direct connect holder is the ultimate in column protection.

Patented Titanium Hybrid Ferrules

Can be installed repeatedly without compromising high-pressure seal.

Free-Turn® Architecture

Allows you to change cartridges without breaking inlet/outlet fluid connections—and without tools.

Auto-Adjusting Connection

Provides ZDV (zero dead volume) connection to any 10-32 female port.

Flexible Design

Replace nut with longer or even tool-free options to best suit your needs.

Unidirectional Raptor™ Cartridge

In-Tandem Development
Made to pair perfectly with Raptor™ LC columns.

Superior Packing Technique
Withstands 600 bar (2.7 µm) / 400 bar (5 µm) operating pressures.

Restek® Quality
Backed by the manufacturing and QC systems you trust.

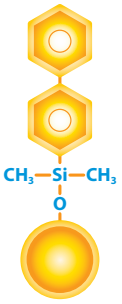
Raptor™ Biphenyl LC Columns (USP L11)

NEW!

Chromatographic Properties

The innovative Biphenyl is Restek's most popular LC stationary phase because it is particularly adept at separating compounds that are hard to resolve or that elute early on C18 and other phenyl chemistries. As a result, the rugged Raptor™ Biphenyl column is extremely useful for fast separations in bioanalytical testing applications like drug and metabolite analyses, especially those that require a mass spectrometer (MS). Increasing retention of early-eluting compounds can limit ionization suppression, and the heightened selectivity helps eliminate the need for complex mobile phases that are not well-suited for MS detection.

Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
2.7 µm Columns			
30 mm	9309A32	9309A3E	9309A35
50 mm	9309A52	9309A5E	9309A55
100 mm	9309A12	9309A1E	9309A15
150 mm	9309A62	9309A6E	9309A65
5 µm Columns			
30 mm	—	930953E	—
50 mm	9309552	930955E	9309555
100 mm	9309512	930951E	9309515
150 mm	9309562	930956E	9309565
250 mm	—	—	9309575



Column Characteristics:

Stationary Phase Category: Phenyl (L11)
Ligand Type: Biphenyl
Particle: 2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")
Pore Size: 90 Å
Surface Area: 150 m^2/g (2.7 µm) or 100 m^2/g (5 µm)
Recommended Usage:
pH range: 1.5–8.0
Maximum Temperature: 80 °C
Maximum Pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)

Properties:

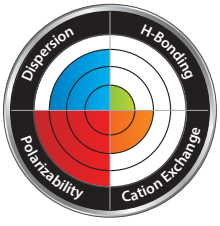
- Increased retention for dipolar, unsaturated, or conjugated solutes.
- Enhanced selectivity when used with methanolic mobile phase.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.

Switch to a Biphenyl when:

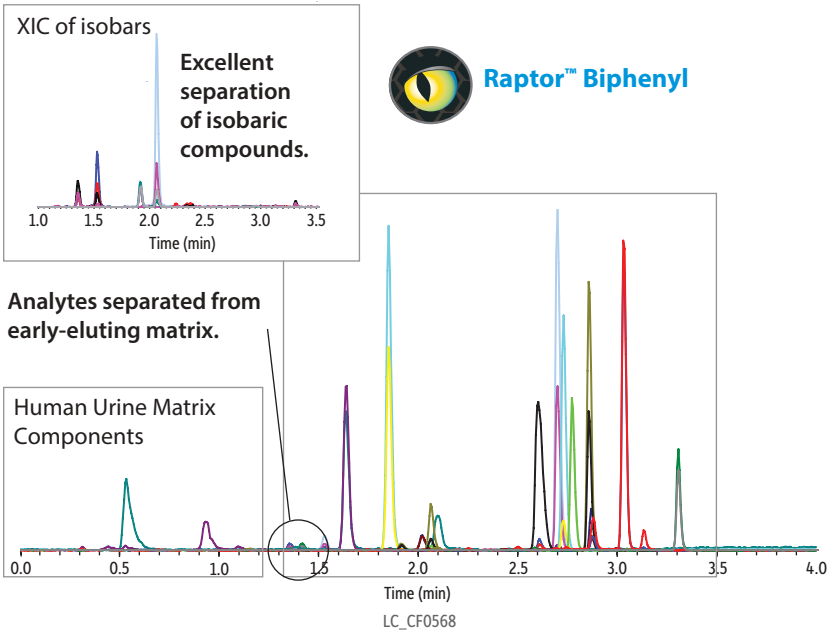
- Limited selectivity is observed on a C18.
- You need to increase retention of hydrophilic aromatics.

USLC® Column Interaction Profile

(See page 161 for more information.)



Pain Panel in Urine on Raptor™ Biphenyl (50 x 3.0 mm) by LC-MS/MS



For compound listing including isobars, visit **www.restek.com** and search for LC_CF0568.

Column	Raptor™ Biphenyl (cat.# 9309A5E)
Dimensions:	50 mm x 3.0 mm ID
Particle Size:	2.7 µm
Temp.:	30 °C
Sample	
Diluent:	Urine:mobile phase A:mobile phase B (17:76:7)
Conc.:	10-100 ng/mL
Inj. Vol.:	10 µL
Mobile Phase	
A:	Water + 0.1% formic acid
B:	Methanol + 0.1% formic acid

Time (min)	Flow (mL/min)	%A	%B
0.00	0.6	90	10
1.50	0.6	55	45
2.50	0.6	0	100
3.70	0.6	0	100
3.71	0.6	90	10
5.00	0.6	90	10

Detector	AB SCIEX API 4000™ MS/MS
Ion Source:	TurboIonSpray®
Ion Mode:	ESI+
Instrument	API LC-MS/MS
Notes	Lorazepam was prepared at 100 ng/mL; all other analytes are 10 ng/mL.

Raptor™ ARC-18 LC Columns (USP L1)

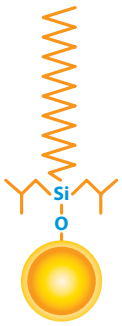
NEW!

Chromatographic Properties

Designed and intended specifically for use on LC-MS/MS systems, the Raptor™ ARC-18 column offers a well-balanced retention profile without the drawbacks of using an ordinary C18 in the harsh, acidic mobile phases needed for mass spectrometry (MS). Even after extended use in these low-pH (≤ 2.0) conditions, the sterically protected ARC-18 offers consistent retention, peak shape, and response for charged bases, neutral acids, small polar compounds, and more. For the rapid analysis of large, multiclass assays by LC-MS/MS, the acid-resistant Raptor™ ARC-18 truly is *ahead of the curve*.

Column Characteristics:

Stationary Phase Category: C18, octadecylsilane (L1)
Ligand Type: Sterically protected C18
Particle: 2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")
Pore Size: 90 Å
Surface Area: 150 m^2/g (2.7 µm) or 100 m^2/g (5 µm)
Recommended Usage:
pH range: 1.0–8.0
Maximum Temperature: 80 °C
Maximum Pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)



Properties:

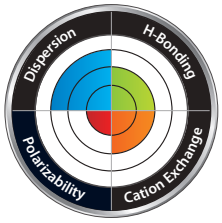
- Well-balanced retention profile.
- Sterically protected and acid-resistant to resist harsh, low-pH mobile phases.
- Ideal for use with sensitive detectors like mass spec.

Switch to an ARC-18 when:

- You are analyzing large, multiclass lists by LC-MS/MS.
- Strongly acidic (pH 1–3) mobile phases are required.

USLC® Column Interaction Profile

(See page 161 for more information.)



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
2.7 µm Columns			
30 mm	9314A32	9314A3E	9314A35
50 mm	9314A52	9314A5E	9314A55
100 mm	9314A12	9314A1E	9314A15
150 mm	9314A62	9314A6E	9314A65
5 µm Columns			
30 mm	—	931453E	—
50 mm	9314552	931455E	9314555
100 mm	9314512	931451E	9314515
150 mm	9314562	931456E	9314565
250 mm	—	—	9314575

Raptor™ C18 LC Columns (USP L1)

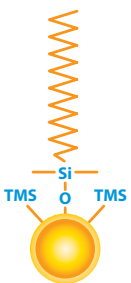
NEW!

Chromatographic Properties

When you need a general-purpose LC column, don't just grab any C18. Choose the speed, efficiency, and long-lasting ruggedness of the Raptor™ C18. This traditional end-capped C18 offers the highest hydrophobic retention of any Raptor™ phase, and it is compatible with a wide range of mobile phases from moderately acidic to neutral (pH 2–8). Whether for food safety or environmental or bioanalytical analyses, this phase offers consistently excellent data quality in less time across myriad reversed-phase applications, matrices, and compound classes. To lower costs and improve profitability, you need columns to last longer, data to be reproducible, and existing HPLC instrumentation to run faster. Get there with the only general-purpose C18 that gives you *Selectivity Accelerated*.

Column Characteristics:

Stationary Phase Category: C18, octadecylsilane (L1)
Ligand Type: End-capped C18
Particle: 2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")
Pore Size: 90 Å
Surface Area: 150 m^2/g (2.7 µm) or 100 m^2/g (5 µm)
Recommended Usage:
pH range: 2.0–8.0
Maximum Temperature: 80 °C
Maximum Pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)



Properties:

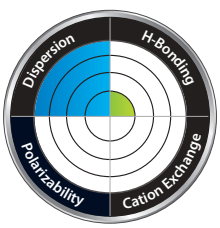
- Compatible with moderately acidic to neutral mobile phases (pH 2–8).
- Excellent data quality in food, environmental, bioanalytical, and other applications.

Switch to a C18 when:

- You need a general-purpose column for reversed-phase chromatography.
- You need to increase retention of hydrophobic compounds.

USLC® Column Interaction Profile

(See page 161 for more information.)



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
2.7 µm Columns			
30 mm	9304A32	9304A3E	9304A35
50 mm	9304A52	9304A5E	9304A55
100 mm	9304A12	9304A1E	9304A15
150 mm	9304A62	9304A6E	9304A65
5 µm Columns			
30 mm	—	930453E	—
50 mm	9304552	930455E	9304555
100 mm	9304512	930451E	9304515
150 mm	9304562	930456E	9304565
250 mm	—	—	9304575

Raptor™ EXP® Guard Column Cartridges

- Free-Turn® architecture lets you change cartridges by hand without breaking inlet/outlet fluid connections—no tools needed.
- Patented titanium hybrid ferrules can be installed repeatedly without compromising high-pressure seal.
- Auto-adjusting design provides ZDV (zero dead volume) connection to any 10-32 female port.
- Guard column cartridges require EXP® direct connect holder (cat.# 25808).
- Pair with EXP® hand-tight fitting (cat.# 25937–25939) for tool-free installation.

To help protect your investment and further extend the life of our already-rugged LC columns, Restek offers the patent-pending guard column hardware developed by Optimize Technologies. A Restek® LC guard cartridge in an EXP® direct connect holder is the ultimate in column protection.

NEW!

Raptor™ EXP® Guard Column Cartridge

Learn more about the Raptor™ EXP® guard column on page 156!

Description	Particle Size	qty.	5 x 2.1 mm cat.#	5 x 3.0 mm cat.#	5 x 4.6 mm cat.#
Raptor ARC-18 EXP Guard Column Cartridge	2.7 µm	3-pk.	9314A0252	9314A0253	9314A0250
Raptor ARC-18 EXP Guard Column Cartridge	5 µm	3-pk.	931450252	931450253	931450250
Raptor Biphenyl EXP Guard Column Cartridge	2.7 µm	3-pk.	9309A0252	9309A0253	9309A0250
Raptor Biphenyl EXP Guard Column Cartridge	5 µm	3-pk.	930950252	930950253	930950250
Raptor C18 EXP Guard Column Cartridge	2.7 µm	3-pk.	9304A0252	9304A0253	9304A0250
Raptor C18 EXP Guard Column Cartridge	5 µm	3-pk.	930450252	930450253	930450250

Maximum cartridge pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)

EXP® Direct Connect Holder

Description	qty.	cat.#
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules)	ea.	25808

Maximum holder pressure: 20,000 psi (1,400 bar)

NEW!

25808
EXP® Direct Connect Holder

also available

Hand-Tight Nut (cat.# 25937–25939)
Upgrade the supplied nut to install your Raptor™ EXP® guard column by hand—no tools needed.

Long Hex-Head Nut (cat.# 25934)
Extend the nut on your Raptor™ EXP® guard column for easier access in tight spaces—no more bumped knuckles.

EXP® Hand-Tight Coupler (cat.# 25940)
Achieve tool-free 8,700+ psi (600 bar) seals anywhere in your LC system with EXP® hand-tight couplers and connectors.

See **page 335** for more EXP® hex-head fittings, couplers, replacement parts, and more.

RESTEK® USLC®

Ultra Selective Liquid Chromatography™
www.restek.com/uslc

Ultra Selective Liquid Chromatography™ Technology

Choose Columns Fast. Develop Methods Faster.

What is Ultra Selective Liquid Chromatography™ (USLC®) technology? This technique is the directed application of orthogonal selectivity—the most influential factor affecting peak separation, or resolution—to provide the practicing chromatographer with the best tools for choosing columns fast and developing methods faster. Through our extensive study of reversed-phase chromatography, Restek created the widest range of selectivity in the industry using just four unique stationary phases: the USLC® column set. We also defined a simple approach to choosing a column with the appropriate selectivity for any application.

Selectivity Drives Separations

Quickly and effectively resolve analytes by understanding and controlling selectivity through USLC® technology.

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

Equation 1: Selectivity has the greatest mathematical effect on resolution.

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

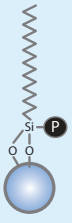
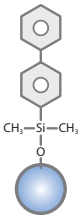
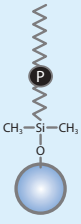
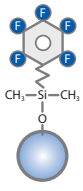
Efficiency *Retention Factor* *Selectivity*

Real Diversity in Phase Chemistry

A small set of defined orthogonal columns means faster separations and more robust methods.

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

Figure 1: Restek® columns offer the widest range of unique and effective phase chemistries to aid the chromatographer in choosing columns fast and developing methods faster.

Restek® USLC® Phase (column class)	**Aqueous C18** (alkyl)	**Biphenyl** (phenyl)	**IBD** (polar embedded)	**PFP Propyl** (fluorophenyl)
				
Ligand Type	Proprietary polar modified and functionally bonded C18	Unique Biphenyl	Proprietary polar functional embedded alkyl	Fluorophenyl
Properties	• General-purpose with a well-balanced retention profile. • Compatible with 100% aqueous mobile phases. • Ideal for multi-component LC-MS analyses.	• Increased retention for dipolar, unsaturated, or conjugated solutes. • Enhanced selectivity when used with protic (methanol) mobile phase. • Ideal for increasing sensitivity and selectivity in LC-MS analyses.	• Increased retention for acids and water-soluble compounds. • Compatible with 100% aqueous mobile phases. • Capable of both reversed-phase and HILIC separations.	• Increased retention for both charged bases and electronegative compounds. • Capable of both reversed-phase and HILIC separations. • Ideal for increasing sensitivity and selectivity in LC-MS analyses.

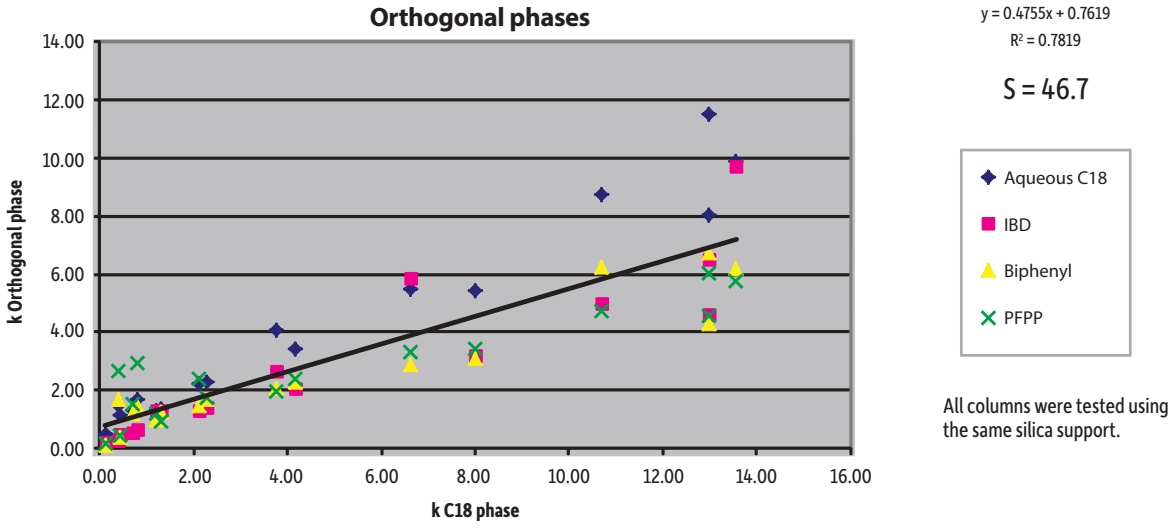
Evaluating and Extending Selectivity

The Restek® USLC® column set offers the highest range of alternate selectivity available.

The diverse selectivity provided by USLC® columns can be demonstrated empirically using the hydrophobic-subtraction model [1]. This model is a novel procedure for characterizing selectivity that uses test probes to define the solute and stationary phase interactions in reversed-phase separations. Restek is leading the commercial application of this model by implementing it in the development of USLC® bonded phases. To evaluate phase selectivity using the hydrophobic-subtraction model, the retention characteristics of the solute probes are compared across different phases relative to a C18 benchmark with all columns using the same silica base.

The resulting scatter plot is an excellent way to visualize selectivity. Stationary phases with similar selectivity show high linearity when graphed. However, stationary phases with alternate selectivity—even orthogonality—produce significant scatter around the regression line. The high degree of scatter shown in Figure 2 shows just how diverse the phases in the USLC® column set are. When we quantify column selectivity based on this correlation by calculating the selectivity (S) statistic [2], the resulting value of 46.7 shows that the USLC® column set truly has the highest range of selectivity available.

Figure 2: Restek has extended the selectivity range for commercially available columns and defined a column set—the four USLC® phases—that is ideal for fast column choice and faster method development.



References

[1] L.R. Snyder, J.W. Dolan, P.W. Carr, *The Hydrophobic-Subtraction Model of Reversed-Phase Column Selectivity*, J. Chromatogr. A 1060 (2004) 77.

[2] U.D. Neue, J.E. O'Gara, A. Mendez, *Selectivity in Reversed-Phase Separations Influence of the Stationary Phase*, J. Chromatogr. A 1127 (2006) 161.

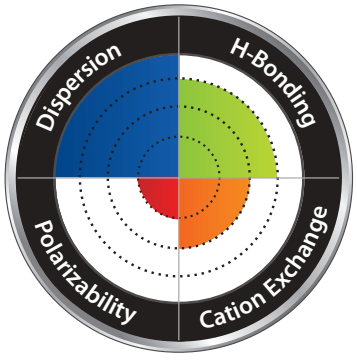
USLC® Column Interaction Profile

Put simply, selectivity is the retention of one compound relative to another. Therefore, because solutes will be retained to different degrees by different molecular interactions, we can fundamentally define a column's selectivity based on the molecular interactions it delivers.

Each USLC® column is optimized for a different chemical interaction. The pie chart provided for each USLC® stationary phase in this catalog (Figure 3) identifies the same four molecular interactions (color coded to correspond to the retention of a different solute type). The more rings shown for a given interaction, the more significant a role it plays in defining solute retention.

If you know what type of column interaction you need for your analysis, use these charts to select your USLC® column.

Figure 3: A look at a sample USLC® column interaction profile.



USLC® Columns
Choose Columns Fast.
Develop Methods Faster.

www.restek.com/**uslc**

USLC® Method Development Toolbox

- Ultra Selective Liquid Chromatography™ (USLC®) method development toolbox contains all four USLC® stationary phases in one convenient package.
- Available for UHPLC (1.9 µm) and HPLC (3 or 5 µm) in 50, 100, or 150 mm lengths.
- Included selection guide makes it even easier to pick the right column the first time.

Description	Size	Includes	qty.	cat.#
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9409252), Aqueous C18 (9418252), IBD (9425252), PFP Propyl (9419252)	kit	25800
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9409212), Aqueous C18 (9418212), IBD (9425212), PFP Propyl (9419212)	kit	25807
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109352), Aqueous C18 (9178352), IBD (9175352), PFP Propyl (9179352)	kit	25801
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109312), Aqueous C18 (9178312), IBD (9175312), PFP Propyl (9179312)	kit	25802
Ultra USLC Method Development Toolbox	3 µm, 3.0 mm x 100 mm	(1) each: Biphenyl (910931E), Aqueous C18 (917831E), IBD (917531E), PFP Propyl (917931E)	kit	25803
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109552), Aqueous C18 (9178552), IBD (9175552), PFP Propyl (9179552)	kit	25804
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109512), Aqueous C18 (9178512), IBD (9175512), PFP Propyl (9179512)	kit	25805
Ultra USLC Method Development Toolbox	5 µm, 4.6 mm x 150 mm	(1) each: Biphenyl (9109565), Aqueous C18 (9178565), IBD (9175565), PFP Propyl (9179565)	kit	25806

Mobile Phase Management 101

Neatly Keep Mobile Phase Lines Where They Belong

Hub-Cap Bottle Tops and Adaptors
See **page 340**.

Hub-Cap (assembly of the bottle cap and plug)

Transfer and Filter Mobile Phase in a Single Step

Hub-Cap Filters
See **page 341**.

Extend Column Life

Bluestem Glass Solvent Filter
See **page 343**.

Avoid Messy Spills Around Mobile Phase Waste Containers

Waste Overflow Indicator
See **page 341**.

Prepare and Maintain Mobile Phases Without Dissolved Gas or Unnecessary Costs

Mobile Phase Sparge Filter
See **page 342**.

Pinnacle® DB Columns: 1.9, 3, or 5 µm particles; 140 Å pore size

Restek® Pinnacle® DB columns are built for optimal UHPLC performance.

Pinnacle® DB columns are 100% manufactured by Restek in our Bellefonte, Pennsylvania, facility. Because performance begins with the support, our Pinnacle® DB UHPLC columns start with base-deactivated spherical silica that is optimized for UHPLC stability. From there, we bond them with a wide variety of phases to give chromatographers a stable and selective column. Get the most out of your UHPLC system. Combine selectivity and efficiency by using Restek® Pinnacle® DB UHPLC columns.

Pinnacle® DB Aqueous C18 Columns (USP L1)

Restek-manufactured silica

Chromatographic Properties

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9418232	—	—
50 mm	9418252	—	—
100 mm	9418212	—	—
3 µm Columns			
30 mm	9418332	941833E	9418335
50 mm	9418352	941835E	9418355
100 mm	9418312	941831E	9418315
150 mm	9418362	941836E	9418365
5 µm Columns			
30 mm	9418532	941853E	9418535
50 mm	9418552	941855E	9418555
100 mm	9418512	941851E	9418515
150 mm	9418562	941856E	9418565
200 mm	9418522	941852E	9418525
250 mm	9418572	941857E	9418575

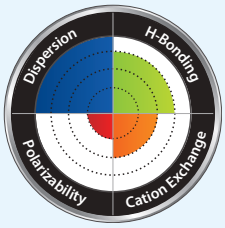
Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

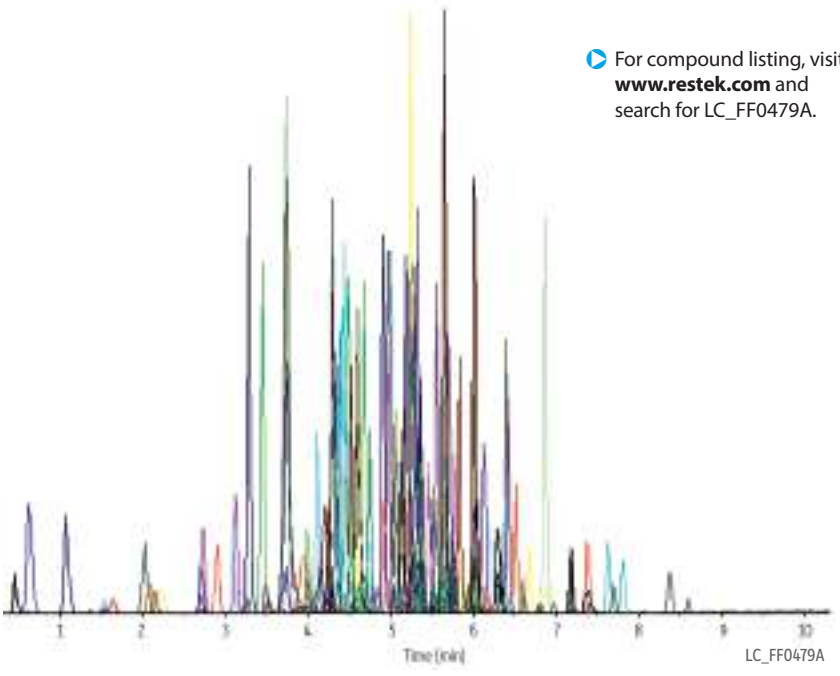
Aqueous C18

USLC® Column Interaction Profile

(See page 161 for more information.)



Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI+)



For compound listing, visit **www.restek.com** and search for LC_FF0479A.

Column	Pinnacle® DB Aqueous C18 (cat.# 9418252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	35 °C
Sample	multicomponent pesticide standard
Diluent:	water
Conc.:	33.3 ppb each pesticide
Inj. Vol.:	5 µL
Mobile Phase	
A:	10 mM NH_4OAc in water
B:	10 mM NH_4OAc in methanol

Time (min)	%B
0	10
1	10
8	90
10	90
11	10

Flow:	0.60 mL/min
Max Pressure:	~517 bar
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	4000 QTRAP® LC-MS/MS system
Ion Source:	TurboIonSpray®
Ion Spray Voltage:	5 kV
Gas 1:	40 psi (275.8 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	500 °C
Instrument	Shimadzu UFLCXR

Restek-manufactured silica

Pinnacle® DB IBD UHPLC Columns (USP L68)

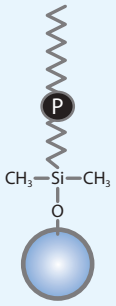
Chromatographic Properties

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

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

Column Characteristics:

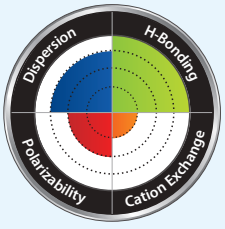
particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



IBD

USLC® Column Interaction Profile

(See page 161 for more information.)



Protect your column and your UHPLC performance with UltraShield and UltraLine UHPLC filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system.

See **page 188**.

www.restek.com/**LCguard**

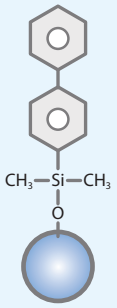
Pinnacle® DB Biphenyl Columns (USP L11)

Restek-manufactured silica

Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9409232	—	—
50 mm	9409252	—	—
100 mm	9409212	—	—
3 µm Columns			
30 mm	9409332	940933E	9409335
50 mm	9409352	940935E	9409355
100 mm	9409312	940931E	9409315
150 mm	9409362	940936E	9409365
5 µm Columns			
30 mm	9409532	940953E	9409535
50 mm	9409552	940955E	9409555
100 mm	9409512	940951E	9409515
150 mm	9409562	940956E	9409565
200 mm	9409522	940952E	9409525
250 mm	9409572	940957E	9409575



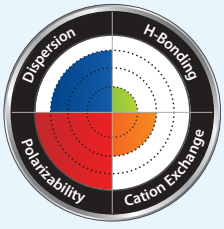
Biphenyl

Column Characteristics:

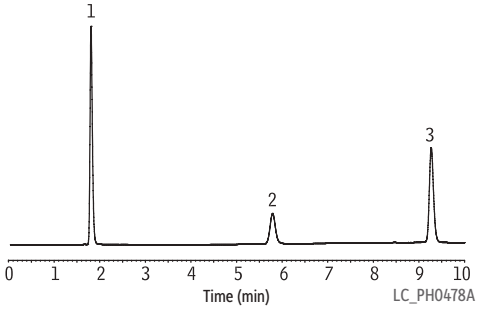
particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

USLC® Column Interaction Profile

(See page 161 for more information.)



NSAIDs on Pinnacle® DB Biphenyl



Peaks
1. Uracil (void marker)
2. Tenoxicam
3. Sulfinpyrazone

Column	Pinnacle® DB Biphenyl (cat.# 9409565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	
Diluent:	0.1% formic acid in water:methanol (40:60)
Conc.:	100 µg/mL each component (see peak list)
Inj. Vol.:	10 µL
Mobile Phase	
A:	0.1% formic acid in water
B:	methanol

Time (min)	%B
0.00	60
2.0	60
8.0	90
20.0	90
20.1	60

Flow:	1.0 mL/min
Detector	UV/Vis @ 254 nm
Instrument	Shimadzu Prominence

Pinnacle® DB PFP Propyl Columns (USP L43)

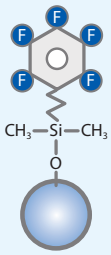
Restek-manufactured silica

Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Column Characteristics:

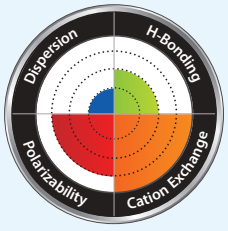
particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



PFP Propyl

USLC® Column Interaction Profile

(See page 161 for more information.)



Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9419232	—	—
50 mm	9419252	—	—
100 mm	9419212	—	—
3 µm Columns			
30 mm	9419332	941933E	9419335
50 mm	9419352	941935E	9419355
100 mm	9419312	941931E	9419315
150 mm	9419362	941936E	9419365
5 µm Columns			
30 mm	9419532	941953E	9419535
50 mm	9419552	941955E	9419555
100 mm	9419512	941951E	9419515
150 mm	9419562	941956E	9419565
200 mm	9419522	941952E	9419525
250 mm	9419572	941957E	9419575

Pinnacle® DB C18 Columns (USP L1)

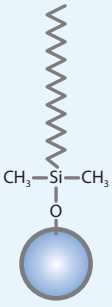
Restek-manufactured silica

Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18



C18

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9414232	—	—
50 mm	9414252	—	—
100 mm	9414212	—	—
3 µm Columns			
30 mm	9414332	941433E	9414335
50 mm	9414352	941435E	9414355
100 mm	9414312	941431E	9414315
5 µm Columns			
30 mm	9414532	941453E	9414535
50 mm	9414552	941455E	9414555
100 mm	9414512	941451E	9414515
150 mm	9414562	941456E	9414565
200 mm	9414522	941452E	9414525
250 mm	9414572	941457E	9414575

also available

Trident Direct Guard Column System

See page 189.

Looking for an equivalent column?

Restek has extensively studied column selectivity and can provide you with an accurate recommendation. Please contact Restek® Technical Support or your local Restek® representative.

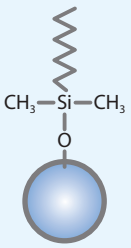
Pinnacle® DB C8 Columns (USP L7)

Restek-manufactured silica

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9413232	—	—
50 mm	9413252	—	—
100 mm	9413212	—	—
3 µm Columns			
30 mm	9413332	941333E	9413335
50 mm	9413352	941335E	9413355
100 mm	9413312	941331E	9413315
5 µm Columns			
30 mm	9413532	941353E	9413535
50 mm	9413552	941355E	9413555
100 mm	9413512	941351E	9413515
150 mm	9413562	941356E	9413565
200 mm	9413522	941352E	9413525
250 mm	9413572	941357E	9413575



C8

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

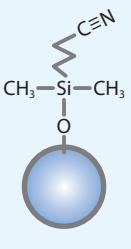
Pinnacle® DB Cyano Columns (USP L10)

Restek-manufactured silica

Chromatographic Properties

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9416232	—	—
50 mm	9416252	—	—
100 mm	9416212	—	—
5 µm Columns			
30 mm	9416532	941653E	9416535
50 mm	9416552	941655E	9416555
100 mm	9416512	941651E	9416515
150 mm	9416562	941656E	9416565
200 mm	9416522	941652E	9416525
250 mm	9416572	941657E	9416575



Cyano

Column Characteristics:

particle size:	1.9 µm or 5 µm, spherical
pore size:	140 Å
carbon load:	4%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane

Whether it's on our new Raptor™ SPP or the proven Pinnacle® DB and Ultra supports, Restek's LC Manufacturing group bonds our silica with stationary phases that offer maximum selectivity and reliability.

Pinnacle® DB Silica Columns (USP L3)

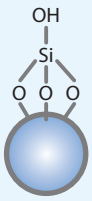
Restek-manufactured silica

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none



Silica

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns			
30 mm	9410232	—	—
50 mm	9410252	—	—
100 mm	9410212	—	—
3 µm Columns			
30 mm	9410332	941033E	9410335
50 mm	9410352	941035E	9410355
100 mm	9410312	941031E	9410315
150 mm	9410362	941036E	9410365
5 µm Columns			
30 mm	9410532	941053E	9410535
50 mm	9410552	941055E	9410555
100 mm	9410512	941051E	9410515
150 mm	9410562	941056E	9410565
200 mm	9410522	941052E	9410525
250 mm	9410572	941057E	9410575

Pinnacle® DB PAH UHPLC Columns

Restek-manufactured silica

Chromatographic Properties

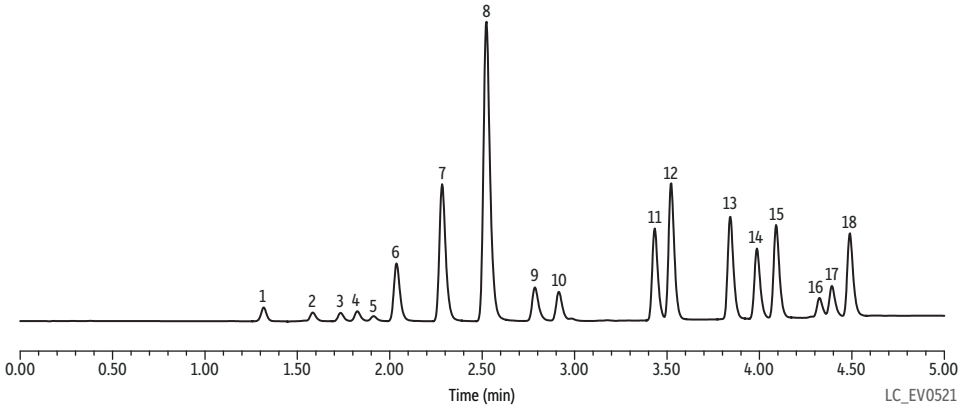
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs, plus two other routinely analyzed PAH compounds, in less than five minutes to greatly reduce run times and increase sample throughput.

Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

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

PAH Mix on Pinnacle® DB PAH



Peaks
1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	EPA Method 8310 PAH Mixture (cat.# 31841)
Diluent:	acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL

Mobile Phase
A: water
B: acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

Max Pressure: 724 bar
Detector Photo diode array @ 254, 4.8 nm
Instrument Waters

Ultra HPLC Columns: 3 or 5 µm particles; 100 Å pore size

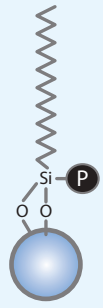
The Ultra line represents Restek's broadest selection of stationary phases on a single silica support. Made of high-purity, type-B silica that minimizes activity and creates high-density bonding, these columns are designed for selective and reliable HPLC applications.

Ultra Aqueous C18 Columns (USP L1)

Chromatographic Properties

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9178332	917833E	9178335
50 mm	9178352	917835E	9178355
100 mm	9178312	917831E	9178315
150 mm	9178362	917836E	9178365
5 µm Columns			
30 mm	9178532	917853E	9178535
50 mm	9178552	917855E	9178555
100 mm	9178512	917851E	9178515
150 mm	9178562	917856E	9178565
200 mm	9178522	917852E	9178525
250 mm	9178572	917857E	9178575

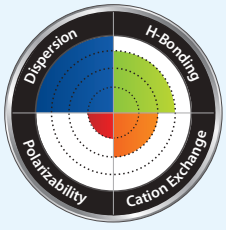


Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

Aqueous C18

USLC® Column Interaction Profile
(See page 161 for more information.)

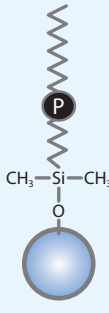


Ultra IBD Columns (USP L68)

Chromatographic Properties

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9175332	917533E	9175335
50 mm	9175352	917535E	9175355
100 mm	9175312	917531E	9175315
150 mm	9175362	917536E	9175365
5 µm Columns			
30 mm	9175532	917553E	9175535
50 mm	9175552	917555E	9175555
100 mm	9175512	917551E	9175515
150 mm	9175562	917556E	9175565
200 mm	9175522	917552E	9175525
250 mm	9175572	917557E	9175575

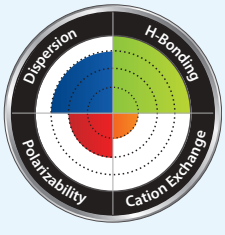


Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl

IBD

USLC® Column Interaction Profile
(See page 161 for more information.)



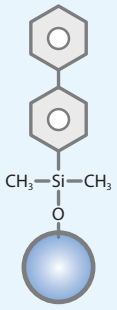
Ultra Biphenyl Columns (USP L11)

Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



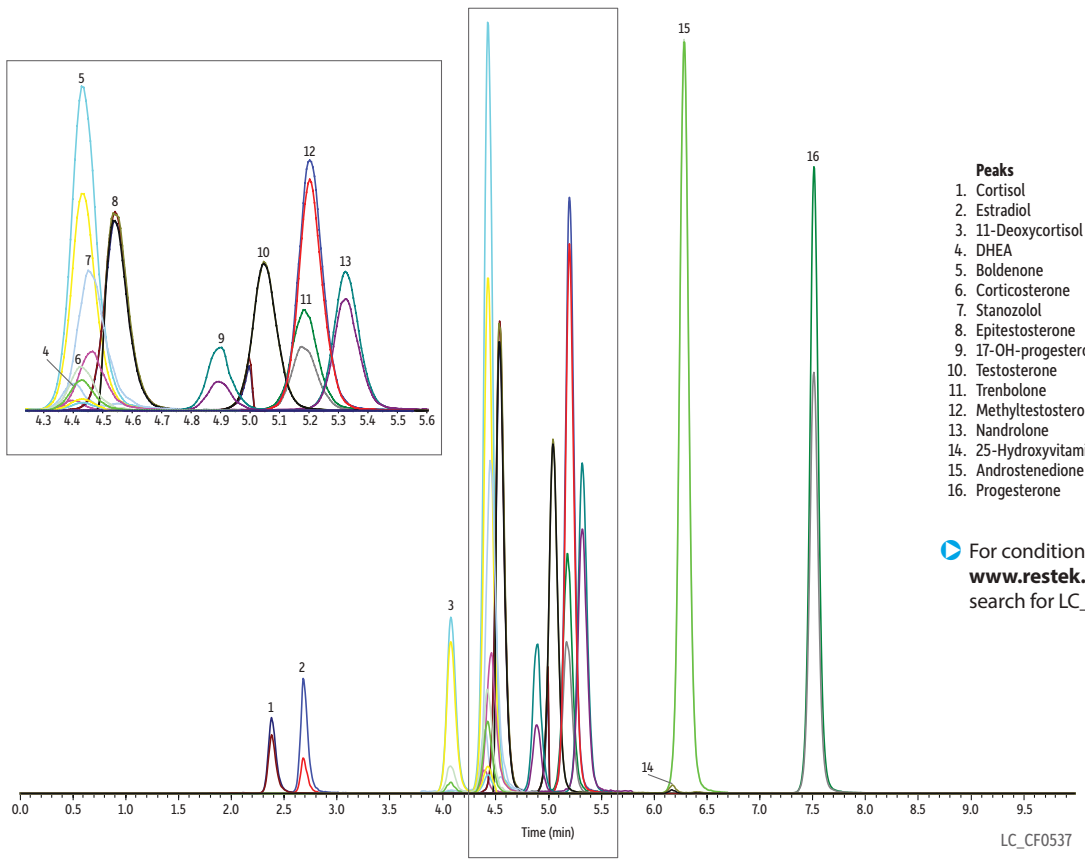
Biphenyl

USLC® Column Interaction Profile

(See page 161 for more information.)

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9109332	910933E	9109335
50 mm	9109352	910935E	9109355
100 mm	9109312	910931E	9109315
150 mm	9109362	910936E	9109365
5 µm Columns			
30 mm	9109532	910953E	9109535
50 mm	9109552	910955E	9109555
100 mm	9109512	910951E	9109515
150 mm	9109562	910956E	9109565
200 mm	9109522	910952E	9109525
250 mm	9109572	910957E	9109575

Steroid Panel Analysis on the Ultra Biphenyl



Peaks	t_R (min)
1. Cortisol	2.3
2. Estradiol	2.6
3. 11-Deoxycortisol	4.0
4. DHEA	4.3
5. Boldenone	4.4
6. Corticosterone	4.4
7. Stanozolol	4.4
8. Epitestosterone	4.5
9. 17-OH-progesterone	4.8
10. Testosterone	5.0
11. Trenbolone	5.1
12. Methyltestosterone	5.1
13. Nandrolone	5.3
14. 25-Hydroxyvitamin D3	6.1
15. Androstenedione	6.2
16. Progesterone	7.5

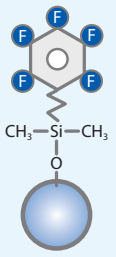
For conditions, visit **www.restek.com** and search for LC_CF0537.

Ultra PFP Propyl Columns (USP L43)

Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9179332	917933E	9179335
50 mm	9179352	917935E	9179355
100 mm	9179312	917931E	9179315
150 mm	9179362	917936E	9179365
5 µm Columns			
30 mm	9179532	917953E	9179535
50 mm	9179552	917955E	9179555
100 mm	9179512	917951E	9179515
150 mm	9179562	917956E	9179565
200 mm	9179522	917952E	9179525
250 mm	9179572	917957E	9179575

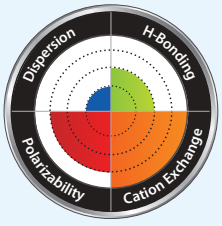


Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl

PFP Propyl

USLC® Column Interaction Profile
(See page 161 for more information.)

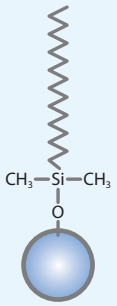


Ultra C18 Columns (USP L1)

Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9174332	917433E	—	9174335
50 mm	9174352	917435E	—	9174355
100 mm	9174312	917431E	—	9174315
150 mm	9174362	917436E	—	9174365
5 µm Columns				
30 mm	9174532	917453E	—	9174535
50 mm	9174552	917455E	—	9174555
100 mm	9174512	917451E	9174514	9174515
150 mm	9174562	917456E	9174564	9174565
200 mm	9174522	917452E	—	9174525
250 mm	9174572	917457E	—	9174575



Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

C18

also available

200+ compound multiresidue pesticides standard kits for LC-MS/MS and GC-MS/MS!

See **pages 568–571**.

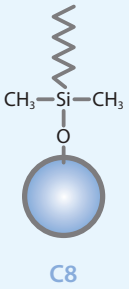
Ultra C8 Columns (USP L7)

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9103332	910333E	—	9103335
50 mm	9103352	910335E	—	9103355
100 mm	9103312	910331E	—	9103315
150 mm	9103362	910336E	—	9103365
5 µm Columns				
30 mm	9103532	910353E	—	9103535
50 mm	9103552	910355E	—	9103555
100 mm	9103512	910351E	9103514	9103515
150 mm	9103562	910356E	9103564	9103565
200 mm	9103522	910352E	—	9103525
250 mm	9103572	910357E	—	9103575

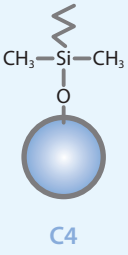
Ultra C4 Columns (USP L26)

Chromatographic Properties

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

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L26
phase category:	C4, butylsilane
ligand type:	monomeric C4



Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9102332	910233E	9102335
50 mm	9102352	910235E	9102355
100 mm	9102312	910231E	9102315
150 mm	9102362	910236E	9102365
5 µm Columns			
30 mm	9102532	910253E	9102535
50 mm	9102552	910255E	9102555
100 mm	9102512	910251E	9102515
150 mm	9102562	910256E	9102565
200 mm	9102522	910252E	9102525
250 mm	9102572	910257E	9102575

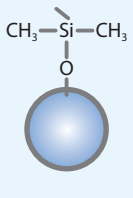
Our LC Manufacturing experts follow tightly controlled processes to ensure that you receive robust and reliable columns every time you order from Restek.

Ultra C1 Columns (USP L13)

Chromatographic Properties

This exceptionally stable C1 phase features our least-retentive reversed-phase hydrocarbon packing.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9101332	910133E	9101335
50 mm	9101352	910135E	9101355
100 mm	9101312	910131E	9101315
150 mm	9101362	910136E	9101365
5 µm Columns			
30 mm	9101532	910153E	9101535
50 mm	9101552	910155E	9101555
100 mm	9101512	910151E	9101515
150 mm	9101562	910156E	9101565
200 mm	9101522	910152E	9101525
250 mm	9101572	910157E	9101575



Column Characteristics:

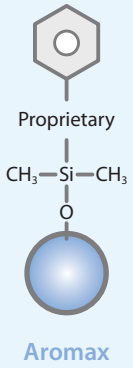
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	5%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L13
phase category:	trimethylsilane
ligand type:	monomeric C1

Ultra Aromax Columns (USP L11)

Chromatographic Properties

Ultra Aromax is a unique reversed-phase material that exhibits extreme retention and selectivity for aromatic and/or unsaturated compounds. This column is a great alternative to our Biphenyl phase when increased retention is required, and it's an excellent choice for gradient LC-MS analyses when conventional columns are not giving adequate retention or selectivity.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9127332	912733E	9127335
50 mm	9127352	912735E	9127355
100 mm	9127312	912731E	9127315
150 mm	9127362	912736E	9127365
5 µm Columns			
30 mm	9127532	912753E	9127535
50 mm	9127552	912755E	9127555
100 mm	9127512	912751E	9127515
150 mm	9127562	912756E	9127565
200 mm	9127522	912752E	9127525
250 mm	9127572	912757E	9127575



Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	17%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L11
phase category:	phenyl
ligand type:	proprietary phenyl ligand

All the Right Tools—
All in One Toolbox

Get all four USLC® stationary phases in one convenient package.

- Available for UHPLC (1.9 µm) and HPLC (3 or 5 µm) in 50, 100, or 150 mm lengths.
- Included selection guide makes it even easier to pick the right column the first time.

See **page 162**.

www.restek.com/**uslc**

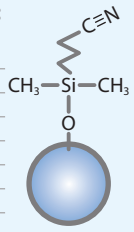
Ultra Cyano Columns (USP L10)

Chromatographic Properties

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane



Cyano

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9106332	910633E	9106335
50 mm	9106352	910635E	9106355
100 mm	9106312	910631E	9106315
150 mm	9106362	910636E	9106365
5 µm Columns			
30 mm	9106532	910653E	9106535
50 mm	9106552	910655E	9106555
100 mm	9106512	910651E	9106515
150 mm	9106562	910656E	9106565
200 mm	9106522	910652E	9106525
250 mm	9106572	910657E	9106575

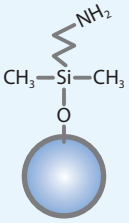
Ultra Amino Columns (USP L8)

Chromatographic Properties

The general-purpose Restek® Amino is an aminopropylsilane that offers reproducible retention and efficiency. It is a great choice for the normal-phase or HILIC analysis of simple sugars.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	2%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L8
phase category:	amino
ligand type:	aminopropylsilane



Amino

Length	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns		
30 mm	910733E	9107335
50 mm	910735E	9107355
100 mm	910731E	9107315
150 mm	910736E	9107365
5 µm Columns		
30 mm	910753E	9107535
50 mm	910755E	9107555
100 mm	910751E	9107515
150 mm	910756E	9107565
200 mm	910752E	9107525
250 mm	910757E	9107575

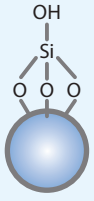
Ultra Silica Columns (USP L3)

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none



Silica

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns			
30 mm	9100332	910033E	9100335
50 mm	9100352	910035E	9100355
100 mm	9100312	910031E	9100315
150 mm	9100362	910036E	9100365
5 µm Columns			
30 mm	9100532	910053E	9100535
50 mm	9100552	910055E	9100555
100 mm	9100512	910051E	9100515
150 mm	9100562	910056E	9100565
200 mm	9100522	910052E	9100525
250 mm	9100572	910057E	9100575

Viva HPLC Columns: 3 or 5 µm particles; 300 Å pore size

Restek-manufactured silica

- Excellent for separating peptides or proteins.
- Rugged, spherical particles with 300 Å pore size.
- High proportion of pore/surface area available to large molecules.

Viva columns are based on a wide pore material we designed for optimal large-molecule separations. In developing Viva silica, we found that although many commercial wide-pore silicas meet the standard 300 Å mean pore size, most have very broad distributions about this mean, with a significant portion of their pore volume falling below 150 Å. This means a large portion of the surface area is unavailable to larger molecules. Viva columns have a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

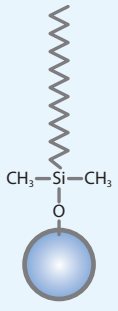
Viva C18 Columns (USP L1)

Restek-manufactured silica

Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9514331	9514332	951433E	9514335
50 mm	9514351	9514352	951435E	9514355
100 mm	9514311	9514312	951431E	9514315
150 mm	9514361	9514362	951436E	9514365
5 µm Columns				
30 mm	9514531	9514532	951453E	9514535
50 mm	9514551	9514552	951455E	9514555
100 mm	9514511	9514512	951451E	9514515
150 mm	9514561	9514562	951456E	9514565
200 mm	9514521	9514522	951452E	9514525
250 mm	9514571	9514572	951457E	9514575



C18

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	300 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

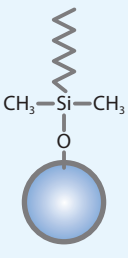
Viva C8 Columns (USP L7)

Restek-manufactured silica

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9513531	9513532	951353E	9513535
50 mm	9513551	9513552	951355E	9513555
100 mm	9513511	9513512	951351E	9513515
150 mm	9513561	9513562	951356E	9513565
200 mm	9513521	9513522	951352E	9513525
250 mm	9513571	9513572	951357E	9513575



C8

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

Viva C4 Columns (USP L26)

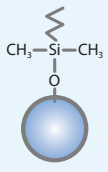
Restek-manufactured silica

Chromatographic Properties

Base-deactivated, wide-pore packing exhibits excellent peak shape for a wide range of compounds. Less retention in reversed-phase assays than Viva C18 or Viva C8.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	3.5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L26
phase category:	C4, butylsilane
ligand type:	monomeric C4



C4

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9512531	9512532	951253E	9512535
50 mm	9512551	9512552	951255E	9512555
100 mm	9512511	9512512	951251E	9512515
150 mm	9512561	9512562	951256E	9512565
200 mm	9512521	9512522	951252E	9512525
250 mm	9512571	9512572	951257E	9512575

Viva Biphenyl Columns (USP L11)

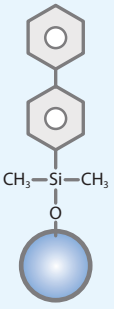
Restek-manufactured silica

Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	7%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



Biphenyl

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9516531	9516532	951653E	9516535
50 mm	9516551	9516552	951655E	9516555
100 mm	9516511	9516512	951651E	9516515
150 mm	9516561	9516562	951656E	9516565
200 mm	9516521	9516522	951652E	9516525
250 mm	9516571	9516572	951657E	9516575

Viva PFP Propyl Columns (USP L43)

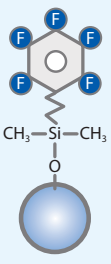
Restek-manufactured silica

Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



PFP Propyl

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9519531	9519532	951953E	9519535
50 mm	9519551	9519552	951955E	9519555
100 mm	9519511	9519512	951951E	9519515
150 mm	9519561	9519562	951956E	9519565
200 mm	9519521	9519522	951952E	9519525
250 mm	9519571	9519572	951957E	9519575

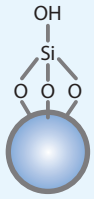
Restek-manufactured silica

Viva Silica Columns (USP L3)

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9510531	9510532	951053E	9510535
50 mm	9510551	9510552	951055E	9510555
100 mm	9510511	9510512	951051E	9510515
150 mm	9510561	9510562	951056E	9510565
200 mm	9510521	9510522	951052E	9510525
250 mm	9510571	9510572	951057E	9510575



Silica

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

Choose Cost-Effective Restek® LC Kits

For Your Preventative Maintenance

- Significant savings over instrument manufacturer prices.
- High-quality components in every kit.
- Wide range of options for LC systems and pumps.

See **page 321** for Agilent-system kits or **page 329** for Waters-system kits.

25270

25145

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Application-Specific LC Phases

Pinnacle® II PAH HPLC Columns

Restek-manufactured silica

Chromatographic Properties

Developed specifically for challenging analyses of polycyclic aromatic hydrocarbons (PAHs). The Pinnacle® II PAH stationary phase incorporates a proprietary C18 bonding that enables unique shape selectivity to baseline-resolve all 16 PAHs listed in U.S. EPA Method 610 plus two other routinely analyzed PAH compounds. Every lot of Pinnacle® II PAH bonded phase material is tested to ensure baseline resolution of the Method 610 PAHs using a simple water/acetonitrile mobile phase gradient. Further, because we make Pinnacle® II PAH columns using our own silica, we have greater control over quality and reproducibility. If you are analyzing PAHs using HPLC, Pinnacle® II PAH columns are a reliable, cost-effective choice.

Column Characteristics:

particle size:	4 µm, spherical
pore size:	110 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
4 µm Columns			
50 mm	9219452	921945E	9219455
100 mm	9219412	921941E	9219415
150 mm	9219462	921946E	9219465
200 mm	9219422	921942E	9219425
250 mm	9219472	921947E	9219475

Pinnacle® II PAH Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Pinnacle II PAH Guard Cartridge	921950212	921950210

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International Technical Service
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Pinnacle® DB PAH UHPLC Columns

Restek-manufactured silica

Chromatographic Properties

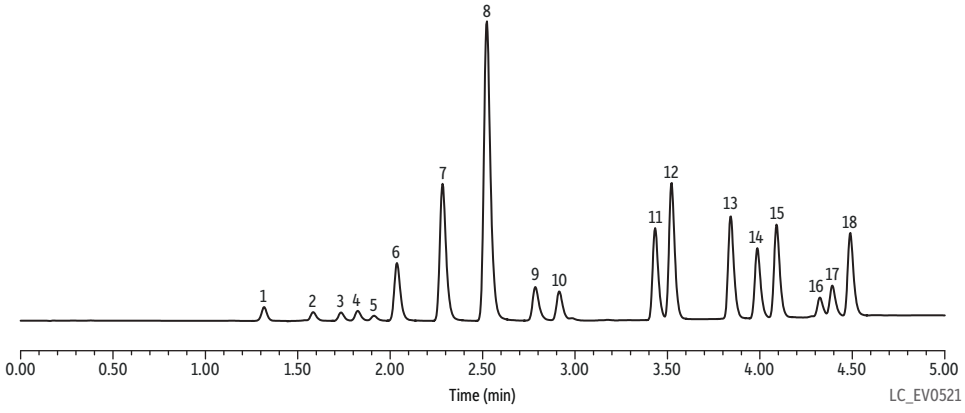
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs, plus two other routinely analyzed PAH compounds, in less than five minutes to greatly reduce run times and increase sample throughput.

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

Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

PAH Mix on Pinnacle® DB PAH



Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	EPA Method 8310 PAH Mixture (cat.# 31841)
Diluent:	acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL
Mobile Phase	
A:	water
B:	acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

Max Pressure:	724 bar
Detector	Photo diode array @ 254, 4.8 nm
Instrument	Waters

Peaks

1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column Characteristics:

particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C

Allure® AK Columns

Chromatographic Properties

This highly retentive, highly selective phase—unique to Restek—was developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. Allure® AK is a reversed-phase HPLC material that has the unique ability to separate all 13 carbonyl compounds specified in California Air Resources Board (CARB) Method #1004 using a simple acetonitrile/water gradient. Other columns require long analysis times or the use of tetrahydrofuran.

Length	3.2 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns with Trident Integral Inlet Fittings		
200 mm	9159523-700	9159525-700

Allure® AK Guard Cartridge

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

QUALITY ISO 9001 • 17025 • Guide 34

Restek Offers a Full Line of Certified Reference Materials

Learn more on **pages 464–465**.

www.restek.com/iso

Allure® Organic Acids Columns

Chromatographic Properties

Allure® Organic Acids columns provide enhanced retention and selectivity for polar organic acids, allowing the separation to be performed on a single 30 cm column. An Allure® Organic Acids column effectively resolves key organic acids such as tartaric and quinic acids using the chromatographic conditions specified in AOAC method 986.13. Retention is stable and reproducible, even with the 100% aqueous mobile phase specified in the AOAC method.

Column Characteristics:

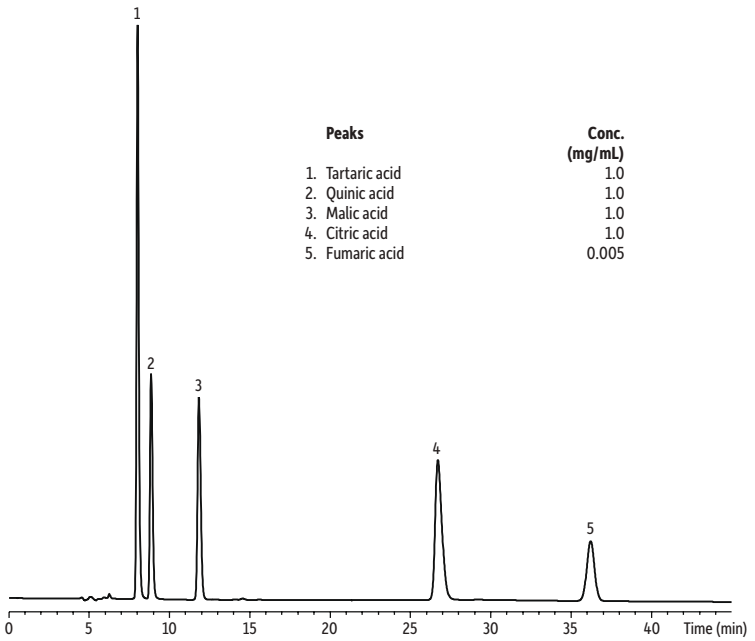
particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Column		
150 mm	916556E	9165565
250 mm	—	9165575
300 mm	—	9165585

Allure® Organic Acids Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Allure Organic Acids Guard Cartridge	916550212	916550210

Organic Acids Standard on Allure® Organic Acids



Peaks	Conc. (mg/mL)
1. Tartaric acid	1.0
2. Quinic acid	1.0
3. Malic acid	1.0
4. Citric acid	1.0
5. Fumaric acid	0.005

LC_0238

Column	Allure® Organic Acids (cat.# 9165585)
Dimensions:	300 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	60 Å
Temp.:	ambient
Sample	standard solution
Diluent:	water
Inj. Vol.:	10.0 µL
Mobile Phase	100 mM phosphate buffer, pH 2.5
Flow:	0.5 mL/min
Detector	UV/Vis @ 226 nm

Ultra Carbamate Columns

Chromatographic Properties

Restek chemists developed the Ultra Carbamate column specifically for carbamates analysis. The unique packing separates 10 target carbamates in just over 10 minutes. The column is compatible with fluorescence or LC-MS detection.* An Ultra Carbamate column can process as many as three samples per hour, versus less than two samples per hour on a general-purpose C18 column. In addition to increased sample throughput, this much faster analysis will significantly reduce solvent usage—and the costs of disposing of solvent waste.

Column Characteristics:

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

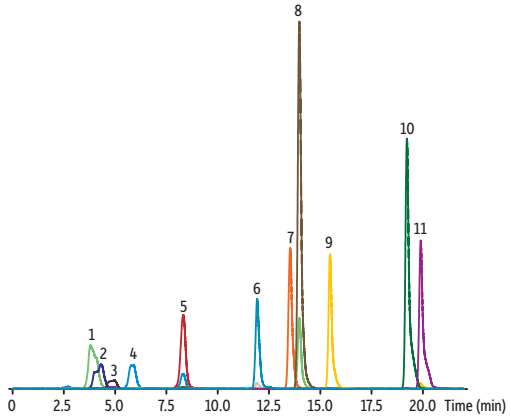
Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
50 mm	9177352	917735E	9177354	9177355
100 mm	9177312	917731E	—	9177315
5 µm Columns				
250 mm	—	—	—	9177575

*For post-column derivatization/fluorescence detection applications using a 4.6 mm ID column, the total system dead volume, including the post-column reactor, must be less than 650 µL. For standard post-column reactor systems, we recommend a 250 mm x 4.6 mm, 5 µm column. Contact Restek® Technical Service or your local Restek® representative for more information.

Ultra Carbamate Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Carbamate Guard Cartridge	917750212	917750210

Carbamates on Ultra Carbamate



LC_FF0473

Peaks
1. Aldicarb sulfone
2. Aldicarb sulfoxide
3. Oxamyl
4. Methomyl
5. 3-Hydroxycarbofuran
6. Aldicarb
7. Propoxur
8. Carbofurane
9. Carbaryl
10. Methiocarb
11. BDMC (IS)

Column	Ultra Carbamate (cat.# 9177352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	531.1 Carbamate Pesticide Calibration Mixture (cat.# 32273) 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (cat.# 32274)
Diluent:	methanol
Conc.:	50 µg/mL
Inj. Vol.:	1 µL
Mobile Phase	
A:	2 mM ammonium acetate:methanol (v/v, 90/10)
B:	2 mM ammonium acetate:methanol (v/v, 10/90)

Time (min)	%A	%B
0.00	80	20
20	0	100
25	0	100

Flow:	0.2 mL/min
Detector	LECO Unique® TOFMS
Run Length:	25 min
Ionization Source Type:	high flow ESI
Ion Mode:	positive
Desolvation Temp.:	130 °C
Nebulizing Pressure:	100 kPa
Desolvation Gas (N_2):	4 L/min
Interface Temp.:	120 °C
Nozzle Voltage:	62 V
Capillary Voltage:	2.75 kV
Instrument	Agilent 1100
Acknowledgement	LECO Corporation

Ultra Quat Columns

Chromatographic Properties

A retentive, high-purity, base-deactivated, reversed-phase packing. Ideal for the analysis of paraquat and diquat or other quaternary amines.

Length	2.1 mm ID cat.#	4.6 mm ID cat.#
3 µm Column		
50 mm	9181352	—
5 µm Column		
150 mm	—	9181565

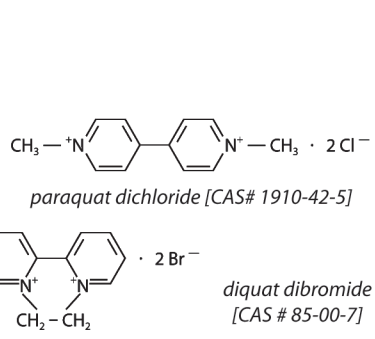
Column Characteristics:

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

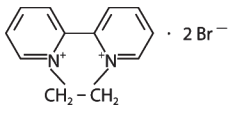
Ultra Quat Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Quat Guard Cartridge	918150212	918150210

Paraquat and Diquat on Ultra Quat



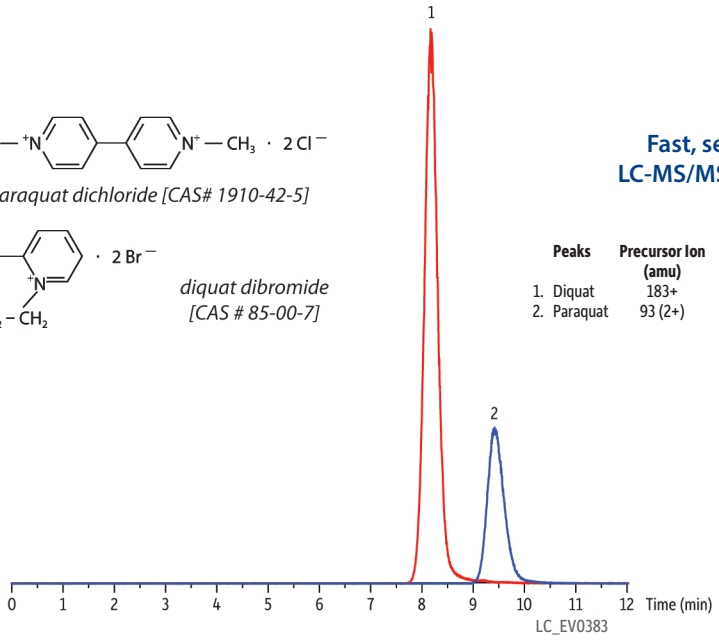
paraquat dichloride [CAS# 1910-42-5]



diquat dibromide [CAS # 85-00-7]

Fast, sensitive LC-MS/MS analysis!

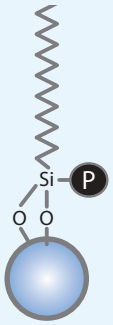
Peaks	Precursor Ion (amu)	Fragment Ion (amu)	DP (V)	Collision Energy (eV)
1. Diquat	183+	157+	30	30
2. Paraquat	93 (2+)	171+	20	20



Column	Ultra Quat (cat.# 9181352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	DI Water
Conc.:	5 µg/mL each component
Inj. Vol.:	10 µL
Mobile Phase	10 mM heptafluorobutyric acid:acetonitrile (95:5)
Flow:	0.3 mL/min
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	API 3200™ MS/MS system
Ion Source:	Electrospray
Ion Mode:	ESI+
Ion Spray Voltage:	5.5 kV
Curtain Gas:	15 psi (103.4 kPa)
Gas 1:	70 psi (482.6 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	600 °C
Mode:	MRM
Dwell Time:	200 ms
Instrument	Applied Biosystems/MDS Sciex LC-MS/MS System
Notes	Collision exit potential: 3V Q1/Q3: unit resolution
Acknowledgement	Data courtesy of Houssain El Aribi, Ph.D., LC/MS Product and Application Specialist, MDS SCIEX, 71 Four Valley Drive, Concord, Ontario, Canada, L4K 4V8

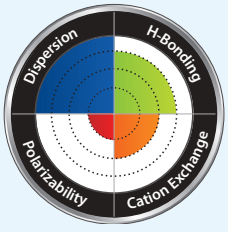
Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18



Aqueous C18

USLC® Column Interaction Profile
(See page 161 for more information.)



Ultra Preparative Columns

Using Restek® Ultra columns for preparative applications can save you time, solvents, and money. By utilizing the right phase for your prep analysis, you can make sure your peaks are resolved and your compounds are pure. The Ultra line has high loading and features high-purity silica.

USLC® Phases for Preparative HPLC

Ultra Aqueous C18 HPLC Prep Columns

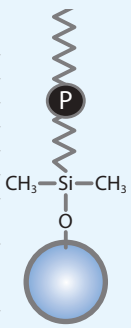
Chromatographic Properties

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

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

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



IBD

USLC® Column Interaction Profile
(See page 161 for more information.)

Ultra IBD HPLC Prep Columns

Chromatographic Properties

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

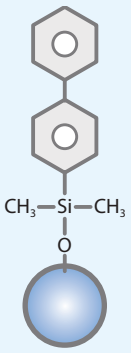
Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
5 µm Columns			
50 mm	9175557	9175558	9175559
100 mm	9175517	9175518	9175519
150 mm	9175567	9175568	9175569
250 mm	9175577	9175578	9175579

Ultra Biphenyl Prep Columns

Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
5 µm Columns			
50 mm	9109557	9109558	9109559
100 mm	9109517	9109518	9109519
150 mm	9109567	9109568	9109569
250 mm	9109577	9109578	9109579

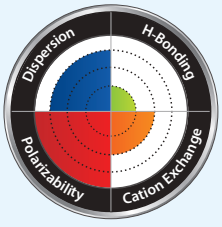


Biphenyl

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

USLC® Column Interaction Profile
(See page 161 for more information.)

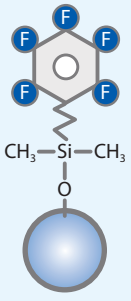


Ultra PFP Propyl Prep Columns

Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
5 µm Columns			
50 mm	9179557	9179558	9179559
100 mm	9179517	9179518	9179519
150 mm	9179567	9179568	9179569
250 mm	9179577	9179578	9179579

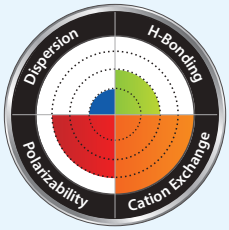


PFP Propyl

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluoro-phenyl propyl

USLC® Column Interaction Profile
(See page 161 for more information.)



Before You Buy a Prep Column...

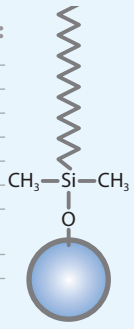
PLEASE NOTE: We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot reuse a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

Traditional Phases for Preparative HPLC

Ultra C18 HPLC Prep Columns

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18



C18

Chromatographic Properties

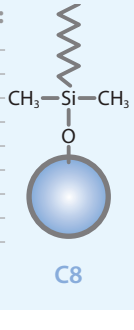
The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

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

Ultra C8 HPLC Prep Columns

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



C8

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

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

Before You Buy a Prep Column...

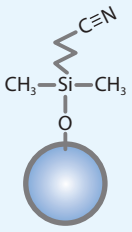
PLEASE NOTE: We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot reuse a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

Ultra Cyano HPLC Prep Columns

Chromatographic Properties

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

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



Cyano

Column Characteristics:

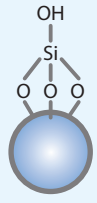
particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropyl silane

Ultra Silica HPLC Prep Columns

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

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



Silica

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

Ultra Bulk Packing Materials (5 µm)

Use our bulk packing materials to pack your own columns!

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

Our extensive QC program ensures the high quality and reproducibility of these silicas. You can be confident that you are getting consistent, high-quality product when you source your silica from Restek.

Use these materials for easy scale-up to preparative chromatography or for packing your own columns.

Description	qty.	cat.#
5 µm Ultra Bulk Packing Materials		
Ultra C1 Bulk Packing	10 g/btl.	91015
Ultra C4 Bulk Packing	10 g/btl.	91025
Ultra C8 Bulk Packing	10 g/btl.	91035
Ultra C18 Bulk Packing	10 g/btl.	91745
Ultra Amino Bulk Packing	10 g/btl.	91075
Ultra Cyano Bulk Packing	10 g/btl.	91065
Ultra Silica Bulk Packing	10 g/btl.	91005

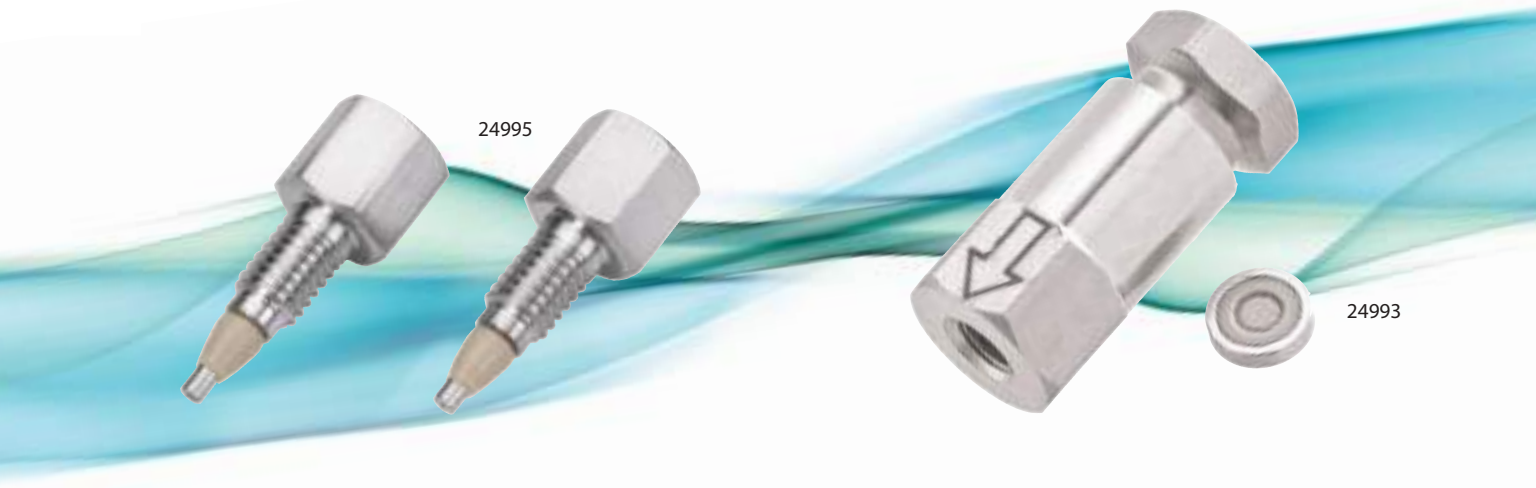
also available

Other stationary phases and particle sizes are also available in bulk; call Customer Service or your local Restek® representative for details.

Protect Your Column and Your UHPLC Performance With UltraShield and UltraLine UHPLC Filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system

Use with any UHPLC system



UltraShield UHPLC PreColumn Filter

- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Universal fit—connects easily to any brand column.
- Leak-tight to 15,000 psi (1,034 bar).
- 0.5 µm or 0.2 µm titanium frit in a stainless steel body with PEEK ferrule.

Specifications:

Inlet/Outlet:	Female/Male 10-32
Port Geometry:	Parker ($^1/_{16}$ CPI)
Material:	Titanium, stainless steel, PEEK ferrule
Filter:	0.5 µm or 0.2 µm stainless steel
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	$^5/_{16}$"

Description	Filter Porosity	qty.	cat.#
UltraShield UHPLC PreColumn Filter	0.5 µm frit	ea.	24995
		5-pk.	24996
		10-pk.	24997
UltraShield UHPLC PreColumn Filter	0.2 µm frit	ea.	25809
		5-pk.	25810
		10-pk.	25811

UltraLine UHPLC In-Line Filter

- In-line design installs easily with standard fittings.
- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Leak-tight to 15,000 psi (1,034 bar).
- Replaceable 0.5 µm stainless steel frit in stainless steel body.

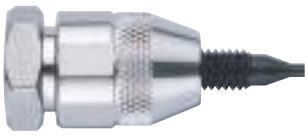
Specifications:

Inlet/Outlet:	Female/Female 10-32
Port Geometry:	Parker ($^1/_{16}$ CPI)
Material:	Stainless steel housing
Filter:	0.5 µm stainless steel, 0.125" W x 0.062" T, 5 µL volume
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	$^3/_8$"

Description	qty.	cat.#
UltraLine UHPLC In-Line Filter (In-Line Assembly with Filter)	ea.	24993
UltraLine Replacement Filters	5-pk.	24994

Trident Direct Guard Cartridge System Easy to Use, Low Dead Volume—
The Ultimate Combination of Convenience and Column Protection

Unlike "one size fits all" guard systems, the Trident direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection, with a variety of bonded phases to match your analytical column. The economical, leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability. The foundation of the Trident direct system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters-style end fittings.* The system is available in configurations to match different protection levels: filter only, guard cartridge holder without filter, and guard cartridge holder with filter. The guard cartridges (see page 191) are available in 2.1 and 4.0 mm ID and are interchangeable within the holder.



25082

Filter:
Protection against particulate matter.

25084

Guard Cartridge and Filter:
Protection against particulate matter *and* moderate protection against irreversibly adsorbed compounds.

Description	qty.	cat.#
High-pressure filter	ea.	25082
10 mm guard cartridge holder without filter	ea.	25083
10 mm guard cartridge holder with filter	ea.	25084
PEEK tip for Waters-style end fittings	ea.	25088
PEEK tip for standard fittings	ea.	25087

*The standard PEEK tip in Trident direct systems is compatible with Parker, Upchurch Scientific, Valco, and other CPI-style fittings. To use Trident direct systems with Waters-style end fittings, replace the tip with cat.# 25088.

Trident direct 10 mm guard cartridge holder with filter

Components

Assembled

Installed onto column

See page 191 for a full selection of Trident HPLC guard cartridges.

Double the Protection With Cap Frits!

Replacement Cap Frits for Trident Guard Cartridges

Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget.

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990

25022

Trident in-line 10 mm guard cartridge holder with filter

Components

Assembled

Installed onto column

Trident HPLC In-Line Guard Cartridge Holders

A Trident in-line guard cartridge holder can be used with almost any HPLC column by connecting it with a short piece of 1/16" tubing, appropriate nuts and ferrules, or finger-tight fittings. The system can be used with Restek® columns, or with columns from other manufacturers. Holders are available for 10 mm guard cartridges (see page 191). Purchase with or without a prefilter, which provides added protection against the particles that can shorten the lifetime of the guard cartridge.

25021

25040

Description	qty.	cat.#
Holder for 10 mm guard cartridge	ea.	25021
Holder with filter for 10 mm guard cartridge	ea.	25040
Frit-Type In-Line Filter, 2.0 µm	ea.	25041

For HPLC tubing, visit **www.restek.com/LCacc**

25940

EXP® Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing

EXP® Hand-Tight Coupler

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

also available

Our entire EXP® fitting selection.

See **page 335**.

Double the Protection With Cap Frits!

25057

Replacement Cap Frits for Trident Guard Cartridges

Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget.

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990

Trident HPLC Guard Cartridges

Description	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Pinnacle DB Guard Cartridges		
Pinnacle DB C18 Guard Cartridge	941450212	941450210
Pinnacle DB C8 Guard Cartridge	941350212	941350210
Pinnacle DB Aqueous C18 Guard Cartridge	941850212	941850210
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210
Pinnacle DB PFP Propyl Guard Cartridge	941950212	941950210
Pinnacle DB Cyano Guard Cartridge	941650212	941650210
Pinnacle DB Silica Guard Cartridge	941050212	941050210
Ultra Guard Cartridges		
Ultra C18 Guard Cartridge	917450212	917450210
Ultra C8 Guard Cartridge	910350212	910350210
Ultra C4 Guard Cartridge	910250212	910250210
Ultra C1 Guard Cartridge	910150212	910150210
Ultra Aromax Guard Cartridge	912750212	912750210
Ultra Aqueous C18 Guard Cartridge	917850212	917850210
Ultra Biphenyl Guard Cartridge	910950212	910950210
Ultra IBD Guard Cartridge	917550212	917550210
Ultra PFP Propyl Guard Cartridge	917950212	917950210
Ultra Cyano Guard Cartridge	910650212	910650210
Ultra Amino Guard Cartridge	—	910750210
Ultra Silica Guard Cartridge	910050212	910050210
Viva Guard Cartridges		
Viva C18 Guard Cartridge	951450212	951450210
Viva C8 Guard Cartridge	951350212	951350210
Viva C4 Guard Cartridge	951250212	951250210
Viva Biphenyl Guard Cartridge	951650212	951650210
Viva PFP Propyl Guard Cartridge	951950212	951950210
Viva Silica Guard Cartridge	951050212	951050210

Trident HPLC Guard Cartridge

GC Accessories

Inlet Liners

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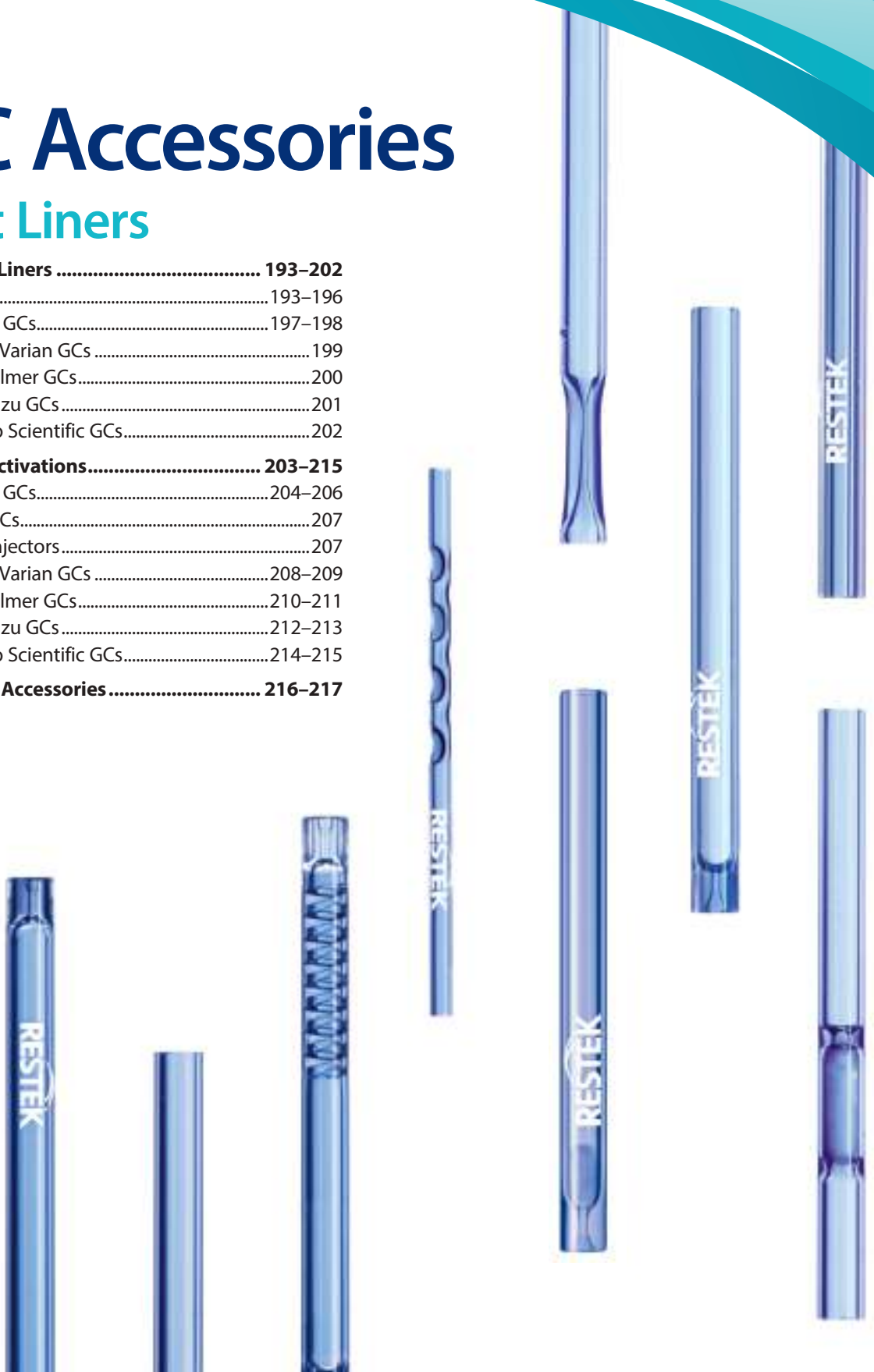


Sky® Inlet Liners

100%* Satisfaction Guaranteed

True Blue Performance

- **Increase accuracy and precision** by preventing loss of sensitive analytes—even when using wool.
- **Achieve lower detection limits** for a wide range of active compounds.
- **Ensure liner-to-liner reproducibility** through consistent manufacturing and extensive testing.
- **100% customer satisfaction**—if a liner doesn't perform to expectations, we will replace it or credit your account.*

When faced with complex choices, simple solutions stand out. Sky® inlet liners from Restek use a comprehensive, state-of-the-art deactivation and are the only blue liners on the market—making them an easy-to-recognize solution to common inlet problems.

The innovative deactivation used for Sky® liners results in exceptional inertness for a wide range of analyte chemistries. By reducing active sites and enhancing analyte transfer to the column, these liners increase accuracy and precision, allowing lower detection limits for many active compounds. **In addition to improved data quality, you'll benefit from fewer liner changes and less downtime for maintenance.**

Sky® liners give you the inertness you need for more accurate trace-level results.

Selecting the right liner for your application can be a challenging task. Sky® inlet liners make the choice simple; the comprehensive deactivation, distinctive color, and availability in popular configurations mean Sky® liners are the best choice for optimizing chromatographic performance. Regardless of your application, Sky® liners provide reliable inertness and assured performance, day-after-day and analysis-after-analysis.

* For details on our 100% satisfaction guarantee, see page 196.

Simple Solutions:

Inert Sky® Inlet Liners Improve Accuracy and Precision for a Wide Range of Analytes

Many chromatographic problems, such as poor response and missing or tailing peaks are caused by activity in the inlet liner. These effects complicate quantification and can be particularly problematic for sensitive analytes. Sky® inlet liners from Restek offer exceptional inertness, ensuring enhanced transfer of analytes to the column, good response, and highly symmetric peaks. The inertness of these liners is due to a state-of-the-art deactivation process that completely passivates the liner—and the wool—so that they are inert to a wide variety of reactive analytes.

Some deactivations, such as base deactivation, are effective only for particular target compound chemistries. In contrast, the balanced deactivation of Sky® liners prevents interactions with many chemical classes. With Sky® inlet liners, you will see improved sensitivity, accuracy, robustness, and reproducibility from liner to liner, which allows you to quantify challenging compounds at trace levels with confidence.

Prevent the Loss of Sensitive Analytes—Even When Using Wool

Sensitive analytes like carbaryl and methiocarb readily react with active sites in your inlet, especially when using a liner with wool. That reactivity makes these compounds difficult to analyze, but excellent for demonstrating inertness (i.e., the reduction of unwanted reactions between a liner and active compounds). Sky® liners with quartz wool offer superb results for these and other inertness probes even at low concentrations, whereas other leading deactivations using borosilicate wool show reduced response—or no response at all. When you are concerned about losing sensitive analytes, feel confident in choosing Sky® liners with wool.

Table I: Relative Response Factors for Sensitive Analytes Using Trace-Level (100 pg on column) Splitless Injection

	Carbaryl	Methiocarb	Captan	Folpet
Sky® Liner w/Wool	0.718	0.720	0.380	0.403
Siltek® Liner w/Wool	ND	ND	0. 087	0. 150
Non-Sky® Liner w/Wool	ND	ND	0.237	0.290

See Figures 1 and 2 for more details.

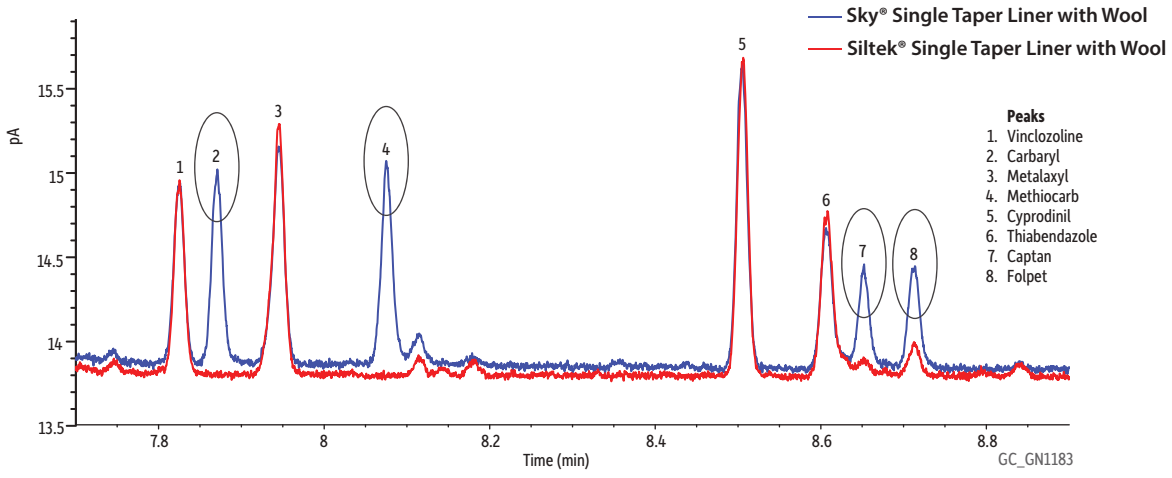
The Story Behind Sky® Liners

For over 25 years, Restek has been a leader in the development and manufacturing of GC and LC products. With Sky® liners, we created a novel, state-of-the-art deactivation process that provides better performance, lower detection limits, and unbeatable accuracy and precision—even when using wool. We also took full control of our production stream to ensure unparalleled reliability and reproducibility. And to prove that every Sky® liner offers True Blue Performance, each one is backed by a 100% satisfaction guarantee.*

But, why are they blue? Restek has always been associated with the color blue because it signifies strength, innovation, and excellence. We made Sky® liners blue because it represents the technological advancements and unmatched quality that define Restek® products and service. Choose blue—the best choice for dependable results.

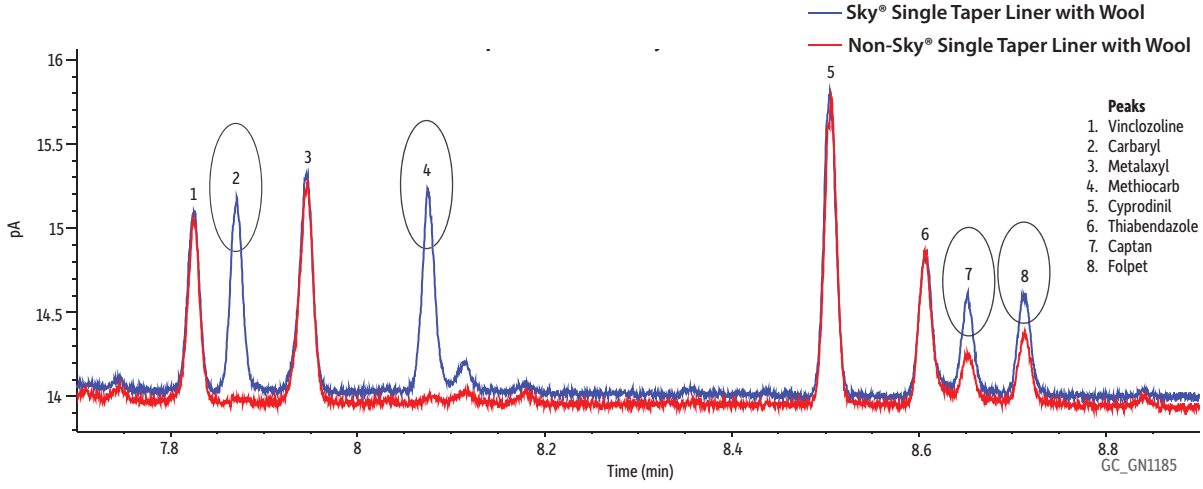
* For details on our 100% satisfaction guarantee, see page 196.

Figure 1: Especially for active compounds like pesticides, Sky® liners with quartz wool offer superior trace-level response over Siltek®-deactivated liners with borosilicate wool.



For a full list of conditions, search for chromatogram# GC_GN1183 at **www.restek.com**

Figure 2: Sky® liners with quartz wool also offer markedly better trace-level response for sensitive analytes compared to non-Sky® liners with borosilicate wool, as shown here with pesticides.

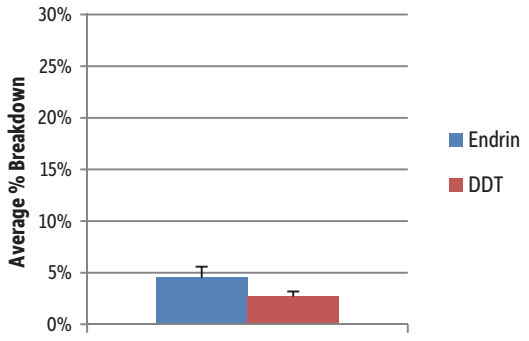


For a full list of conditions, search for chromatogram# GC_GN1185 at **www.restek.com**

Ensure Consistent Data From Liner to Liner and Injection to Injection

It's not good enough to have one quality liner. You have to be confident that *every liner you use* will give you the same high level of performance *every time you use it*. We test Sky® liners extensively to ensure they are exceptionally inert and will provide optimal results with every lot, liner, and injection.

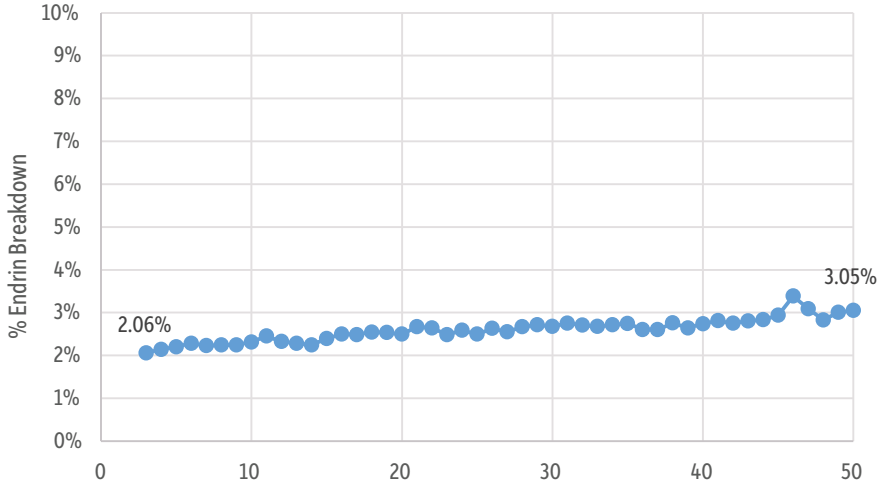
Figure 3: Sky® inlet liners offer outstanding lot-to-lot inertness and reproducibility—exhibited here through consistently low endrin and DDT breakdown test results.



Error bars represent 1 standard deviation. The data represent triplicate analyses of multiple liners (n = 70) taken from 10 different lots.

Column	Rxi®-5Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13620)
Sample	50 ng/mL (ppb) 100 ng/mL DDT in hexane
Injection	
Inj. Vol.:	1 µL splitless (hold 45 sec)
Liner:	Sky® 4 mm single taper w/wool (cat. # 23303.5)
Inj. Temp.:	250 °C
Purge Flow:	20 mL/min
Oven	
Oven Temp.:	75 °C (hold 0.75 min) to 310 °C at 20 °C/min (hold 1 min)
Carrier Gas	constant flow
Flow Rate:	1.5 mL/min
Detector	Micro-ECD @ 330 °C
Make-Up Gas Flow Rate:	60 mL/min
Make-Up Gas Type:	N_2

Figure 4: Even after 50 injections, highly robust Sky® liners show minimal increase in compound degradation.



See Figure 3 for conditions.

Choose Blue, the Best Choice for Dependable Results

Sky® liners provide exceptional inertness across a wide range of active analytes. The consistent, comprehensive deactivation process results in the accuracy and precision you need for reliable trace-level analyses. Simplify your liner selection—and improve your results—with Sky® liners from Restek. **www.restek.com/sky**

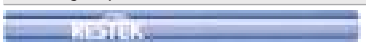
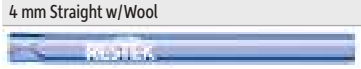
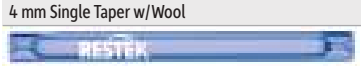
100% Satisfaction Guaranteed

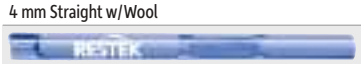
* 100% SATISFACTION GUARANTEE: If your Sky® inlet liner does not perform to your expectations for any reason, simply contact Restek® Technical Service or your local Restek® representative and provide a sample chromatogram showing the problem. If our GC experts are not able to quickly and completely resolve 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**

Sky® Inlet Liners for Agilent GCs

COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#	
1 mm Split	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.)	23333.1	23333.5	23333.25	
4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25	
2 mm Precision Liner w/Wool	2.0 mm 6.3 mm x 78.5 mm		23468.1	23468.5		NEW!
4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	23305.1	23305.5	23305.25	
4 mm Cyclo	4.0 mm 6.3 mm x 78.5 mm		23312.1	23312.5	23312.25	

Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
2 mm Splitless	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	23313.1	23313.5	23313.25
2 mm Splitless w/Wool	2.0 mm 6.5 mm x 78.5 mm		23314.1	23314.5	23314.25
2 mm Single Taper	2.0 mm 6.5 mm x 78.5 mm		23315.1	23315.5	23315.25
2 mm Single Taper w/Wool	2.0 mm 6.5 mm x 78.5 mm		23316.1	23316.5	23316.25
 4 mm Straight	4.0 mm 6.3 mm x 78.5 mm	210-3003 (ea.) 210-3003-05 (5-pk.)	23301.1	23301.5	23301.25
4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	23302.1	23302.5	23302.25
4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	5062-3587, 5190-2293 (ea.) 5183-4693, 5190-3163 (5-pk.) 5183-4694 (25-pk.)	23303.1	23303.5	23303.25
 4 mm Double Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	23308.1	23308.5	23308.25
4 mm Cyclo Double Taper	4.0 mm 6.5 mm x 78.5 mm		23310.1	23310.5	23310.25

Split/Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#	
4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25	
 Low Pressure Drop Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23309.1	23309.5		
Low Pressure Drop Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm	5183-4647, 5183-4711 (ea.) 5183-4701, 5183-4712 (5-pk.) 5183-4713 (25-pk.)	23467.1	23467.5	23467.25	NEW!

Patent pending

Sky® Inlet Liners for Agilent GCs

Sky® Inlet Liners for Agilent GCs

COLUMN INSTALLS THIS END

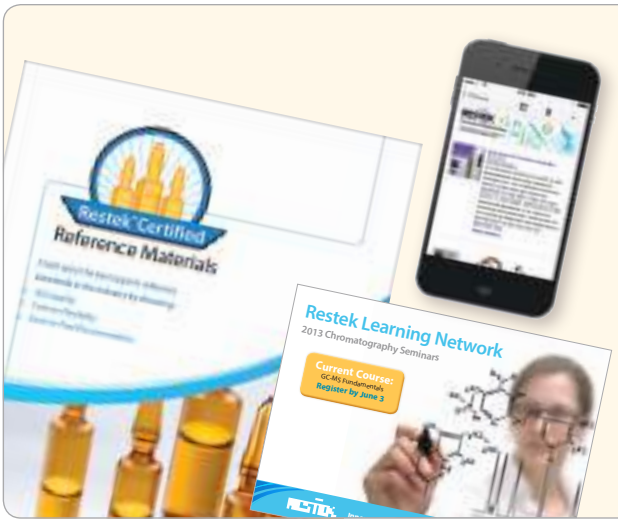
CIS4 and PTV Liners for Agilent GCs	ID OD x L	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	10-pk. cat.#
On Column PTV	1.7 mm 3.0 mm x 71 mm		23430.1	23430.5	
Single Baffle PTV	2.0 mm 3.0 mm 71 mm	5183-2036 (10-pk.)			23431.10
Single Baffle PTV w/Wool	2.0 mm 3.0 mm 71 mm	5183-2038 (10-pk.)			23432.10
Baffled PTV	1.5 mm 3.0 mm 71 mm	5183-2037 (10-pk.)			23433.10

Analytical Controls TPI Inlet Liners for Agilent GCs	ID OD x L	10-pk. cat.#
TPI for 0.53 mm ID columns	2.4 mm 4.0 mm x 71 mm	23429.10
TPI for 0.25/0.32 mm ID columns	2.4 mm 4.0 mm x 71 mm	23428.10

SPME Liners for Agilent GCs	ID OD x Length	ea. cat.#	5-pk. cat.#
SPME Liner	0.75 mm 6.35 mm x 78.5 mm	23434.1	23434.5

Direct Injection Liners for Agilent GCs (for 0.25/0.32/0.53mm ID Columns)	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Drilled Uniliner (hole near bottom)	4.0 mm 6.3 mm x 78.5 mm	G1544-80730 (ea.)	23306.1	23306.5	23306.25
Drilled Uniliner (hole near bottom) w/Wool	4.0 mm 6.3 mm x 78.5 mm		23307.1	23307.5	
Drilled Uniliner (hole near top)	4.0 mm 6.3 mm x 78.5 mm		23311.1	23311.5	23311.25

Patent pending



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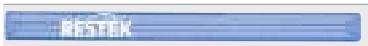
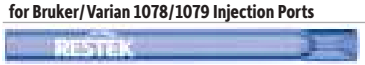
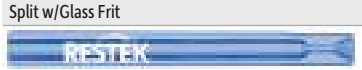
Sky® Inlet Liners for Bruker/Varian Injection Ports

COLUMN INSTALLS THIS END

Liners for Bruker/Varian 1177 S/SL Injection Ports	ID OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
4 mm Split Liner w/Glass Frit	4.0 mm 6.3 mm x 78.5 mm		23330.1	23330.5
4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23328.1	23328.5
4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	392611927	23331.1	23331.5
4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	392611936	23332.1	23332.5

SPI Liners for Bruker/Varian S/SL Injection Ports	ID OD x L	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
SPI Liner	0.53 mm 4.6 mm x 54 mm	190010906	23460.1	23460.5	
 SPI Liner	0.8 mm 4.6 mm x 54 mm	190010907	23461.1	23461.5	23461.25

Liners for Bruker/Varian 1078/1079 Injection Ports	ID OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 3.4 mm Split–No Frit	3.4 mm 5.0 mm x 54 mm	392611945	23329.1	23329.5	23329.25
Split w/Glass Frit	3.4 mm 5.0 mm X 54 mm	392611946	23462.1	23462.5	
 Splitless	2.0 mm 5.0 mm X 54 mm	392611947	23463.1	23463.5	
SPME Liner	0.75 mm 5.0 mm X 54 mm	392611948	23465.1	23465.5	
Split Precision Liner w/Wool	3.4 mm 5.0 mm X 54 mm		23466.1	23466.5	

Patent pending

tech tip

Correct installation of Sky® inlet liner is quick and easy. Simply orient the liner so the column installs toward the "R" on the Restek logo.

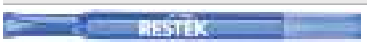
Sky® Inlet Liners for PerkinElmer GCs

COLUMN INSTALLS THIS END

Split Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Splitter w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502009	23449.1	23449.5
Split Precision Liner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6121020	23450.1	23450.5

Splitless Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Splitless w/Wool	2.0 mm 6.2 mm x 92.1 mm	N6121021	23451.1	23451.5

PSS Liners for PerkinElmer GCs	ID OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Auto SYS XL PSS Split/Splitless w/Wool	2.0 mm 4.0 mm x 86.2 mm	N6121004	23317.1	23317.5	23317.25

DI Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Open-Top Uniliner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502016	23452.1	23452.5
Drilled Uniliner (hole near top)	4.0 mm 6.2 mm x 92.1 mm	N6121022	23453.1	23453.5
 Drilled Uniliner (hole near bottom)	4.0 mm 6.2 mm x 92.1 mm	N6502013	23454.1	23454.5

Patent pending

Sky® Inlet Liners for Shimadzu GCs

COLUMN INSTALLS THIS END

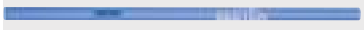
Split Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#	
3.5 mm Split	3.5 mm 5.0 mm x 95 mm	221-41444-01	23318.1	23318.5	23318.25	
3.5 mm Split w/Wool	3.5 mm 5.0 mm x 95 mm		23319.1	23319.5	23319.25	
3.5 mm Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23320.1	23320.5		
Single Taper Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23455.1	23455.5		
Cyclo	3.5 mm 5.0 mm x 95 mm		23456.1	23456.5		

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#	
3.5 mm Single Taper	3.5 mm 5.0 mm x 95 mm	221-48335-01	23321.1	23321.5	23321.25	
3.5 mm Single Taper w/Wool	3.5 mm 5.0 mm x 95 mm		23336.1	23336.5		NEW!
3.5 mm Single Taper w/Wool	3.5 mm 5.0 mm x 95 mm		23322.1	23322.5		
Double Taper	3.5 mm 5.0 mm x 95 mm		23457.1	23457.5		

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x L	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Split/Splitless w/Wool	3.5 mm 5.0 mm x 95 mm	221-41444-00	23458.1	23458.5	23458.25

Liners for Shimadzu 17A PTV GCs	ID OD x L	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
PTV w/Wool	1.6 mm 4.0 mm x 95 mm	225-09212-01	23435.1	23435.5	23435.25

DI Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x L		ea. cat.#	5-pk. cat.#	
Uniliner w/Wool	3.5 mm 5.0 mm x 95 mm		23459.1	23459.5	

Liners for Shimadzu 2010 PTV GCs	ID OD x L		ea. cat.#	10-pk. cat.#	
PTV 2010	1.5 mm 3.5 mm x 95 mm		23471.1	23471.10	NEW!
 PTV 2010 w/Wool	1.5 mm 3.5 mm x 95 mm		23472.1	23472.10	NEW!

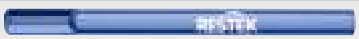
Patent pending.

Sky® Inlet Liners for Thermo Scientific GCs

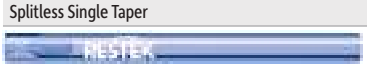
Sky® Inlet Liners for Thermo Scientific GCs

COLUMN INSTALLS THIS END

Split Liners for Thermo TRACE GC Ultra and Focus SSL	ID OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Split Straight	3.0 mm 8.0 mm x 105 mm	453 20031	23439.1	23439.5	23439.25
Split Straight w/Wool	3.0 mm 8.0 mm x 105 mm		23440.1	23440.5	23440.25
5 mm Straight	5.0 mm 8.0 mm x 105 mm	453 20030	23323.1	23323.5	23323.25
5 mm Straight w/Wool	5.0 mm 8.0 mm x 105 mm		23324.1	23324.5	23324.25
5 mm Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23327.1	23327.5	

Splitless Liners for Thermo TRACE GC Ultra and Focus SSL	ID OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Splitless	3.0 mm 8.0 mm x 105 mm	453 20032	23441.1	23441.5	23441.25
Splitless w/Wool	3.0 mm 8.0 mm x 105 mm		23442.1	23442.5	23442.25
Splitless Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23443.1	23443.5	
 5 mm Splitless	5.0 mm 8.0 mm x 105 mm	453 20033	23325.1	23325.5	23325.25
5 mm Splitless w/Wool	5.0 mm 8.0 mm x 105 mm		23326.1	23326.5	23326.25

Split Liners for Thermo TRACE 1300 Series GCs	ID OD x L	ea. cat.#	5-pk. cat.#
Split	1.0 mm 6.3 mm x 78.5 mm	23448.1	23448.5

Splitless Liners for Thermo TRACE 1300 Series GCs	ID OD x L	ea. cat.#	5-pk. cat.#
Splitless Straight	4.0 mm 6.3 mm x 78.5 mm	23445.1	23445.5
Splitless Single Taper	4.0 mm 6.5 mm x 78.5 mm	23446.1	23446.5
 Splitless Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	23447.1	23447.5

Split/Splitless Liners for Thermo TRACE 1300 Series GCs	ID OD x L	ea. cat.#	5-pk. cat.#
Split/Splitless Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	23444.1	23444.5

Split Liners for Thermo Scientific TRACE PTV	ID OD x L	Similar to TS Part #	ea. cat.#	5-pk. cat.#
Split PTV	1.0 mm 2.75 mm x 120 mm	453 22054	23436.1	23436.5
Split PTV	2.0 mm 2.75 mm x 120 mm	453 22045	23437.1	23437.5
Baffled PTV	2.0 mm 2.75 mm x 120 mm		23438.1	23438.5

Patent pending

Other Deactivations

Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every clear Restek® liner is IP deactivated unless otherwise requested.

Sky® inlet liners feature Restek's premier deactivation.

Siltek®-Deactivation*

For Siltek®-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Siltek Liner	Siltek Liner w/Wool	Siltek Liner w/CarboFrit
5-pk.	-214.5	-213.5	-216.5
25-pk.	-214.25	-213.25	-216.25

*There is an additional cost for these deactivations. Contact your Restek representative for pricing.

Base-Deactivation*

For base-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Base-Deactivated Liner	Base-Deactivated Liner w/ Base-Deactivated Wool	Base-Deactivated Liner w/CarboFrit
5-pk.	-210.5	-211.5	-229.5
25-pk.	-210.25	-211.25	-229.25

*There is an additional cost for these deactivations. Contact your Restek representative for pricing.

Don't Forget Routine Maintenance

Inlet liners are the key to good injection port maintenance; changing them regularly helps prevent the following problems:

- Sample degradation resulting in poor response.
- Sample adsorption resulting in poor peak shape (tailing).
- Sample discrimination.
- Irreproducibility.
- Extraneous peaks from contamination or cored septum particles.

Finally, be sure to condition your liners at 20 °C higher than the operating inlet temperature for a minimum of 10 minutes to prepare them for use. By following these basic tips, you can avoid inlet problems and improve chromatographic performance.

Sky® Inlet Liners

100% Satisfaction Guaranteed

Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

Inlet Liners for Agilent GCs

Liners for Agilent GCs

COLUMN INSTALLS THIS END

Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
2 mm Splitless	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	20712	20713	20714
4 mm Splitless	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	210-3003 (ea.) 210-3003-5 (5-pk.)	20772	20773	20774
4 mm Splitless w/Deactivated Wool	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	22400	22401	22402
5 mm Splitless	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22975	22976	
2 mm Splitless (Quartz)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	18740-80220 (ea.) 5183-4707 (5-pk.)	20914	20915	
4 mm Splitless (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20912	20913	
4 mm Splitless w/Deactivated Wool (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22403	22404	
Single Taper Splitless (2 mm)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20795	20796	20797
Single Taper Splitless (4 mm)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	20798	20799	20800
Single Taper Splitless (4 mm) w/Deactivated Wool†	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5062-3587 (ea.) 5183-4693 (5-pk.) 5183-4694 (25-pk.)	22405	22406	22407
Single Taper Splitless (5 mm)	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22973	22974	
Double Taper Splitless (4 mm)	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	20784	20785	20786
Cyclo Double Taper (2 mm)	trace, active, dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20907	20908	
Cyclo Double Taper (4 mm)	trace, active, dirty samples > 2 µL	4.0 mm 6.5 mm x 78.5 mm		20895	20896	20997
Recessed Single Taper (2 mm)**	base easily packs with wool for dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20980	20981	20982
Recessed Single Taper (4 mm)**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20983	20984	20985
Recessed Single Taper (4 mm) w/Deactivated Wool**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22408	22409	22410
Recessed Double Taper (4 mm)**	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20986	20987	

*Nominal ID at syringe needle expulsion point.
**Use with two-hole ferrule for dual-column analysis.

Liners for Agilent GCs, *cont.*

COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part#	ea. cat.#	5-pk. cat.#	25-pk. cat.#
1 mm Split**	for purge & trap inlet splitting or sample <1 µL	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.) 5183-4709 (5-pk.)	20972	20973	
4 mm Split w/Deactivated Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	20781	20782	20783
Laminar Cup Splitter	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20801	20802	
mini-Lam Split	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20990	20991	
Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 78.5 mm	18740-80190 (ea.) 5183-4699 (5-pk.)	20709	20710	
Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 78.5 mm		20706	20707	20708
2 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	2.0 mm 6.3 mm x 78.5 mm		20823	20824	
4 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	21022	21023	20979
4 mm Single Taper Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4022-5, 5183-4712 (5-pk.)	22983	22984	22985

Split/Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Low Pressure Drop Precision Liner w/Deactivated Wool	universal	4.0 mm 6.3 mm x 78.5 mm		21032	21033	
Low Pressure Drop Liner w/Deactivated Wool	universal	4.0 mm 6.3 mm x 78.5 mm	5183-4647, 5183-4711 (ea.) 5183-4701, 5183-4712 (5-pk.) 5183-4713 (25-pk.)	20994	20995	20996

SPME Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.35 mm x 78.5 mm	21110	21111

*Nominal ID at syringe needle expulsion point.
**Use this liner for increased sensitivity.

Genuine Restek Replacement Parts for Agilent GCs

Download *Genuine Restek Replacement Parts Catalog for Agilent GCs* today!

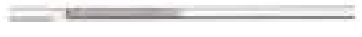
www.restek.com/GRRP

Inlet Liners for Agilent GCs

Liners for Agilent GCs, *cont.*

COLUMN INSTALLS THIS END

DI Liners for Agilent GCs** (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		21054	21055	20998
Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80730	20756	20771	
Double Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		20508	20509	
Double Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80700	20954	20989	
Drilled Cyclo-Uniliner (hole near top)	trace, dirty, high MW, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22979	22980	
1 mm Uniliner	trace, active samples, samples <1 µL	1.0 mm 6.3 mm x 78.5 mm		21052	21053	
Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22268	22269	
Cyclo-Uniliner	trace, dirty, high MW active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22270	22271	
Open-top Uniliner w/Deactivated Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22272	22273	

CIS4 and PTV Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part#	10-pk. cat.#
Straight Glass	general use	2.0 mm 3.0 mm x 71 mm	5183-2036	21157
Baffled Glass	active compounds, drugs, pesticides	1.5 mm 3.0 mm x 71 mm	5183-2037	21704
 Glass w/Deactivated Wool	large volume injections	2.0 mm 3.0 mm x 71 mm	5183-2038	21156

*Nominal ID at syringe needle expulsion point.
**Hole in Drilled Uniliner liner makes direct injection possible with EPC-equipped Agilent 6890 & 7890 GCs!

Siltek® Metal Inlet Liners for Agilent GCs

Won't crack, chip, or break like glass liners.

Liner Type (5.2 mm ID x 6.3 mm OD x 78.5 mm)	5-pk. cat.#	25-pk. cat.#
Cyclo Single Taper	20974	20975
Single Taper	21702	21703
Cyclo	20726	
Split/Splitless w/Deactivated Wool	21700	21701

COLUMN INSTALLS THIS END

Liners for APEX ProSep 800 & ProSep 800 Plus GCs

APEX Liners for ProSep 800 & ProSep 800 Plus GCs	Benefits/Uses:	ID* OD x Length	Similar to APEX Part #	ea. cat.#
Mega IV (4.0 mm ID)	injections ≤125 µL	4.0 mm 6.0 mm x 243 mm	L-00410	21075
Micro I (1.0 mm ID)	injections ≤5 µL	1.0 mm 6.0 mm x 243 mm	L-00110	21073
MIDI II (2.0 mm ID)	injections ≤25 µL	2.0 mm 6.0 mm x 243 mm	L-00210	21074

*Nominal ID at syringe needle expulsion point.

Liners for ATAS Injectors

Liners for ATAS Injectors	Benefits/Uses:	ID* OD x Length	Similar to ATAS Part #	ea. cat.#	5-pk. cat.#
ATAS Fritted Single Taper	dirty samples	3.0 mm 5.0 mm x 80 mm	A100126	22419	22420

Liners for ATAS LINEX DMI System OPTIC 2 and 3 inlets	ID* OD x Length	5-pk. cat.#
ATAS LINEX DMI Liner	3.3 mm 5.0 mm x 81 mm	22353

*Nominal ID at syringe needle expulsion point.

Reference Standards Documentation Search

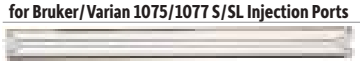
Search by cat.# or lot #!

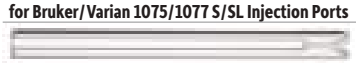
- MSDSs
- Certificates
- Datapacks

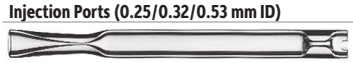
www.restek.com/**documents**

Inlet Liners for Bruker/Varian GCs

Liners for Bruker/Varian 1075/1077 S/SL Injection Ports

Split Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
 1 mm Split	purge & trap inlet splitting or samples <1 µL	1.0 mm 6.3 mm x 72 mm		20970	20971
Splitter w/Deactivated Wool	universal, use with rapid autosamplers	4.0 mm 6.3 mm x 72 mm	190010901	20792	20793
Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 72 mm		20724	20725
Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 72 mm		20727	20728
Frit Splitter	dirty samples, non-active compounds	4.0 mm 6.3 mm x 72 mm	190010903	20715	20716
Split Precision Liner w/Deactivated Wool	dirty samples, active samples	4.0 mm 6.3 mm x 72 mm		21030	21031

Splitless Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.3 mm x 74 mm	190010905	20721	20722	20723
4 mm Splitless	trace samples >2 µL	4.0 mm 6.3 mm x 74 mm		20904	20905	20906

DI Liners for Bruker/Varian 1075/1077 S/SL Injection Ports (0.25/0.32/0.53 mm ID)	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 72 mm	20345	20346

SPME Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.3 mm x 74 mm	21112	21113

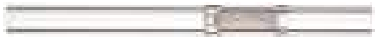
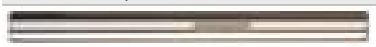
Liners for Bruker/Varian S/SL Injection Ports

SPI Liners for Bruker/Varian S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
0.5 mm SPI	high linearity for 0.25 & 0.32 mm ID columns	0.53 mm 4.6 mm x 54 mm	190010906	20775	20776	20777
0.8 mm SPI	high linearity for 0.53 mm ID columns	0.80 mm 4.6 mm x 54 mm	190010907	20778	20779	20780
SPI with Buffer	dirty samples >1 µL, fits 0.25, 0.32 & 0.53 mm ID columns	2.4 mm 4.6 mm x 54 mm	190010908	20850	20851	20852

COLUMN INSTALLS THIS END

*Nominal ID at syringe needle expulsion point.

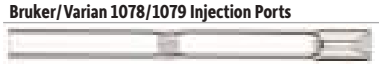
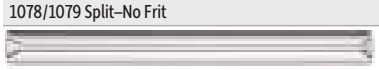
Liners for Bruker/Varian 1177 S/SL Injection Ports

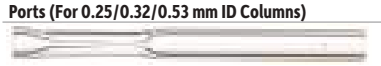
Liners for Bruker/Varian 1177 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
4 mm Split w/Glass Frit	universal	4.0 mm 6.3 mm x 78.5 mm		21045	21046
4 mm Split w/Deactivated Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	392611934		21079
 4 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm		20759	20762
Low Pressure Drop Precision Liner w/Deactivated Wool	trace samples <2 µL, dirty samples	2.0 mm 6.3 mm x 78.5 mm		22421	22422
 2 mm Splitless w/Deactivated Wool	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	392599903		21077
Single Taper Splitless (4 mm)	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611927	21896	21897
Single Taper Splitless (4 mm) w/Deactivated Wool	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611928	21896-200.1	21897-200.5
Double Taper Splitless (4 mm)	trace, active samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611929	21891	21892

DI Liners for Bruker/Varian 1177 S/SL Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21470	21471
Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21468	21469

*Nominal ID at syringe needle expulsion point.

Liners for Bruker/Varian 1078/1079 Injection Ports

Liners for Bruker/Varian 1078/1079 Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1078/1079 Split w/Glass Frit	dirty samples, non-active compounds	3.4 mm 5.0 mm x 54 mm	392611946	21708	21709	
1078/1079 Splitless	trace samples <2 µL	2.0 mm 5.0 mm x 54 mm	392611947	21711	21712	
Open 0.5 mm ID	trace samples <1 µL	0.5 mm 5.0 mm x 54 mm	392611949	20992	20993	
1078/1079 Split–No Frit	active samples	3.4 mm 5.0 mm x 54 mm	392611945	20859	20901	20909
 Open 0.75 mm ID	trace, low volume samples	0.75 mm 5.0 mm x 54 mm	392611948	21714	21715	21716
1078/1079 Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.4 mm 5.0 mm x 54 mm		21024	21025	

DI Liners for Bruker/Varian 1078/1079 Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 54 mm	24974	24975

*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

Inlet Liners for PerkinElmer GCs

Liners for PerkinElmer GCs

COLUMN INSTALLS THIS END

Split Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Straight	universal, for most common analyses	3.5 mm 5.0 mm x 100 mm	N6502008	20736	20737	
Auto SYS Splitter w/Deactivated Wool	universal for most common analyses	4.0 mm 6.2 mm x 92.1 mm	N6502009	20832	20833	20834
Auto SYS Cup Splitter	high & low MW compounds	4.0 mm 6.2 mm x 92.1 mm	N6502011	20835	20836	
Auto SYS Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.2 mm x 92.1 mm	N6502012	20910	20911	
Auto SYS Laminar Cup Splitter	high MW compounds	4.0 mm 6.2 mm x 92.1 mm		20827	20828	
Auto SYS Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.2 mm x 92.1 mm	N6121020	21026	21027	

Splitless Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Splitless (2 mm ID)	trace samples	2.0 mm 5.0 mm x 100 mm	N6502007	20730	20731	
Auto SYS Splitless	headspace, purge & trap	1.0 mm 6.2 mm x 92.1 mm	N6502006	21272	21273	21274
Auto SYS Splitless (2 mm ID) w/Deactivated Wool	trace samples	2.0 mm 6.2 mm x 92.1 mm	N6121021	20829	20830	
Auto SYS Double Taper	trace, active samples up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502003	20853	20854	
Auto SYS Cyclo Double Taper	trace, dirty, active samples, up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502005	20899	20900	

PSS Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
PSS Split/Splitless (1 mm ID)	trace samples	1.0 mm 4.0 mm x 86.2 mm	N6121006	20738	20741
Auto SYS XL PSS Split/Splitless w/Deactivated Wool	most common analyses	2.0 mm 4.0 mm x 86.2 mm	N6121004	21717	21718
PSS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	2.0 mm 4.0 mm x 86.2 mm		22986	22987

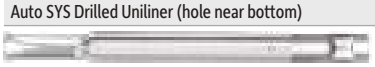
*Nominal ID at syringe needle expulsion point.

Liners for PerkinElmer GCs, *cont.*

COLUMN INSTALLS THIS END

Zero Dilution Liners for PerkinElmer Auto SYS and Clarus GCs	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
Zero Dilution Outer Liner	headspace analysis	2.5 mm 6.2 mm x 90 mm	N1011445	22992	22993

Zero Dilution Liners for PerkinElmer GCs with PSS Inlets	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
Zero Dilution Outer Liner	headspace analysis	2.5 mm 4.2 mm x 83 mm	N1011447		24979

DI Liners for PerkinElmer GCs (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
Auto SYS Open-Top Uniliner w/Deactivated Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502016	20837	20838
Auto SYS Cyclo-Uniliner	trace, dirty, high MW active samples, high linearity	4.0 mm 6.2 mm x 92.1 mm	N6502017	20839	20840
Auto SYS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6121022	20819	20822
Auto SYS Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502013	21293	21294
 Auto SYS Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502014	21295	21296

*Nominal ID at syringe needle expulsion point.

Inlet Liners for Shimadzu GCs

Liners for Shimadzu 14A GCs

Split Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Split	universal, for most common analyses	3.5 mm 5.0 mm x 99 mm	221-32544-01	20860	20861	20862
Cyclo	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 99 mm		20870	20871	
Laminar Cup Splitter	high MW compounds	3.5 mm 5.0 mm x 99 mm		20868	20869	

Splitless Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#
3.5 mm Splitless	trace samples	3.5 mm 5.0 mm x 99 mm	221-32544-00	20863	20864

*Nominal ID at syringe needle expulsion point.

Liners for Shimadzu 17A, 2010, and 2014 GCs

Split Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
1 mm Split	purge & trap, fast GC	1.0 mm 5.0 mm x 95 mm		20976	20977	20978
3.5 mm Split	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-01	22283	22284	22285
2 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	2.0 mm 5.0 mm x 95 mm		22171	22172	
3.5 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		21020	21021	
3.5mm Single Taper Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		22173	22174	
Cyclo	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 95 mm		22072	22073	

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#
2 mm Single Taper Splitless	universal, trace samples	2.0 mm 5.0 mm x 95 mm		22276	22277
3.5 mm Single Taper Splitless	universal, trace samples	3.5 mm 5.0 mm x 95 mm	221-48335-01	22286	22287
Double Taper Splitless	reduces backflash and catalytic decomposition	3.5 mm 5.0 mm x 95 mm		22274	22275

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Split/Splitless w/Deactivated Wool	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-00	20955	20956	20957

*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

Liners for Shimadzu 17A, 2010, and 2014 GCs, *cont.*

COLUMN INSTALLS THIS END

SPME Liner for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
SPME Liner	ideal for low volume SPME applications	0.75 mm 5.0 mm x 95 mm	22278	22279

DI Liners for Shimadzu 17A, 2010, and 2014 GCs (0.25/0.32/0.53 mm ID)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
Uniliner w/Deactivated Wool	trace, dirty, high MW active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21713	21719
Open-Top Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21285	21286
Open-Top Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21287	21288
Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21289	21290
Single Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21291	21292

*Nominal ID at syringe needle expulsion point.

Liners for Shimadzu 17A PTV GCs

Liners for Shimadzu 17A PTV GCs	Benefits/Uses	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
17A PTV Liner w/Deactivated Wool	trace, dirty, high & low MW active samples	1.6 mm 4.0 mm x 95 mm	225-09212-01	21705	21706	21707

*Nominal ID at syringe needle expulsion point.

Inlet Liners for Thermo Scientific GCs

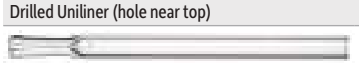
Liners for Thermo Scientific 1300 Series GCs

Splitless Liners for Thermo Scientific 1300 Series GCs	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#	
2 mm Splitless	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	23250	23251	NEW!
4 mm Splitless	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	23252	23253	NEW!
4 mm Splitless, Base Deactivated	trace samples < 2 µL	4.0 mm 6.5 mm x 78.5 mm	23254	23255	NEW!
4 mm Splitless w/Base Deactivated Wool	trace samples < 2 µL	4.0 mm 6.5 mm x 78.5 mm	23256	23257	NEW!

Liners for Thermo Scientific TRACE GC Ultra & Focus SSL

Split Liners for Thermo Scientific TRACE GC Ultra & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
1 mm Split	purge & trap, fast GC	1.0 mm 8.0 mm x 105 mm	453 20075	20916	20917	
3 mm Split	universal	3.0 mm 8.0 mm x 105 mm	453 20031	20936	20937	20938
5 mm Split	universal	5.0 mm 8.0 mm x 105 mm	453 20030	20939	20940	20941
Laminar Cup Splitter	high MW compounds	4.0 mm 8.0 mm x 105 mm		20948	20949	
Cup Splitter	high & low MW compounds	4.0 mm 8.0 mm x 105 mm		20950	20951	
5 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		22288	22289	

Splitless Liners for Thermo Scientific TRACE GC Ultra & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
Splitless Liner	trace samples	2.0 mm 8.0 mm x 105 mm		22266	22267	NEW!
Splitless (3 mm ID)	trace samples	3.0 mm 8.0 mm x 105 mm	453 20032	20942	20943	20944
Splitless (5 mm ID)	trace samples	5.0 mm 8.0 mm x 105 mm	453 20033	20945	20946	20947
Double Taper	trace, active samples up to 4 µL	4.0 mm 8.0 mm x 105 mm		20952	20953	
5 mm Splitless Precision Liner w/Deactivated Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		21028	21029	

DI Liners for Thermo Scientific TRACE GC Ultra & Focus SSL (0.32 & 0.53mm ID columns)	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
Uniliner w/Deactivated Wool	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	21005	21006
Drilled Uniliner (hole near top)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22411	22412
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22413	22414

COLUMN INSTALLS THIS END

*Nominal ID at syringe needle expulsion point.

Liners for Thermo Scientific TRACE PTV

COLUMN INSTALLS THIS END

Split Liners for Thermo Scientific TRACE PTV	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#
1 mm ID Glass Liner	trace samples, high recovery & linearity	1.0 mm 2.75 mm x 120 mm	453 22054	21114	21115
2 mm ID Glass Liner	universal	2.0 mm 2.75 mm x 120 mm	453 22045	21116	21117
Baffle Liner	trace samples	2.0 mm 2.75 mm x 120 mm		22074	22075

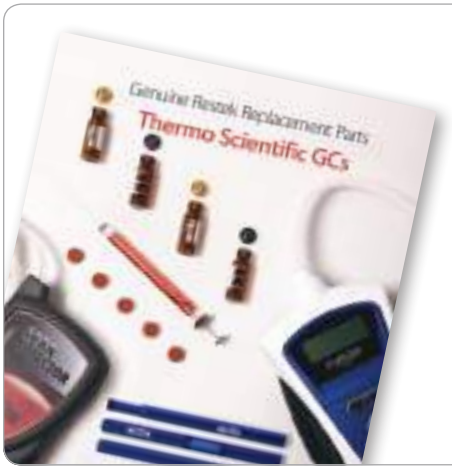
*Nominal ID at syringe needle expulsion point.

Siltek®-Treated Metal Inlet Liners for Thermo Scientific GCs

Won't crack, chip, or break like glass liners.

Liner Type (5.0 mm ID x 8.0 mm OD x 105 mm)	ea. cat.#	5-pk. cat.#
5 mm ID Split/Splitless w/Deactivated Wool	—	21004
Liner Type (2.75 mm OD x 120 mm)	**ea. cat.#**	**5-pk. cat.#**
1 mm ID Split/Splitless*	21080	21081
2 mm ID Split/Splitless*	21082	21083

*Works with PTV injectors.



Genuine Restek Replacement Parts for Thermo Scientific GCs

Download *Genuine Restek Replacement Parts Catalog for Thermo Scientific GCs* today!

www.restek.com/GRRP

Inlet Liner Accessories

24324

Deactivated Glass Wool

- More inert than our traditional glass wool.
- Use to vaporize a sample in a liner prior to introduction into a capillary column.

Description	qty.	cat.#
Deactivated Glass Wool	10 grams	24324

20999

Base-Deactivated Glass Wool

Ideal for amines and other basic compounds.

Description	qty.	cat.#
Base-Deactivated Glass Wool	10 grams	20999

tech tip

Use of Packings With an Autosampler

We recommend using an injection port liner with wool or CarboFrit® packing when making injections with an autosampler. If there is no packing material in the liner, the solvent droplets act like water on a hot iron: they bounce around until vaporized (Leidenfrost phenomenon). Because autosamplers make rapid injections, samples can be incompletely vaporized, leading to nonreproducible peak response and tailing. You can prevent this by using wool or CarboFrit® packing material in the splitless liner to provide a surface for the solvent droplets to "sit" on until the heat from the injector vaporizes them.

Prepacked Inlet Liners

Let Restek do the work! Just add the appropriate suffix to the liner catalog number.

qty.	Wool	CarboFrit†	
ea.	-200.1	-209.1	addl. cost
5-pk.	-200.5	-209.5	addl. cost
25-pk.	-200.25	-209.25	addl. cost

†CarboFrit® inserts require a neck greater than 2 mm.

CarboFrit® Inlet Liner Packing Material

- Highly inert.
- Extends analytical column lifetime.
- Enhances reproducibility of split and splitless injections.
- Uniform pore size and consistent packing density guarantee consistent flow through the liner.
- Easy to install in any liner with an ID > 3.5 mm when using puller-inserter tool listed below.*

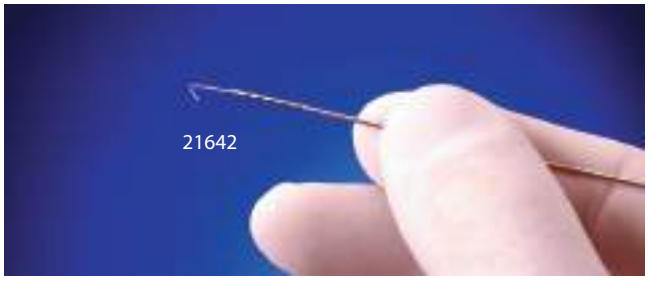
Add the corresponding suffix number to the liner catalog number.

qty.	suffix	
ea.	-209.1	addl. cost
5-pk.	-209.5	addl. cost
25-pk.	-209.25	addl. cost

*Liners with IDs less than 3.5 mm are difficult to pack. We will pack them on a custom basis (minimum neck ID of 2 mm required).

Replacement CarboFrit® Inserts

Description	qty.	cat. #
Frits for liner ID ≤ 4 mm	10-pk.	20295
Frits for liner ID > 4 mm	10-pk.	20294



CarboFrit® Puller/Inserter Tool

- Hook end for removing CarboFrit® inserts.
- Bent end (90°) for inserting CarboFrit® inserts.

Description	qty.	cat.#
CarboFrit Puller/Inserter Tool	ea.	21642

Mini Wool Puller/Inserter

Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.

Description	qty.	cat.#
Mini Wool Puller/Inserter	2-pk.	20114

Eliminates user variation!

Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.

Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.

Place a plug of loosely bound wool at the top of the inlet liner.

Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID ≥ 2 mm.

No more burned fingers!

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

tech tip

Injector Maintenance

Approximately ninety percent of "bad" chromatography is traceable to problems in the injection port. These problems include contaminated carrier gas, incorrect injector flows, active or dirty sites on inlet seals and liners, improper use of wool, leaks, backflash, discrimination, incorrect injector temperature, poor column installation, and use of the wrong injection technique. To minimize injection port problems, set up a routine maintenance schedule and be sure to investigate the injector first when troubleshooting.

GC Accessories

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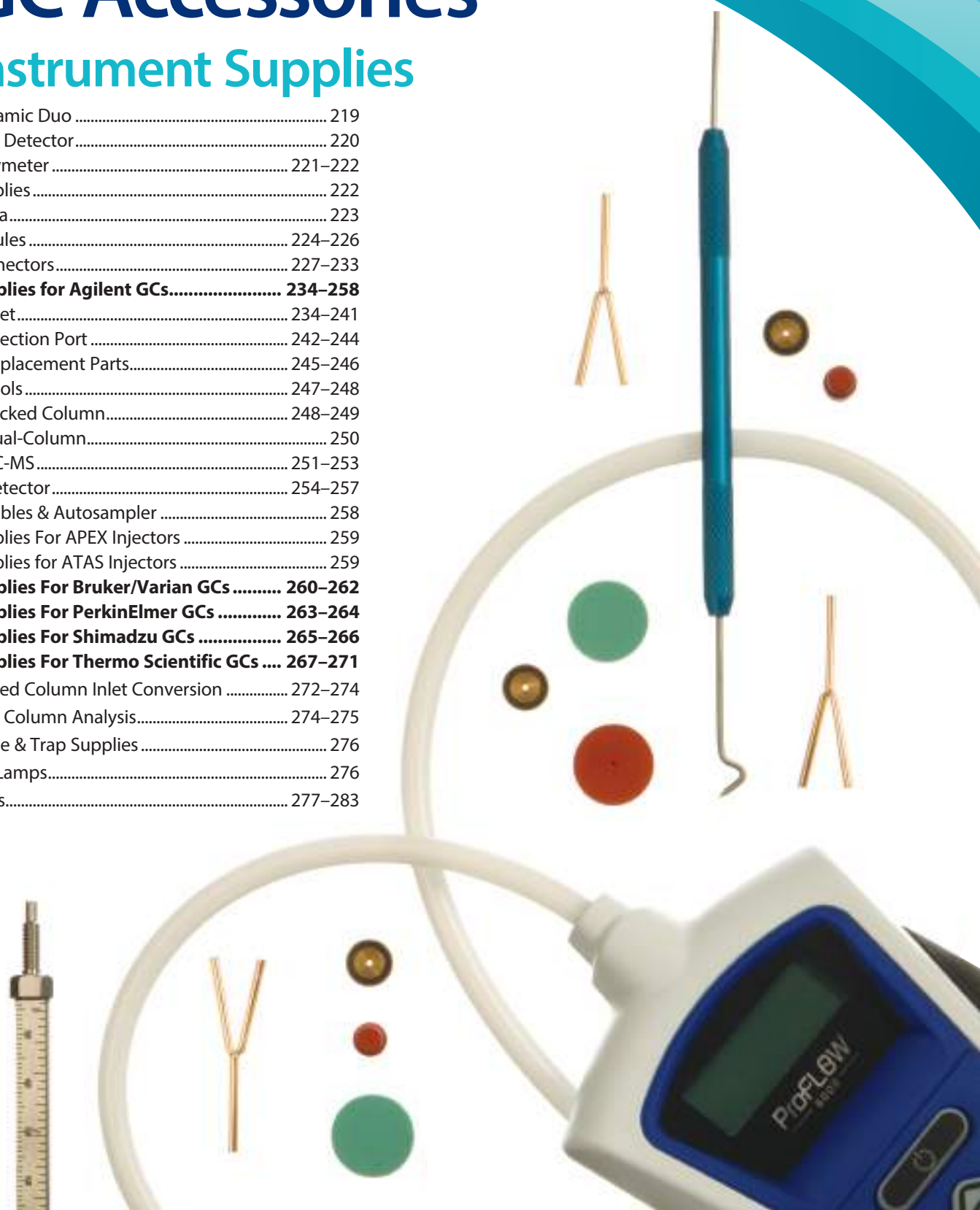


Dynamic Duo (Restek® Leak Detector and ProFLOW 6000 Flowmeter)

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.

Restek's New Leak Detector

Redesigned and better than ever, our new leak detector is an essential tool for trouble-shooting 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 Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

Limits of Detection

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

Minimum Detectable Gas Limits and Indicating LED Color:
Helium, 1.0 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.

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

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

22658

22657

Description	qty.	cat.#
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Related Products and Accessories		
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

Leak Detector

22655

Restek® Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek® leak detector.

Features & benefits include:

- Audible tone indicates the severity of a leak.
- Redesigned circuitry offers 12 hours of operation between charges.
- Detects a broad range of gases; Ex rated for use with hydrogen and other explosive gases.*
- Ergonomic, handheld design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Long-lasting battery; up to 12 hours of continuous use.
- Automatic shutoff.
- A convenient carrying and storage case.
- Easy-to-clean probe assembly.
- A universal charger set (U.S., European, UK, and Australian plugs included).

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

Restek's electronic leak detector makes finding leaks a quick and easy task.

Leak Detector Specifications

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

Limits of Detection

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

Minimum Detectable Gas Limits and Indicating LED Color:
Helium, 1.0 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.

22658

22657

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657
Car Charger/Adaptor	ea.	22652
Universal AC Power Adaptor	ea.	22653

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

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

Restek recommends

If you think that your Restek® electronic leak detector needs service or repair, please contact Restek® Customer Service before sending your unit in (cat.# 22655-R). Leak detector service/repair will include inspection and testing of the unit.

22652

NEW!

22653

Restek ProFLOW 6000 Electronic Flowmeter

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% of flow reading or ± 0.2 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 2-AA batteries (included).
- Data output via USB port.
- 1-year warranty.
- Recalibration service available.

Flowmeters that can measure flammable gases are becoming mandatory due to the increased use of hydrogen in chromatography. With its Ex rating, the Restek® ProFLOW 6000 meter is designed specifically with explosive and flammable gases in mind.

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.

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

Description	qty.	cat.#
Restek ProFLOW 6000 Electronic Flowmeter With Hard-Sided Carrying Case	ea.	22656
ProFLOW 6000 Recalibration Service	ea.	22656-R
Soft-Side Storage Case	ea.	22657

*The flowmeter is designed to measure clean, dry, non-corrosive gases.
Patented

22656

Restek recommends

Recalibrate your ProFLOW 6000 flowmeter once every year. Prolonged failure to recalibrate your unit may result in increased error. To always get the most accurate flow measurements, contact Customer Service to send in your flowmeter for recalibration (cat.# 22656-R).

22657
Optional soft-side storage case is ideal for storing your leak detector or flowmeter in smaller spaces, such as your toobox.

RESTEK®
Pure Chromatography

20135

Soap Film Bubble Flowmeter

- 1 mL flowmeter for flows between 0.1 and 10 cc/min.
- 50 mL flowmeter for flows between 10 and 300 cc/min.
- Includes a reservoir bulb, twenty-four inches (60 cm) of 1/4-inch ID tubing, adaptor tubes for 1/8-inch tubing and 0.53 mm ID capillary columns, and Velcro® fasteners.

Description	Volume	qty.	cat.#
Bubble Flowmeter	1 mL	ea.	20135
Bubble Flowmeter	50 mL	ea.	20136

Methane Cylinder Kit

For optimizing linear velocity

Setting the column flow rate by injecting methane and optimizing linear velocity is a preferred method for establishing reproducible retention times (ASTM Method E1510-93). The kit includes a Scotty® 14 cylinder containing 1% methane in helium, a MINICYL regulator, a syringe adaptor, and a package of twenty-five septa for the adaptor.

20197

Description	qty.	cat.#
Methane Cylinder Kit	kit	20197
Replacement Septa for Syringe Adaptor	25-pk.	20198
Replacement Methane Cylinder	ea.	20199

20612

Capillary Column Rinsing Reservoir Kit

Restore the performance of bonded-phase capillary columns by dissolving and removing soluble, nonvolatile residue, using this reservoir kit. The 50 mL rinsing reservoir is equipped with 1/4-inch inlet and outlet connections and includes a built-in fritted disk to prevent particulate matter from contaminating the column. The kit includes reservoir, pressure regulator, fittings, ferrules, and tubing. Reservoir also available separately.

Description	qty.	cat.#
Rinsing Reservoir Complete Kit	kit	20612
Rinsing Reservoir only	ea.	20613

Column not included.

21000

FID Flow Measuring Adaptor

for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

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. cat.#	100-pk. cat.#
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.

Premium Non-Stick BTO® Septa

- Usable to 400 °C inlet temperature*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs**.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.

Septum Diameter	50-pk. cat.#	100-pk. cat.#
5 mm CenterGuide	27082	27083
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091
11.5 mm CenterGuide	27092	27093
12.7 mm (1/2") CenterGuide	27094	27095
17 mm CenterGuide	27096	27097
Shimadzu Plug	27098	27099

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. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.
**12.7 mm and 17 mm septa packaged in precleaned glass jars.

Measure your old septum here (size in mm)

HANDY septum size chart

Instrument	Septum Diameter (mm)
Agilent (HP)	
5880A, 5890, 6850, 6890, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5
Bruker/Varian	
Injector type:	
Packed column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11
Finnigan (TMQ)	
GC 9001	9.5
GCQ	9.5
QCQ	9.5
TRACE 2000	9.5
PerkinElmer	
Sigma series	11
900,990	11
8000 series	11
Auto SYS	11
Auto SYS XL	11
Shimadzu	
All models	Plug
SRI	
GCs with heated inlet	9.5
All other models	Plug
Thermo Scientific	
TRACE GC	17
GCQ w/TRACE, PTV	17
8000 series	17
1300 and 1310 GC	11
Tracor	
540	11.5
550,560	9.5

tech tip

Tips for Handling Septa

All septa, regardless of composition, puncturability, or resistance to thermal degradation will fail if they are mishandled. Overtightening a septum nut invariably will reduce septum lifetime by increasing coring/splitting. All septa contain volatile materials (e.g., phthalates) that are released when the septum is heated (septum bleed). Because most GCs are equipped with a septum purge, septum bleed generally will disappear within 30 minutes after installing a new septum and exposing it to normal injector temperatures. All Restek septa are preconditioned and are ready to use without delay.

tech tip

Choosing the Right Ferrule
Graphite ferrules are soft, easy to seal, stable to 450 °C, and contain no binders that might off-gas. Vespel®/graphite ferrules work better for vacuum and high-pressure applications (e.g., GC-MS) because they will not fragment or allow oxygen to permeate into the system, whereas graphite ferrules will. Because Vespel®/graphite ferrules are made from a harder material, they might require retightening after several temperature cycles.

Vespel® Ferrules

- 100% high-temperature polyimide.
- Stable to 350 °C.
- Durable, leak-tight.

Vespel® Ferrules

Graphite Ferrules

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.

Vespel®/Graphite Ferrules

- VG2, 60% Vespel®/40% graphite blend offers the best combination of sealing and ease of workability.
- VG1, 85% Vespel®/15% graphite blend offers equivalent composition to Agilent Vespel®/graphite ferrules.
- Seal with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
- Stable to 400 °C.
- Recommended for mass spec transfer lines.

Graphite Ferrules

Vespel/®Graphite Ferrules

Capillary Ferrules for 1/16-Inch Compression-Type Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

NEW!

Ferrule ID	Fits Column ID	qty.	Vespel	Graphite	VG1 (85/15)	VG2 (60/40)
0.3 mm		10-pk.	22213	20233	27061	20275
0.4 mm	0.10/0.15/0.18/ 0.25/0.28 mm	10-pk.	22214	20200	27062	20211
0.4 mm	0.10/0.15/0.18/ 0.25/0.28 mm	50-pk.	—	20227	27063	20229
0.5 mm	0.32 mm	10-pk.	22215	20201	27064	20212
0.5 mm	0.32 mm	50-pk.	—	20228	27065	20231
0.6 mm	0.28 mm**	10-pk.	—	—	27066	20232
0.8 mm	0.45/0.53 mm	10-pk.	22216	20202	27067	20213
0.8 mm	0.45/0.53 mm	50-pk.	—	20224	27068	20230
1.0 mm	0.75 mm*	10-pk.	22217	21058	27069	24912
1.2 mm	0.75 mm*	10-pk.	22218	—	—	—
1.6 mm	1.00 mm*	10-pk.	—	21060	—	—

*For micropacked columns.
**For 0.28 mm MXT columns.

Encapsulated Graphite Ferrules

Encapsulated Ferrules for 1/16-Inch Compression Fittings

- Reusable—will not deform and stick in fittings.
- Less torque needed to seal ferrule.
- Restek's unique blend of graphite minimizes fragmentation and out-gassing.

Ferrule ID	Fits Column ID	qty.	cat.#
0.4 mm	0.25 mm	10-pk.	21036
0.5 mm	0.32 mm	10-pk.	21037
0.8 mm	0.53 mm	10-pk.	21038

Compact Ferrules for Agilent 5890/6890/6850/7890 GCs

Available in graphite or Vespel®/graphite material.

Ferrule ID	Fits Column ID	qty.	Graphite	NEW! VG1 (85/15)	VG2 (60/40)
0.4 mm	0.25/0.28 mm	10-pk.	20250	27070	20238
0.4 mm	0.25/0.28 mm	50-pk.	20251	27071	20239
0.5 mm	0.32 mm	10-pk.	21007	27072	20248
0.5 mm	0.32 mm	50-pk.	21008	27073	20249
0.8 mm	0.45/0.53 mm	10-pk.	20252	27074	20263
0.8 mm	0.45/0.53 mm	50-pk.	20253	27075	20264
1.0 mm	0.75 mm*	10-pk.	21059	—	—
1.6 mm	1.00 mm*	10-pk.	21061	—	—

*For micropacked columns.

Standard Ferrules for 1/16-, 1/8-, and 1/4-Inch Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

Fitting Size	Ferrule ID	qty.	Vespel	Graphite	NEW! VG1 (85/15)	VG2 (60/40)
1/4"	3/16"	5-pk.	—	—	—	20258
1/16"	1/16"	10-pk.	22210	20207	27076	20218
1/8"	1/8"	10-pk.	22211	20208	27077	20219
1/8"	reduce to 1/16"	10-pk.	—	20209	—	20220
1/4"	1/4"	10-pk.	22212	20210	27078	20221
1/4"	reduce to 1/8"	10-pk.	22219	20225	—	20222
1/4"	reduce to 1/16"	10-pk.	—	20226	—	20223

Two-Hole Ferrules for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	VG2 (60/40)
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

Reducing Ferrules

Available in graphite or Vespel®/graphite material.

Fitting Size	Ferrule ID	Fits Column ID	qty.	Graphite	NEW! VG1 (85/15)	VG2 (60/40)
1/8"	0.4 mm	0.25 mm	5-pk.	20205	27079	20254
1/8"	0.5 mm	0.32 mm	5-pk.	20205	27080	20255
1/8"	0.8 mm	0.53 mm	5-pk.	20206	27081	20215
1/4"	0.4 mm	0.25 mm	5-pk.	20203	—	—
1/4"	0.5 mm	0.32 mm	5-pk.	20203	—	20257
1/4"	0.8 mm	0.45/0.53 mm	5-pk.	20204	—	20217

Blank Ferrules for 1/16-Inch Fittings

Fitting Size	Ferrule ID	qty.	VG2 (60/40)
1/16"	no hole	10-pk.	20240

Ferrules

PTFE Ferrules

- Upper temperature limit 250 °C.
- 100% PTFE; completely inert.
- One-piece design requires no back ferrule.

Fitting Size	Ferrule ID	qty.	cat.#
1/16"	1/16"	10-pk.	21122
1/16"	0.4 mm	10-pk.	21123
1/16"	0.5 mm	10-pk.	21124
1/16"	0.8 mm	10-pk.	21125
1/8"	1/8"	10-pk.	21126
3/16"	3/16"	10-pk.	21127
1/4"	1/4"	10-pk.	21128

Graphite Ferrules

(M4 Fittings) for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.

Ferrule ID	Fits Column ID	Similar to TS Part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	—	22221	22222
0.4 mm	0.18–0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45–0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

5 mm Ferrules for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.

Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121

Graphite Ferrules for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	Similar to Shimadzu Part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829

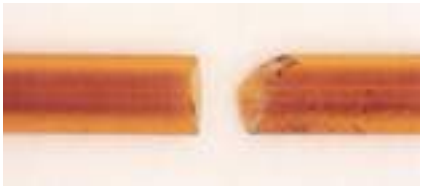
GRAPHPACK® 2M Ferrules for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel Part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225

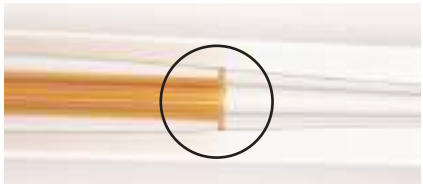
Restek Press-Tight® Connectors

Press-Tight® connectors are lightweight, quickly installed, and easy to use. They connect fused silica tubing having outside diameters ranging from 0.33 to 0.74 mm (Restek® 0.1 to 0.53 mm ID). Press-Tight® connectors do not cause solvent tailing, or adsorb active compounds.

Press-Tight® connectors most often are used to connect a guard column to an analytical column. They also are used to connect columns differing in polarity, for unique separations, or to repair a broken column.



Make a clean, square cut for optimum connector performance. The cut on the right will produce a poor seal.



A brown ring indicates a proper seal.

Our attention to detail is why Restek® products are known for quality and reliability.

Obtaining a leak-tight seal:

To achieve optimum performance from these connectors, begin with a properly cut fused silica column or retention gap end. Even if you use polyimide resin (cat.# 20445, page 228) for extra insurance, a poorly cut capillary column will make an inadequate seal.

Press the cut ends into the connector, then establish a flow, and leak-check the seal with a Restek® electronic leak detector (cat.# 22655, page 220) before heating the system.

What is the maximum temperature for a Press-Tight® connector?

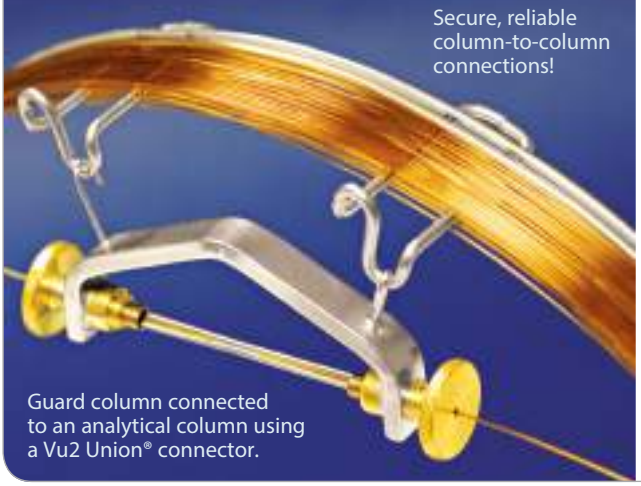
Press-Tight® connectors are effective at oven temperatures up to 325 °C, the temperature at which the polyimide coating on the column decomposes and the connection will begin to leak. We strongly recommend using a Vu2 Union® (page 229) or SeCure® "Y" (page 230) connector if oven temperatures will exceed 325 °C for prolonged periods of time.

Can Press-Tight® connectors be used with MXT® columns?

No. To achieve a leak-tight fused silica to stainless steel connection, we recommend an MXT® connector (see page 231).

Let Restek Make the Connection!

Secure, reliable column-to-column connections!



Guard column connected to an analytical column using a Vu2 Union® connector.

Restek will connect a guard column/transfer line to any analytical column, using a Vu2 Union® connector. We will leak-check the connection and confirm analytical integrity by analyzing a test mixture. To order a preconnected guard column/transfer line, add the three-digit suffix from the chart below to any analytical column catalog number. Example: A 5 m, 0.32 mm ID guard column connected to a 30 m, 0.32 mm ID, 1.0 µm Rtx®-5 column is cat.# 10254-163.

5m Guard Column ID	cat.# suffix	Additional Cost*
0.15 mm	-160	
0.18 mm	-161	
0.25 mm	-162	
0.32 mm	-163	
0.53 mm	-164	

10m Guard Column ID	cat.# suffix	Additional Cost*
0.25 mm	-165	
0.32 mm	-166	
0.53 mm	-167	

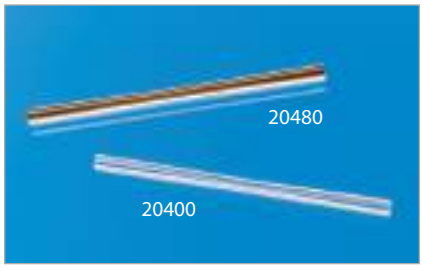
*Additional cost will be added to the price of the column.

Guard columns listed are intermediate polarity (IP) deactivated.

For more information about guard columns, see **pages 18–19**.

Press-Tight® Connectors

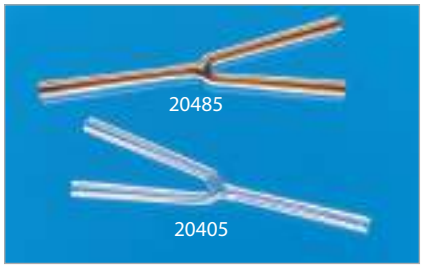
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).



Universal Press-Tight® Connectors

- Connect a guard column to an analytical column.
- Repair a broken column.
- Connect a column outlet to a transfer line.

Description	5-pk.	25-pk.	100-pk.
Universal Press-Tight Connectors	20400	20401	20402
Universal Press-Tight Connectors, Deactivated	20429	20430	—
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	—

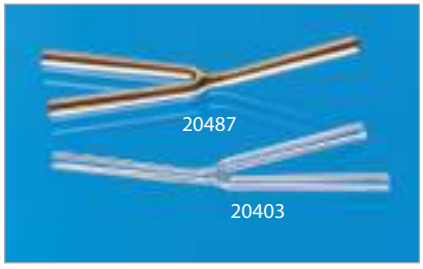


Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.

Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486



Universal Angled "Y" Press-Tight® Connectors

- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

Description	ea.	3-pk.
Universal Angled "Y" Press-Tight Connector	20403	20404
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled "Y" Press-Tight Connector, Siltek Deactivated	20487	20469

Polyimide Resin

Securely connects a Press-Tight® connector to a fused silica column.

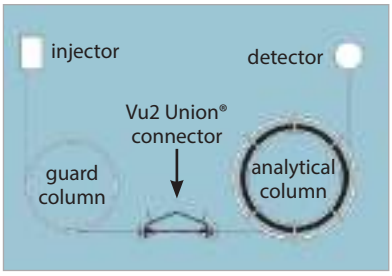
Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445

Vu2 Union® Connectors

- Connect a guard column to an analytical column.
- Connect a column to a transfer line.
- Connect two columns in series.
- Repair a broken column.
- Fit both Restek® cage designs.

Restek's Vu2 Union® connector combines the simplicity of a Press-Tight® union with the strength of a metal union.

A guard column connected to an analytical column by a Vu2 Union® connector.



Fit both Restek® cage designs.

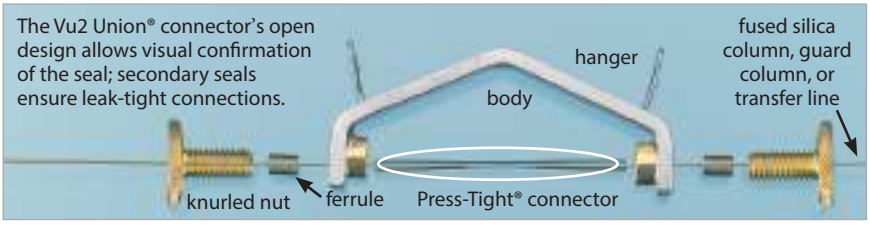
Secure, reliable column-to-column connections!

How does a Vu2 Union® connector work?

A Press-Tight® union in the Vu2 Union® connector joins the fused silica tubing ends together; the ferrule and knurled nut at each end of the connector hold the tubing in place via a secondary seal between the ferrule and the Press-Tight® union. Each knurled nut applies independent pressure to each ferrule to make leak-tight seals with the column ends. These ultra-strong connections will not unexpectedly disconnect under temperature changes, vibrations, or other stresses normally encountered in GC analyses. The open design allows visual confirmation of the seal between the column and the Press-Tight® union to ensure confidence in the connection. Hang the connector from the column cage to minimize stress on the connections.

Who will benefit from using Vu2 Union® connectors?

Any analyst using guard columns, transfer lines, or restrictor tubing; performing a dual-column analysis with columns connected in series; or seeking to repair a broken column will find Vu2 Union® connectors the simple, reliable, easy-to-use solution to their connection needs.



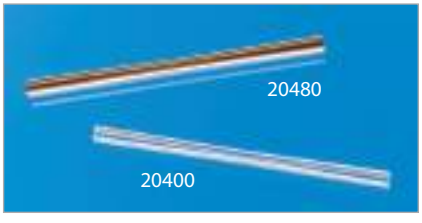
NOTE: This product is not recommended for GC column-to-MS connections.

Kits include: Vu2 Union® body, two knurled nuts, two Press-Tight® unions, and four ferrules

Description	Ferrules Fit Column ID	qty.	cat.#
Vu2 Union Connector Kit	0.10–0.15 mm	kit	22220
Vu2 Union Connector Kit	0.18–0.28 mm	kit	21105
Vu2 Union Connector Kit	0.32 mm	kit	21106
Vu2 Union Connector Kit	0.45–0.53 mm	kit	21107
Knurled Nut		2-pk.	21108

Universal Press-Tight® Connectors

Description	5-pk.	25-pk.	100-pk.
Universal Press-Tight Connectors	20400	20401	20402
Universal Press-Tight Connectors, Deactivated	20429	20430	—
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	—



Graphite Ferrules for Vu2 Union® Connectors

- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	22221	22222
0.4 mm	0.18–0.28 mm	20280	20281
0.5 mm	0.32 mm	20282	20283
0.8 mm	0.45–0.53 mm	20284	20285

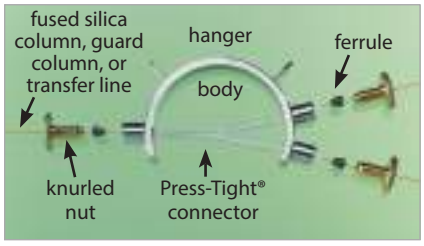
Fit both Restek® cage designs.

SeCure® "Y" Connector Kits

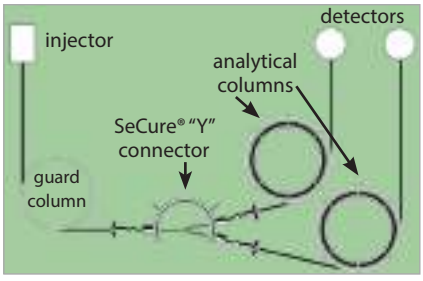
- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and 1/16" graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek® cage designs.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

The SeCure® "Y" connector's open design allows visual confirmation of the seal.

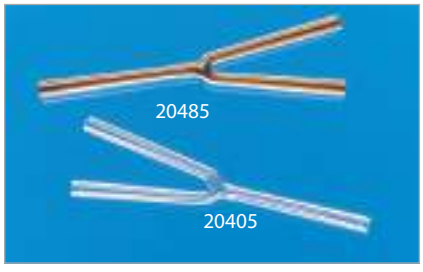


Dual-column confirmational analysis with a single injection—one of the SeCure® "Y" connector's many uses.



Kits include: SeCure® "Y" connector body, three knurled nuts, universal "Y" Press-Tight® union, three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure "Y" Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure "Y" Connector Kit	0.32 mm	kit	20277
SeCure "Y" Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279



Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).

Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486

Graphite Ferrules for SeCure® "Y" Connectors

- Preconditioned to minimize out-gassing.
- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 10-pk.	Graphite 50-pk.
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	20200	20227
0.5 mm	0.32 mm	20201	20228
0.8 mm	0.45/0.53 mm	20202	20224

MXT®-Union Connector Kits for Connecting Metal and/or Fused Silica GC Columns

- Low dead volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 350 °C.
- Available in union and "Y" configurations.
- Can also be used for connecting fused silica to metal.

These MXT® connectors can be used with fused silica tubing because of a Valcon polyimide, 1/32-inch, one-piece fused silica adaptor. This unique graphite-reinforced composite allows a capillary column to slide into the adaptor and be locked in place simply by loosening and tightening the fitting.

MXT®-Union Connector Kits
for Connecting Metal and/or Fused Silica GC Columns

Each kit contains the MXT® union; two 1/32-inch nuts; and two, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Fused Silica Columns	kit	21386
For 0.32 mm ID Fused Silica Columns	kit	21385
For 0.53 mm ID Fused Silica Columns	kit	21384

MXT® "Y"-Union Connector Kits
for Connecting Metal and/or Fused Silica GC Columns

Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Columns	kit	21389
For 0.32 mm ID Columns	kit	21388
For 0.53 mm ID Columns	kit	21387

1/32-Inch Valco® Adaptor Ferrules (Valcon Polyimide)

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

Tubing OD	Tubing ID	Valco #	qty.	cat.#
0.25–0.40 mm	0.25 mm	FS.4-5	5-pk.	20137
0.40–0.50 mm	0.32 mm	FS.5-5	5-pk.	20140
0.50–0.80 mm	0.53 mm	ZF.5V-5	5-pk.	20141
1/32" Replacement Nut			5-pk.	20389

20146

Ferrule Removal Kit

The tapered tools in this kit have teeth designed to grip and remove fused silica adaptor ferrules that have become stuck in the fitting detail. Each kit has two tools: one for removing 1/32-inch adaptor ferrules and one for removing 1/16-inch adaptor ferrules.

Description	Valco #	qty.	cat.#
Ferrule Removal Kit	FRK1	kit	20146

tech tip

Coupling GC Columns
An MXT® connector is a good alternative to a glass connector when coupling GC columns. This connector is constructed from stainless steel and will not break; it uses ferrules for sealing. The design ensures low dead volume, and Siltek® treatment ensures the MXT® connector is inert; both features help minimize peak tailing. MXT® connectors can be used to connect metal-to-metal, metal-to-fused silica, or fused silica-to-fused silica tubing. When connecting metal tubing, use 1/32-inch stainless steel ferrules (see page 232); for fused silica tubing, use Valcon polyimide adaptor ferrules (see above).

MXT® Low Dead Volume Connector Kits For Metal Columns

These low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns. They can be used at temperatures up to 430 °C without degrading the deactivated layer. Purchase the appropriate ferrules for connecting 0.28, 0.32, or 0.53 mm ID tubing.

MXT® Low Dead Volume Connector Kits
for Metal Columns

- Connect a guard column/transfer line to an MXT® stainless steel column.
- Low thermal mass tracks rapid oven temperature programming.
- Stainless steel ferrules and nuts.
- Available in "Y" and union configurations.
- Siltek® treatment ensures ultimate inertness.

Each kit contains the MXT® union, two 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20397
For 0.32 mm ID MXT Columns	kit	20536
For 0.53 mm ID MXT Columns	kit	20394

MXT® Low Dead Volume "Y" Connector Kits
for Metal Columns

Connect two MXT® columns to one inlet or one MXT® column to two detectors.

Each kit contains the MXT® union, three 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20396
For 0.32 mm ID MXT Columns	kit	20537
For 0.53 mm ID MXT Columns	kit	20395

Replacement Ferrules
(1/32-Inch Stainless Steel) for MXT® Connectors

Ferrule ID	Fits Column ID	qty.	cat.#
0.59 mm	0.28 mm	10-pk.	20398
0.53 mm	0.32 mm	10-pk.	20535
0.79 mm	0.53 mm	10-pk.	20399

1/4-Inch–3/16-Inch Open-End Wrenches

High-quality miniature wrenches to use with MXT® low-dead-volume connectors.

Description	qty.	cat.#
1/4"–3/16" Open-End Wrenches	2-piece set	20388

MXT® Capillary Columns

Ideal for High Temperature GC Analysis

- Metal tubing won't become brittle at high temperatures (430 °C).
- Exclusive Siltek® layer makes the internal surface as inert as deactivated fused silica.
- Can be tightly coiled well under 4.5" without breaking, even under stress.
- Column efficiency (Trennzahl valve) is similar to that of fused silica.

See **pages 104–115**.

www.restek.com/**mxt**

20147

Zero Dead Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. Made of 300-series stainless steel. For use with 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZU1T	ea.	20150

20159

20158

Male Pipe to Valco® Internal Adapter (Stainless Steel)

Makes a minimum volume connection from a female pipe fitting on a pressure gauge or regulator to a Valco® zero-dead-volume fitting. Made of 300 series stainless steel; stainless steel ferrules included.

Description	Fitting Size	Bore	Valco #	qty.	cat.#
Male Pipe to Valco Internal Adapter	1/8" NPT Male to 1/16" ZDV	1.0 mm	PZA21	ea.	20158
Male Pipe to Valco Internal Adapter	1/4" NPT Male to 1/16" ZDV	1.0 mm	PZA41	ea.	20159

20286

20287

Nuts & Ferrules

(1/16-Inch Stainless Steel) for Valco® Connectors

Description	Valco #	qty.	cat.#
Ferrules, 1/16" Stainless Steel	ZF1-10	10-pk.	20286
Nuts, 1/16" Stainless Steel	ZN1-10	10-pk.	20287

21015

1/16-Inch Valco® Adaptor Ferrules

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

	Valcon Polyimide			Virgin Polyimide		
Tubing OD	Valco #	qty.	cat.#	Valco #	qty.	cat.#
0.30≤0.40 mm	FS1.4-5	5-pk.	20142	FS1.4V1-5	2-pk.	21015
0.40≤0.50 mm	FS1.5-5	5-pk.	20143	FS1.5V1-5	2-pk.	21016
0.50≤0.80 mm	FS1.8-5	5-pk.	20144	—	—	—
0.80≤0.90 mm	FS1.9-5	5-pk.	20145	—	—	—

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Supplies for Agilent GCs: Inlet

22241

Viton® O-Rings for Agilent GCs

Fit split (6.3 mm OD) or splitless (6.5 mm OD) liners.

Description	Max Temp	Similar to Agilent Part #	10-pk. cat.#	50-pk. cat.#
Viton O-Rings for Agilent GCs	300 °C	5188-5365	22241	22242

20296

Graphite O-Rings for Agilent and Bruker/Varian 1177 Injectors

Excellent thermal stability at injection port temperatures up to 450 °C!

Description	Max Temp	Similar to Agilent Part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	5180-4168	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	5180-4173	20298	20299

22336

Replacement Viton® O-Rings for use with the Agilent Flip Top Inlet Sealing System

Description	Similar to Agilent Part #	qty.	cat.#
Viton Replacement O-Rings for use with the Agilent Flip Top Inlet Sealing System	5188-5366	10-pk.	22336

21409

Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409

22684

Liner Seals for CIS4 and PTV

Description	Max Temp	Similar to Agilent Part #	Similar to Gerstel Part #	qty.	cat.#
Liner Seals for CIS4 and PTV	450 °C	5182-9749	007541-005-00	5-pk.	22684

22352

22349

21409

Inlet Adaptor

PTV Inlet Adaptor Kit for Gerstel CIS 3 and CIS 4 PTV Inlets

- Meets original manufacturer's performance.
- Includes inlet adaptor, silver PTV seal, and slotted capillary nut.

Description	Similar to Gerstel Part #	qty.	cat.#
PTV Inlet Adaptor Kit for 0.25 and 0.32 mm ID Columns	007259-045-00	kit	22350
Silver PTV Seals	002841-005-00	5-pk.	21409
PTV Slotted Capillary Column Nut	001268-005-00	2-pk.	22349
Liner Seal Pre-Seat Tool	007542-000-00	ea.	22352

22223

GRAPHPACK® 2M Ferrules for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel Part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225

Merlin Microseal Septa for Agilent GCs

- Allow operation from 3 to 100 psi (general-purpose Microseal septa) or 1 to 45 psi (low-pressure Microseal septa).
- 400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring; longer life; and consistent, low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. No adapter is required for the Agilent inlet. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	Similar to Agilent Part #	qty.	cat.#
General Purpose Kit for Agilent GCs (3 to 100 psi)				
Nut & 2 General Purpose (#410) Microseals	404	5181-8833	kit	22810
Nut & 1 General Purpose (#410) Microseal	405	5182-3442	kit	22811
Low Pressure Kit for Agilent GCs (1 to 45 psi)				
Nut & 2 Low Pressure (#310) Microseals	304		kit	22813
Nut & 1 Low Pressure (#310) Microseal	305	5181-8816	kit	22814
Replacement Microseals				
General-Purpose Microseal (most applications, 3 to 100 psi)	410	5182-3444	ea.	22812
Low-Pressure Microseal (1 to 45 psi)	310	5181-8815	ea.	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		ea.	22782
Replacement Microseal Nut	403	5182-3445	ea.	22809

Note: Merlin Microseal septa require a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Compatible syringes and replacement needles are available at www.restek.com.

Merlin MicroShot™ Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot™ injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot™ injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.

22226

Description	Merlin cat.#	qty.	cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

*Syringe not included. Requires Agilent-style (ball-end plunger) autosampler syringe.

Supplies for Agilent GCs: Inlet

Thermolite® Septa

Premium Non-Stick BTO® Septa

Septa for Agilent GCs

- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs.

Septum Diameter	50-pk. cat.#	100-pk. cat.#
Thermolite Septa (usable to 340 °C inlet temp.)		
5 mm (3/16")	27121	27122
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)		
5 mm CenterGuide	27082	27083
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.
Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

HANDY septum size chart

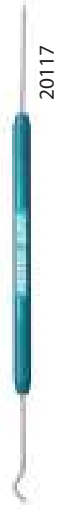
Agilent Instrument	Septum Diameter (mm)
5880A, 5890, 6890, 6850, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.

Dislodge a stuck ferrule quickly and easily—without scoring the fitting.

Remove a septum without damaging an expensive weldment.



20117

Description	qty.	cat.#
Septum Puller	ea.	20117

21309

Septum Nuts for use with Agilent 5890/6890/6850/7890 Split/Splitless Injectors

- Needle guide allows easy penetration and prevents septum coring.
- Manual injection septum nut allows use of 26-gauge needles for on-column injections.
- Made of high-quality stainless steel.

Description	Similar to Agilent Part #	qty.	cat.#
Septum Nut, Autosampler & PTV (for 23-gauge needles)	18740-60835	ea.	20631
Septum Nut, Manual Injection (for 26-gauge needles)	18740-60835	ea.	21309

Septum Nut Removal Tool

for Agilent 5890/6850/6890/7890 GCs

- Easily remove the septum nut without touching the heated nut—no more burned fingers!
- Unique, ergonomic handle—easy to grip.
- Nut remains in tool for quick reattachment.

24918

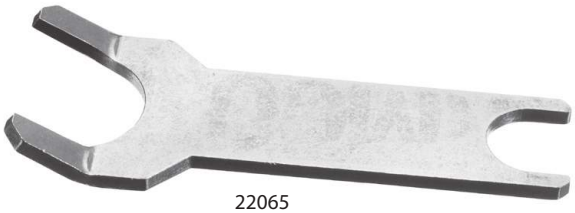
Slip tool over septum nut...

loosen nut...

and remove, avoiding hot metal surfaces.

Septum nut remains in tool until reinstalled.

Description	qty.	cat.#
Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs	ea.	24918



22065

Inlet Wrench for Agilent 5890/6850/6890 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065

21393

Injection Port Repair Tool for Agilent Split/Splitless Injection Ports

- Remove contaminants, achieve a better seal.
- Cleans critical inlet seal areas.

Description	qty.	cat.#
Injection Port Repair Tool for Agilent Split/Splitless Injection Ports (includes: a handle and brush adaptor, 5 medium sanding disks, 5 fine sanding disks, a 6.5 mm bore brush, & a 7 mm bore brush)	ea.	21393
Replacement Sanding Disks (5 fine & 5 medium)	10-pk.	22689
Replacement Bore Brushes (one 6.5 mm & one 7 mm)	2-pk.	21353

Rethreading Tool for Agilent Split/ Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.

23018

Repair damaged injection port threads!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool	ea.	23018

22181

Inlet Maintenance Kit for Agilent GCs

- Includes the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

Inlet kit includes:

- 0.4, 0.5, and 0.8 mm ID graphite ferrules
- Viton® O-rings
- Capillary nuts
- Inlet seals
- Reducing nut
- Scoring wafer
- 11 mm Thermolite® septa
- 4.0 mm single taper liner
- 4.0 mm split liner with wool
- Capillary column caps
- $^{1}/_{4}$" x $^{5}/_{16}$" wrench
- Septum puller
- Installation gauge
- Wire cleaning brush
- Jet reamers/ferrule removers
- Inlet liner removal tool
- Septa nut removal tool

Description	qty.	cat.#
Inlet Maintenance Kit	kit	22181

Supplies for Agilent GCs: Inlet

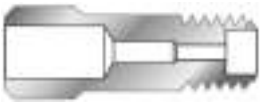
Stainless Steel

Brass

Capillary Column Nuts for Agilent 5890/6850/6890/7890 GCs

Available in brass or stainless steel.

Choose for use with "compact" Agilent-style ferrules...



or for use with standard ferrules.

Description	Similar to Agilent Part #	qty.	cat.#
For use with "compact" Agilent-style ferrules.			
Stainless Steel Capillary Column Nut	5181-8830	2-pk.	21884
Brass Capillary Column Nut	5181-8830	2-pk.	21878
For use with standard 1/16"-type ferrules.*			
Stainless Steel Capillary Column Nut	05921-21170	2-pk.	20883
Brass Capillary Column Nut	05921-21170	2-pk.	21879

*Designed to fit a wider variety of 1/16" ferrules

free literature

GC Column Installation Made Easier with Extended Reducing Nuts for the Agilent® Split/Splitless Inlet

Download your free copy from www.restek.com

lit. cat.# GNAR2056-UNV

Extended Capillary Column Nuts

for Agilent 5890/6850/6890/7890 GCs

- Visible below inlet insulating cup for easy, breakage-free column installation without removing cup.
- Finger-tight design to allow wrench-free use.
- Available for standard (1/16") and compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.

Description	qty.	cat.#
Extended Capillary Column Nut Kit for standard 1/16" ferrules Includes: extended reducing nut and extended capillary column nut for standard 1/16" ferrules	kit	22633
Extended Capillary Column Nut Kit for compact ferrules Includes: extended reducing nut and extended capillary column nut for compact ferrules	kit	22634
Extended Reducing Nut	ea.	22635
Extended Capillary Column Nut for standard 1/16" ferrules	ea.	22636
Extended Capillary Column Nut for compact ferrules	ea.	22637

100% Satisfaction Guaranteed

Sky® Inlet Liners

True Blue Performance

Exceptionally inert Sky® inlet liners with state-of-the-art deactivation improve trace-level analysis—**and now come with a 100% satisfaction guarantee!***

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

* For details on our 100% satisfaction guarantee, visit **www.restek.com/sky**

Hot Swap Capillary Column Nuts

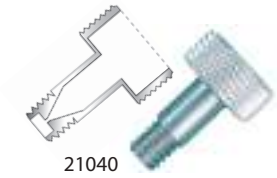
22347

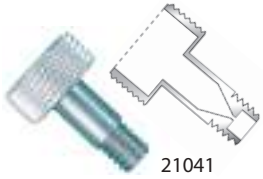
- No more burned fingers!
- No more downtime waiting for injector parts to cool down.

Never worry again about burned fingers or having to wait for the injector to cool down. The Hot Swap capillary column nut allows you to change your capillary column while the injector temp is still hot.

Description	qty.	cat.#
For use with "compact" Agilent-style ferrules.		
Hot Swap Capillary Column Nut	ea.	22348
For use with standard 1/16"-type ferrules.		
Hot Swap Capillary Column Nut	ea.	22347

NOTE: For proper operation, oven fan must be kept operational during change out or risk of burn may occur.


21040


21041

Finger-Tight Capillary Column Nuts

- Allow wrench-free column installations.
- Available for standard (1/16") and compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.

Description	Similar to Agilent Part #	qty.	cat.#
For use with "compact" Agilent-style ferrules.			
Finger-Tight Capillary Column Nuts	5020-8293, 5020-8292	2-pk.	21040
For use with standard 1/16"-type ferrules.			
Finger-Tight Capillary Column Nuts		2-pk.	21041

Injector/Detector Plug Nuts

21883

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.

Description	Similar to Agilent Part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883

21034

21399

Easily seat ferrules for consistent installations!

Capillary Installation Gauge for Agilent GCs

- Seats graphite* ferrules onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399

*For use with graphite ferrules only.

Restek Recommends!

A dual Vespel® ring inlet seal eliminates the need for a washer!

Patented

Dual Vespel® Ring Inlet Seals Washerless, Leak-Tight Seals for Agilent GCs

- Does not require a separate washer.
- Requires less torque to seal.
- Does not require retightening of reducing nut after several oven cycles.
- Extends column lifetime by preventing oxygen from reaching the column.
- Same price as the regular inlet seals with washers.
- Siltek® treatment provides enhanced inertness versus stainless steel.

Extend column lifetime!

21238 21240 21248

0.8 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#	50-pk. cat.#
Gold-Plated	21240	21241	23418
Siltek-Treated	21242	21243	23419
Stainless Steel	21238	21239	23420

1.2 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	21246	21247
Siltek-Treated	21248	21249
Stainless Steel	21244	21245

22083 22085

Dual Vespel® Ring Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications >500 mL/min.
- Washerless, leak-tight seals.

0.8 mm ID Dual Vespel Ring Cross-Disk Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	22083	22084
Siltek-Treated	22085	22086

Restek innovation!

Patented

1/16" Adaptor Fitting

Flip Seal® Dual Vespel® Ring Inlet Seals

- Reversible, two-sided design allows significantly more analyses than other seals, at the same price—simply use, flip, then use again!
- Vespel® ring embedded in top and bottom surface eliminates need for a washer.
- Highly inert gold or Siltek®-deactivated seals reduce breakdown and adsorption of active compounds, maximizing component transfer to GC column.
- Very little torque required to make seal—reduces operator variability.

Flip Seal Dual Vespel Ring Inlet Seal	2-pk. cat.#		10-pk. cat.#
Gold-Plated	23411		23413
Siltek-Deactivated	23412		23414
Flip Seal Dual Vespel Ring Inlet Seal Kit		**qty.**	**cat.#**
Includes: gold-plated inlet seal, reducing nut adaptor, 1/16" SS nut		kit	23406

Note: The Flip Seal® inlet seal requires a special reducing nut adaptor fitting, which is included in the kit. The Flip Seal® Adaptor can be used with standard 1/16" ferrules.

Replacement Inlet Seals With Washers

- Siltek® treatment provides enhanced inertness versus stainless steel.
- All seals include washers.

Replacement Inlet Seals for Agilent GCs

The inlet seal at the base of the Agilent 5890/6890/7890 GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

To reduce breakdown and adsorption of active compounds, use Siltek® or gold-plated seals.

Single-Column 0.8 mm ID (Opening)	Similar to Agilent Part #	2-pk. cat.#	10-pk. cat.#	50-pk. cat.#
Gold-Plated	5188-5367	21317	21318	23415
Siltek-Treated		21319	21320	23416
Stainless Steel	18740-20880	21315	21316	23417
0.25/0.32 mm ID Dual-Column 1.2 mm ID (Opening)		**2-pk. cat.#**	**10-pk. cat.#**	
Gold-Plated		21305	21306	
Siltek-Treated		21307	21308	
Stainless Steel		20390	20391	
0.53 mm ID Dual-Column 1/16-inch ID (Opening)		**2-pk. cat.#**	**10-pk. cat.#**	
Stainless Steel		20392	20393	

Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

All seals include washers.

Replacement Inlet Seal Washers

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Inlet Seal Washers	5061-5869	15-pk.	21710

Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications >500 mL/min on Agilent 5890 GCs.
- Siltek® treatment provides enhanced inertness versus stainless steel.
- All seals include washers.

0.8 mm ID Cross-Disk Inlet Seal	Similar to Agilent Part #	2-pk. cat.#	10-pk. cat.#
Gold-Plated	5182-9652	20477	20476
Siltek-Treated	—	20475	20474
1.2 mm ID Cross-Disk Inlet Seal	**Similar to Agilent Part #**	**2-pk. cat.#**	**10-pk. cat.#**
Gold-Plated	—	21009	21010
Siltek-Treated	—	21011	21012

Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409

Restek innovation!

Simply slip the weldment removal tool over the weldment, then twist and remove the weldment. For speed and efficiency, the weldment stays secured in the weldment removal tool until you reattach it.

EZ Twist Top® Split/Splitless Injection Ports for Agilent GCs

- Change inlet liners faster and more easily.
- Gas lines are attached to shell weldment bottom to help eliminate broken gas lines.
- Gas lines don't interfere with routine maintenance.
- Weldment removal tool allows for quick removal of the hot weldment without fingers ever touching hot surfaces.
- Weldment stays secure in the tool for reattachment.

The importance of injection port maintenance has been well documented by instrument and column companies industry wide. Restek has made it easy to carry out this maintenance with the innovation of our EZ Twist Top® injection port.

Get the EZ Twist Top Advantage	Restek EZ Twist Top	Agilent Flip Top
Eliminate damaged gas lines	x	
Siltek deactivation for enhanced inertness & durability	x	
Avoid touching hot metal surfaces—weldment tool included	x	

EZ Twist Top® Split/Splitless Injection Port for Agilent 7890 GCs

Description	qty.	cat.#
Injection Port Assembly Kit Includes: weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22177
Injection Port Assembly Kit, Siltek Treated Includes: Siltek weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22178
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22175
Shell Weldment, Siltek Treated	ea.	22176
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728

Visit www.restek.com/slideshows for an educational video on our EZ Twist Top® injection port system.

tech tip

Which EZ Twist Top® injection port should you buy?

The type of split vent trap you have connected to the EPC module/block on your 6890/6850 Agilent GC determines which EZ Twist Top® Injection Port you need to buy.

Simply remove the top and rear panel on the GC and see if you have the small (pencil type) split vent filter (cat.# 22820) or the large canister type filter (cat.# 23031) attached to the split vent gas line. If you have the small (pencil type) split vent filter, you need the EZ Twist Top® injection port for Agilent 6890/6850 GCs (cat.# 22721 or 22722). If you have the large canister filter, you'll need the EZ Twist Top® with optional split vent for Agilent 6890/6850 GCs, for use with large canister type filters (cat.# 22735 or 22736).

EZ Twist Top® Split/Splitless Injection Port
for Agilent 6850/6890 GCs With Large Canister-Type Filter

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22735
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22736
Optional Split/Splitless Shell Weldment	ea.	22733
Optional Split/Splitless Shell Weldment, Siltek Treated	ea.	22734

EZ Twist Top® Split/Splitless Injection Port
for Agilent 6850/6890 GCs with Pencil Traps

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22721
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22722
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22723
Shell Weldment, Siltek Treated	ea.	22730
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728

EZ Twist Top® Split/Splitless Injection Port for Agilent 5890 GCs

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22725
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22726
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22727
Shell Weldment, Siltek Treated	ea.	22731
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728

Split/Splitless Injection Ports for Agilent GCs

Would you like better performance from your injector? Our Siltek®-treated split/splitless injector is a direct replacement for Agilent 5890 and 6890/6850 GCs, but Siltek® treatment passivates the metal surface to ensure an inert pathway for the sample, delivering increased performance. The injector is manufactured from high-quality stainless steel and meets or exceeds Agilent original equipment performance.

20265

20266

Split/Splitless Injection Port

(Direct Replacement or Siltek® Treated) for Agilent 5890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	19251-80570	ea.	20266
Replacement Shell Weldment, Siltek Treated	19251-80570	ea.	20268

*Cat.# 20265 and 20267 are for use with manual flow or EPC on Agilent 5890 GCs.
For use with manual flow only on Agilent 6890/6850 GCs.

22674

22686

20265

22673

Split/Splitless Injection Port

(Direct Replacement or Siltek® Treated) for Agilent 6890/6850 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Weldment with EPC	G1544-60575	ea.	22674
Replacement Weldment with EPC, Siltek Treated	G1544-60575	ea.	22672
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	G1544-80570	ea.	22673
Replacement Shell Weldment, Siltek Treated	G1544-80570	ea.	22671
Split/Splitless Weldment (for use with large canister-type filter)	G1544-60585	ea.	22686
Split/Splitless Weldment (for use with large canister-type filter), Siltek Treated	G1544-60585	ea.	22670

*Cat.# 20265 and 20267 are for use with manual flow or EPC on Agilent 5890 GCs.
For use with manual flow only on Agilent 6890/6850 GCs.

Injection Port Weldments for Agilent GCs for Use With Purge and Trap Systems

Easily attach your purge-and-trap with pre-installed low dead volume fittings.

22664

Injection Port Weldments

for Agilent GCs with Tekmar Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22664
Weldment for Agilent 6890 GCs with large canister-type filter	ea.	22668
Weldment for Agilent 5890 GCs	ea.	22666

22665

Injection Port Weldments

for Agilent GCs with OI Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22665
Weldment for Agilent 6890 GCs with large canister-type filter	ea.	22669
Weldment for Agilent 5890 GCs	ea.	22667

27184

1/16-Inch Capillary Inlet Adaptor Fitting Kit
Split/Splitless Fitting for Capillary Columns

- 1/16-inch split/splitless fitting that accepts standard capillary ferrules.
- Easier to install capillary columns because the nut protrudes farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, capillary nut, gold-plated 0.8 mm ID dual Vespel® ring inlet seal, and one 0.4 mm ID ferrule.

Description	qty.	cat.#
1/16-Inch Capillary Inlet Adaptor Fitting Kit	kit	27184
0.8 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21240
	10-pk.	21241

22078

Direct Replacement Reducing Nut
for Agilent 5890/6850/6890/7890 GCs

- Made from high-quality stainless steel.
- Meets original manufacturer's equipment performance.

Description	Similar to Agilent Part #	qty.	cat.#
Reducing Nut	18740-20800	ea.	22078

24323

EPC Test Kit for Agilent 6890 GCs
Kit includes three O-rings, two plugs, one mounting screw, and one test block.

Description	Similar to Agilent Part #	qty.	cat.#
EPC Test Kit for Agilent 6890 GCs	G1530-60960*	kit	24323

*Similar to Agilent part # G1530-60960, but not exact equivalent. Kits differ in parts.

Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035

20409

Heat Sink
for Agilent 5890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Heat Sink	18740-20940	ea.	20409

27199

Heater Block
for Agilent 6850/6890/7890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Heater Block	G3452-20500, G1544-20570	ea.	27199

Supplies for Agilent GCs: Replacement Parts

Heater/Sensor Assembly for Agilent 6850/6890/7890 GCs

- Use with FID, TCD, NPD, and split/splitless inlets.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Heater/Sensor Assembly	G1530-61950	ea.	27200

Heater Block Retaining Nuts for Agilent GC Split/Splitless Injectors

- Aluminum construction.
- Meet or exceed manufacturer's performance.

23042

Description	Similar to Agilent Part #	qty.	cat.#
Heater Block Retaining Nut for Agilent 5890 GCs	19251-20620	ea.	22080
Heater Block Retaining Nut for Agilent 6850/6890 GCs	G1544-20590	ea.	23042

Oven Temperature Sensor Assembly for Agilent GCs

Description	Similar to Agilent Part #	qty.	cat.#
Oven Temperature Sensor for Agilent 5890 GCs	05890-61030	ea.	23040
Oven Temperature Sensor for Agilent 6890 GCs	G1530-61030	ea.	23039

20634

60 psig Backpressure Regulator Kit for Agilent GCs

Increase the versatility of your Agilent 5890 GC by replacing the existing 30 psig (207 kPa) backpressure regulator and gauge with our 60 psig (414 kPa) regulator. Enables you to use longer 60 m and 105 m columns as well as shorter 10 m columns. Includes complete instructions.

Description	Similar to Agilent Part #	qty.	cat.#
Backpressure Regulator Kit	19246-60630	kit	20634

Replacement Chemical Traps and Parts for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6850/6890 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware		2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6850/6890 GCs	G1544-60610, G1544-80530	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530, 5188-6495	kit	23032

Air Diverter for Agilent GCs

- Divert GC exhaust heat up and away from the lab bench.
- Meets or exceeds original manufacturer's performance.
- Easy to install—no tools required.
- Compatible with 4" flexible metal dryer hose.

Description	Similar to Agilent Part #	qty.	cat.#
Air Diverter for Agilent 5890/6890/7890 GCs	19247-60510, G1530-80650	ea.	22076

Inlet Wrench for Agilent 5890/6850/6890 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

22065

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065

Rethreading Tool

for Agilent Split/Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.

23018

Repair damaged injection port threads!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool	ea.	23018

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

20181

No more burned fingers!

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

26262

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

Supplies for Agilent GCs: Tools, Packed Column

Everything you need in one complete kit!

22186

Make Life Easier (MLE) Capillary Tool Kit for Agilent GCs

Includes:

- Capillary installation gauge for Agilent GCs
- Injector wrench for Agilent GCs
- Septum nut removal tool
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186

Column Hanger

for Agilent 7890, 6890, 5890, and 5880A GCs

Description	qty.	cat. #
Column Hanger for Agilent 7890, 6890, 5890, and 5880A GCs	ea.	22128

22128

Direct Injection (DI) Inserts and Liner Adaptor for 1/4-Inch Packed Column Injection Ports (for 0.25, 0.32, & 0.53 mm ID columns)

DI Glass Inserts for Agilent 5890 Packed Column GC

- Tolerances closely controlled.
- Can be removed from the septum nut weldment.

Description	Similar to Agilent Part #	qty.	cat.#
DI Glass Inserts for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	5-pk.	20967

DI Uniliner® Liners for Agilent 5890 Packed Column GC

- Press-Tight® taper forms dead volume free connection to column.
- Minimizes solvent and peak tailing.
- Use with 0.25, 0.32, and 0.53 mm ID capillary columns.
- Can be removed from the septum nut weldment.

Description	Fits Same Liner Adaptor as Agilent Part #	qty.	cat.#
DI Uniliner Liner for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	ea.	20964
		5-pk.	20965
		25-pk.	20966

DI Liner Adaptor

for Agilent 5890 Packed Column GC

- Uses standard 1/16-inch capillary nut and ferrules.
- Convenient wrench pad at base.
- Includes 1/4-inch graphite ferrule and stainless steel nut.
- Use with Agilent or Restek® DI glass inserts or Restek® DI Uniliner® liners for an Agilent 5890 packed column GC.

Description	Similar to Agilent Part #	qty.	cat.#
DI Liner Adaptor for Agilent 5890 Packed Column GC	19244-80540	ea.	21303

Siltek® Septum Packed Purge Port Weldment for Agilent 5890 GCs

Siltek® treatment makes weldment inert and eliminates adsorption of sensitive compounds (e.g., DDT and endrin). Order Viton® O-rings (cat.# 21685, below) and appropriate septa (page 236) separately.

Description	Similar to Agilent part #	qty.	cat.#
Siltek Septum Packed Purge Port Weldment for Agilent 5890 GCs	19243-80570	ea.	21691
Viton Replacement O-rings	5080-8898	10-pk.	21685

Micropacked Inlet Conversion Kits

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	qty.	cat.#
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel Ring Inlet Seals, large bore (2)	2-pk.	22429
Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated	ea.	22430
Replacement 4 mm Splitless Liner	ea.	20772

*For use with packed column FIDs only.

Large-Bore Dual Vespel® Ring Inlet Seals

1/4" SS Nut

Large-Bore FID Adaptor

1/4" Vespel®/Graphite Ferrule

1/16" SS Nuts

Large-Bore Reducing Nut

1/16" Vespel®/ Graphite Ferrules

22430

20772

27185

Inlet Adaptor Kit for Dual Column Installation

for Agilent Capillary Injectors (Split/Splitless Fitting for Capillary Columns)

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespel® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247

20645

For use with 0.53 mm ID columns.

1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/Splitless Fitting for 0.53 mm ID Capillary Columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393

Two-Hole Ferrules

for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	VG2 (60/40)
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

100% Satisfaction Guaranteed

Sky® Inlet Liners

Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Agilent GCs with 5971/5972, 5973, or 5975 GC-MS

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and eliminates the need to vent.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of down-time with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

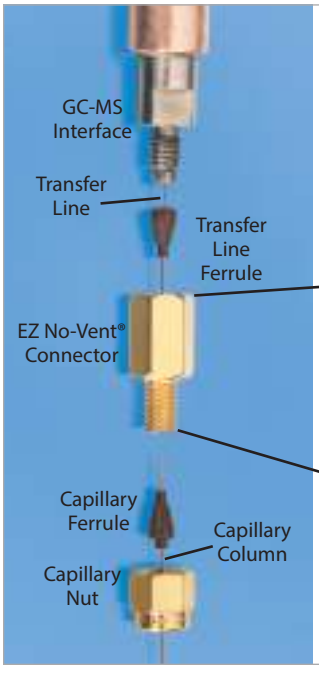


Figure 1: The EZ No-Vent® connector incorporates a laser-machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases as in other manufacturers' systems.

Laser drilled to 100 µm ID

Change columns in minutes—without venting!

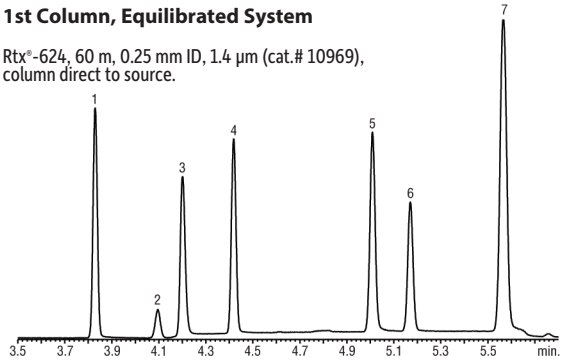
Restek innovation!

Kit installs easily, without special tools or plumbing.

Figure 2: Sharp, symmetric peaks for gases show the EZ No-Vent® connector does not add dead volume and allows rapid column changes.

1st Column, Equilibrated System

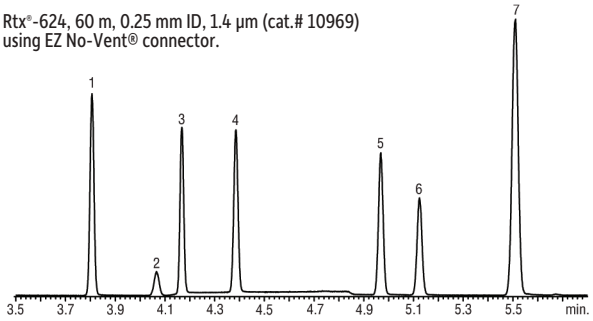
Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat.# 10969), column direct to source.



GC_EV00659a

Acquired 76 Minutes After Installing 2nd Column

Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat.# 10969) using EZ No-Vent® connector.



GC_EV00659b

Peaks

1. Dichlorodifluoromethane
2. 1,2-dichlorotetrafluoroethene (Freon® 114)
3. Chloromethane
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Trichlorofluoromethane

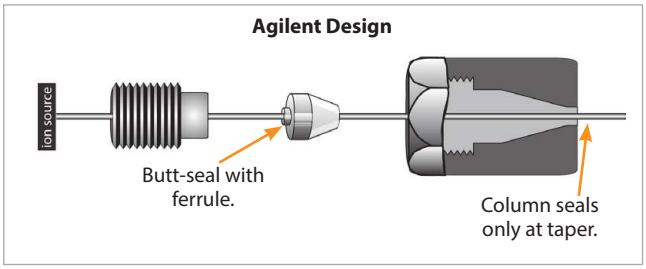
Column	Rtx®-624, 60 m, 0.25 mm ID, 1.40 µm (cat.# 10969)	**Detector**	Agilent 5973 GC-MS
Sample	502.2 Calibration mix #1 (gases) (cat.# 30042)	Transfer Line Temp.:	280 °C
Injection	purge and trap split	Analyzer Type:	Quadrupole
Inj. Temp.:	300 °C	Tune Type:	BFB
Oven		Ionization Mode:	EI
Oven Temp.:	60 °C	Scan Range:	35-550 amu
Carrier Gas	He, constant flow	**Instrument**	Agilent/HP6890 GC
Flow Rate:	1.0 mL/min		

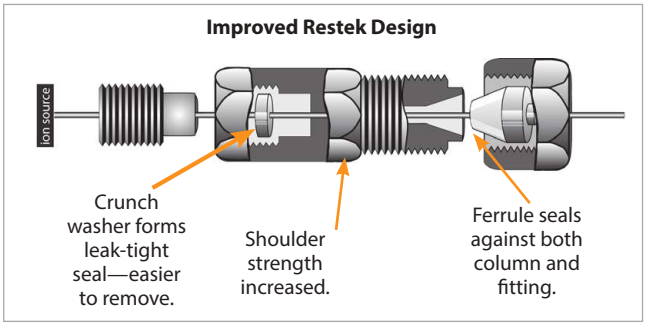
Description	qty.	cat.#
EZ No-Vent Connector Kit Includes: EZ No-Vent Connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft.), column plug, column nut	kit	21323
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:		
0.30≤0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40≤0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110

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

MSD Source Nut

20643

- 1.2 mm nut bore permits easy removal of ferrules with a standard tapered-needle file (cat.# 20106).
- Made of brass to prevent thread-stripping on the transfer line.
- Design enhances ease of threading onto the transfer line and improves overall lifetime.

Description	Similar to Agilent Part #	qty.	cat.#
(Detector) MSD Source Nut	05988-20066	2-pk.	20643

Restek innovation!

21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.

Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).

Score and remove the exposed end of the column.

Loosen the nut.

Description	Similar to Agilent Part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894

Gold Tip Transfer Line

24699

- For use with Agilent 5971/5972 MS systems.
- Gold-plated for inertness.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Gold Tip Transfer Line	05971-20305	ea.	24699

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.

22685

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

Inland 45 Pump Oil

Recommended for most mass spectrometers.

24819

- 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, 6040-0798	1 liter	24819

Rough Pump Oil #19 for MSD Pumps, Oil Vacuum Pump

22687

- Formulated from crude oil stocks known for their durability and line-lubricating qualities.
- Use in Agilent 5973/5972/5971 and GCD mass spec systems, or in other manufacturers' MSD systems that require rough pump oil.
- Under average use, the oil in the foreline rough pump should be replaced every six months.

Description	qty.	cat.#
Rough Pump Oil for MSD Pumps	1 liter	22687

27194

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.

The Restek GC-MS Cleaning Kit (cat.#s 27194, 27195) Includes:

- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)
- Aluminum oxide (1-kg jar)
- Cotton tip applicators
- Tweezers, large
- Tweezers, small
- Septum puller
- Dremel® tool, battery-operated (optional, 27194)
- Tool kit bag

Reorder Kit (cat.# 27196) Includes:

- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)

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

23074

- Proprietary specialized surface material resulting in very high secondary electron emission.
- Air stable.
- 2-year shelf life guarantee.
- Discrete dynode design results in extended operating life.

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a 2-year shelf life warranty (stored in original sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps instrument downtime to a minimum.

did you know?

For a typical ETP electron multiplier for GC-MS, the total active dynode surface area is ~1,000 mm^2. This can be compared to a standard continuous dynode multiplier that has a total channel surface area of only around 160 mm^2 (for a channel with 1 mm diameter and 50 mm length). This increased surface area spreads out the workload of the electron multiplication process over a larger area, effectively slowing the aging process and improving operating life and gain stability.

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

*Note: The electron multipliers have been specifically developed to retrofit the original manufacturer's equipment. The detector incorporates a modular design to facilitate ease of replacement and additional innovations intended to enhance performance. First-time installation requires a mount that includes the mechanical housing. After initial installation, only the replacement electron multiplier is required.
†This unit is designed for use in the 5975, 5973 GC, and the LC-MSD (not for 5975C Triple Axis Detector).

Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035

FID Collector Housing Kits for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Housing Kit for Agilent 5890 GCs (includes collector body, spanner nut, and silicone washer—order mount separately)	19231-20920	kit	23037
FID Collector Housing Kit for Agilent 6890/7890 GCs (includes collector body, silicone washer, nut, and mount)	G1531-20550	kit	23045
FID Collector Housing for Agilent 6890/7890 GCs	G1531-20740	ea.	23044
Replacement Silicone Washers for FID Collector Housing for Agilent 5890/6890/7890 GCs	5180-4165	12-pk.	23064

FID Collector Mount for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Mount for Agilent 5890 GCs	19231-20930	ea.	23036
FID Collector Mount for Agilent 6890/7890 GCs	G1531-20550	ea.	23043

FID Base Weldment for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Includes brass nut.
- Available for Agilent 5890, 6850, or 6890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Base Weldment for Agilent 5890 GCs	19231-80580	ea.	23041
FID Base Weldment, Pack Column FID for Agilent 6850/6890 GCs	G1531-80580	ea.	23052
FID Base Weldment, Capillary Column FID for Agilent 6850/6890 GCs	G1531-80630	ea.	23053

Note: 6890 GC connections to EPC modules are not compatible with the 7890 EPC modules.

Spanner Wrench

for Agilent 6890/6850/6890/7890 FID Collector Assemblies

- Easily remove the nut from the FID collector without damaging the nut.
- Unique, ergonomic handle—easy to grip.
- Fits all instrument models.

Remove FID ignitor castle.

Easily loosen the nut by aligning the two pins on the bottom of the wrench with the two open slots on the nut...

then turn counterclockwise...

and remove.

Description	Similar to Agilent Part #	qty.	cat.#
Spanner Wrench for Agilent 5890/6890/6850/7890 FID Collector Assembly	19231-00130	ea.	22329

FID Collector Assembly Kit for Agilent 5890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Assembly Kit (includes insulators)	19231-60690	kit	23010
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21131
FID Collector (includes insulators)	19231-20970, 19231-20960, 19231-20950	ea.	21138
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137
Siltek FID Ignitor Castle		ea.	21135

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).

21000

FID Flow Measuring Adaptor
for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

FID Gauge Pack for Agilent 5890 GCs

- Pressure regulators and gauges for air and hydrogen.
- 1/8-inch bulkhead allows easy hookup to instrument.
- Rated for inlet pressures to 250 psi (1,724 kPa).
- Rated for outlet pressures of 0 to 60 psi (0–414 kPa).

22071

Description	qty.	cat.#
FID Gauge Pack for Agilent 5890 GCs	ea.	22071

FID Collector Assembly Kit for Agilent 6850/6890/7890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Assembly Kit (includes insulator)	G1531-60690	kit	21699
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21132
FID Collector (includes insulators)	G1531-20690, G1531-20700	ea.	21139
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).

FID Maintenance Kits for Agilent GCs

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

FID kits include:

- 1/4" and 0.4, 0.5, and 0.8 mm ID graphite ferrules
- FID/NPD capillary adaptor
- Capillary nuts
- Jet reamers/ferrule removers
- 1/4" nut
- Scoring wafer
- Capillary column caps
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs
- FID flow-measuring adaptor
- 1/4" x 5/16" wrench
- Installation gauge
- Wire cleaning brush
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs
- Spanner wrench
- FID jet removal tool

22179

Description	qty.	cat.#
FID Maintenance Kit for Agilent 5890 GCs	kit	22180
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179

Supplies for Agilent GCs: Detector

tech tip

Which FID Jet Should I Use?

There are two FID jet configurations for Agilent GCs. The longer "adaptable" jet fits both 5890 and 6890 GCs, and can be used with capillary or packed columns. The shorter "dedicated" jet is for the FID in the 6890/7890 GC that is designed only for use with capillary columns.

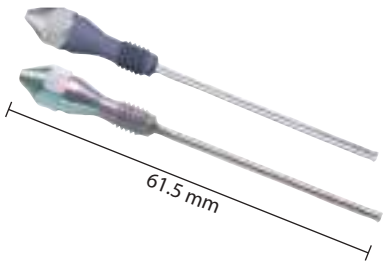
FID Replacement Jets

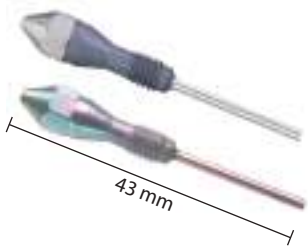
Standard Version

- Threads specially coated for easy installation and removal.
- Special processing ensures the highest degree of cleanliness.
- Meets or exceeds original manufacturer's performance.

High-Performance Version—Siltek® Treated

- Similar to the standard version, but Siltek® treated.
- Extremely inert, for use with active compounds.





Capillary Adaptable FID Replacement Jet for Agilent 5890/6890/6850 GCs

Engineered with a fluted tip to guide the capillary column into the jet.

Description	Similar to Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	19244-80560	ea.	20670	3-pk.	20671
High-Performance Siltek Treated, 0.011-Inch ID Tip	19244-80560	ea.	20672	3-pk.	20673

Capillary Dedicated FID Replacement Jet for Agilent 5890/6890/6850/7890 GCs

Description	Similar to Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	G1531-80560	ea.	21621	3-pk.	21682
High-Temperature, 0.018-Inch ID Tip	G1531-80620	ea.	23078	3-pk.	23079
High-Performance Siltek Treated, 0.011-Inch ID Tip	G1531-80560	ea.	21620	3-pk.	21683

Packed Column FID Replacement Jets for Agilent 5890/6890/6850 GCs

- 0.018-inch ID jets: Used for most general-purpose packed column applications.
- 0.030-inch ID jets: For packings that exhibit high bleed and that frequently clog the tip of smaller 0.018-inch jets.

Description	Similar to Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.018-Inch ID Tip	18710-20119	ea.	21694	3-pk.	21695
High-Performance Siltek Treated, 0.018-Inch ID Tip	18710-20119	ea.	21696	3-pk.	21697

Description	Similar to Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.030-Inch ID Tip	18789-80070	ea.	21688	3-pk.	21689
High-Performance Siltek Treated, 0.030-Inch ID Tip	18789-80070	ea.	21686	3-pk.	21687

22328

FID Jet Removal Tool for Agilent 5890/6850/6890/7890 FIDs

- Securely grips jet in socket for easy removal or installation.
- Unique, ergonomic handle—easy to hold.

Slip tool over FID jet... loosen jet... and remove.

Description	qty.	cat.#
FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs	ea.	22328

23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

FID/Injector Cleaning Kit

The FID/injector cleaning kit includes:

- Nylon tube brushes (1/8", 3/16", 1/4").
- Pipe cleaner.
- Stainless steel tube brushes (3/8", 3/16", 1/4").
- Stainless steel surface brush.
- Stainless steel jet reamers.
- Emery cloth.

Description	qty.	cat.#
FID/Injector Cleaning Kit	kit	20120

Injector/Detector Plug Nuts

21883

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.

Description	Similar to Agilent Part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883

20884

FID/NPD Adaptor Fitting

- Easy-to-use, sturdy, compact stainless steel fitting.
- 1/16-inch nut uses standard graphite or Vespel®/graphite ferrules.
- Wrench pad won't turn when installing a capillary column.
- Includes 1/4- and 1/16-inch stainless steel nuts, and 1/4-inch Vespel® and 0.4 mm ID graphite ferrules.

Description	qty.	cat.#
FID/NPD Adaptor Fitting	kit	20884

22077

FID/NPD Capillary Adaptor Fitting

for Agilent 5890/6890/6850 GCs

- High-quality stainless steel construction.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
FID/NPD Capillary Adaptor Fitting	19244-80610	ea.	22077

ECD/FID Dual-Purpose Make-Up Gas Kit

for Agilent 5890 GCs

Kit includes: replacement fitting, 1/4" nut, Vespel®/graphite ferrule, 1/16" nut, 0.4 mm ID graphite ferrule, Siltek®-treated guide.

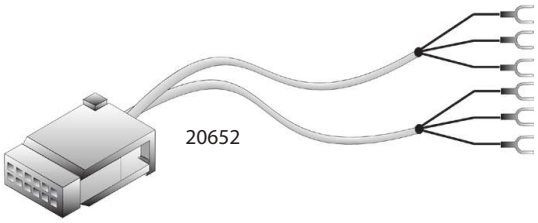
Description	Similar to Agilent Part #	qty.	cat.#
ECD/FID Replacement Fitting Kit with Flow Manifold Connection		kit	21301
Replacement ECD Siltek Metal Guide		2-pk.	21302
Replacement ECD Fused Silica Liner	19233-20625	ea.	27192
		5-pk.	27193
Replacement Micro ECD Liner	G2397-20540	ea.	27190
		5-pk.	27191

Supplies for Agilent GCs: Cables & Autosampler

Replacement Cables

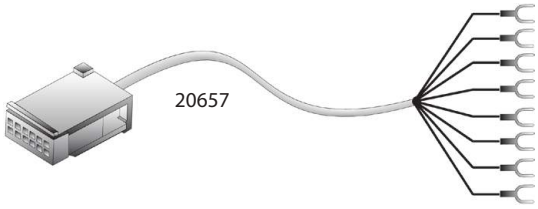
for Agilent GCs, Integrators, & Autosamplers

- Considerable savings over original manufacturer's equipment.
- Instructions and wiring diagrams included.
- Manufactured with only the highest-quality components.



Connect an Agilent 5890 GC to a non-Agilent integrator or standard strip chart recorder.

Description	Similar to Agilent Part #	length	qty.	cat.#
Replacement Cable	05890-60800	6 ft	ea.	20652



Connect an Agilent 5890 GC to remote-start another piece of equipment or to start the Agilent 5890 GC from that piece of equipment.

Description	Similar to Agilent Part #	length	qty.	cat.#
Replacement Cable	05890-61080	6 ft	ea.	20657

Injector Mounting Posts and Parking Post

for Agilent 7673 & 7683 Autosamplers

Performance equivalent to original manufacturer's parts.

Description	Similar to Agilent Part #	qty.	cat.#
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 6890 GCs	07673-21140	ea.	21237
Injector Mounting Post for Agilent 7683 Series Autosamplers for use with 6850/6890 GCs	G2613-20500	ea.	21172
Parking Post for Agilent 7673/7683 Series Autosamplers for use with 5890/6890/7890 GCs	05890-61525	ea.	22343

Turret Tray Assembly

for Agilent 7673 Autosamplers

Holds sample, waste, and solvent vials.

Description	Similar to Agilent Part #	qty.	cat.#
Turret Tray Assembly for Agilent 7673 Autosamplers	07673-60605	ea.	22855

Autosampler Plunger Carrier Belt

for Agilent 7673A & 7673B Autosamplers

All parts meet or exceed original manufacturer's performance.

Description	For Agilent Model #	qty.	cat.#
Autosampler Plunger Carrier Belt	7673A, 7673B	ea.	22695

Carriage Motor Belt

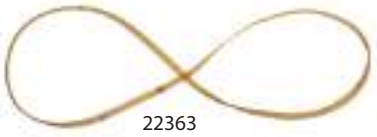
for Agilent 7673A, 7673B, and 7673C Autosamplers

Meets original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Carriage Motor Belt for Agilent 7673A, 7673B, and 7673C	1500-0676	ea.	22692

Z-Belt for Agilent 7673B & 7683 Autosamplers

Meets original manufacturer's performance.



Description	Similar to Agilent Part #	qty.	cat.#
Z-Belt for Agilent 7673B & 7683 Autosamplers	1500-0803	ea.	22363

Injector Turret Motor for Agilent 7673A & 7673B Injectors

Meets original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Injector Turret Motor for Agilent 7673A & 7673B Injectors	07673-60810	ea.	22337

22067

22354

22355

Viton® O-Rings for Apex Liners

Description	Max. temp.	qty.	cat.#
Viton O-Rings for APEX liners	250 °C	25-pk.	22067

Accessories for ATAS LINEX DMI System

Description	qty.	cat. #
Needle Guide for ATAS LINEX DMI Liner	5-pk.	22354
Microvial/Insert for ATAS LINEX DMI Liner	100-pk.	22355

Supplies for Bruker/Varian GCs

Inlet Liner Seals

for Bruker/Varian 1177 Injectors

Meets or exceeds original manufacturer's performance.

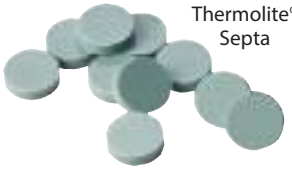
Description	Max. Temp.	Similar to Bruker/Varian Part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	—	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	39-26119-40	20298	20299

Liner Seals

for Bruker/Varian 1078/1079 GCs

Description	Max. Temp.	Similar to Bruker/Varian Part #	qty.	cat.#
5 mm Graphite Liner Seals for Bruker/Varian 1078/1079 GCs	450 °C	392611919, 392534201	10-pk.	22683

Premium Non-Stick BTO® Septa



Thermolite® Septa

Septa for Bruker/Varian GCs

Septum Diameter	50-pk. cat.#	100-pk. cat.#
Thermolite Septa (usable to 340 °C inlet temp.)		
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
Premium Non-stick BTO Septa (usable to 400 °C inlet temp.*)		
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

HANDY septum size chart

Injector Type	Septum Diameter (mm)
Packed Column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11

22779

22780

Merlin Microseal Septa for Bruker/Varian GCs

400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	cat.#
General Purpose Kit for Bruker/Varian 1078/1079 GCs Includes: Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	21-11W	22779
General Purpose Kit for Bruker/Varian 1177 GCs Includes Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	22-11W	22780
Replacement Microseals		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782

20881

Capillary Nuts for Bruker/Varian GCs

Choose brass or stainless steel construction.

Description	Similar to Bruker/Varian Part #	qty.	cat.#
Brass Capillary Nuts	03-949551-00	2-pk.	20881
Stainless Steel Capillary Nuts	03-949551-00	2-pk.	20882

Siltek® Treated Inlet Support Springs

for Bruker/Varian 1075/1077 Split Injectors

Siltek® treated to eliminate sample adsorption.

21690

Description	Similar to Bruker/Varian Part #	qty.	cat.#
Siltek Treated Inlet Support Springs for Bruker/Varian 1075/1077 Split Injectors	03-949786-00	3-pk.	21690

22335

Capillary Installation Gauge for Bruker/Varian GCs

for use with 1/16" ferrules

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335

*For use with graphite ferrules only.

22184

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit

for Bruker/Varian GCs

Includes:

- Capillary installation gauge for Bruker/Varian GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22184

Rethreading Tool

for Bruker/Varian Injection Ports

- Repair worn or damaged threads.
- Multiple uses (injection ports, fittings, etc.).
- Built-in guide to prevent cross-threading.

Make your injection port threads like new!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, then repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool for 7/16" compression fitting (Bruker/Varian injection ports)	ea.	23019
Rethreading Tool for 1/4" Bruker/Varian-style capillary column fittings	ea.	21893

Restek innovation!

Kit installs easily, without special tools or plumbing.

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Bruker/Varian Saturn 2000 Series Mass Spectrometers

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

As an employee-owned company, we take pride in producing the best chromatography products on the market.

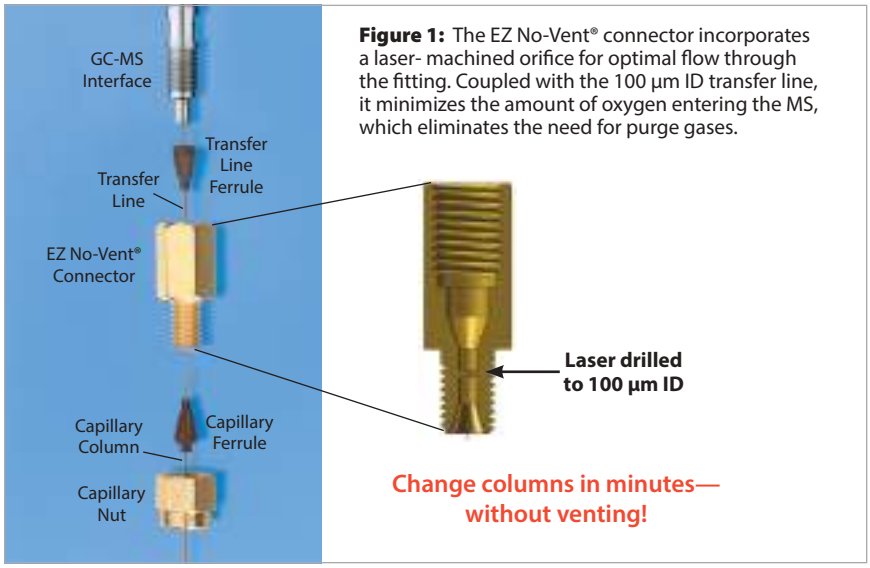


Figure 1: The EZ No-Vent® connector incorporates a laser- machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#
EZ No-Vent Connector Kit for Bruker/Varian Saturn 2000 Series MSs Includes: EZ No-Vent connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22423
Replacement ferrules for connecting capillary column to EZ No-Vent connector:		
0.30≤0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40≤0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110

Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs With PSS Injector

Fits 4 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs w/PSS Injector	450 °C	N610-1751	10-pk.	21475
	450 °C	N610-1751	25-pk.	21476

Viton® O-Rings for PerkinElmer PSS Injector

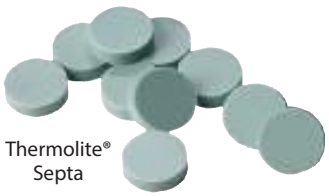
Fits 4 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Viton O-Rings for PerkinElmer PSS Injector	250 °C	N6101747	10-pk.	20366

Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus With CAP Injector

Fits 6.2 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus w/CAP Injector	250 °C	N6101374	10-pk.	20262



Thermolite® Septa

Premium Non-Stick BTO® Septa

Septa (11 mm) for PerkinElmer GCs

Thermolite Septa Usable to 340 °C Inlet Temp.		Premium Non-Stick BTO Septa Usable to 400 °C Inlet Temp.	
qty.	**cat.#**	**qty.**	**cat.#**
50-pk.	27142	50-pk.	27090
100-pk.	27143	100-pk.	27091

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.

Merlin Microseal Septa for PerkinElmer GCs

22781

400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistent low needle insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	Similar to PE#	cat.#
General Purpose Kit for PerkinElmer GCs (3 to 100 psi) Includes: Nut, Adapter, O-ring & 2 General Purpose (#410) Microseals	51-12W	N9303344	22781
Replacement Microseals			
General-Purpose Microseal (most applications, 3 to 100 psi)	410	N9303345	22812
Low-Pressure Microseal (1 to 45 psi)	310		22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		22782

ChromaBLOGraphy

Check out the Restek blog for the latest developments and new applications!

blog.restek.com

22318 22319 22320

Injector Adaptors for PerkinElmer CAP Injector

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.
- Siltek®-treated version available for increased inertness.

Description	Similar to PE Part #	qty.	cat.#
For use with PE-style capillary nuts			
Injector Adaptor for PerkinElmer CAP Injector	N6100157	ea.	22318
Siltek-Treated Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22320
For use with 1/16" compression-style nuts			
Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22319

FID Capillary Column Adaptors

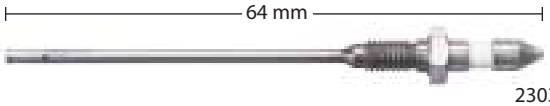
for PerkinElmer Auto SYS XL

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

22608

22609

Description	Similar to PE Part #	qty.	cat.#
For use with PE-style capillary nuts			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	N6120020	ea.	22608
For use with 1/16" compression-style nuts			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL		ea.	22609



23038

FID Replacement Parts

for PerkinElmer Auto SYS XL and Clarus 500

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

Description	Similar to PE Part #	qty.	cat.#
FID Jet for PerkinElmer Auto SYS XL and Clarus 500	N6100361	ea.	23038
Auto-Ignite FID Replacement Part Kit for PerkinElmer Auto SYS XL and Clarus 500	N6103167, N6103175, N6101085, N6001204, 09912223	kit	23061
Nozzle Insulator for PerkinElmer Auto SYS XL and Clarus 500	N6101085	ea.	23062
FID Body for PerkinElmer Auto SYS XL and Clarus 500	N6100364	ea.	23063

MLE Make Life Easier!

22185

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit

for PerkinElmer GCs

Includes:

- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22185

100% Satisfaction Guaranteed

Sky® Inlet Liners

Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

Viton® O-Rings
for Shimadzu 17A, 2010, and 2014 GCs

Description	Max. Temp.	Similar to Shimadzu Part #	qty.	cat.#
Viton O-Rings for Shimadzu 17A, 2010, and 2014 GCs	250 °C	036-11203-84	10-pk.	24899

Graphite O-Rings
for Shimadzu 2010 and 2014 GCs

Description	Max. Temp.	Similar to Shimadzu Part #	qty.	cat.#
Graphite O-Rings for Split Liners	450 °C	221-48393-91	5-pk.	20243
Graphite O-Rings for Splitless Liners	450 °C	221-47222-91	5-pk.	20244

Thermolite® Septa

Premium Non-Stick BTO® Septa

Septa (Plug) for Shimadzu GCs

Thermolite Septa Usable to 340 °C Inlet Temp.		Premium Non-stick BTO Septa Usable to 400 °C Inlet Temp.*	
qty.	**cat.#**	**qty.**	**cat.#**
50-pk.	27154	50-pk.	27098
100-pk.	27155	100-pk.	27099

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. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.

Septum Nut
for Shimadzu 17A, 2010, and 2014 GCs

- One-piece design for ease of installation and removal.
- Made of clear anodized aluminum and high-quality stainless steel.

22079

Description	Similar to Shimadzu Part #	qty.	cat.#
Septum Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41286-00, 221-44584-00	ea.	22079

21895

Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs

Includes 17A injector nut, 0.4 mm graphite ferrule, and 1/16-inch stainless steel capillary nut.

Description	qty.	cat.#
Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	21895
Siltek Treated Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	22331

Merlin Microseal Septa for Shimadzu GCs

- Compatible with Shimadzu models GC-2010 and GC-2025 only.
- 450 °C maximum injection port temperature.
- For use with 23-gauge (0.63 mm, 0.025") needle or probe with blunt, truncated conical tip.

22972

A Merlin Microseal septum provides several distinct advantages: elimination of septum coring, long lifetime, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms; these sliding seals prevent septum coring and the associated accumulation of septum crumbs in the injection port liner. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	cat.#
General Purpose Kit for Shimadzu GCs (3 to 100 psi) Includes: Nut, Adapter, O-Ring, & 2 General-Purpose (#410) Microseals	61-12	22972
Replacement Microseals		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782

slot

22688

Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs

Meets original manufacturer's performance.

Description	Similar to Shimadzu Part #	qty.	cat.#
Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	22688

no slot

20375

Restek Enhanced Capillary Nut
for Shimadzu 17A, 2010, and 2014 GCs

- Restek's design eliminates the slot, increasing lifetime and durability.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Shimadzu Part #	qty.	cat.#
Restek Enhanced Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	20375

Supplies for Shimadzu GCs

21121

5 mm Ferrules for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.

Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121

24829

Graphite Ferrules
for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	Similar to Shimadzu Part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829

21159

Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu Part #	qty.	cat.#
Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159

22333

Capillary Installation Gauge
for Shimadzu 17A, 2010, and 2014 GCs

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333

*For use with graphite ferrules only.

22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334

22630 22631 22632

FID Jets for Shimadzu 2010 GCs

Description	Similar to Shimadzu Part #	qty.	cat.#
Capillary FID Jet for Shimadzu 2010 GCs	221-48258-91	ea.	22630
Packed Column FID Jet for Shimadzu 2010 GCs	221-48885-91	ea.	22631
Wide Bore FID Jet for Shimadzu 2010 GCs	221-49373-91	ea.	22632

Everything you need in one complete kit!

22182

Make Life Easier (MLE) Capillary Tool Kit
for Shimadzu GCs

Includes:

- Capillary installation gauge for Shimadzu GCs
- Injector wrench for Shimadzu GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182

Dual Vespel® Ring Inlet Seals

NEW!

Washerless, Leak-Tight Seals for Thermo 1300/1310 GCs

- Does not require a separate washer.
- Requires less torque to seal.
- Does not require retightening of reducing nut after several oven cycles.
- Extends column lifetime by preventing oxygen from reaching the column.
- Same price as the regular inlet seals with washers.
- Siltek® treatment provides enhanced inertness versus stainless steel.

Feature	Benefit
Vespel® ring embedded in bottom surface.	Eliminates need for a washer.
Vespel® ring embedded in top surface.	Very little torque required to make seal—reduces operator variability.
Lower leak rate compared to OEM metal inlet seals.	Less detector noise.
Prevents oxygen from permeating the carrier gas.	Increases column lifetime.

Patented

Our patented dual Vespel® ring inlet seal greatly improves injection port performance—it stays sealed, even after repeated temperature cycles, without retightening the reducing nut! This seal features two soft Vespel® rings, one embedded in its top surface and the other embedded in its bottom surface. These rings eliminate the need for a washer and ensure very little torque is needed to make a leak-tight seal. The rings will not harm the critical seal in the injector body, or any other surface, and are outside the sample flow path.

To reduce breakdown and adsorption of active compounds, use a gold-plated or Siltek®-treated seal.

0.8 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	22243	22244
Siltek-Treated	22247	22248
1.2 mm ID Dual Vespel Ring Inlet Seal	**2-pk. cat.#**	**10-pk. cat.#**
Gold-Plated	22245	22246
Siltek-Treated	22249	22250

Replacement Inlet Seals With Washers

- Siltek® treatment provides inertness similar to fused silica.
- All seals include washers.

Replacement Inlet Seals for Thermo Scientific 1300/1310 GCs

The inlet seal at the base of the GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

Single-Column Installation 0.8 mm ID (Opening)	Similar to Thermo Part #	qty.	cat.#
Gold-Plated	290GA082	2-pk.	22231
Gold-Plated	290GA081	10-pk.	22232
Siltek-Treated	290GA092	2-pk.	22237
Siltek-Treated	290GA091	10-pk.	22238
0.25/0.32 mm ID Dual-Column Installation 1.2 mm ID (Opening)	**Similar to Thermo Part #**	**qty.**	**cat.#**
Gold-Plated	290GA122	2-pk.	22233
Gold-Plated	290GA121	10-pk.	22234

22231

22237

Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

Cross-Disk Inlet Seals for Thermo Scientific 1300/1310 GCs

All seals include washers.

0.8 mm ID Cross-Disk Inlet Seal	Similar to Thermo Part #	qty.	cat.#
Gold-Plated	290GA083	2-pk.	22235
Gold-Plated	290GA084	10-pk.	22236
Siltek-Treated	290GA093	2-pk.	22239
Siltek-Treated	290GA094	10-pk.	22240

22235

22239

Supplies for Thermo Scientific GCs

Inlet Liner Seals
for Thermo Scientific TRACE PTV

Description	Max. Temp.	Similar to TS Part #	qty.	cat.#
Inlet Liner Seals for Thermo Scientific TRACE PTV	450 °C	29013417	2-pk.	21392

Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL Instruments

Description	Max. Temp.	Similar to TS Part #	qty.	cat.#
Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	450 °C	290-334-06	ea.	21898
	450 °C	290-334-06	2-pk.	21899

Premium Non-Stick BTO® Septa

Septa (9 mm, 9.5 mm, 11 mm, 17 mm) for Thermo Scientific GCs
Premium Non-Stick BTO® Septa

- Usable to 400 °C inlet temperature*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs**.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.

Septum Diameter	50-pk. cat.#	100-pk. cat.#
Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)		
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
11 mm (7/16") CenterGuide	27090	27091
17 mm CenterGuide	27096	27097

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. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.
**12.7 mm and 17 mm septa packaged in precleaned glass jars.

HANDY septum size chart

Instrument	Septum Diameter (mm)
Thermo Scientific	
TRACE GC, 8000, 8000 TOP, GCQ w/TRACE, PTV, 8000 series17	17
TRACE 1300, 1310	11
Finnigan (TMQ)	
GC 9001, GCQ, QCQ, TRACE 2000	9.5

24971

Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Description	Similar to TS Part #	qty.	cat.#
Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	35001050	ea.	24971

21299 24972

Septa Holder Kits
for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

- Includes septum support and holder.
- Made from high-quality stainless steel.
- Silcosteel®-AC-treated version helps with septum removal.

Description	Similar to TS Part #	qty.	cat.#
Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 350054335	kit	21299
Silcosteel-AC-Treated Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 35005433	kit	24972

22089

Gold-Plated Liner Cap
for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Description	Similar to TS Part #	qty.	cat.#
Gold-Plated Liner Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	29004290	ea.	22089

23057

Silver Seals for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Description	Similar to TS Part #	qty.	cat.#
Silver Seal for Split/Splitless Injector	29033629	10-pk.	23057
	29033629	20-pk.	23058

24916

24969

24917

24970

20543

20544

Adapters for Capillary Columns
on Thermo Scientific TRACE & Focus SSL

- Use same installation distance as manufacturer's adaptors.
- Made of high-quality stainless steel.
- Siltek®-treated version available for additional inertness.

Description	Similar to TS Part #	qty.	cat.#
For use with standard 1/16" ferrules.			
Adaptor for Capillary Column on Detector Base		ea.	24916
Adaptor for Capillary Column on Split/Splitless Injector		ea.	24917
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20543
For use with M4 ferrules.			
Adaptor for Capillary Column on Detector Base	347 25 436	2-pk.	24969
Adaptor for Capillary Column on Split/Splitless Injector	347 05 451	ea.	24970
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20544

Nut for Terminal Fitting
for Thermo Scientific TRACE GCs

24896

Description	Similar to TS Part #	qty.	cat.#
Nut for Terminal Fitting for Thermo Scientific TRACE GCs	350 221 25	2-pk.	24896

Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Made of high-quality stainless steel.

24973

Description	Similar to TS Part #	qty.	cat.#
Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	350 32 423	5-pk.	24973

Graphite Ferrules (M4 Fittings)
for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs

Ferrule ID	Fits Column ID	Similar to TS Part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	—	22221	22222
0.4 mm	0.18–0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45–0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

FID Jet for Thermo Scientific TRACE & Focus GCs

Meets or exceeds original manufacturer's performance.

23080

Description	Similar to TS Part #	qty.	cat.#
FID Jet for Thermo Scientific TRACE & Focus GCs	404 043 01	ea.	23080

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Liner Cap Removing Tool

for Thermo Scientific GCs: Focus GC, TRACE GC Ultra & TRACE GC x GC

24937

- Easily loosens the liner cap from the injector.
- Unique, ergonomic handle—easy to grip.

Remove septum cap, septum holder, septum, and septum support.

Place tool on liner cap. Align two pins on bottom of tool with two open slots on liner cap.

Turn counter-clockwise to loosen liner cap.

Use tweezers (cat.# 20101) to remove liner cap.

Description	Similar to TS Part #	qty.	cat.#
Liner Cap Removing Tool for Thermo Scientific GCs	205 070 10	ea.	24937

22997

Metric Wrench Set

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997

22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999

22330

Capillary Installation Gauge

for Thermo Scientific TRACE & Focus SSL (M4 Ferrules)

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Install nut and ferrule onto column. Cut column end squarely. Slide column into installation gauge to recommended insertion distance. Finger-tighten column nut.

Tighten assembly to ensure a properly seated ferrule. Loosen assembly and remove column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

*For use with graphite ferrules only.

MLE
Make Life Easier!

Everything you need in one complete kit!

22183

Make Life Easier (MLE) Capillary Tool Kit

for Thermo Scientific GCs

Includes:

- Capillary installation gauge for Thermo Scientific GCs
- Liner cap removing tool for Thermo Scientific GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22183

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Thermo Scientific Focus DSQ GC Mass Spectrometers

22454

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

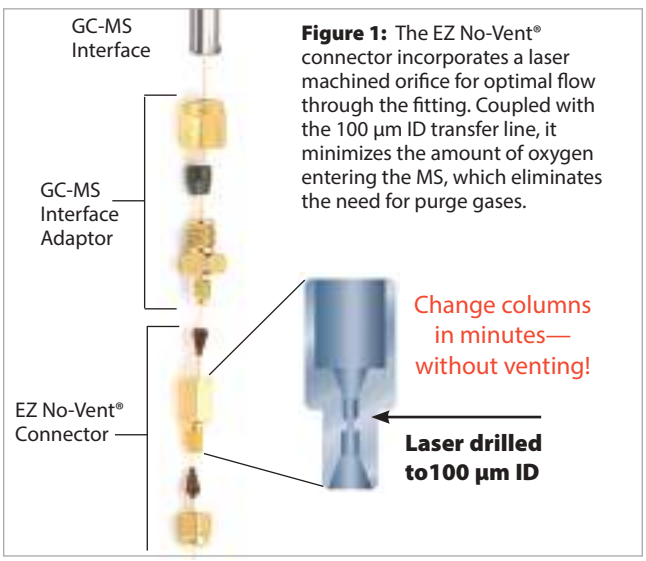


Figure 1: The EZ No-Vent® connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#
EZ No-Vent Connector Kit for Thermo Scientific Focus DSQ GC Mass Spectrometers Includes: EZ No-Vent Connector, interface adaptor, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22454
Replacement Ferrules for connecting capillary column to EZ No-Vent Connector:		
0.30≤0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40≤0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110
Open-End Wrenches, 3/8" x 7/16"	2-pk.	22455

22082

Transfer Line Reducing Kit

for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers

Meets or exceeds original manufacturer's performance.

Description	Similar to TS part #	qty.	cat.#
Transfer Line Reducing Kit for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers	76458-2014s, 76458-2009s, A0101-03151	kit	22082

100% Satisfaction Guaranteed

Sky® Inlet Liners

Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

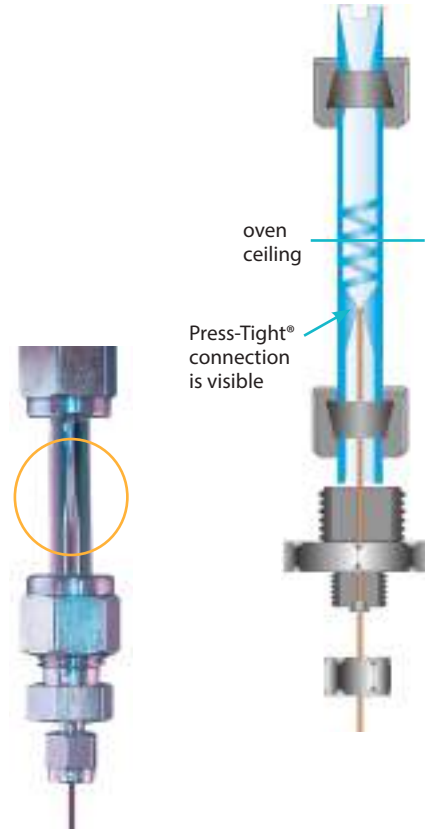
Packed Column Inlet Conversion

it's a fact

The 1/4-inch Vu-Tight liner fits directly into a 1/4-inch injection port. The connection between the liner and the column is in the GC oven, allowing visual confirmation of the seal. Problems, such as a crushed column end in the Press-Tight® taper, can be detected easily, making proper installation worry-free. The Cyclo Vu-Tight liner prevents nonvolatile residue from contaminating the column.

Converting Packed Inlets to Capillary Column Use

Two types of inlet conversion kits are available for a 1/4-inch packed column injection port to fit either 0.32 or 0.53 mm ID capillary columns: the Vu-Tight liner and the Uniliner® liner with adaptor (next page). The Vu-Tight liner fits directly into the 1/4-inch injection port and allows visual confirmation of the connection between the column and the liner. The Uniliner® liner and adaptor work together to allow either direct or on-column injection when using 0.53 mm ID columns. Both systems incorporate a Press-Tight® connection between the liner and column inlet, minimize dead volume, and reduce solvent peak tailing.



Features of Both Conversion Kits:

- Fit Agilent, Bruker/Varian, and other common GCs with 1/4-inch packed column injection ports (with maximum insertion depth of 4 inches).
- Install easily within 15 minutes.
- Accommodate either 0.32 or 0.53 mm ID fused silica columns (tubing OD ≥ 0.5 mm).
- Liners are deactivated and extremely inert.
- Liners designed to accept dirty samples are available for either system.
- Press-Tight® connections between the liner and column inlet minimize dead volume, reduce solvent peak tailing, and sharpen early-eluting components.

Vu-Tight DI Liners for 1/4-Inch Packed Injection Port Conversion

- Visually observe the Press-Tight® connection between the column end and liner.
- Fit 0.32 and 0.53 mm ID capillary columns (column ODs from 0.5 mm to 0.8 mm).
- Slotted top prevents obstruction of carrier gas flow.
- Two designs available.
- Operate in the direct injection mode.

Vu-Tight DI Liners for 1/4-Inch Packed Injection Port Conversion

Can easily be packed with wool for dirty samples.

Description	qty.	cat.#
Vu-Tight DI Liner	ea.	20342
Vu-Tight DI Liner	5-pk.	20343
Vu-Tight DI Liner	25-pk.	20344

Cyclo Vu-Tight DI Liners (1/4-inch OD)

Ideal for dirty samples. Spiral bore prevents nonvolatile residue from contaminating the column.

Description	qty.	cat.#
Cyclo Vu-Tight DI Liner	ea.	20787
Cyclo Vu-Tight DI Liner	5-pk.	20788

Vu-Tight Installation Fittings Kit

Includes a 1/4-inch stainless steel nut and graphite ferrule for attaching the liner to the GC inlet and a 1/4 to 1/16-inch stainless steel reducer, plus a 1/4-inch and 0.5 mm ID graphite ferrule for attaching the column to the liner.

Description	qty.	cat.#
Vu-Tight Installation Fittings Kit	kit	20504

Uniliner® Liner for 1/4-Inch Packed Injection Port Conversion

- Reduces solvent tailing.
- Versatile—0.53 mm ID version can be used in the direct (DI) or on-column (OC) injection mode.
- Incorporates a gentle taper that seals the column and reduces dead volume in direct injection mode.
- Available in various designs.

On-column injections can be performed only with 0.53 mm ID columns because 26-gauge needles do not fit into the bore of 0.32 mm ID columns, or into the Unliner® liner taper.

Description	Column ID Injection Mode*	ea. cat.#	5-pk. cat.#
Uniliner Liner (small buffer volume chamber 60 mm long, for injections ≤2 µL)	0.53 mm DI or OC	20902	20903
Uniliner Liner (large buffer volume chamber 85 mm long, for injections ≤4 µL)	0.32 & 0.53 mm DI only	20308	20309
	0.53 mm DI or OC	20301	20305
Cyclo-Uniliner Liner (for active, dirty samples)	0.32 & 0.53 mm DI only	20319	20320
Open-Top Uniliner Liner (packed with wool)	0.32 & 0.53 mm DI only	20315	20316
Low Volume/Purge & Trap Uniliner Liner (1 mm ID x 5 mm OD: use in 1/4" injection ports to troubleshoot purge & trap units)	0.32 & 0.53 mm DI only		20314

Includes 1/4-inch nut & graphite ferrule, 1/16-inch nut, and 0.8 mm ID graphite ferrule.

Uniliner Liner Adaptor (required for installing Uniliner liners in 1/4" injection ports)	Stainless Steel cat.#	Siltek-Treated cat.#
For injection ports <8 cm	20310	22282
For injection ports 8-15 cm	20311	

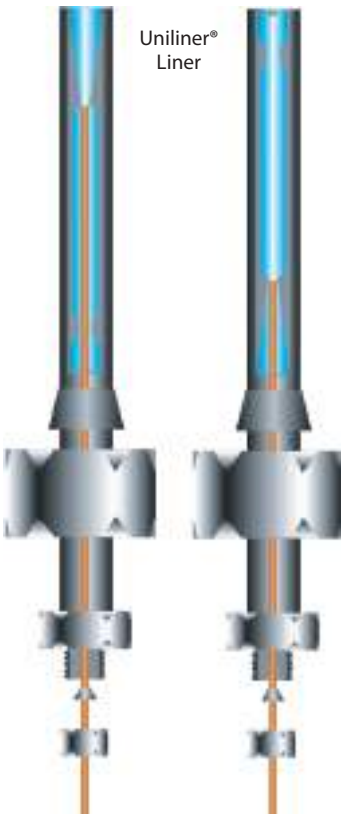
1/4" Ferrules for Uniliner Liner Adaptor	qty.	cat.#
	5-pk.	20234

*DI = direct injection, OC = on-column injection

Note: a Uniliner liner must be used with a Uniliner liner adaptor (cat.# 20310 or 20311) for 1/4-inch injection ports. Remember to include a liner adaptor when ordering a Uniliner liner, unless you are purchasing replacement Uniliner liners.

it's a fact

5 mm Uniliner® liners fit into the 1/4-inch Uniliner® liner adaptor, which fits into a 1/4-inch injection port. The Uniliner® liner can be inserted in one direction for direct injections or inverted for on-column injections. Because the 1/4-inch injection port ferrule seals against the metal liner adaptor surface, it is virtually impossible to crack the glass Uniliner® liner during installation.



Packed Column Inlet Conversion, Dual-Column Analysis

Injection Port Conversion Chart

	Uniliner Liner Set-Up		Vu-Tight Fitting	
Instrument	**Uniliner Liner:** cat.# 20301, 20305, 20308, 20309, 20315, 20316, 20319, 20320, 20902, & 20903	**Liner Adaptor:** cat.# 20310	**Vu-Tight Fitting Kit:** cat.# 20504 **Liner:** cat.# 20342, 20343, 20344, 20787, & 20788	**Vu-Tight Fitting Kit:** cat.# 20504
Agilent GCs (1/4-inch injection ports) Models: 5700, 5710, 5711, 5712, 5830, 5840, 5880, 5890, 6850, 6890	✓	✓	✓	✓
Varian GCs (1/4-inch injection ports) Models: 1200, 1400, 2100, 2400, 3300-3700, 4400, 4600, 6000	✓	✓	✓	✓
Tracor GCs (1/4-inch injection ports) Models: 540, 550, 560, 565, 570	✓	✓	✓	✓
Packard Becker GCs (1/4-inch injection ports) Models: 427, 428, 429, 430, 433, 436, 437, 438	✓	✓	✓	✓
Gow-Mac GCs (1/4-inch injection ports) Models: 69-750, 69-550	✓	✓	✓	✓
HNU GCs (1/4-inch injection ports) Models: 301, 401, 421	✓	✓	✓	✓
PerkinElmer GCs (1/4-inch injection ports) Models: Sigma, 1B-4B, 300, 2001, 2100	✓	✓	✓	✓
PerkinElmer Auto SYS*	✓			

*Does not require Uniliner liner adaptor.

Inlet Adaptor Kit for Dual Column Installation

for Agilent Capillary Injectors (Split/Splitless Fitting for Capillary Columns)

27185

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespel® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247

Graphite Replacement Ferrules

ID	fitting size	qty.	cat.#
0.5 mm	1/16"	10-pk.	20201
	1/16"	50-pk.	20228
0.8 mm	1/16"	10-pk.	20202
	1/16"	50-pk.	20224
1/4-inch	1/4"	10-pk.	20210

20645

1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/Splitless Fitting for 0.53 mm ID Capillary Columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393

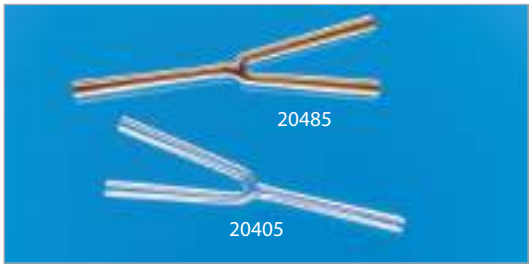
Two-Hole Ferrules for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

Press-Tight® Connectors

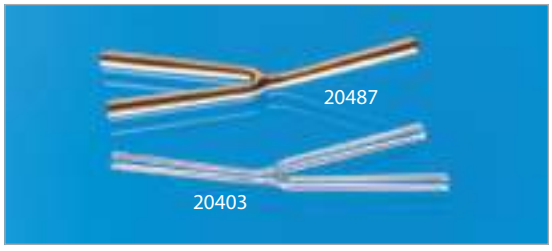
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).



Universal "Y" Press-Tight® Connectors An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.

Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486



Universal Angled "Y" Press-Tight® Connectors

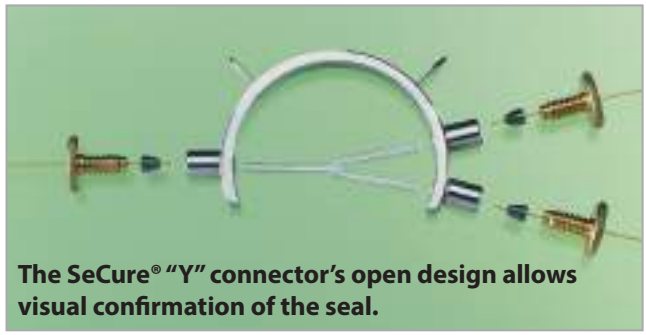
- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

Description	ea.	3-pk.
Universal Angled "Y" Press-Tight Connector	20403	20404
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled "Y" Press-Tight Connector, Siltek Deactivated	20487	20469

Polyimide Resin

Securely connects a Press-Tight® connector to a fused silica column.

Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445



The SeCure® "Y" connector's open design allows visual confirmation of the seal.

SeCure® "Y" Connector Kits

- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and 1/16" graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek® cage designs.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

Kits include: SeCure® "Y" connector body, three knurled nuts, universal "Y" Press-Tight® union, and three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure "Y" Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure "Y" Connector Kit	0.32 mm	kit	20277
SeCure "Y" Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279

MXT® "Y"-Union Connector Kits

For Connecting Metal and/or Fused Silica GC Columns

- Low dead volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 350 °C.
- Available in union and "Y" configurations.
- Can also be used for connecting fused silica to metal.

Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Columns	kit	21389
For 0.32 mm ID Columns	kit	21388
For 0.53 mm ID Columns	kit	21387

Purge-and-Trap Spargers

- Available with uniform frits to ensure maximum purging efficiency.
- Use nonfritted spargers for wastewater samples.
- Manufactured to tight tolerances to ensure a leak-tight seal.

Description	Volume	qty.	cat.#
Fritted Spargers			
Fritted, 1/2-inch mount	5 mL	ea.	21150
Fritted, 1/2-inch mount	10 mL	ea.	26138
Fritted, 1/2-inch mount	25 mL	ea.	21151
Non-Fritted Spargers			
Non-Fritted, 1/2-inch mount	5 mL	ea.	26139
Non-Fritted, 1/2-inch mount	10 mL	ea.	26140
Non-Fritted, 1/2-inch mount	25 mL	ea.	26141

21035

Moisture Control By-Pass Lines for Tekmar Instruments

- Increase response for ketones, alcohols, and acetates.
- Silcosteel®-deactivated tubing for increased inertness.
- Suitable for U.S. EPA Methods 8260, 524.2, and OLM4.1.
- Easily attaches in minutes.

Description	qty.	cat.#
Moisture Control By-Pass Line for Tekmar 3000	ea.	21035
Moisture Control By-Pass Line for Tekmar 3100	ea.	21109

20676

20675

23020

Photoionization (PID) Lamps

Model 108-10.0/10.6 offers both 10.0 and 10.6 eV potential, has a 0.781" base diameter, and is used in Tracor, OI, and Baseline instruments. Model 103 has a 1.375" base and is used in HNU and SRI detectors. Model 108-BTEX lamp's higher output makes it ideal for detection of BTEX compounds.

Features	Benefits
Longer life.	More for your money with each lamp.
Model 108-BTEX has 33% more output than older models.	Operate continuously at 1 ma and 250 °C for 6 months and still have better than 50% of the initial output.
Lamps individually tested.	Your lamp will work to specifications.
Variety of models.	Among the best lamps available for most instrumentation.

Description	eV Rating	Base	qty.	cat. #
PID Lamp, Model 103 C	10.2	1.375"	ea.	20676
PID Lamp, Model 108	10.0/10.6	0.781"	ea.	20675
PID Lamp, Model 108-BTEX	10.0/10.6	0.781"	ea.	23020
PID Lamp Polishing Kit (contains iron oxide cleaning compound, swabs, and instructions)			kit	20674

Antifoam Agent for Purge-and-Trap Samples

- Efficiently controls foam; effective over a wide pH range.
- No hazardous materials, no components that are target analytes.
- Effective at less than 0.1% of sample volume.

See **page 546**.

Make Life Easier (MLE) Capillary Tool Kits

Everything you need in one complete kit!

All kits include these components:

- 1/8", 3/16", 1/4" nylon brushes
- 1/4", 3/8", 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

22186

22185

MLE tool kits conveniently provide the tools that make it easier to install and maintain capillary columns at a discounted price compared to buying the tools individually!

MLE Capillary Tool Kit for Agilent GCs (cat.# 22186) also includes:

- Capillary installation gauge for Agilent GCs
- Injector wrench for Agilent GCs
- Septum nut removal tool
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for Bruker/Varian GCs (cat.# 22184) also includes:

- Capillary installation gauge for Varian GCs
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for PerkinElmer GCs (cat.# 22185) also includes:

- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for Shimadzu GCs (cat.# 22182) also includes:

- Capillary installation gauge for Shimadzu GCs
- Injector wrench for Shimadzu GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench

22184

22182

MLE Capillary Tool Kit for Thermo Scientific GCs (cat.# 22183) also includes:

- Capillary installation gauge for Thermo Scientific GCs
- Liner cap removing tool for Thermo Scientific GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186
MLE Capillary Tool Kit for Bruker/Varian GCs	kit	22184
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183

22183

Easily seat ferrules for consistent installations!

21034

21399

22330

22335

22333

Capillary Installation Gauge

- Seats ferrules onto column for consistent installations.*
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Using the Capillary Installation Gauge for Agilent-Style Fittings

Install the column nut and ferrule onto the column. Slide the column into the installation gauge to the recommended insertion distance. Finger-tighten the nut.

Tighten the assembly to ensure a properly seated ferrule. Loosen the assembly and remove the column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

*For use with graphite ferrules only.

Restek **innovation**!

21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.

Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).

Score and remove the exposed end of the column.

Loosen the nut.

Description	Similar to Agilent Part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894

22858

21044

Capillary Column Caps

- Attach to the column in seconds to form an airtight seal.
- Increase column lifetime—prevent moisture and air from entering the column during storage.
- Two styles to choose from: glass or silicone material.
- Glass caps are color-coded for identifying detector and injector ends.
- Not recommended for reuse.

Description	Material	qty.	cat.#
Capillary Column Caps	Glass	10-pk.	21044
Capillary Column Caps	Silicone	10-pk.	22858

23015

Scoring Wafer With Handle

- Ceramic wafer is straight-edged for cutting fused silica tubing cleanly.
- Unique, ergonomic handle is made of soft, comfortable rubber.

Description	qty.	cat.#
Scoring Wafer with Handle	2-pk.	23015

Ceramic Scoring Wafer

Four straight scoring edges for cutting fused silica tubing and four serrated edges for cutting MXT® metal capillary columns.

20116

Description	qty.	cat.#
Ceramic Scoring Wafers	5-pk.	20116

Sapphire Scribe

20182

- Cuts fused silica tubing.
- Produces a clean, square cut.

One quick stroke...

and just a tap leaves a clean, square end.

Description	qty.	cat.#
Sapphire Scribe	ea.	20182

23027

Shortix® Capillary GC Column Cutter

- Consistently make precise, clean, square cuts with a diamond blade.
- Built-in magnifier to verify square cut.
- Use with 0.25 mm ID to 0.53 mm ID tubing (0.78 mm OD maximum).

23026

Description	qty.	cat.#
Shortix Capillary GC Column Cutter	ea.	23026
Maintenance Kit for Shortix Capillary GC Column Cutter (Includes: diamond cutting wheel, O-rings, and a tool to open the column cutter)	kit	23027

Reference Standards Documentation Search

Locate SDSs, certificates, and data packs by cat. # or lot #

www.restek.com/**documentation**

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

20181

No more burned fingers!

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

26262

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

Eliminates user variation!

Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.

Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.

Place a plug of loosely bound wool at the top of the inlet liner.

Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID ≥ 2 mm.

Inlet Wrench for Agilent 5890/6850/6890 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

22065

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065

21159

Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu Part #	qty.	cat.#
Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159

22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334

20387

Open-End Wrench Set

High-quality 1/4" x 5/16", 3/8" x 7/16", 7/16" x 1/2", and 1/2" x 9/16" wrenches for tightening a wide variety of chromatography fittings.

Description	qty.	cat.#
Open-End Wrench Set	set	20387

20110

Open-End Wrenches

High-quality wrenches for tightening capillary fittings.

Description	Size	qty.	cat.#
Open-End Wrenches	1/4" x 5/16"	2-pk.	20110
Open-End Wrenches	3/8" x 7/16"	2-pk.	22455

22997

Metric Wrench Set

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997

22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999

22998

12-Piece, Ball-Point Hex Key Set

Includes twelve hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998

23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

20109

High-Temperature String

Use to restring capillary columns, attach column connectors to column cages, or hold the column in the GC oven. Capable of withstanding temperatures to 400 °C.

Description	qty.	cat.#
High-Temperature String	10 m	20109
High-Temperature String	450 m	20618

20101

Slide-Lock Tweezers and 15 cm Compact Steel Ruler

- "Lock" capillary columns to the correct insertion distance recommended by the instrument manufacturer during installation.
- Useful for many laboratory tasks.

This duo provides an alternative way to install capillary columns to the correct insertion distance recommended by the instrument manufacturer.

Description	qty.	cat.#
Slide-Lock Tweezers and 15 cm Compact Steel Ruler	set	20101

20112

Stainless Steel Tube Brushes/Surface Brush

Unlike brass brushes that can leave a metal residue, these stainless steel tube brushes ($^3/_8$-, $^3/_{16}$-, and $^1/_4$-inch) work well for cleaning dirty collectors, injector ports, and detector ports. The surface brush can be used to remove residue that builds up on metal detector jets and electronic contacts.

Description	qty.	cat.#
Stainless Steel Tube Brushes/Surface Brush	4-piece set	20112

20108

Nylon Tube Brushes and Pipe Cleaner

Use to remove small septum fragments and residue from dirty glass inlet liners. Brushes are $^1/_8$-, $^3/_{16}$-, and $^1/_4$-inch in diameter; pipe cleaner is one foot (30 cm) long.

Description	qty.	cat.#
Nylon Tube Brushes and Pipe Cleaner	4-piece set	20108

20106

4" Tapered Needle Files

These files can be used for many purposes. They are especially useful for removing ferrules that are lodged in injector or detector ports.

Description	qty.	cat.#
4" Tapered Needle Files	2-pk.	20106

21601

MXT® Needle Files

Multi-purpose files especially useful for cutting Siltek® treated stainless steel columns.

Description	qty.	cat.#
MXT Needle Files	2-pk.	21601

20122

Mini Hand Drill Set

Drill ferrules to the proper ID in seconds! Includes three drills, for use with 0.25, 0.32, and 0.53 mm ID (0.4, 0.5, and 0.8 mm OD) capillary columns.

Description	qty.	cat.#
Mini Hand Drill Set	3-piece set	20122

20113

Stainless Steel Jet Reamers / Ferrule Removers

A great tool for cleaning detector jets or removing stuck ferrules from other small orifices. Serrated design is optimal for removing silica deposits and other contaminants.

Description	qty.	cat.#
Stainless Steel Jet Reamers / Ferrule Removers	6-piece set	20113

20124

Pocket Magnifier

- Small and easy to handle.
- 10x magnification makes it easy to see the column end to verify a square cut.

Description	qty.	cat.#
Pocket Magnifier	ea.	20124

22066

GC Oven Thermometer

- Verify GC oven temperature.
- Quick measurements via sensor in the measuring tip.
- Swivel head can turn 180°.
- Wide measuring range: -50 °C to +350 °C.

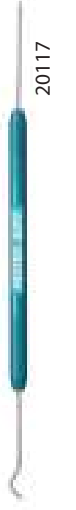
Description	qty.	cat.#
GC Oven Thermometer	ea.	22066

22187

Flashlight with Swivel Head

- Ideal for tight spaces—like inside a GC oven.
- Uses two AA batteries (included).

Description	qty.	cat.#
Flashlight with Swivel Head	ea.	22187


20117

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.

Dislodge a stuck ferrule quickly and easily—without scoring the fitting.

Remove a septum without damaging an expensive weldment.

Description	qty.	cat.#
Septum Puller	ea.	20117

GC Accessories

Gas Management

Gas Purification Essentials 285
Gas Management System 286
Leak Detector 286
Super Clean® Gas Filters 287–291
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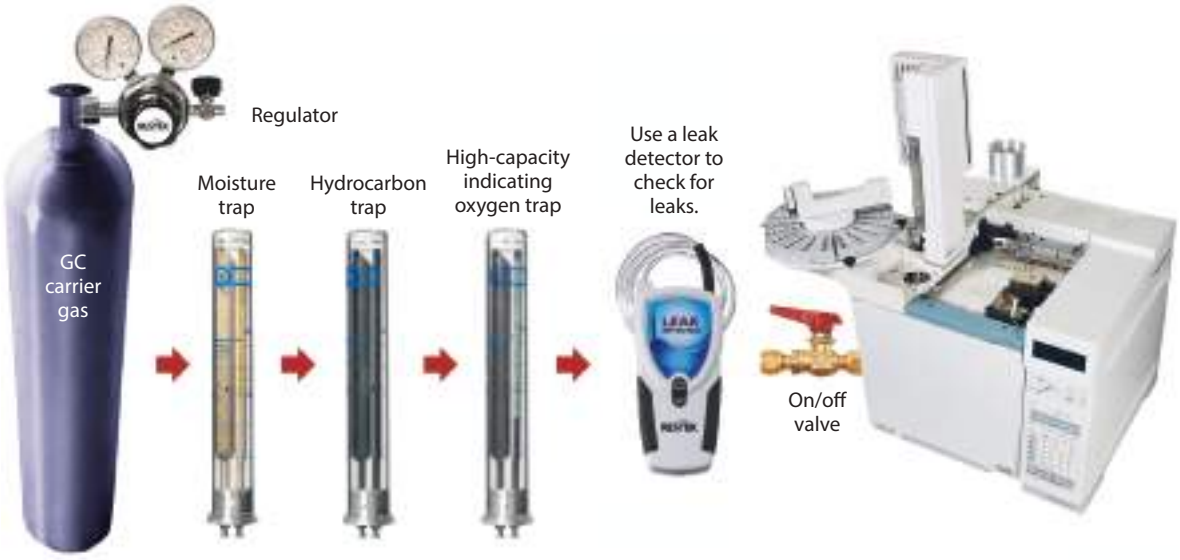
Restek provides the following total gas system solution:

- Restek® gas purifiers provide cost-effective gas purity assurance.
- Restek stainless steel and copper tubing is precleaned and ready to use.
- Swagelok® and Parker A-Lok® tube fittings consistently deliver high-quality performance.
- Extensive line of hand tools, including Restek's electronic leak detector, to make your work easier and faster.
- Gas generators offer an uninterrupted supply of gas.
- Gas regulators ensure optimum line pressure control of all your chromatography gases.

Restek Technical Service (1-800-356-1688, ext. 4; 1-814-353-1300, ext. 4; or support@restek.com) or your Restek representative can answer your questions and provide system-design advice. From the gas source to your point of use, we offer the products and services that ensure the purity of your gas.



Why do I need to use traps and where should I install them?

Carrier gas must contain less than 1 ppm of oxygen, water vapor, or any other trace contaminant to prevent column degradation, shortened column lifetime, and increased stationary phase bleed. Contaminants cause ghost peaks to appear during temperature programming and degrade the validity of analytical data. The expense of using high-purity gases in combination with carrier gas purifiers will be offset by longer column lifetime and less instrument maintenance.

Moisture Removal

Moisture in carrier gas lines will prematurely degrade oxygen and hydrocarbon traps and increase detector noise (particularly with ECDs). As a precaution, we highly recommend installing a moisture trap before the hydrocarbon and oxygen traps on all carrier gas lines. Our favorite trap is the Super Clean® ultra-high capacity moisture filter (cat.# 22028, p. 287).

Hydrocarbon Removal

Use a hydrocarbon trap if your gas has a potential source of hydrocarbon contaminants (e.g., an oil pump in an air compressor) or if you suspect you are observing carrier gas ghost peaks. Install the hydrocarbon trap after the moisture trap to prevent moisture from degrading the hydrocarbon-trapping ability of the activated carbon in the hydrocarbon trap. We recommend the Super Clean® ultra-high capacity hydrocarbon filter (cat.# 22030, p. 287).

Oxygen Removal

Oxygen is a column killer and can enter the system at any connection that is leaking. It is present even in ultra-high purity gases, as minute leaks at fittings allow oxygen to influx against the concentration gradient. There are many choices for oxygen removal—the Super Clean® ultra-high capacity oxygen Filter (cat.# 22029, p. 287) is popular with Restek chemists. Because oxygen can enter a gas line at any fitting, the oxygen trap should be the last connection before the gas line enters the chromatograph.

Leak Checking

To prevent column degradation, increase column lifetime, and decrease stationary phase bleed, carrier gas should always contain <1 ppm oxygen. This can be monitored by continually leak checking all gas system connections using the Restek® electronic leak detector (cat.# 22655, p. 286).

for more info

Questions about which carrier gas purifier to use?
Call Restek Technical Service at 1-814-353-1300, ext. 4, or contact your Restek representative to discuss your application.

Gas Management System, Leak Detector

Restek® Gas Management System

- Removes moisture, hydrocarbons, and oxygen from carrier gas, extending column lifetime.
- Produces high-purity carrier gas for most applications.
- Includes one each: moisture, hydrocarbon, and indicating oxygen trap.
- Replacing traps is safe and easy.
- Maximum flow: 150 cc/min for optimal performance.

Restek has put together a convenient unit providing gas purification all in one step. Complete with an indicating trap, your gas purification issues are handled in one central location.

Dimensions:
12" x 14" x 3"
(30.5 x 35.6 x 7.6 cm)

trap configuration

did you know?

The Restek® gas management system removes water vapor (to 10 ppb), hydrocarbons (to 0.1 ppm), and oxygen (to less than 0.1 ppm) with three traps housed in one unit.

Description	Fittings	qty.	cat.#
Restek Gas Management System	includes fittings for 1/8" and 1/4" gas line	kit	21999
Replacement Traps		**qty.**	**cat.#**
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Indicating Oxygen Trap	1/8" Brass	ea.	22010

NEW LOOK!

22655

Restek® Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek® leak detector.

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

Leak Detector Specifications

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

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657
Car Charger/Adaptor	ea.	22652
Universal AC Power Adaptor	ea.	22653

22658

Verify hard-to-reach leaks using the small probe adaptor (sold separately).

22652 22653

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

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

Restek recommends

If you think that your Restek® electronic leak detector needs service or repair, please contact Restek® Customer Service before sending your unit in (cat.# 22655-R). Leak detector service/repair will include inspection and testing of the unit.

Restek® Super Clean® Gas Filter Kits and Replacements

- High-purity output ensures 99.9999% pure gas (at max. flow of 2 L/min).
- Designed for easy, hassle-free cartridge changes.
- Glass inside to prevent diffusion; polycarbonate housing outside for safety.
- All traps measure 10 5/8" x 1 3/4" (27 x 4.4 cm).
- Each base plate unit measures 4" x 4" x 1 7/8" (10.2 x 10.2 x 4.8 cm).

22022

Table I: Each Super Clean® gas filter provides high-purity outlet gas.

Type of Filter	Outlet Gas Quality (%)	Maximum Pressure/ Maximum Flow Rates	Use for:	Indicator Color Change	Capacity H_2O (g)	Capacity O_2 (mL)	Capacity Hydrocarbons (g) (*n*-Butane)	Estimated Lifetime (Years)
Moisture cat.# 22028	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	7.2	—	—	>2
Oxygen cat.# 22029	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Green to grey	—	1,000	—	>2
Hydrocarbons cat.# 22030	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	No indicator	—	—	12	>2
Fuel Gas[1] cat.# 22022	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	3.5	—	6	>1.5
Triple[2] cat.# 22020	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Yellow/orange to clear Green to grey	1.8	500	4	>1
Helium Specific[2] cat.# 21982	>99.9999	11 bar 159 psi/ 7 L/min	Helium	Yellow/orange to clear Green to grey	1.8	500	4	>1

[1] Removes hydrocarbons and moisture.
[2] Removes hydrocarbons, moisture, and oxygen.

did you know?

All Super Clean® gas filter cartridges (except the hydrocarbon filter cat.# 22030) feature easy-to-read indicators. The indicator code is shown on every trap, so there is no confusion about when to replace it.

22020

22022

base plate

Description	qty.	cat.#
Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon triple gas filter	kit	22019
Fuel Gas Purification Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and hydrocarbon/moisture fuel gas filter	kit	22021
Ultra-High Capacity Hydrocarbon Filter	ea.	22030
Ultra-High Capacity Moisture Filter	ea.	22028
Ultra-High Capacity Oxygen Filter	ea.	22029
Replacement Triple Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	22020
Replacement Fuel Gas Filter (removes moisture and hydrocarbons)	ea.	22022
Helium-Specific Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon helium-specific filter	kit	21983
Replacement Helium-Specific Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	21982
Gas Filter Bundle Kit Includes: one triple gas filter (cat.# 22020) and two fuel gas filters (cat.# 22022)	kit	22031

tech tip

Oxygen and Moisture Traps
Restek highly recommends oxygen and moisture traps for make-up gas when operating sensitive detectors such as electron capture detectors (ECD). The hydrogen reaction gas for sensitive electrolytic conductivity detectors (ELCD) also requires a hydrocarbon trap to remove trace impurities.

22026

22025

22027

Restek® Filter Base Plates

- End fittings available in brass or stainless steel.
- Base plates fit all stand alone Super Clean® gas filters offered.

Each single-position base plate unit measures:
4" x 4" x 1 7/8" (10.2 x 10.2 x 4.8 cm)
Each 2-position base plate unit measures:
8" x 4" x 1 7/8" (20.3 x 10.2 x 4.8 cm)
Each 3-position base plate unit measures:
12" x 4" x 1 7/8" (30.5 x 10.2 x 4.8 cm)
Standard base plate inlet/outlet fittings accept 1/8" tubing. To adapt to 1/4" tubing, order 1/8" to 1/4" tube end reducers.

	Brass		Stainless Steel	
Description	qty.	cat.#	qty.	cat.#
Filter Base Plate, Single-Position	ea.	22025	ea.	22344
Filter Base Plate, 2-Position	ea.	22026	ea.	22345
Filter Base Plate, 3-Position	ea.	22027	ea.	22346

Wall Mounting Bracket

Base plates can be mounted by using screws and the mounting holes on the base plate, or by using this optional wall mounting bracket.

21984

Description	qty.	cat.#
Wall Mounting Bracket for Super Clean Base Plates	ea.	21984

Replacement O-Rings for Cartridge Base Plates

Pack includes 10 large O-rings and 10 small O-rings.

22023

Description	qty.	cat.#
Replacement O-Rings for Cartridge Base Plates	20-pk.	22023

1/8-Inch to 1/4-Inch Tube End Reducer

To adapt 1/8" Super Clean® base plate fittings to 1/4" tubing, use 1/8" to 1/4" tube end reducers.

21833

	Brass		Stainless Steel	
Description	qty.	cat.#	qty.	cat.#
Tube End Reducer, 1/8" to 1/4"	5-pk.	21833	2-pk.	21933

Restek® Super Clean® Gas Trapping System for LC-MS

A Super Clean® quick-change cartridge system efficiently removes hydrocarbons from nitrogen!

- Designed for easy, hassle-free cartridge changes.
- Up to 20 L of hydrocarbon-free nitrogen per minute.
- Filters connected in parallel to handle high flows for LC-MS.

Super Clean® gas filters provide high-purity outlet gas

Type of filter:	Hydrocarbon (charcoal)
Max. Flow:	20 L/min
Outlet Gas Quality %:	99.9999%
Maximum Pressure:	11 bar/159 psi
Estimated Lifetime:	3 to 6 months

All traps measure:
10 5/8" x 1 3/4" (27 x 4.4 cm)
Each 2-position base plate unit measures:
8" x 4" x 1 7/8" (20.3 x 10.2 x 4.8 cm)
Standard base plate inlet/outlet fittings accept 1/4" tubing. To adapt to 1/8" tubing, order 1/4" to 1/8" tube end reducers.

20 L of purified nitrogen per minute!

The Super Clean® gas trapping system purifies nitrogen and is ideal for use in LC-MS systems. The two-position base plate (installed in the gas line; standard base plate inlet/outlet fittings accept 1/4" tubing) allows cartridges to be exchanged without introducing impurities into the system. Spring-loaded check valves seal when a cartridge is removed and open only when a new cartridge has been locked in place. There is no need for loosening and tightening fittings every time you change cartridges, and your system cannot become contaminated during the changing process.

To meet the high flow needs of the LC-MS system, the activated charcoal–filled cartridges are positioned and connected in parallel. The incoming gas stream is split equally between the cartridges, and the two streams are rejoined after purification but before the gas exits the base plate. This approach allows longer contact between the nitrogen and the adsorbent, ensuring higher gas purity and eliminating a potential source of contaminants to your analyses.

A handy date wheel, included with the system, indicates the cartridge installation date and the recommended replacement date.

Description	qty.	cat.#
Super Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061
Particle Drop-In Filter, 0.5 µm	2-pk.	22367

also available

Looking for a nitrogen generator for your LC-MS?

Restek offers a full line of Parker LC-MS generators.

See **page 299.**

Restek® Click-On Inline Super Clean® Purification Gas Traps

- High-purity output ensures 99.9999% pure gas.
- Click-On fittings for easy, leak-tight cartridge changes; brass or stainless steel, 1/4" or 1/8".
- Helium-specific triple gas trap is ideal for GC-MS—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Triple gas trap is ideal for purifying carrier gas—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Fuel gas trap is ideal for purifying flame ionization detector (FID) fuel gases, removing both moisture and hydrocarbons.

Click-On adaptor connectors allow cartridges to be exchanged without introducing oxygen, moisture, and hydrocarbons. Spring-loaded check valves seal when a filter is removed and open only when a new filter has been locked in place.

See next page for more Click-On in-line Super Clean® products.

Filter Type	Gas Quality at Outlet	Maximum Pressure	Maximum Flow (L/min)	Use For	H_2O (g)	Capacity O_2 (mL)	Hydrocarbons (g) (*n*-Butane)	Estimated Lifetime (Years)
Moisture cat.# 22467	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	15	NA	NA	>3
Oxygen cat.# 22468	>99.9999	11 bar 160 psi	25	Inert carrier gas	NA	2,000	NA	>3
Hydrocarbon cat.# 22466	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	NA	NA	24	>3
Fuel Gas[1] cat.# 22465	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	7	NA	12	>2
Triple[2] cat.# 22464	>99.9999	11 bar 160 psi	25	Inert carrier gas	4	1,000	8	>2
Helium-Specific Triple[2] cat.# 22473	>99.9999	11 bar 160 psi	25	Helium	4	1,000	8	>2

[1]Removes hydrocarbons, moisture.
[2]Removes hydrocarbons, moisture, oxygen.

NOTE: Super Clean® gas filters are recommended for purifying noncorrosive gases with low concentrations of contaminants. The maximum concentration of oxygen in the incoming gas stream for oxygen purifiers is 0.5%.

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

did you **know**?

Trap replacement depends on the quality of the incoming gas. Use the double connector and install an indicating cartridge after a trap to indicate when the trap should be replaced.

Restek Click-On In-Line Super Clean® Gas Traps and Connector Kits

Description	qty.	cat.#
Carrier Gas Purification Kit		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22456
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22457
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22458
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22459
Fuel Gas Purification Kit		
Includes: (4) 1/8" SS connectors and (2) hydrocarbon/moisture traps	kit	22460
Includes: (4) 1/8" brass connectors and (2) hydrocarbon/moisture traps	kit	22461
Includes: (4) 1/4" SS connectors and (2) hydrocarbon/moisture traps	kit	22462
Includes: (4) 1/4" brass connectors and (2) hydrocarbon/moisture traps	kit	22463

tech tip

To prevent settling of dessicant, mount vertically, not horizontally.

22474

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super Clean® Indicator

- Oxygen: green to grey
- Moisture: beige to clear

Install an indicator after the Click-On in-line gas filter so there is no confusion about when to replace the traps.

Description	qty.	cat.#
Click-On In-line Super Clean Indicator (oxygen, moisture)	ea.	22474

Note: Fittings sold separately.

22464

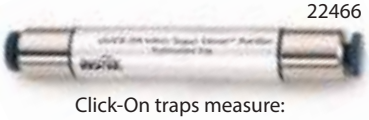
Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super Clean® Replacement Gas Traps

Description	qty.	cat.#
Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22464
Fuel Gas Trap (removes moisture and hydrocarbons)	ea.	22465

Note: Replacement trap only—fittings sold separately.

22466



Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super Clean® Ultra-High Capacity Gas Traps

Description	qty.	cat.#
Ultra-High Capacity Hydrocarbon Trap	ea.	22466
Ultra-High Capacity Moisture Trap	ea.	22467
Ultra-High Capacity Oxygen Trap	ea.	22468

Click-On In-Line Super Clean® Connectors

Click-On connectors allow you to change traps quickly, without introducing oxygen into your system.

Attach Click-On connectors to the gas lines once—avoid damaging the lines.

22477

Each connector is 2 3/8" (6 cm) in length.

Description	Fittings	qty.	cat.#
Click-On In-line Super Clean Connectors	1/8" Brass	2-pk.	22475
Click-On In-line Super Clean Connectors	1/8" Stainless Steel	2-pk.	22476
Click-On In-line Super Clean Connectors	1/4" Brass	2-pk.	22477
Click-On In-line Super Clean Connectors	1/4" Stainless Steel	2-pk.	22478

Click-On In-Line Super Clean® Double Connector

Connects any Click-On trap to a Click-On indicator.

22479

Each double connector is 3" (8 cm) in length.

Description	qty.	cat.#
Click-On In-line Super Clean Double Connector, Stainless Steel	ea.	22479

22480

22481

Accessories for In-Line Super Clean® Gas Traps and Connectors

Description	qty.	cat.#
Wall-Mounting Clamps for Click-On In-line Super Clean Gas Traps	4-pk.	22480
Replacement O-Rings for Click-On In-line Super Clean Connectors (includes 10 large and 10 small)	20-pk.	22481

Helium-Specific Click-On In-Line Super Clean® Gas Trap and Connector Kits

Helium-specific Click-On in-line Super Clean® gas trap and kits are designed specifically for purification of helium in GC-MS systems.

Description	qty.	cat.#
Helium-Specific Carrier Gas Cleaning Kits		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22469
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22470
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22471
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22472
Replacement Trap		
Helium-Specific Replacement Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22473

22473

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super Clean® Big Trap Filter Kits

NEW!

- Largest-capacity traps available—run longer without replacing.
- "Quick connect" fittings with spring-loaded check valves allow filter replacement in seconds without tools or contamination.
- Stainless steel construction withstands pressures up to 1,000 psig.
- High-purity output ensures 99.9999% pure gas (maximum flow of 8 L/min).
- Triple gas trap is ideal for purifying carrier gas.
- Helium-specific triple gas trap is made for GC-MS—ready to use within 15 minutes of installation.
- Hydrocarbon trap removes hydrocarbon contamination from carrier gas to help eliminate ghost peaks.

Click-On In-Line Super Clean® Big Traps measure:
22" x 2 1/2" (55.9 x 6.4 cm)

Capacity:
Triple Gas Traps: 2.0 L oxygen; 30 g total hydrocarbons; 70 g water
Hydrocarbon Trap: 90 g total hydrocarbons

27201

Description	qty.	cat.#
Triple Helium Kit, 1/4"		
Includes: (2) 1/4" SS connectors, (1) oxygen/moisture/hydrocarbon helium-specific trap, and (2) wall-mounting clamps	kit	27201
Triple Helium Kit, 1/8"		
Includes: (2) 1/8" SS connectors, (1) oxygen/moisture/hydrocarbon helium-specific trap, and (2) wall-mounting clamps	kit	27202
Hydrocarbon Kit, 1/4"		
Includes: (2) 1/4" SS connectors, (1) oxygen/moisture/hydrocarbon trap, and (2) wall-mounting clamps	kit	27203

Click-On In-Line Super Clean® Big Trap Replacement Filters

NEW!

Capacity:
Triple Gas Traps: 2.0 L oxygen; 30 g total hydrocarbons; 70 g water
Hydrocarbon Trap: 90 g total hydrocarbons

27205

Description	qty.	cat.#
Triple Helium Trap	ea.	27204
Triple Standard Trap	ea.	27205
Hydrocarbon Trap	ea.	27206

Note: Replacement filter only—fittings sold separately. See Click-On in-line Super Clean® Big Trap filter kits for more information.

Click-On In-Line Super Clean® Big Trap Wall-Mounting Clamp Set

NEW!

27207

Description	qty.	cat.#
Click-On In-Line Super Clean Big Trap Wall-Mounting Clamp Set	2-pk.	27207

Dimensions: 9 1/4" x 2" (23.5 x 5.1 cm)

High-Capacity Indicating Oxygen Trap

- Indicator changes from dark blue to black as oxygen and water are trapped.
- Lasts longer than three smaller traps.
- Use with all carrier gases.
- Ambient operating temperature, 100 psi (689 kPa) operating pressure.
- Built-in frit traps microparticles.
- Outlet gas purity:

  O_2 < 0.1 ppm when inlet does not exceed 15 ppm.

  H_2O < 0.5 ppm when inlet does not exceed 10 ppm.
- Maximum operating pressure: 150 psi (1,034 kPa).
- Maximum flow: 16.5 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Indicating Oxygen Trap	1/8" Compression Tube Brass	ea.	20624
High-Capacity Indicating Oxygen Trap	1/4" Compression Tube Brass	ea.	20623
Replacement Cartridge (fits 1/4" or 1/8" housing)		ea.	20625
Replacement O-Rings (5 small O-rings and 5 large O-rings)		kit	22081

Dimensions: 10" x 1 1/4" (25.4 x 3.2 cm)

Indicating Oxygen Trap

- Indicator changes from light green to grey as oxygen is trapped.
- Heavy-walled glass body, protected by polycarbonate sleeve, prevents oxygen and water infusion.
- Prepurged for fast stabilization.
- 100 psi (689 kPa) maximum operating pressure.
- Reduces oxygen to 0.1 ppm.
- 10 µm frits at inlet and outlet.
- Optimal flow rate: < 150 mL/min.

Description	Fittings	qty.	cat.#
Indicating Oxygen Trap	1/8" Brass	ea.	22010
Indicating Oxygen Trap	1/4" Brass	ea.	22011

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

High-Capacity Oxygen Trap

- Removes up to 600 mg of oxygen or 2 g of water.
- Long life—typically purifies more than five 200 ft^3 cylinders.
- Reduces oxygen to 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Flow: 3 L/min @ 32 psi (221 kPa).

Description	Fittings	qty.	cat.#
High-Capacity Oxygen Trap	1/8" Nickel-Plated Brass	ea.	20601
High-Capacity Oxygen Trap	1/4" Nickel-Plated Brass	ea.	20600

Molecular Sieve S-Trap

- Traps water vapor; increases column and oxygen trap lifetime.
- Reduces baseline noise from sensitive detectors such as ECDs and mass spectrometers.
- Activated and ready to use.
- Reduces water to less than 1 ppm.
- Maximum flow: 1 L/min.

Dimensions:
6 3/4" x 5 5/8" (17.1 x 14.3 cm)

Description	Fittings	qty.	cat.#
Molecular Sieve S-Trap	1/8" Brass	ea.	20686

This trap can be regenerated by heating to 300 °C for three hours using a 50-70 mL flow of dry nitrogen.

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)
Moisture capacity: 16 g of water

High-Capacity Moisture Trap

- Purged with ultra-high-purity helium; ready to use with any carrier gas including hydrogen.
- Reduces water to less than 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Maximum flow: 1.25 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
High-Capacity Moisture Trap	1/4" Nickel-Plated Brass	ea.	20638

Dimensions:	13" x 2" (33 x 5.1 cm)
Moisture capacity:	6 g of water
Maximum flow:	1 L/min

Indicating Moisture Trap

- Reduces water to less than 10 ppb; indicator changes from yellowish-green to blue at 5% relative humidity.
- Prepurged for fast stabilization.
- Reduces noise from high-sensitivity detectors.
- Heavy-walled glass body prevents oxygen and water infusion.
- 10 µm frit prevents microparticulate damage to needle valves and flow controllers.
- Maximum operating pressure: 100 psi (689 kPa).

Description	Fittings	qty.	cat.#
Indicating Moisture Trap	1/8" Brass	ea.	22014
Indicating Moisture Trap	1/4" Brass	ea.	22015

21991

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

Capillary-Grade Hydrocarbon Trap

- Packed with an extremely high surface area, baked coconut shell–based activated carbon.
- Purged with ultra-high-purity helium; ready to use with any carrier gas including hydrogen.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- Maximum operating pressure: 250 psi (1,724 kPa).

Description	Fittings	qty.	cat.#
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Capillary-Grade Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	21992

22012

Dimensions: 9 1/4" x 2 1/4" (23.5 x 5.7 cm)

Refillable Hydrocarbon Trap

- Removes trace impurities from carrier gas.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- 60 µm frit prevents gas contamination by purifier particles.
- Good for purge-and-trap systems.
- Refillable and rechargeable.
- Maximum operating pressure: 125 psig (862 kPa).
- Maximum flow: 5 L/min.

Description	Fittings	qty.	cat.#
Refillable Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	22012
Refillable Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	22013
Carbon Refill (two recharges)		pint	20626

Hydrocarbon S-Trap

- Removes hydrocarbons and other contaminants.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- Each individually activated to ensure maximum efficiency.
- Fits in GC oven for easy thermal recharging.
- Maximum operating pressure: 60 psi (414 kPa).

22016

Dimensions: 6 3/4" x 5 5/8" (17.1 x 14.3 cm)

Description	Fittings	qty.	cat.#
Hydrocarbon S-Trap	1/8" Brass	ea.	22016

20636

Dimensions: 6" x 1 3/4" (15.2 x 4.4 cm)

Indicating Hydrocarbon Trap for Air Compressors

- Pass compressed air from an oil-filled air compressor through this trap to remove oil vapors and mist.
- Indicator changes from pale pink to deep pink.

Description	Fittings	qty.	cat.#
Indicating Hydrocarbon Trap for Air Compressors	1/8" Brass	ea.	20637
Indicating Hydrocarbon Trap for Air Compressors	1/4" Brass	ea.	20636

20698

Dimensions: 6" x 1" (15.2 x 2.5 cm)

High-Capacity Split Vent Trap

- Reduces the release of hazardous materials from the capillary split vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
High-Capacity Split Vent Trap	1/8"	ea.	20698
High-Capacity Split Vent Trap	1/8"	5-pk.	20699

22017

Dimensions: 6" x 1" (15.2 x 2.5 cm)

ECD Vent Trap

- Reduces the release of hazardous materials from the ECD vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
ECD Vent Trap	1/8"	ea.	22017

tech tip

Carrier Gas Purity

Carrier gas should contain less than 1 ppm of oxygen, moisture, or other trace contaminants to prevent column degradation, increase column lifetime, and decrease stationary phase bleed.

The expense of using high-purity gases in combination with carrier gas line purifiers will be offset by longer column lifetime and less GC maintenance.

Gas Management Supplies

Dimensions:
21" x 1 1/2"
(53.3 x 3.8 cm)

VICI® Mat/Sen® Gas-Specific Purifier Modules

- Replace separate oxygen, moisture, and hydrocarbon traps with one multiple-bed purifier, specific for purifying helium, hydrogen, nitrogen, or air.
- Reduce gas impurities from ppm to low ppb levels.
- Decrease baseline noise and increase GC-MS sensitivity.
- Prepurged with the specified gas to shorten downtime.

Performance for these purifiers is optimized by incorporating a multiple-bed format that progressively lowers concentrations of contaminants at each successive bed. VICI® Mat/Sen® purifiers are guaranteed to produce gases that are purer than 99.9999%, when supplied with gas of 99.995% purity, and are prepurged with the specified gas to speed conditioning. Purifier capacity is approximately four tanks of gas at 99.995% (50 ppm) purity, and correspondingly longer for purer gases.

Please Note: We recommend using an indicating oxygen trap (e.g., cat.# 22029, pg. 287) downstream from a VICI® Mat/Sen® purifier to continually ensure gas purity and indicate absolute change-out time.

Specifications:

Length:	21" (53.3 cm)
Diameter:	1.5" (3.8 cm)
Maximum Inlet Pressure:	1,000 psi (6895 kPa)
Maximum Recommended Flow:	500 mL/min
Pressure Drop from 120 psi (827 kPa) inlet at a flow of 0-500 mL/min:	<0.20 psi (1.4 kPa)
Compression End Fittings:	1/8" or 1/4", stainless steel
Shipping Weight:	3.04 lb (1,300 g)

	Compression Tube Fittings			
Gas-Specific Purifier Module	**1/4-inch qty.**	**1/4-inch cat.#**	**1/8-inch qty.**	**1/8-inch cat.#**
Helium Purifier Module	ea.	22600	ea.	22601
Hydrogen Purifier Module	ea.	22602	ea.	22603
Nitrogen Purifier Module*	ea.	22604	ea.	22605
Air Purifier Module	ea.	22606	ea.	22607

*Warning: Do not use with nitrogen containing more than 500 ppm of oxygen. If the oxygen level in the stream exceeds 500 ppm, use an air purifier.

Gas Pressure Gauge Kit

- Use an in-line pressure gauge to indicate when a thermal gas purifier getter tube should be replaced.
- Includes 1/8" tee and 0–100 psi (0-689 kPa) gauge.

21657

Description	qty.	cat.#
In-line Gas Pressure Gauge Kit for Thermal Gas Purifiers	kit	21657

Replacement Chemical Traps and Parts for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6850/6890 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware		2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6850/6890 GCs	G1544-60610, G1544-80530	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530, 5188-6495	kit	23032

Parker Balston® H2PEMPD Hydrogen Generators

NEW!

- Proton exchange membrane (PEM) cell eliminates the need for liquid electrolytes.
- Maintenance-free palladium purifier removes oxygen to <0.01 ppm and moisture to <1.0 ppm.
- Produces continuous supply of 99.99999+% pure hydrogen gas.
- Does not require downstream gas filters.
- Maximum outlet pressures of 100 or 175 psig (690 or 1,200 kPa).
- Automatic safety feature shuts the generator down if a hydrogen leak is detected.
- Compact unit, requires only one square foot of bench space.

Specifications:

Purity:	99.99999+% pure hydrogen
Outlet Port:	1/4" compression
Electrical Requirements:	100 to 230 VAC, 50/60Hz
Physical Dimensions:	17.1" h x 13.5" w x 21" d
Shipping Weight:	60 lb

Description	Model #	Capacity	Delivery Pressure	qty.	cat.#
Hydrogen Generator	H2PEMPD-510	510 cc/min	100 psig	ea.	22144
Hydrogen Generator	H2PEMPD-510	510 cc/min	175 psig	ea.	22145
Hydrogen Generator	H2PEMPD-650	650 cc/min	100 psig	ea.	22146
Hydrogen Generator	H2PEMPD-650	650 cc/min	175 psig	ea.	22147
Hydrogen Generator	H2PEMPD-850	850 cc/min	100 psig	ea.	22148
Hydrogen Generator	H2PEMPD-850	850 cc/min	175 psig	ea.	22149
Hydrogen Generator	H2PEMPD-1100	1,100 cc/min	100 psig	ea.	22150
Hydrogen Generator	H2PEMPD-1100	1,100 cc/min	175 psig	ea.	22151
Hydrogen Generator	H2PEMPD-1300	1,300 cc/min	100 psig	ea.	22152
Hydrogen Generator	H2PEMPD-1300	1,300 cc/min	175 psig	ea.	22153
Maintenance Kits					
6-Month Maintenance Kit for H2PEMPD Units Includes: Deionizer cartridge, 100 µm water filter, environmental filters (2), and filter replacement tool				kit	22154
24-Month Maintenance Kit for H2PEMPD Units Includes: deionizer cartridge, 100 µm water filter, environmental filters (2), filter replacement tool, tube clamp, water pump, and fan guard (2)				kit	22155

Your satisfaction is our top priority.

Parker Filtration

- Dimensions: 17.12" x 13.46" x 17.95"
- 59 lb dry weight

Safer alternative to high-pressure gas cylinders!

Parker Balston® PEM Hydrogen Generators

- Proton exchange membrane (PEM) cell eliminates the need for liquid electrolytes.
- Reliably generate 99.9995% pure hydrogen—for better chromatography.
- Eliminates high-pressure cylinders—greater convenience and improved lab safety.
- Compact unit, requiring only one square foot of bench space.
- Quick and easy to service and maintain; unique display lighting changes color for easy status checks and water level indication.
- Comes with a set of universal power adapters for U.S., European, and Asian plug types.
- Automatic safety feature shuts the generator down if a hydrogen leak is detected.

Specifications

Purity:	99.9995% pure hydrogen
Delivery Pressure:	5-100 psig ± 0.5 psig (69-689 kPa ± 7kPa)
Outlet Port:	1/8" compression
Electrical Requirements:	100-230 VAC/50-60 Hz
Physical Dimensions:	17.12" h x 13.46" w x 17.95" d (43.48 x 34.19 x 45.6 cm)
Shipping Weight:	59 lb (27 kg) dry

Description	Model #	Capacity	qty.	cat.#
Hydrogen Generator	H2PEM-100	100 cc/min	ea.	23065
Hydrogen Generator	H2PEM-165	165 cc/min	ea.	23066
Hydrogen Generator	H2PEM-260	260 cc/min	ea.	23067
Hydrogen Generator	H2PEM-510	510 cc/min	ea.	23068
Replacement and Maintenance Components for Hydrogen Generators (for all models listed above)				
Replacement Desiccant Cartridge for H2PEM Generators			ea.	23069
6-Month Maintenance Kit for H2PEM Generators Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters			kit	23070
24-Month Maintenance Kit for H2PEM Generators Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters, 1 water level sensor, 1 water pump, and 1 desiccant cartridge			kit	23071

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Parker Balston® Hydrogen Generators

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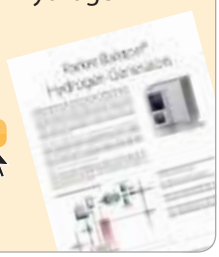

Restek Electronic Leak Detector

Protect your instrument and analytical column!

- Ergonomic, handheld design.
- Handy probe storage for cleanliness and convenience.

www.restek.com/**leakdetector**

Parker Balston® Model FID-1000 and FID-2500 Gas Stations

- Single unit produces UHP zero air from house compressed air and 99.9995% pure hydrogen from deionized water.
- Ideal for supplying up to 5-6 FIDs.
- Eliminates inconvenient and dangerous gas cylinders.
- Silent operation, minimal operator attention required.

Parker Balston® gas stations provide both UHP grade hydrogen gas and zero grade air for flame ionization detectors. The system is specifically designed to supply gas to FIDs and to support flame thermionic and flame photometric detectors. The units produce zero air by purifying compressed air to a total hydrocarbon concentration of 0.1 ppm or less (measured as methane).

The hydrogen generators produce hydrogen gas from deionized water, using the principle of electrolytic dissociation of water and hydrogen proton conduction through a proton exchange membrane cell.

Produce zero air and pure hydrogen from one unit!

Specifications - FID Gas Stations:	
Hydrogen Purity:	99.9995%
Zero Air Purity:	< 0.1 ppm total hydrocarbons as methane
Max. Hydrogen Flow Rate:	FID-1000: 90 cc/min
	FID-2500: 250 cc/min
Max. Zero Air Flow Rate:	FID-1000: 1000 cc/min
	FID-2500: 2500 cc/min
Power:	120 VAC/amp, 60 Hz, 480 watts
Hydrogen Outlet Pressure:	60 psig (414 kPa)
Zero Air Outlet Pressure:	40-125 psig* (276-862 kPa)
Inlet Connection:	1/4" NPT (female)
Outlet:	1/8" compression
Dimensions:	16.5" h x 10.5" w x 17" d
	(42 cm x 27 cm x 43 cm)
Weight:	53 lb (24 kg)

Description	Model #	qty.	cat. #
Gas Station	Model FID-1000 (ideal for 1-2 FIDs)	ea.	20177
Gas Station	Model FID-2500 (ideal for 5-6 FIDs)	ea.	24913
Replacement Components for FID Gas Stations			
Resin Bed Cartridge for Hydrogen Generators in FID-1000 and FID-2500 Gas Stations		ea.	24914
Replacement Desiccant Cartridge		ea.	21671
FID Gas Station Annual Maintenance Kit Includes: 1 desiccant cartridge, 1 resin cartridge, 1 inline filter**, and 1 tube filter**		ea.	24915

*Zero air inlet requires minimum of 40 psig (276 kPa) compressed air pressure.
** Filters should be changed every year; resin and desiccant cartridges can be replaced every 2 years.

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FID Gas Stations

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ordering **note**

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20697

Parker Balston® Nitrogen Gas Generators

- Produces ultra-pure nitrogen (up to 99.9999%).
- Require only a compressed air source and 110 volt AC power.
- Typical applications include GC carrier gas, make-up gas, and low flow sample concentrators.
- Maintenance kits include replacement filters.

Specifications	Model HPN2-1100 or UHPN2-1100
Maximum Nitrogen Flow Rate:	See Flow Table
Nitrogen Purity:	99.9999%
Minimum/Maximum Inlet Pressure:	60 psig/125 psig (414/862 kPa)
Electrical Requirements[1]:	120 VAC/60 Hz
Dimensions:	35" h x 12" w x 16" d (89 cm x 30 cm x 41 cm)
Shipping Weight:	115 lb (52 kg)

Flow Table for Models HPN2-1100 and UHPN2-1100

Inlet Air Pressure	Maximum Outlet Flow (cc/min)	Maximum Outlet Pressure
125 psig (862 kPa)	1100	85 psig (586 kPa)
110 psig (758 kPa)	1000	75 psig (517 kPa)
100 psig (689 kPa)	900	65 psig (448 kPa)
90 psig (621 kPa)	800	60 psig (414 kPa)
80 psig (552 kPa)	700	50 psig (345 kPa)
70 psig (483 kPa)	600	45 psig (310 kPa)
60 psig (414 kPa)	500	35 psig (241 kPa)

Note:
Model HPN2-1100 does not remove hydrocarbons.
[1]Power consumption is:
Model HPN2-1100 = 25 Watts
Model UHPN2-1100 = 700 Watts

Nitrogen Generators	Model #	qty.	cat.#
Nitrogen Generator	HPN2-1100 (ultra-high purity)	ea.	21653
Nitrogen Generator	UHPN2-1100 (ultra-high purity zero grade)	ea.	20697
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Annual Maintenance Kit Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter	for HPN2-1100, 76-92	kit	21649
Annual Maintenance Kit Includes: 1st, 2nd, and 3rd stage prefilters (1 each) and 1 final filter	for UHPN2-1100, 76-94, 76-96	kit	21655

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Gas Management Supplies for GC Labs

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lit. cat.# GNBR1758-UNV

Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.

22130

22129

Specifications	NitroFlow Lab*	N2-04	N2-14	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min N2-22A: 29 L/min	36 L/min max. flow	N2-22: 44 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	None	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	75 lb (34 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

* Has built-in air compressor.

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS Includes: Oxygen analyzer and audible alarm (monitors oxygen in nitrogen stream and signals high or low concentrations)	N2-35A Model, 44 L/min max. flow	ea.	22134
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Maintenance Kit Includes: carbon filter	for NitroFlow Lab	kit	22156
6-Month Maintenance Kit* Includes: 1st stage prefilter, 2nd stage prefilter, and final filter (2 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	21648
6-Month Maintenance Kit With Carbon Filter* Includes: 1st stage prefilter, 2nd stage prefilter, hydrocarbon scrubber, and final filter (1 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	22135
Generator Maintenance Kit Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)	kit	21647

*The manufacturer recommends maintenance for this unit every 6 months.

20677

ordering **note**

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Parker Balston® Zero Air Generators

- Turn in-house compressed air into ultra-pure air (<0.1 ppm total hydrocarbons).
- Remove hydrocarbons to less than 0.1 ppm by catalytic oxidation.
- Operate at 40–125 psi (276–862 kPa).
- Typical payback is less than one year, based on cylinder costs.
- Install easily and take up little bench space*.
- Maintenance kits include a one-year supply of prefilters and final filter.

Model	Number of FIDs*
75-83NA	Up to 2
HPZA-3500	Up to 8
HPZA-7000	Up to 16
HPZA-18000	Up to 40
HPZA-30000	Up to 66

*Based on a 450 cc/min fuel air rate

Specifications

Maximum Zero Air Flow Rate:	75-83NA	1 L/min
	HPZA-3500	3.5 L/min
	HPZA-7000	7 L/min
	HPZA-18000	18 L/min
	HPZA-30000	30 L/min
Outlet Hydrocarbon Concentration (as Methane):	75-83NA	< 0.1 ppm
	HPZA-30000	< 0.1 ppm
	Other Models	< .05 ppm
Minimum/Maximum Inlet Air Pressure:	40 psig/125 psig (276/862 kPa)	
Maximum Inlet Hydrocarbon Concentration (as Methane):	100 ppm	
Pressure Drop at Maximum Flow Rate:	4 psi (28 kPa) differential	
Maximum Inlet Air Temperature:	78°F (25°C)	
Inlet/Outlet Ports:	1/4" NPT (female)	
Start-up Time to Specified Hydrocarbon Concentration:	45 minutes	
Electrical Requirements:	75-83NA HPZA-3500, HPZA-7000 HPZA-18000, HPZA-30000	120 VAC/60 Hz, 0.5 amps 120 VAC/60 Hz, 2.0 amps 120 VAC/60 Hz, 4.0 amps
Dimensions:	75-83NA Other Models	10" h x 12" w x 3" d (25 cm x 30 cm x 8 cm) 16" h x 11" w x 13" d (42 cm x 27 cm x 34 cm)
Shipping Weight:	75-83NA Other Models	7 lb (3 kg) 41 lb (19 kg)

Zero Air Generator	Model #	Capacity	qty.	cat. #
Zero Air Generator	75-83NA	1,000 cc/min	ea.	20684
Zero Air Generator	HPZA-3500	3,500 cc/min	ea.	20680
Zero Air Generator	HPZA-7000	7,000 cc/min	ea.	20681
Zero Air Generator	HPZA-18000	18,000 cc/min	ea.	20682
Zero Air Generator	HPZA-30000	30,000 cc/min	ea.	20683
Annual Maintenance Kits			**qty.**	**cat. #**
Annual Maintenance Kit Includes: 1 prefilter and 1 sintered metal filter	for 75-83NA		kit	21646
Generator Maintenance Kit Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)		kit	21647
Replacement Catalyst Towers	**Model #**	**Capacity**	**qty.**	**cat. #**
Replacement Catalyst Tower	for 75-83NA	1,000 cc/min	ea.	22005
Replacement Catalyst Tower	for HPZA-3500	3,500 cc/min	ea.	22004
Replacement Catalyst Tower	for HPZA-7000	7,000 cc/min	ea.	22006
Replacement Catalyst Tower	for HPZA-18000	18,000 cc/min	ea.	22007
Replacement Catalyst Tower	for HPZA-30000	30,000 cc/min	ea.	22008

*Parker Model 75-83NA (Restek cat.# 20684) is a wall-mount model, and its dimensions are 12" w x 10" h x 3" d.

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Zero Air Generators

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lit. cat.# GNTS1439-UNV

Silcosteel® Regulators and Switchover Systems

Applications:

- CEM continuous emission monitoring.
- Environmental stack and gas emission standards.
- Low-level sulfur and mercury analysis.
- Reactive or corrosive gases.
- Off-shore platform systems.
- Corrosive and salt water exposure.

Single- and dual-stage regulators and switchover systems are available with Silcosteel® surface treatment. This proprietary passivation process provides excellent inertness for sulfur and mercury calibration standards and improved corrosion resistance over bare 316L stainless steel or other more expensive alloys.

Silcosteel®-treated sampling and transfer systems allow oil and gas exploration companies, chemical and petrochemical plants, and refineries to obtain accurate sulfur and mercury data the first time, every time, with no delay, sample errors, or false readings, down to part-per-billion (ppb) levels. Analysts charged with monitoring sulfur and mercury levels in process streams can save thousands of dollars in improved yields, better test cycle times, and improved system reliability.

Silcosteel® Regulators (Dual Stage & Single Stage)

Description	qty.	cat.#
Single-Stage Regulator		
CGA 330 (H_2S and other reduced sulfurs)	ea.	21361-5
CGA 350 (H_2, P_5)	ea.	21361-6
CGA 660 (NO, NO_2, SO_2)	ea.	21361-11
Dual-Stage Regulator		
CGA 330 (H_2S and other reduced sulfurs)	ea.	21360-2
CGA 350 (H_2, P_5)	ea.	21360-7

For other CGA fittings, please contact your local Restek representative.

Outlet pressure: 0 to 150 psig
Outlet gauge: 30"–0 to 200 psig
Inlet gauge: 0 to 4,000 psig
Outlet assembly: diaphragm valve, 1/4" tube fitting

Automatic Switchover System for Corrosive Gases (Silcosteel®-Treated)

Description	qty.	cat.#
CGA 320 (CO_2, CH_3F)	ea.	22364320
CGA 330 (H_2S and other reduced sulfurs)	ea.	22364330
CGA 350 (H_2, P_5)	ea.	22364350

Outlet pressure: 0 to 150 psig
Outlet gauge: 30"–0 to 200 psig
Inlet gauge: 0 to 4,000 psig
Outlet assembly: diaphragm valve, 1/4" tube fitting

Overview of Restek Ultra-High Purity (UHP) Gas Regulators

- Regulators feature metal-to-metal seals throughout for long-term leak-tightness.
- Metal diaphragm outlet valve ensures gas purity.
- Each regulator is helium leak-test-certifiable to $1x10^{-8}$ scc/sec.
- Temperature range: -40 °C to 60 °C.

Ultra-High Purity (UHP) Brass Body Gas Regulators

UHP brass regulators are the best choice when using ultra-high purity carrier gas for sensitive GC applications using MS, PID, or ECD detection methods. They feature reduced internal dead volume relative to stainless steel bodies. The metal valve diaphragm ensures leak-free shutoff. Oxidation-resistant chrome plating maintains a like-new appearance.

All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Dual-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Most stable outlet pressure control.
- Secondary pressure regulation not needed.
- Most widely used regulator.
- Less internal volume than stainless steel gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21667
CGA 350 (H_2, P_5)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21668
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21669
DIN 477 #1 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22369
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22368
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22370
DIN 477 #10 (N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22371
BS 341 #3 (He, Ar, Air, N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22136
BS 341 #4 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22137

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Single-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20646
CGA 350 (H_2, P_5)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20647
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20648
DIN 477 #1 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22373
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22372
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22374
DIN 477 #10 (N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22375
BS 341 #3 (He, Ar, Air, N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22138
BS 341 #4 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22139

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

Inlet connections: 1/4" FPT
Outlet assembly: 1/4" FPT port

Ultra-High Purity Chrome-Plated Brass Line Gas Regulator

- Oxidation-resistant, chrome-plated.
- Use where you need to reduce the line pressure by 20 psig (138 kPa) or more.
- Same purity protection as high-pressure cylinder regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
1/4" female NPT ports*	0–50 psig (0–345 kPa)	30", 0 to 100 psig (0–689 kPa)	ea.	21666
1/4" female NPT ports*	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	22452

*Order appropriate male connector, pipe-to-tube fittings.

Ultra-High Purity (UHP) Stainless Steel Body Gas Regulators

UHP stainless steel regulators are the standard for ultra-high-purity and corrosion-resistant pressure regulation. They are more easily purged of atmospheric components, compared to brass gas regulators, making them ideal for the most demanding applications. Stainless steel is especially useful in atmospheres of dry corrosive gases such as hydrogen.

Dual-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Most stable outlet pressure control.
- Secondary pressure regulation not needed.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20662
CGA 350 (H_2, P_5)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20663
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20664
DIN 477 #1 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22377
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22376
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22378
DIN 477 #10 (N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22379
BS 341 #3 (He, Ar, Air, N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22140
BS 341 #4 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22141

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Single-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20665
CGA 350 (H_2, P_5)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20666
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20667
DIN 477 #1 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22380
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22445
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22446
DIN 477 #10 (N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22447
BS 341 #3 (He, Ar, Air, N_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22142
BS 341 #4 (H_2)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22143

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

ordering note

International Fittings

All gas regulators are available with the following BS (British Standard) and DIN (German Industrial Standards Organization) connections. Please contact your local Restek representative for more information.

BS 341 #01	BS 341 #08	BS 341 #15	DIN 477 #06	DIN 477 #10	DIN 477 #14
BS 341 #02	BS 341 #10	DIN 477 #01	DIN 477 #07	DIN 477 #11	DIN 477 #15
BS 341 #03	BS 341 #13	DIN 477 #03	DIN 477 #08	DIN 477 #12	
BS 341 #04	BS 341 #14	DIN 477 #05	DIN 477 #09	DIN 477 #13	

BS 341 #3 Fitting

DIN 477 #3 Fitting

21339

Flexible Stainless Steel Hoses

Description	Length	Fittings	qty.	cat. #
Flexible Stainless Steel Hose	36"	1/4" Female NPT	ea.	21339
Flexible Stainless Steel Hose	18"	1/4" Female NPT	ea.	21340

Hydrogen Flashback Arrestor

21334

- Valve cuts off gas supply in the event of a flashback.
- Can be reset and reused after flashback has occurred.
- Meets safety requirements of BS6158, EN730, ISO 5175, AS 4603 and are UL Listed 23Y5.

Specifications:

Body and Internals:	Brass with brass internals
Temperature Sensor:	Polyethylene
Valve spring:	316 stainless steel
Connections:	1/4" female NPT
Maximum pressure:	Hydrogen, 50 psig (3.5 bar)

Description	Fittings	qty.	cat.#
Hydrogen Flashback Arrestor, Brass Body	1/4" Female NPT	ea.	21334

21336

CGA Fittings

CGA-specified nuts and nipples with internal frit, 1/4-inch NPT nickel-plated brass.

Description	qty.	cat.#
CGA 580 Fitting (N_2, He, Ar)	ea.	21336
CGA 350 Fitting (H_2, P_5)	ea.	21337
CGA 590 Fitting (Air)	ea.	21338

Swagelok® Male Connector, Pipe-to-Tube Fittings

23134

23179

Fitting Type	Size (inches)	Similar to Swagelok	Brass qty.	Brass cat.#	Stainless Steel qty.	Stainless Steel cat.#
Male Connector	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
Male Connector	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
Tube End Reducer	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179

Automatic Switchover System for Noncorrosive Gases (Critical Purity)

High-purity automatic switchover systems provide a continuous supply of high-purity gas to the laboratory, process, or instrument to allow you to replace a depleted gas source without interruption in the gas supply. Continuous gas supply is achieved by setting the two regulators at slightly different pressures and discharging one side of the system at a time. These models include flexible, all-stainless-steel pigtails with armor casing. The CGA connection on each pigtail has a check valve in the gland to prevent contamination and minimize purging requirements.

20668580

Switching pressure: 200 psig/170 psig (1,379/1,172 kPa)
Inlet connections: flexible SS pigtails (36")
Line regulator: 0 to 150 psig (0–1,034 kPa)

Brass Automatic Switchover System with Line Regulator	qty.	cat.#
CGA 580 (N_2, He, Ar)	ea.	20668580
CGA 350 (H_2, P_5)	ea.	20668350
CGA 590 (Air)	ea.	20668590
Stainless Steel Automatic Switchover System with Line Regulator	**qty.**	**cat.#**
CGA 580 (N_2, He, Ar)	ea.	21593580

Protocol Station

The protocol station is designed for convenient wall mounting of high-purity gas regulators. Wall mounting provides ease of use, prevents gas regulator damage, and improves safety. Either chrome-plated brass or 316 stainless steel option is complete with a 3-foot, flexible, all-stainless-steel pigtail with armor casing. The CGA connection on the pigtail has an integral check valve in the gland to prevent contamination during cylinder changeout.

21347

Chrome-Plated Brass Protocol Station*	qty.	cat.#
CGA 580 (N_2, He, Ar)	ea.	21347
CGA 350 (H_2, P_5)	ea.	21348
CGA 590 (Air)	ea.	21349
Stainless Steel Protocol Station*	**qty.**	**cat.#**
CGA 580 (N_2, He, Ar)	ea.	21327

*Pressure regulator not included. Order separately.

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.: Phone: 1-800-356-1688, ext. 4 • e-mail: support@restek.com

Outside the U.S.: Contact International Technical Service at intltechsupp@restek.com or find a local distributor at **www.restek.com/distributor**

21321

Cylinder Valve Wrench

This specially designed wrench enables easy opening of cylinder valves that are fitted with a hand wheel. It is also suitable for removing difficult cylinder caps.

Description	qty.	cat.#
Cylinder Valve Wrench	ea.	21321

21322

Universal Cylinder Wrench

Use this versatile wrench for tightening gauges and gas regulator CGA fittings to cylinder outlets and pipe thread connections.

Description	qty.	cat.#
Universal Cylinder Wrench	ea.	21322

21333

23400

23401

23402

Cylinder Holders, Wall Mounted

Prevent serious injuries! These holders are designed to prevent free-standing gas cylinders from tipping over and injuring personnel. The cast aluminum holder can be secured to a wall or the side of a work bench. Each mount will secure a cylinder 4-15 inches in diameter.

Description	Size	qty.	cat.#
Cylinder Holder, Wall Mounted	Single	ea.	21333
Cylinder Holder, Wall Mounted	Double	ea.	23400
Cylinder Holder, Wall Mounted	Triple	ea.	23401
Cylinder Holder, Wall Mounted	Four	ea.	23402

20635

Backpressure Gas Regulator

Capillary GC inlet systems have backpressure regulators to maintain a constant upstream pressure and rapidly respond to catastrophic leaks. The 0–60 psig (0-414 kPa) operating range is sufficient to operate a 105 m, 0.25 mm ID column at its optimum flow rate.

Description	qty.	cat.#
Backpressure Gas Regulator	ea.	20635

20610

MINICYL Regulator

This compact general purpose regulator has many laboratory applications including air-drying glassware, sparging or evaporating solutions, and controlling pneumatic valves. It is constructed of lightweight aluminum with an elastomer diaphragm. Includes a 0–60 psig (0-414 kPa) gauge and either 1/8- or 1/4-inch tube fittings.

Description	Fittings	Max Inlet Pressure	qty.	cat.#
MINICYL Regulator	1/8" Fittings	300 psi	ea.	20610
MINICYL Regulator	1/4" Fittings	300 psi	ea.	20611

Swagelok® Fitting Kits

Save more than 40% by purchasing a Swagelok® fittings kit compared to paying full price for the individual parts!

- Includes the most common assortment of 1/8" and 1/4" brass or stainless steel fittings.
- Parts list makes reordering easy.
- Parts come in sturdy toolbox for easy and convenient storage.

40% savings

Swagelok® Fitting Kit (Brass)

Swagelok #	Description (qty included in kit)
B-202-1	1/8" brass nut (20)
B-402-1	1/4" brass nut (20)
B-203-1	1/8" brass front ferrule (20)
B-403-1	1/4" brass front ferrule (20)
B-204-1	1/8" brass back ferrule (20)
B-404-1	1/4" brass back ferrule (20)
B-200-C	1/8" brass cap (6)
B-400-C	1/4" brass cap (6)
B-200-P	1/8" brass plug (6)
B-400-P	1/4" brass plug (6)
B-200-6	1/8" brass union (2)
B-400-6	1/4" brass union (2)
B-400-6-2	1/4" to 1/8" brass reducing union (2)
B-200-3	1/8" brass tee (2)
B-400-3	1/4" brass tee (2)
B-400-R-2	1/8" to 1/4" brass tube end reducer (2)
B-200-R-4	1/4" to 1/8" brass tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Brass	kit	23141

Swagelok® Fitting Kit (Stainless Steel)

Swagelok #	Description (qty included in kit)
SS-202-1	1/8" SS nut (20)
SS-402-1	1/4" SS nut (20)
SS-203-1	1/8" SS front ferrule (20)
SS-403-1	1/4" SS front ferrule (20)
SS-204-1	1/8" SS back ferrule (20)
SS-404-1	1/4" SS back ferrule (20)
SS-200-C	1/8" SS cap (6)
SS-400-C	1/4" SS cap (6)
SS-200-P	1/8" SS plug (6)
SS-400-P	1/4" SS plug (6)
SS-200-6	1/8" SS union (2)
SS-400-6	1/4" SS union (2)
SS-400-6-2	1/4" to 1/8" SS reducing union (2)
SS-200-3	1/8" SS tee (2)
SS-400-3	1/4" SS tee (2)
SS-400-R-2	1/8" to 1/4" SS tube end reducer (2)
SS-200-R-4	1/4" to 1/8" SS tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Stainless Steel	kit	23197

Swagelok® Fittings (Brass & Stainless Steel)

Restek is pleased to offer one of the premier lines of fittings available for chromatographers in the market today. We can supply the entire line of Swagelok® fittings. If you do not see the exact product you're looking for, please call us or contact your Restek representative for a quote.

nut

front ferrule

back ferrule

nut & ferrule set

plug

union

reducing union

tee

cross

tube end reducer

port connector

male connector

female connector

male quick coupling

female quick coupling

Fitting Type	Size	Swagelok #	Brass qty.	Brass cat.#	316 Grade Stainless Steel qty.	316 Grade Stainless Steel cat.#
Nut	1/16"	102-1	20-pk.	23100	5-pk.	23150
	1/8"	202-1	40-pk.	23101	10-pk.	23151
	1/4"	402-1	40-pk.	23102	10-pk.	23152
Front Ferrule	1/16"	103-1	20-pk.	23103	10-pk.	23153
	1/8"	203-1	40-pk.	23104	20-pk.	23154
	1/4"	403-1	40-pk.	23105	20-pk.	23155
Back Ferrule	1/16"	104-1	20-pk.	23106	10-pk.	23156
	1/8"	204-1	40-pk.	23107	20-pk.	23157
	1/4"	404-1	40-pk.	23108	20-pk.	23158
Nut & Ferrule Set	1/16"	—	10-pk.	23109	2-pk.	23159
	1/8"	—	20-pk.	23110	5-pk.	23160
	1/4"	—	20-pk.	23111	5-pk.	23161
Plug	1/16"	100-P	5-pk.	23112	2-pk.	23162
	1/8"	200-P	10-pk.	23113	4-pk.	23163
	1/4"	400-P	10-pk.	23114	4-pk.	23164
Union	1/16"	100-6	3-pk.	23115	ea.	23165
	1/8"	200-6	5-pk.	23116	2-pk.	23166
	1/4"	400-6	5-pk.	23117	2-pk.	23167
Reducing Union	1/8" to 1/16"	200-6-1	5-pk.	23118	ea.	23168
	1/4" to 1/16"	400-6-1	5-pk.	23119	2-pk.	23169
	1/4" to 1/8"	400-6-2	5-pk.	23120	2-pk.	23170
Tee	1/16"	100-3	2-pk.	23121	ea.	23171
	1/8"	200-3	2-pk.	23122	ea.	23172
	1/4"	400-3	2-pk.	23123	ea.	23173
Cross	1/8"	200-4	2-pk.	23124	ea.	23174
	1/4"	400-4	2-pk.	23125	ea.	23175
Tube End Reducer	1/8" to 1/16"	100-R-2	5-pk.	23126	2-pk.	23176
	1/4" to 1/16"	100-R-4	5-pk.	23127	2-pk.	23177
	1/8" to 1/4"	400-R-2	5-pk.	23128	2-pk.	23178
	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179
Port Connector	1/8"	201-PC	5-pk.	23130	2-pk.	23180
	1/4"	401-PC	10-pk.	23131	2-pk.	23181
	1/8" to 1/4"	401-PC-2	5-pk.	23132	2-pk.	23182
Male Connector	1/8" to 1/8" NPT	200-1-2	10-pk.	23133	2-pk.	23183
	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
	1/16" to 1/8" NPT	100-1-2	5-pk.	23135	2-pk.	23185
	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
	1/4" to 1/8" NPT	400-1-2	10-pk.	23137	2-pk.	23187
Female Connector	1/8" to 1/8" NPT	200-7-2	5-pk.	23138	2-pk.	23188
	1/4" to 1/4" NPT	400-7-4	5-pk.	23139	2-pk.	23189
	1/4" to 1/8" NPT	400-7-2	5-pk.	23140	2-pk.	23190
Male & Female Quick Couplings	1/8" male*	QC4D-200	—	—	ea.	23191
	1/8" male	QC4S-200	—	—	ea.	23192
	1/8" female*	QC4B-200	—	—	ea.	23193
	1/4" male*	QC4D-400	—	—	ea.	23194
	1/4" male	QC4S-400	—	—	ea.	23195
	1/4" female*	QC4B-400	—	—	ea.	23196

*Includes self-sealing shutoff valve.

Swagelok® Fittings (Siltek®/Sulfinert® & Silcosteel®-CR Treated)

- Full line of treated 1/16", 1/8", and 1/4" fittings.
- Silcosteel®-CR treatment enhances corrosion resistance by 10x or more.
- For custom treatment on any Swagelok® fitting or other system parts not listed here, call us or contact your Restek representative.

			Siltek/Sulfinert Treated		Silcosteel-CR Treated	
Fitting Type	**Size**	**Swagelok #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Union	1/16"	SS-100-6	ea.	22540	ea.	22575
	1/8"	SS-200-6	ea.	22541	ea.	22576
	1/4"	SS-400-6	ea.	22542	ea.	22577
	3/8"	SS-600-6	ea.	22909	ea.	22904
Tee	1/16"	SS-100-3	ea.	22543	ea.	22578
	1/8"	SS-200-3	ea.	22544	ea.	22579
	1/4"	SS-400-3	ea.	22545	ea.	22580
	3/8"	SS-600-3	ea.	22910	ea.	22905
Reducing Union	1/8" to 1/16"	SS-200-6-1	ea.	22546	ea.	22581
	1/4" to 1/16"	SS-400-6-1	ea.	22547	ea.	22582
	1/4" to 1/8"	SS-400-6-2	ea.	22548	ea.	22583
	3/8" to 1/4"	SS-600-6-4	ea.	22911	ea.	22906
Elbow	1/8"	SS-200-9	ea.	22549	ea.	22584
	1/4"	SS-400-9	ea.	22550	ea.	22585
Plug	1/8"	SS-200-P	ea.	22573	ea.	22620
	1/4"	SS-400-P	ea.	22574	ea.	22597
Cross	1/8"	SS-200-4	ea.	22551	ea.	22586
	1/4"	SS-400-4	ea.	22552	ea.	22587
Tube End Reducer	1/8" to 1/16"	SS-100-R-2	ea.	22553	ea.	22588
	1/4" to 1/16"	SS-100-R-4	ea.	22554	ea.	22589
	1/8" to 1/4"	SS-400-R-2	ea.	22555	ea.	22590
	1/4" to 1/8"	SS-200-R-4	ea.	22556	ea.	22591
Port Connector	1/8"	SS-201-PC	ea.	22557	ea.	22592
	1/4"	SS-401-PC	ea.	22558	ea.	22593
	1/8" to 1/4"	SS-401-PC-2	ea.	22559	ea.	22594
Male Connector	1/8" to 1/8" NPT	SS-200-1-2	ea.	22561	ea.	22595
	1/4" to 1/4" NPT	SS-400-1-4	ea.	22562	ea.	22596
	1/16" to 1/8" NPT	SS-100-1-2	ea.	22563	ea.	22610
	1/8" to 1/4" NPT	SS-200-1-4	ea.	22564	ea.	22611
	1/4" to 1/8" NPT	SS-400-1-2	ea.	22565	ea.	22612
	3/8" to 3/8" NPT	SS-600-1-6	ea.	22912	ea.	22907
Female Connector	1/8" to 1/8" NPT	SS-200-7-2	ea.	22566	ea.	22613
	1/4" to 1/4" NPT	SS-400-7-4	ea.	22567	ea.	22614
	1/4" to 1/8" NPT	SS-400-7-2	ea.	22568	ea.	22615
	1/8" to 1/4" NPT	SS-200-7-4	ea.	22569	ea.	22616
Bulkhead Union	1/8"	SS-200-61	ea.	22570	ea.	22617
	1/4"	SS-400-61	ea.	22571	ea.	22618

union

tee

reducing union

elbow

plug

cross

tube end reducer

port connector

male connector

female connector

bulkhead union

Custom Coatings

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

For more information on our custom coatings, see page 312.

nut

front ferrule

back ferrule

nut & ferrule set

plug

union

reducing union

tee

cross

tube end reducer

port connector

male connector

female connector

male & female quick couplings

Parker® Fittings (Brass & Stainless Steel)

Parker's (A-Lok®) two-piece ferrules and NPT fittings are ideal for installing new equipment, modifying existing instrumentation, or replacing worn connections. Restek offers both brass and stainless steel fittings. If there is a particular Parker® fitting that you are looking for and it is not listed here, please contact us to inquire about availability.

			Brass		316 Grade Stainless Steel	
Fitting Type	**Size**	**Parker #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Nut	1/16"	1 Nu 1	20-pk.	21800	5-pk.	21900
	1/8"	2 Nu 2	40-pk.	21801	10-pk.	21901
	1/4"	4 Nu 4	40-pk.	21802	10-pk.	21902
Front Ferrule	1/16"	1 FF 1	20-pk.	21803	10-pk.	21903
	1/8"	2 FF 2	40-pk.	21804	20-pk.	21904
	1/4"	4 FF 4	40-pk.	21805	20-pk.	21905
Back Ferrule	1/16"	1 BF 1	20-pk.	21806	10-pk.	21906
	1/8"	2 BF 2	40-pk.	21807	20-pk.	21907
	1/4"	4 BF 4	40-pk.	21808	20-pk.	21908
Nut & Ferrule Set	1/16"	—	10-pk.	21809	2-pk.	21909
	1/8"	—	20-pk.	21810	5-pk.	21910
	1/4"	—	20-pk.	21811	5-pk.	21911
Plug	1/16"	1 BLP 1	5-pk.	21815	2-pk.	21915
	1/8"	2 BLP 2	10-pk.	21816	4-pk.	21916
	1/4"	4 BLP 4	10-pk.	21817	4-pk.	21917
Union	1/16"	1 SC 1	3-pk.	21818	ea.	21918
	1/8"	2 SC 2	5-pk.	21819	2-pk.	21919
	1/4"	4 SC 4	5-pk.	21820	2-pk.	21920
Reducing Union	1/8" to 1/16"	2 RU 1	5-pk.	21823	ea.	21923
	1/4" to 1/16"	4 RU 1	5-pk.	21824	2-pk.	21924
	1/4" to 1/8"	4 RU 2	5-pk.	21825	2-pk.	21925
Tee	1/16"	1 ET 1	2-pk.	21826	ea.	21926
	1/8"	2 ET 2	2-pk.	21827	ea.	21927
	1/4"	4 ET 4	2-pk.	21828	ea.	21928
Cross	1/8"	2 ECR 2	2-pk.	21829	ea.	21929
	1/4"	4 ECR 4	2-pk.	21830	ea.	21930
Tube End Reducer	1/8" to 1/16"	2 TUR 1	5-pk.	21831	2-pk.	21931
	1/4" to 1/16"	4 TUR 1	5-pk.	21832	2-pk.	21932
	1/8" to 1/4"	2 TUR 4	5-pk.	21833	2-pk.	21933
	1/4" to 1/8"	4 TUR 2	5-pk.	21834	2-pk.	21934
Port Connector	1/8"	2 PC 2	5-pk.	21835	2-pk.	21935
	1/4"	4 PC 4	10-pk.	21836	2-pk.	21936
	1/8" to 1/4"	2 PC 4	5-pk.	21837	2-pk.	21937
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	10-pk.	21841	2-pk.	21941
	1/4" to 1/4" NPT	4 MSC 4N	10-pk.	21842	2-pk.	21942
	1/16" to 1/8" NPT	1 MSC 2N	5-pk.	21843	2-pk.	21943
	1/8" to 1/4" NPT	2 MSC 4N	10-pk.	21844	2-pk.	21944
	1/4" to 1/8" NPT	4 MSC 2N	10-pk.	21845	2-pk.	21945
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	5-pk.	21846	2-pk.	21946
	1/4" to 1/4" NPT	4 FSC 4N	5-pk.	21847	2-pk.	21947
	1/4" to 1/8" NPT	4 FSC 2N	5-pk.	21848	2-pk.	21948
Male & Female Quick Couplings	1/8" male*	2A-Q4VN	—	—	ea.	21957
	1/8" male	2A-Q4P	—	—	ea.	21958
	1/8" female*	2A-Q4CN	—	—	ea.	21959
	1/4" male*	4A-Q4VN	—	—	ea.	21960
	1/4" male	4A-Q4P	—	—	ea.	21961
	1/4" female*	4A-Q4CN	—	—	ea.	21962

*Includes self-sealing shut-off valve.

Parker® Fittings (Siltek®/Sulfinert® Treated & Silcosteel®-CR Treated)

A broad line of 1/16", 1/8" and 1/4" fittings are available with Siltek®/Sulfinert® or Silcosteel®-CR treatment. Because of expanding applications for these coatings, we have received many requests for a broader product offering. If you do not see everything you need, contact us for information on custom coating services.

			Siltek/Sulfinert Treated		Silcosteel-CR Treated	
Fitting Type	**Size**	**Parker #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Union	1/16"	1 SC 1	ea.	22520	ea.	22863
	1/8"	2 SC 2	ea.	22521	ea.	22864
	1/4"	4 SC 4	ea.	22522	ea.	22865
Tee	1/16"	1 ET 1	ea.	22526	ea.	22866
	1/8"	2 ET 2	ea.	22527	ea.	22867
	1/4"	4 ET 4	ea.	22528	ea.	22868
Reducing Union	1/8" to 1/16"	2 RU 1	ea.	22523	ea.	22869
	1/4" to 1/16"	4 RU 1	ea.	22524	ea.	22870
	1/4" to 1/8"	4 RU 2	ea.	22525	ea.	22871
Elbow	1/8"	2 EE 2	ea.	22530	ea.	22875
	1/4"	4 EE 4	ea.	22531	ea.	22876
Plug	1/8"	2 BLP 2	ea.	21540	ea.	22878
	1/4"	4 BLP 4	ea.	21541	ea.	22879
Cross	1/8"	2 ECR 2	ea.	21542	ea.	22872
	1/4"	4 ECR 4	ea.	21543	ea.	22873
Tube End Reducer	1/8" to 1/16"	2 TUR 1	ea.	21544	ea.	22880
	1/4" to 1/16"	4 TUR 1	ea.	21545	ea.	22881
	1/8" to 1/4"	2 TUR 4	ea.	21546	ea.	22882
	1/4" to 1/8"	4 TUR 2	ea.	21547	ea.	22883
Port Connector	1/8"	2 PC 2	ea.	21548	ea.	22884
	1/4"	4 PC 4	ea.	21549	ea.	22885
	1/8" to 1/4"	2 PC 4	ea.	21550	ea.	22886
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	ea.	21551	ea.	22887
	1/4" to 1/4" NPT	4 MSC 4N	ea.	21552	—	—
	1/16" to 1/8" NPT	1 MSC 2N	ea.	21553	ea.	22889
	1/8" to 1/4" NPT	2 MSC 4N	ea.	21554	ea.	22890
	1/4" to 1/8" NPT	4 MSC 2N	ea.	21555	ea.	22891
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	ea.	21556	ea.	22892
	1/4" to 1/4" NPT	4 FSC 4N	ea.	21557	ea.	22893
	1/4" to 1/8" NPT	4 FSC 2N	ea.	21558	ea.	22894
	1/8" to 1/4" NPT	2 FSC 4N	ea.	21559	—	—
Plug Valve, 2-Way	1/8"	2A PR4 VT SS	ea.	21586	—	—
	1/4"	4A PR4 VT SS	ea.	21587	—	—
Ball Valve, 2-Way	1/8"	2A B2LJ2 SSP	ea.	21588	—	—
	1/4"	4A B2LJ2 SSP	ea.	21589	—	—

Please note: Nuts and ferrules are not treated unless requested (custom parts). Nuts and ferrules normally are not in contact with sample pathway, and thus do not require coating.

Ball and plug valves are also available in brass and stainless steel. See **page 316**.

union

tee

reducing union

elbow

plug

cross

tube end reducer

port connector

male connector

female connector

plug valve, 2-way

ball valve, 2-way

Valco® Fittings (Siltek®/Sulfinert® Treated)

		Siltek/Sulfinert Treated	
Fitting Type	**Size**	**qty.**	**cat.#**
Zero Dead Volume Tee	1/16"	ea.	22534
	1/8"	ea.	22535
Zero Dead Volume Union	1/16"	ea.	22532
	1/8"	ea.	22533

zero dead volume tee

zero dead volume union

Tubing and Available Coatings

Restek sets the standard in tubing for analytical and process applications. Complete your system with precleaned or treated tubing and treated fittings and valves for an inert, corrosion-resistant pathway.

Available tubing coatings include:

- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.

Frequently Asked Questions

1. Can treated tubing be bent?

Treated tubing can be bent into curves with a bend radius greater than 1 inch for 1/16-inch OD tubing, 2 inches for 1/8-inch OD tubing, or 4 inches for 1/4-inch OD tubing. The treatment layer will remain intact as long as the tubing isn't stretched dramatically. If tight bends are necessary, use a treated elbow union or bend untreated tubing and send it to Restek for custom treatment.

2. Can compression fittings be used without crushing the treatment layer?

Yes. The layer is thin and permeates the surface. It compresses with minimal damage.

3. Is welding possible after treatment?

Yes. The coating does not interfere with the welding of two coated components. The coating is lost at the weld and in the heat affected zones approximately 2 to 5 mm on either side of the weld.

4. Is any additional chemical deactivation necessary?

A Sulfinert® or Silcosteel® layer leaves few exposed active sites, so there usually is no need for additional treatment. Chemical deactivation is useful in chromatographic applications in which water will be vaporized on the Silcosteel®-treated surface, but is not necessary for Sulfinert®-treated surfaces. Parts used in high-temperature applications (>400 °C) cannot be chemically deactivated.

5. What are the temperature constraints of these surface treatments?

On stainless steel, a Silcosteel® layer is stable to 600 °C. Parts treated with a secondary polymeric layer are limited to temperatures of 400 °C in inert atmospheres and 250 °C when oxygen is present, the temperature maximums for the polymer. Temperatures above 600 °C can be used under certain conditions—please contact us for information.

6. Why use Sulfinert® or Silcosteel® treatment instead of PTFE coating?

Three reasons: 1) Sulfinert® and Silcosteel® layers are nonpolymeric, so they do not exhibit the problems associated with gas permeability. 2) PTFE coating often flakes off the surface, while the Sulfinert® or Silcosteel® layer is tightly integrated into the substrate lattice. 3) PTFE coating is limited to 280 °C, while Silcosteel®-treated stainless steel tubing and fittings can be used to 600 °C.

7. Why use Sulfinert®-treated tubing for transfer lines?

Sulfinert®-treated stainless steel tubing offers all of the advantages of glass or fused silica tubing for the transfer of active compounds (e.g., sulfurs), but is far more durable and flexible.

8. Is treated tubing similar to glass-lined tubing (GLT)?

No. Sulfinert® or Silcosteel®-treated tubing is flexible and can be bent without heating. Also, the Sulfinert® or Silcosteel® layer is highly inert, unlike impure glass.

9. How can I clean the surface of a treated part after use?

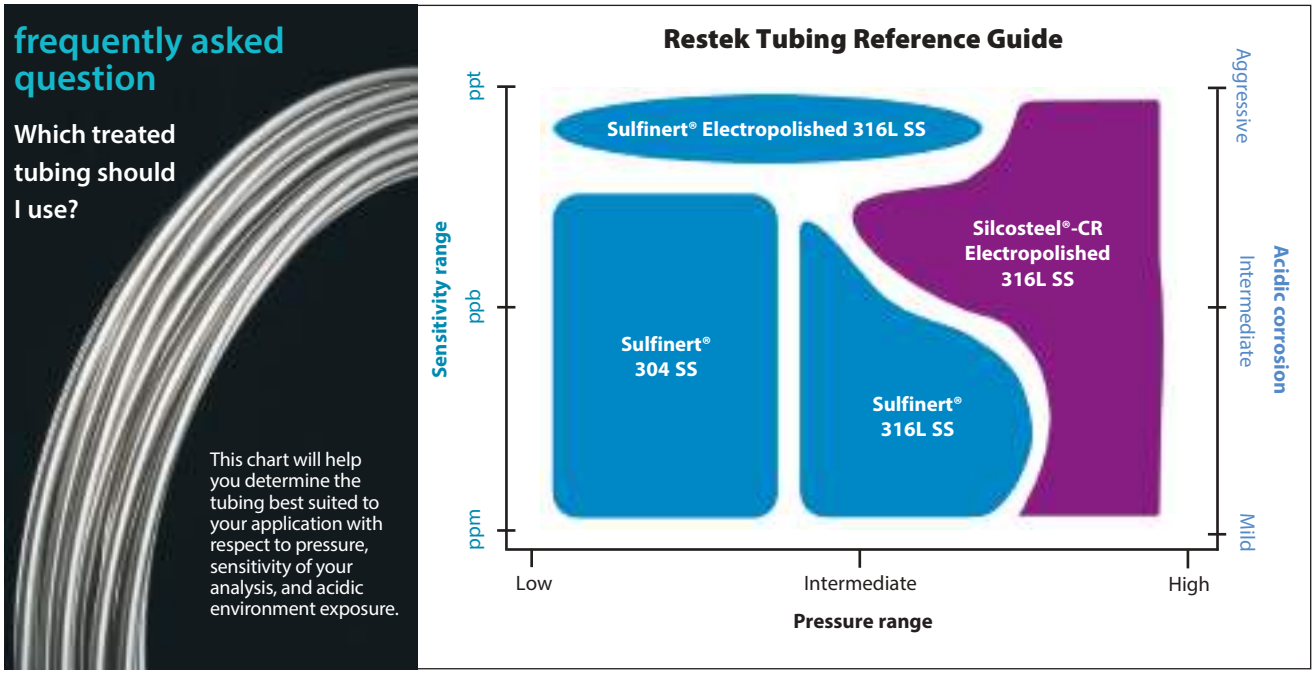
Most often, a mild organic solvent (methylene chloride, methanol, hexane) or water is sufficient. Mild sonication may assist and accelerate the process. Do not use caustic, abrasive, or high pH (pH>8) cleaners, as they will damage or dissolve the layer. Steam cleaning in the presence of oxygen or air could create surface activity, and also should be avoided.

10. What materials should I avoid using with Silcosteel®-treated parts?

The Silcosteel® coating is silicon-based and is prone to attack by hydrofluoric acid or by basic compounds. The surface should not be exposed to media with pH>8.

11. Siltek® and Sulfinert®: What's the Difference?

Siltek® is the name for the patented deposition process. When the Siltek® process was developed, the application that showed the greatest benefit was the storage and transfer of low ppb level active sulfur compounds, such as hydrogen sulfide and mercaptans. Because there was (and continues to be) demand for a reliable surface treatment for this application, the name Sulfinert® is used to describe Siltek®-treated products created specifically for this purpose.



Rinsed and Cleaned 304 Stainless Steel Tubing

Use for providing carrier, fuel, make-up, or auxiliary gases to laboratory instruments.

		Length							
ID (in.)	OD (in.)	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
0.01"	1/16"	29000	29001	29002	29003	21500	29004	29005	21502
0.02"	1/16"	29006	29007	29008	29009	21503	29010	29011	21505
0.03"	1/16"	29012	29013	29014	29015	21506	29017	29018	21508
0.04"	1/16"	29019	29020	29021	29022	21509	29023	29024	21511
0.085"	1/8"	29025	29026	29027	29028	21512	29029	29030	21514
0.21"	1/4"	29031	29032	29033	29034	21515	29035	29036	21517

*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. Maximum continuous lengths are: 2,000 ft (cat.# 21502, 21505, 21508, 21511), 1,500 ft (cat.# 21514), and 750 ft (cat.#21517). Pricing for lengths of 101 ft or more is on a per foot basis.

An extra charge is applied for cutting and/or straightening stainless steel and/or copper tubing, calculated from the total number of pieces produced for each line item.

Copper Tubing

- Use for plumbing GC systems.
- Cleaned to remove residual organics.

ID	OD	Wall	Max Operating Pressure	qty.	cat.#
0.065"	1/8"	0.030"	2,800 psig	50 ft	22628
0.190"	1/4"	0.030"	1,000 psig	50 ft	22629

Minimum Bend Radius for Coated Tubing

OD	Min. Bend Radius
1/16"	1" (2.5 cm)
1/8"	2" (5.1 cm)
1/4"	4" (10.2 cm)
3/8"	6" (15.2 cm)

ordering note

Required length in meters x 3.2808 = length in feet.

did you know?

A smoother internal surface is less adsorptive.

Top: electropolished finish, surface roughness average number: 10-15.

Bottom: conventional finish, surface roughness average number: approx. 23-27.

Treated Seamless Electropolished 316L Grade Stainless Steel Tubing

Our highest performing tubing. Recommended for:

- Demanding/corrosive environments.
- High temperatures.
- Ultimate inertness.

			Length							
ID	OD	Wall Thickness	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#*	>100 Feet cat.#*
Silcosteel®-CR Treated (Coiled)										
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29037	29038	29039	29040	29041	29042	—	29043
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29044	29045	29046	29047	29048	29049	29050	29051
Sulfinert Treated (Coiled)										
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29052	29053	29054	29055	29056	29057	—	29058
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29059	29060	29061	29062	29063	29064	29065	29066

*1/8" OD: 95 ft in one continuous coil; 1/4" OD: 300 ft in one continuous coil. Longer lengths will be more than one coil. Pricing for lengths of 101 ft or more is on a per foot basis.
Note: required length in meters x 3.2808 = length in feet.

did you know?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000 ft.

Treated Welded/Drawn 304 Grade Stainless Steel Tubing

An extra charge is applied for cutting Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item

Our most popular grade of tubing. Recommended for:

- Chromatography applications.
- Gas delivery systems.
- Lower pressures.
- Inert applications.

Maximum temperature of 450 °C in an inert atmosphere.

			Length							
ID	OD	Wall Thickness	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
Sulfinert® Treated (Coiled)										
0.011" (0.28 mm)	0.022" (0.56 mm)		29194	29195	29196	29197	29198	29199	29200	29201
0.021" (0.53 mm)	0.029" (0.74 mm)		29202	29203	29204	29205	29206	29207	29208	29209
0.010" (0.25 mm)	1/16" (1.59 mm)		29210	29211	29212	29213	29214	29215	29216	29217
0.020" (0.51 mm)	1/16" (1.59 mm)		29218	29219	29220	29221	29222	29223	29224	29225
0.030" (0.76 mm)	1/16" (1.59 mm)		29226	29227	29228	29229	29230	29231	29232	29233
0.040" (1.02 mm)	1/16" (1.59 mm)		29234	29235	29236	29237	29238	29239	29240	29241
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29242	29243	29244	29245	29246	29247	29248	29249
0.210" (5.33 mm)	1/4" (6.35 mm)	0.020"	29250	29251	29252	29253	29254	29255	29256	29257

*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. Maximum continuous lengths are: 200** ft (cat.# 29201, 29209), 2,000 ft (cat.# 29217, 29225, 29233, 29241), 1,150 ft (cat.# 29249), and 750 ft (cat.# 29257). Pricing for lengths of 101 ft or more is on a per foot basis.
**Contact us if longer length is needed for cat.# 29201 or 29209.

Treated Seamless 316L Grade Stainless Steel Tubing

ordering note

Required length in meters x 3.2808 = length in feet.

High durability tubing. Recommended for:

- Inert applications.
- High temperatures.
- High pressures.
- Corrosive environments.
- Zero bleed.

			Length							
ID	OD	Wall Thickness	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
Silcosteel®-CR Treated (Coiled)										
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	29091	29092	29093	29094	29095	29096	29097	29098
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29099	29100	29101	29102	29103	29104	29105	29106
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	29107	29108	29109	29110	29111	29112	29113	29114
Sulfinert® Treated (Coiled)										
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	29067	29068	29069	29070	29071	29072	29073	29074
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29075	29076	29077	29078	29079	29080	29081	29082
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	29083	29084	29085	29086	29087	29088	29089	29090

*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. 1/8" OD: 1,500 ft in one continuous coil; 1/4" OD: 750 ft in one continuous coil; 3/8" OD: 250 ft in one continuous coil. Longer lengths will be more than one coil. Pricing for lengths of 101 ft or more is on a per foot basis.

Treated Straight, 6-Foot Length Stainless Steel Tubing

Individual 6-foot (± 1/2") straight pieces.

In response to customer requests, we offer 6-foot straight lengths of 1/8-, 1/4, and 3/8-inch treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

ID	OD	Wall Thickness	qty.	cat.#
Silcosteel®-CR Treated, 316L Grade				
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	ea.	22898
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	ea.	22899
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	ea.	22900
Sulfinert® Treated, 316L Grade				
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	ea.	22901
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	ea.	22902
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	ea.	22903

Sulfinert® treated tubing is recommended for purge & trap and headspace systems.

Treated Hydroguard® Deactivated Stainless Steel Tubing

Hydroguard® deactivation creates a high-density surface that is not readily attacked by aggressive hydrolysis.

			Length (per-foot pricing on 101 feet or more)							
ID	OD	Wall Thickness	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#
Silcosteel® Treated, 304 Grade										
0.010" (0.25 mm)	1/16" (1.59 mm)		29186	29187	29188	29189	29190	29191	29192	29193
0.020" (0.51 mm)	1/16" (1.59 mm)		29178	29179	29180	29181	29182	29183	29184	29185
0.030" (0.76 mm)	1/16" (1.59 mm)		29170	29171	29172	29173	29174	29175	29176	29177
0.040" (1.02 mm)	1/16" (1.59 mm)		29162	29163	29164	29165	29166	29167	29168	29169
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29154	29155	29156	29157	29158	29159	29160	29161
0.210" (5.33 mm)	1/4" (6.35 mm)	0.020"	29146	29147	29148	29149	29150	29151	29152	29153
Silcosteel® Treated, Seamless 316L Grade										
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	29138	29139	29140	29141	29142	29143	29144	29145
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29130	29131	29132	29133	29134	29135	29136	29137
Silcosteel® Treated, Electropolished 316L Grade										
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29123	29124	29125	29126	29127	29128	—	29129
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29115	29116	29117	29118	29119	29120	29121	29122

An extra charge is applied for cutting Sulfinert®, Silcosteel®, or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item.

Gas Valves, VCO Fittings

Toggle valve

Ball valve

Plug valve

Shut-Off Gas Valves Swagelok®

Valve Type	1/8" Brass cat.#	1/4" Brass cat.#	1/8" Stainless Steel cat.#	1/4" Stainless Steel cat.#
Toggle	23142	23143	23198	23199
Ball	23144	23145	23200	23201
Plug	23146	23147	23202	23203

Metering Gas Valves

Swagelok®

23206

Description	qty.	cat.#
1/8" Chrome-Plated Brass Metering Valve, straight	ea.	23148
1/4" Chrome-Plated Brass Metering Valve, straight	ea.	23149
1/8" Stainless Steel Metering Valve, straight	ea.	23204
1/4" Stainless Steel Metering Valve, straight	ea.	23205
Vernier Knob for Metering Valve	ea.	23206

23204

Toggle valve

Ball valve

Plug valve

Shut-Off Gas Valves Parker Balston®

Valve Type	1/8" Brass cat.#	1/4" Brass cat.#	1/8" Stainless Steel cat.#	1/4" Stainless Steel cat.#
Toggle	22188	22189	22190	22191
Ball	22192	22193	22194	22195
Plug	22196	22197	22198	22199

Metering Gas Valves

Parker Balston®

22209

Description	qty.	cat.#
1/8" Nickel-Plated Brass Metering, straight	ea.	22200
1/4" Nickel-Plated Brass Metering, straight	ea.	22201
1/8" Stainless Steel Metering, straight	ea.	22204
1/4" Stainless Steel Metering, straight	ea.	22205
Vernier Knob for Metering Valve	ea.	22209

22200

23207

23209

23214

23211

23215

VCO® O-Ring Face Seal Fittings

(Stainless Steel & Treated) Swagelok®

- Unique design allows easy installation where space is limited.
- Assemblies can be used from high pressure to critical vacuum across a wide range of temperatures.
- Smooth finish on gland face ensures positive seal.
- Sealing is accomplished with a captive O-ring in the body component.

Swagelok® VCO® O-ring face seal fittings are designed for rapid assembly in pipe, tube, and welded systems.

Specifications:

Pressure Ratings	Up to 15,400 psig (1,061 bar)
Temperature Ratings	Up to 400 °F (204 °C)

Description	Material	qty.	cat.#
1/4" VCO to 1/4" Tube Adaptor	Stainless Steel	2-pk.	23207
1/4" VCO to 1/4" Tube Adaptor	Siltek Treated	2-pk.	23209
1/4" VCO to 1/4" Tube Fitting	Siltek Treated	ea.	23211
1/4" VCO to 1/8" Tube Fitting	Stainless Steel	2-pk.	23215
1/4" VCO Body Blind	Stainless Steel	2-pk.	23214
Replacement O-Ring, 70 Durometer Fluorocarbon FKM, VCO 1/4", Size 010		10-pk.	23208

21325

GC Installation Kit

This kit contains the tubing and fittings needed to add an additional GC to your lab bench. Kit includes: tubing cutter, one 1/8-inch x 1/4-inch reamer, one 1/4-inch x 1/8-inch brass tube end reducer, one 7/16-inch wrench, one 1/2-inch wrench, four 1/8-inch brass tees, ten 1/8-inch brass nuts, ten brass front and back ferrules, and 50 feet (15.2 meters) of our instrument-grade cleaned 1/8-inch copper tubing.

Description	qty.	cat.#
GC Installation Kit	kit	21325

23004

54-Piece Tool Kit

Set comes with screwdrivers, pliers, wrenches, sockets, scissors, clamps, and more. Durable, zippered, notebook-style carrying case for easy transport.

Description	qty.	cat.#
Tool Kit	kit	23004

Plier Set

Includes 6-inch nose/side cutter, 6-inch wire cutter, and 6-inch adjusting pliers.

Description	qty.	cat.#
Plier Set	set	23033

22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999

22998

12-Piece, Ball-Point Hex Key Set

Includes twelve hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998

23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

23002

5-in-1 Magnetic Screwdriver

Magnetic power tip holds bits and screws securely.

Description	qty.	cat.#
5-in-1 Magnetic Screwdriver	set	23002

23001

Wrench Set

Includes 4-inch, 6-inch, and 8-inch adjustable wrenches.

Description	qty.	cat.#
Wrench Set	set	23001

20192

1/16-Inch Tubing Cutter

- Produces square, smooth cuts in 1/16-inch tubing.
- Eliminates tubing distortion.
- Cuts hard or soft copper, aluminum, brass, stainless steel, Monel® alloy, or titanium.
- Replaceable cutting wheel.

Description	qty.	cat.#
1/16" Tubing Cutter	ea.	20192
Replacement Cutting Wheels	3-pk.	20185

20193

1/16-Inch Tubing Cutting Pliers

- Ideal for cutting 1/16-inch tubing.
- Cuts quickly, reducing distortion.
- Cuts clean, eliminating need for deburring.

Description	qty.	cat.#
1/16" Tubing Cutting Pliers	ea.	20193

Ridgid® Tubing Cutter

- Excellent for cutting 1/8- or 1/4-inch metal tubing.*
- Compact size is ideal for tight spaces.
- Replaceable cutting wheel.

23011

Description	qty.	cat.#
Ridgid Tubing Cutter for 1/8" or 1/4" metal tubing	ea.	23011
Replacement Cutting Wheels	2-pk.	23012

*Not for use with stainless steel tubing.

23029

SSI TC-20 Tube Cutting Machine

- Cuts 1/16", 1/8", or 1/4" tubing with inside diameter as small as 0.008".
- Electrically operated bench-top model.
- Handy dressing tool on the swing arm removes burrs and reams tubing.
- Voltage selectable 110–120/220–240 volts, 50–60 Hz.*

Dimensions: 8"x 6 1/4" x 4 1/4" (20.3 x 15.9 x 10.8 cm)
Weight: 11 lb (5.0 kg)

Description	qty.	cat.#
SSI Tubing Cutter Machine	ea.	23029
SSI Replacement Cutting Wheels	3-pk.	23030

*Unit shipped set for 110–120 operating voltage. Switch to 220–240 volts by using alternate fuse and power cord (included).

Hi-Duty Tubing Cutter

- Specifically designed to cut 1/8" to 1-1/8" (4 mm to 28 mm) OD tubing.

22356

- Easily cuts stainless steel, Monel® alloy, and other hard-temper materials.
- Unique design makes clean, right-angle cuts and eliminates spiraling.
- Integral reamer folds away for safety and convenience.
- Replacement cutter wheels also available.

Description	qty.	cat.#
Hi-Duty Tubing Cutter	ea.	22356
Replacement Cutting Wheels	2-pk.	22357

20188

Tubing Burring & Reaming Tool

Removes burrs and reams tubing.

Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191

20134

Tubing Reamer

- Removes burrs from stainless steel tubing.
- For 1/4- or 1/8-inch tubing.
- Nonslip safety design.

Description	qty.	cat.#
Tubing Reamer	ea.	20134

23009

Tubing Bender

- Bends 1/8-inch, 3/16-inch, or 1/4-inch tubing.
- Assists in making accurate left-hand, right-hand, or offset bends.

Description	qty.	cat.#
Tubing Bender	ea.	23009

ResTape PTFE Tape

- For threaded connections in a wide range of plumbing materials.
- Each roll is 1/2" x 260".
- Maximum temperature: 260 °C.

Description	Color	Uses	qty.	cat.#
ResTape	Green PTFE	oxygen service*	ea.	22485
ResTape	Yellow PTFE	general gas service**	ea.	22486
ResTape	Grey PTFE	stainless steel fittings***	ea.	22487

*Compatible with gaseous or liquid oxygen, and with many other gases and liquids.
**Compatible with a broad range of gases and liquids.
***Anti-galling. Also compatible with many other metals and polymers.

22627

Flexible Inspection Light

- Inspect inside surfaces of sample cylinders or other chambers.
- 14" reach.
- 100,000-hour LED life.

Description	qty.	cat.#
Flexible Inspection Light	ea.	22627

22622

Swaging Tool

- Preswage compression fittings for easy installation.
- Ideal for installations in tight areas.
- For use with 1/4" Swagelok® fittings only.

Description	qty.	cat.#
Swaging Tool	ea.	22622

22623

Tee Wrench

- Hold 1/4" or 6 mm tee or cross fittings secure in multiple orientations during installation.
- Fits easily in tool box, pouch, or belt.
- Cushioned vinyl grip with generous gripping area.
- For Swagelok® fittings only.

Description	qty.	cat.#
Tee Wrench	ea.	22623

22624

Gap Inspection Gauge

- Confirm that fittings are sufficiently tightened.
- For use with 1/4", 3/8", 1/2" Swagelok® fittings.
- For Swagelok® fittings in new installations only.

Description	qty.	cat.#
Gap Inspection Gauge	ea.	22624

LC Accessories

Instrument Replacement Parts
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Preventive Maintenance (PM) Kits for Agilent HPLC Systems

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Autosampler PM Kit Includes: rotor seal, needle seat, needle assembly, seat cap	1050	01078-68721	kit	25259
Autosampler PM Kit Includes: rotor seal, piston seals (2), needle assembly, needle seat, finger caps (3)	1100, 1200	G1313-68709	kit	25271
Pump PM Kit Includes: PTFE frits (2), outlet cap, gold disk seal, active inlet cartridge, piston seals (4), glass solvent filters (2)	1050, 1100, 1200	G1311-68710	kit	25270
Pump Maintenance Kit Includes: sapphire plunger (2), piston seals (2), outlet ball check valve, active inlet cartridge, PTFE frits (5)	1100, 1200	5065-4499	kit	25915

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Injector & Autosampler Supplies for Agilent HPLC Systems

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Needle Seat	1050, 1090	79846-67101	ea.	25258
Needle Seat Assembly	1100, 1200, 1220	G1329-87017	ea.	25265
Needle Assembly	1100, 1200	G1313-87201	ea.	25278
Needle Assembly, 900 µL	1050, 1100, 1200	G1313-87202	ea.	25916
Rotor Seal, 2-Groove (not for use with 7125 injection valve)	1050	0101-0626	ea.	25272
Rotor Seal, 2-Groove	1100, 1200	0100-1853	ea.	25275
Rotor Seal (Rheodyne-Style), 3-Groove	1090	1535-4048	ea.	25349
Stator Face Assembly	1100, 1200	0100-1851	ea.	26424
Connecting Tube	1050, 1100	G1311-67304	ea.	25058
Injector Lubricant, PTFE, 10 g	1050, 1100	79841-65501	ea.	26520
Solvent Inlet Filter, SS	1050, 1090, 1100, 1200	01018-60025	ea.	26423
Isolation Seal for Injection Valve	1100, 1200	0100-1852	ea.	25917

For even more options, visit
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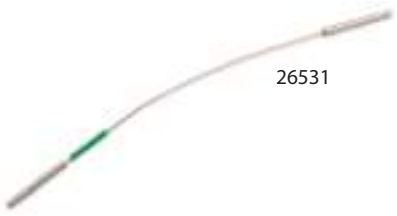
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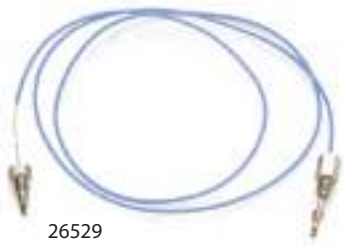
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Capillary Stainless Steel Tubing Assemblies for Agilent HPLC Systems

- Precut, micropolished tubing and preseated fittings for quick, easy maintenance of your Agilent HPLC systems.
- Meet or exceed manufacturer's performance.

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Capillary SS Tubing With Fittings, 130 mm x 0.17 mm ID	1090	01090-87305	ea.	26525
Capillary SS Tubing With Fittings, 800 mm x 0.17 mm ID	1050	01078-87305	ea.	26526
Capillary SS Tubing With Fittings, 180 mm x 0.17 mm ID	1100	G1313-87305	ea.	26527
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01018-67305	ea.	26528
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01078-87306	ea.	26529
Seat Capillary, SS Tubing, 0.17 mm ID	1050	01078-87303	ea.	26530
Capillary SS Tubing, 105 mm x 0.17 mm ID	—	5021-1816	ea.	26531
Mixing Capillary Assembly	1100	G1312-67302	ea.	26532
Capillary SS Tubing, Valve to Metering Head	1100	G1313-87301	ea.	26533
Capillary SS Tubing, 150 mm x 0.17 mm ID	—	5021-1817	ea.	26534
Capillary SS Tubing, 280 mm x 0.17 mm ID	—	5021-1818	ea.	26535
Capillary SS Tubing, 400 mm x 0.17 mm ID	—	5021-1819	ea.	26536
1/16" Fitting, Front and Back Ferrules, Stainless Steel	—	5062-2418	10-pk.	26537

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Pump Supplies for Agilent HPLC Systems

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	2-pk.	22482
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	10-pk.	22483
Piston Seals, Black, ASI	1050, 1100	5062-8516	10-pk.	25176
Piston Seals, Black	1090	5062-2494	4-pk.	25347
Pump Block Piston Seal	1050, 1100, 1200	0905-1420	2-pk.	25918
Seal Wash Kit, Binary Pump (4 seals, 4 gaskets)	1050, 1100, 1200	—	kit	25268
Seal Wash Kit (2 seals, 2 gaskets)	1050, 1100, 1200	—	kit	25269
Wash Seal	1050, 1100, 1200	0905-1175	ea.	25277
Active Inlet Cartridge	1050, 1100, 1200	5062-8562	ea.	26393
Seal, Gold Disk (outlet)	1050, 1100, 1200	5067-4728	ea.	25889
Outlet Cap	1050, 1100, 1200	5062-2485	4-pk.	25139
Outlet Cap & Gold Seal Assembly	1050, 1100, 1200	—	2-pk.	25890
Outlet Ball Valve, Binary Pump	1100, 1200	G1312-60012	ea.	25267
Outlet Ball Valve	1050, 1100, 1200	G1311-60012	ea.	25276
Sieves for Outlet Valve	1100, 1200	5063-6505	10-pk.	25266
Check Valve Cartridge Assembly	1090	79835-67101	ea.	25344
Frits, PTFE	1050, 1100, 1200	01018-22707	5-pk.	25466
Plunger Assembly	1050, 1100, 1200	5063-6586	ea.	25273
Sapphire Piston	1090	3980-0672	ea.	25345

*Graphite-filled PTFE; best for organic solvents.

For even more options, visit
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Lamps for Agilent HPLC Systems

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Detector Lamp, 1090 DA, 1050 VW/DA/MWD	1090, 1050	79883-60002	ea.	25260
Lamp, DAD G1315A, G1365A*	1100, 1200	2140-0590	ea.	25261
Lamp, VWD G1314A	1100, 1200	G1314-60100	ea.	25262
Lamp, DAD Long-Life Deuterium (2,000 hours)	1100, 1200 DAD	5181-1530	ea.	25399
8453 Deuterium Lamp	—	2140-0605	ea.	25263
Deuterium Lamp (2,000 hours)*	1100 DAD/MWD/1200	2140-0813	ea.	25888

*Compatible with 1260.

Other Supplies for Agilent HPLC Systems

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Bottle Head Assembly	—	G1311-60003	ea.	25059

Injector & Autosampler Supplies for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Needle	PE Series 200 Pumps	N2930023	ea.	25432

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Pump Supplies for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Low-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907339	ea.	25435
Standard High-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907324	ea.	25434
Standard Pump Seal Kit	200 Series	N2910383	kit	26425
High-Pressure Seal Kit Includes: pump seals (4), backup rings (4), O-rings (4)	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	0254-0275	kit	25433
Inlet Check Valve	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620, Series 200 Micropump	02540177	ea.	25438
Outlet Check Valve	PE 200, 4, 250, 400, 410, 620	02540197	ea.	25437

*Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

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Deuterium Lamps for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Deuterium Lamp	Lambda–2, 5, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 25, 40, 800, 900	B016-0917	ea.	25436
Deuterium Lamp	200 Series, 785A	N2920149	ea.	25431

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For even more options, visit
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Injector & Autosampler Supplies for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Needle Seal, Vespel	LC-2010, SIL-10ADvp, 10AXL	228-33355-04	ea.	25468
Needle Seal, PEEK	SIL-10ADvp, 10AXL, HT	228-33355-01	ea.	25919
Needle Seal, PEEK	SIL-2010A/C HT, 20A/AC	228-42325-01	ea.	25920
Rotor Seal	SIL-10ADvp	228-21217-97	ea.	24986
Rotor Seal Assembly	SIL-10A, 10AXL, 10Ai	228-21217-91	ea.	25469
Stator Assembly	SIL-10A, 10AXL, 10Ai	228-21220-91	ea.	25470
Syringe, 500 µL	SIL-10A, 10AXL, 10Ai	228-25237-04	ea.	25471

25284

Deuterium Lamps for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Deuterium Lamp	SPD-10, 10A, 10AVvp, SPD-20A, SPD-20AV	228-34016-02	ea.	25284

Protect your column and your UHPLC performance with UltraShield and UltraLine UHPLC filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system.

See **page 188**.

www.restek.com/**LCguard**

Pump Supplies for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Plunger Seal, Polyethylene, Gold**	LC-10Ai, 10AS, 10AT, 10ATvp, LC-7A	228-21975-00	ea.	25290
Plunger Seal, Black*	LC-10AD, 10ADvp, LC-20AD/AB, LC-600, LC-2010 A/C HT, LC-9A	228-35146-00	ea.	24980
Plunger Seal, Gold**	LC-10ADvp, LC-20AD/AB	228-32628-00	ea.	24981
Plunger Seal, Black*	LC-10ATvp, LC-20AT, LC-HT, SIL-10ADvp, SIL-2010 A/C HT, SIL-20A/AC, SIL-HT	228-35145-00	ea.	24985
Plunger Rinse Seal	LC-10Ai, LC-10AS, LC-10AT, LC-10ATvp	228-28499-00	ea.	25292
Inlet Check Valve	LC-6A, LC-10AS	228-12353-91	ea.	25287
Inlet Check Valve	LC-600, LC-9A, LC-10AD	228-18522-91, 228-33492-91	ea.	25295
Inlet Check Valve	LC-10ADvp	228-39093-92	ea.	24984
Inlet Check Valve	LC-10AT, LC-10ATvp	228-32166-91	ea.	26521
Inlet Check Valve	LC-20AD/AB XR	228-48249-91, 228-45704-91	ea.	26426
Outlet Check Valve	LC-6, LC-10AS, LC-8A	228-09054-93	ea.	25288
Outlet Check Valve Rebuild Kit Includes: ruby ball (2), seat (2), thin washer (2), thick washer (2), retainer washer (2)	LC-6A, LC-10AS	228-11200-91	kit	25289
Outlet Check Valve	LC-600, LC-9A, LC-10AD, LC-10AT	228-18522-92, 228-32531-92	ea.	25282
Outlet Check Valve	LC-10ADvp, LC-10ATvp	228-34976-91	ea.	24983
Outlet Check Valve	LC-20AD/AB XR	228-45705-91, 228-45563-91	ea.	26427
Sapphire Plunger	LC-10AS, LC-7A	228-17019-93	ea.	25291
Sapphire Plunger	LC-600, LC-9A, LC-10AD	228-18523-91	ea.	25294
Sapphire Plunger	LC-20AT	228-35009-93	ea.	25921
Sapphire Plunger	LC-20AD/AB, LC-2010	228-35601-93	ea.	25922
Sapphire Plunger	LC-2010A/C HT, LC-HTSIL-10ADvp, SIL-20A/AC	228-35010-91	ea.	25923
Plunger Assembly, Ceramic	LC-10ADvp	228-35601-91	ea.	25472
Plunger Assembly, Ceramic	LC-10ATvp	228-35009-92	ea.	25473
Plunger Assembly, Sapphire	LC-10ADvp	228-35601-92	ea.	24982
Suction Filter, SS	LC-10ADvp, 10ATvp, 20AD/AB, 2010A/C HT	228-45707-91	ea.	25924

*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

For even more options, visit **www.restek.com/LCacc**

Injector & Autosampler Supplies for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Rotor Seal Assembly, Rheodyne 7010	TSP AS100, 300, 1000, 3000, 3500, 8875, and 8880 Autosamplers	1535-4048, 7010-039, 2508-0360	ea.	25481
Syringe Assembly, 250 µL	1000, CM3000, CM3500, AS100	A3588-020	ea.	25482
Syringe, 500 µL	8800 Series	3301-0100	ea.	25483

Lamps for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Lamp, UV	Spectrachrom 200, UV100, UV1000, UV150, UV200, UV2000, UV3000	9551-0023	ea.	25484

Pump Supplies for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Inlet Check Valve Assembly	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3495-010	ea.	25474
Outlet Check Valve Assembly	8700, 8800, 881, ISOCHROM	A3490-010	ea.	25475
Transducer Check Valve Assembly	P1000, P2000, P4000	A3990-010	ea.	25479
Check Valve Cartridge	3000, 3200, 3500, 4000, 4100, Constametric I, II, and III	900946	ea.	25485
Piston	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3102-010	ea.	25476
Sapphire Plunger	CM3000, CM3200, CM3500, CM4000	801306	ea.	25486
Back-Up Seal	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2963-010	ea.	25477
Plunger Seal, Gold Superseal**	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2962-010	ea.	25478
Plunger Seal Kit, Gold** Includes: SS plunger seal spacer, Rulon plunger seal spacer (2), O-ring, gold plunger seal	LDC Constametric Pumps	801892001	kit	25487
Plunger Seal, Black*	CM3000, CM3200, CM3500, CM4000	206129001	ea.	25488
Plunger Seal, Gold**	CM3000, CM3200, CM3500, CM4000	206156001	ea.	25489
Kel-F Washer	P1000, P2000, P4000	A4848-010	ea.	25480

*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

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Preventive Maintenance (PM) Kits for Waters HPLC Systems

Description	Model #	Similar to Waters Part #	qty.	cat.#
2690/2695 Pump & Autosampler PM Kit Includes: sapphire plungers (2), seal wash plunger seals (4), head plunger seals (4), wash tube seals (4), battery, sparge diffuser, filter insert, face seals (4), solvent reservoir 10 µm filters (4), 250 µL syringe, check valve cartridges (2), wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle assembly, gold injector seals (2), stainless steel ferrule, compression screw	Alliance 2690, 2695	WAT270944	kit	25143
717 Autosampler PM Kit Includes: seal pack assembly, tube assembly (0.020" ID), needle, needle compression screw, 0.062 stainless steel ferrule, pre-column filter assembly, filter insert, 250 µL WISP syringe	717 Autosampler	WAT052669	kit	25145
600 Pump PM Kit Includes: PerformancePLUS cartridges (4), sparge diffusers (4), Super Seals (2), solvent reservoir 10 µm filters (4), sapphire plungers (2), reference valve button, valve disk spacer, valve disk, TFE ball plug, TFE seat, ruby ball, inlet tube body assembly manifold insert, insert seal, belleville washers (2), flat washer	600 Pump	WAT052675	kit	25144
616 Pump PM Kit Includes: sapphire plungers (2), sparge diffusers (4), solvent reservoir 10 µm filters (4), plunger seals (2), plunger wash seals (2), O-rings (2), backup rings (2), check valve cartridges (4)	616 Pump	WAT052672	kit	25146
515 Pump PM Kit Includes: PerformancePLUS check valves (4), sparge diffuser, solvent reservoir 10 µm filter, sapphire plungers (2), plunger seals (2), pivot inserts (2), pivot guides (2), washer (2), plunger springs (2), retaining rings (2)	515 Pump	WAT052587	kit	26519
1525 Pump PM Kit Includes: sapphire plungers (4), check valve cartridges (8), plunger seals (4), solvent reservoir 10 µm filters (2), reference valve button, valve disk spacer, valve disk	1525 Pump	201000114	kit	26430

Simplify Routine LC Maintenance

Preventive Maintenance Kits

- Significant savings over instrument manufacturer prices.
- High-quality components in every kit.
- Wide range of options for HPLC systems and pumps.

www.restek.com/**LC-Maintenance**

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(back)

Injector & Autosampler Supplies for Waters HPLC & ACQUITY UPLC® Systems

Description	Model #	Similar to Waters Part #	qty.	cat.#
Needle Assembly, 0.010 mm ID	ACQUITY	700002644	ea.	25942
Sample Loop, 10 µL	ACQUITY, nanoACQUITY	430001326	ea.	25943
Wash Station O-Ring	ACQUITY, nanoACQUITY	700002572	ea.	25944
Metering Syringe, 100 µL	ACQUITY, nanoACQUITY	700002570	ea.	25945
Tube Assembly, Inject Outlet	ACQUITY	430001084	ea.	25946
Tube Assembly, System Outlet	ACQUITY	430001486	ea.	25947
Seal Pack Rebuild Kit, Without Seal Wash Tube Assembly Includes: wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle, injector seal (2), compression screw, ferrule	2690, 2695	WAT271019	kit	25495
Seal Pack With Needle Includes: seal pack assembly, pre-column filter assembly, needle, 0.020" ID tube assembly, compression screw, ferrule	717, LC Module 1	WAT045559	ea.	25496
Vespel Rotor Seal	1090, 7000, 7010, 7040, 7067	7010-039	ea.	25279
Vespel Rotor Seal	7125, 7126, 7725, 7725i, 9725	7125-047	ea.	25280
Isolation Seal	7010	7010-015	ea.	25281

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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (Also see pages 332–333.)

Description	Model #	Similar to Waters Part #	qty.	cat.#
Head Plunger Seal Kit Includes: head plunger seals (2), back-up washers (2)	ACQUITY, nanoACQUITY	700002599	kit	26428
Wash Seal	ACQUITY, nanoACQUITY	700002598	2-pk.	26429
Pump O-Ring	ACQUITY, nanoACQUITY	WAT076152	ea.	25951
In-Line Filter Assembly, Stainless Steel Frit	ACQUITY, nanoACQUITY	289003547	ea.	25952
Filter Frit Cartridge, Stainless Steel	ACQUITY	700002913	ea.	25953
Solvent Bottle Filters	ACQUITY	700003616	7-pk.	25954
Tube Assembly, SSV to In-line Filter	nanoACQUITY	430001470	ea.	25948
Tube Assembly, Transducer to Check Valve, BSM	ACQUITY, nanoACQUITY	430001121	ea.	25949
Tube Assembly, Transducer to Check Valve, QSM	ACQUITY	430002357	ea.	25950
Tube Assembly, SSV to I2V	ACQUITY	430001443	ea.	25941
Super Seal for Analytical Heads	M6KA,1515, 1525, 510, 515, 590, 600, 610, LC Module 1	WAT022946	ea.	25374
Plunger Seal, Gold**	1515, 1525, 510, 515, 600, 610, LC Module 1	—	ea.	25375
Plunger Seal, Black*	1515, 1525, 510, 515, 600, 610, LC Module 1	WAT026613	ea.	25378
Plunger Seal, Gold for EF Heads**	510, 515, 590, 600, 610, LC Module 1	700002282	ea.	25380
Pump Seal Kit Includes: plunger seals (2), wash seals (2), O-rings (2), back-up rings (2)	616, 1525 Micro	WAT034515	kit	25497
Seal Wash Plunger Seals	2690, 2695, 2790, 2795	WAT270160, WAT271018	2-pk.	25386
Head Plunger Seals, Gold	2690, 2695, 2790, 2795	WAT270789, WAT270938	2-pk.	25387
Head Plunger Seals, Black	2690, 2695, 2790, 2795	WAT271066	2-pk.	25388
Seal Wash Face Seal	2690, 2695, 2790, 2795	WAT271017	ea.	25428
Wash Tube Seal Kit	2690, 2695, 2790, 2795	WAT270940	4-pk.	25429
Face Seals Replacement Kit	2690, 2695, 2790, 2795	WAT270163, WAT270939	4-pk.	26547

*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

Instrument Replacement Parts for Waters HPLC & ACQUITY UPLC® Systems

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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (cont.)

Description	Model #	Similar to Waters Part #	qty.	cat.#
Primary Check Valve	ACQUITY, nanoACQUITY	700002596	2-pk.	25955
Accumulator Check Valve (Double Ball & Seat)	ACQUITY, nanoACQUITY	700002968	2-pk.	25956
I2 Check Valve Cartridge	ACQUITY	700005165	ea.	25957
Inlet Check Valve Assembly	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT033679, WAT025214	ea.	25360
Inlet Check Valve Housing	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT025203	ea.	25361
Inlet Check Valve Rebuild Kit Includes: blue washer (2), retainer gasket (2), Kel-F insert (2), ruby ball (2), TFE seat (2), TFE washer (2)	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT060495	kit	25362
Outlet Check Valve Assembly (Actuator Style)	M6KA, 510, 590	WAT025028	ea.	25363
Outlet Check Valve Housing (Actuator Style)	M6KA, 510, 590	WAT025212	ea.	25364
Outlet Check Valve Rebuild Kit (Actuator Style) Includes: 2 µm cup filter (2), compression spring (2), actuator (2), TFE washer actuator seat (2), TFE washer (2)	M6KA, 510, 590	WAT026016	kit	25365
Outlet Check Valve Assembly (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025216	ea.	25366
Outlet Check Valve Housing (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025207	ea.	25367
Outlet Check Valve Rebuild Kit (Ball & Seat Style) Includes: 2 µm cup filter (2), ruby ball (2), ball seat (2), Kel-F insert (2), blue washer (2), washer (2)	1525EF, 510, 515, 600, 610, LC Module 1	WAT026014	kit	25368
Inlet Check Valve Assembly, 225 µL (Extended Flow)	1525EF, 510, 515, 600, 610, LC Module 1	WAT060307	ea.	25369
Check Valve Rebuild Kit (Extended Flow) Includes: $^{3}/_{16}$" EF ruby ball (2), EF ball seat (2), EF guide seal (2), EF ball guide (2), EF housing seal (2)	510, 590, 600, LC Module 1	WAT088223	kit	25371
PerformancePLUS Check Valve Housing	1515, 1525, 510, 515, 525, 600, 610	—	ea.	25372
PerformancePLUS Check Valve Cartridge	1515, 1525, 2690, 2695, 2795, 510, 515, 600, 610	700000254	2-pk.	25370
Check Valve Cartridges	2690, 2695, 2790, 2795	WAT270941	2-pk.	25373
Check Valve Cartridge, Stainless Steel	616	WAT024960	ea.	25498

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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (cont.)

Description	Model #	Similar to Waters Part #	qty.	cat.#
Sapphire Plungers	ACQUITY, nanoACQUITY	700002600	2-pk.	25958
Sapphire Plunger	M6KA, 510, 590, 600, 610, LC Module 1	WAT025656, WAT069511	ea.	25381
Sapphire Plunger (Extended Flow)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT060304	ea.	25382
Sapphire Plunger Assembly Kit Includes: sapphire plunger, pivot insert, pivot guide, washer, spring, retaining ring	515, 1515, 1525	WAS207069	kit	25384
Sapphire Plunger	616, 625, 626, 1525 Micro	WAT031788	ea.	25420
Sapphire Plunger	2690, 2695, 2790, 2795, 2796	WAT270488, WAT271067, WAT270959	ea.	25385
Indicator Manifold Kit Includes: TFE ball plug, TFE seat, ruby ball, manifold insert, TFE insert seal, belleville washer (2), flat washer, inlet tube body assembly	M45, 501, 510, 515, 590, 600, 610	WAT060448	kit	25412
Reference Valve Rebuild Kit Includes: ref valve button, valve disk spacer, valve disk	600 Pump	WAT025746	kit	25492
Ferrule, Stainless Steel	—	WAT022330	ea.	25417
Compression Screw, Stainless Steel	—	WAT025313	ea.	25493
Battery	2690, 2695, 717, 486, 484	WAT080443	ea.	25494

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Detector Supplies for Waters HPLC & ACQUITY UPLC® Systems

Description	Model #	Similar to Waters Part #	qty.	cat.#
Xenon Lamp (without holder or mirror)	470	—	ea.	25404
Xenon Lamp	474	—	ea.	25405
Deuterium Lamp, Long Life (2,000 hours)*	486	WAT080678	ea.	25410
Deuterium Lamp	996, 2996	WAT052586	ea.	25408
Deuterium Lamp	2487, 2488	WAS081142	ea.	25409

*Standard lamps have nominal 1,000-hour life.

Thomson SINGLE StEP® Filter Vials

Sample filtration that's economical, eco-friendly, and fast!

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12x32 mm autosamplers, including UHPLC instruments.

See **page 410**.

www.restek.com/**singlestep**

EXP® Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing

- Hand-tight fitting style achieves effortless HPLC seals—no tools needed for a 8,700+ psi seal.
- Both hand-tight and hex-head styles wrench-tighten for reliable UHPLC use up to 20,000+ psi!
- Patented ferrule can be installed repeatedly without compromising high-pressure seal.
- Hybrid design combines the durability of titanium with the sealing ability of PEEK.
- Cutting-edge system provides ZDV (zero dead volume) connection to any 10-32 female port.
- Compatible with 1/16" PEEK and stainless steel tubing.

Restek is pleased to offer the reusable EXP® fitting system from Optimize Technologies for the ultimate in easy, reliable LC connections!

The patented hybrid EXP® ferrule combines the durability of titanium with the sealing ability of PEEK for a swage that can be reused over and over again. And, when you choose the hand-tight fitting style, the special EXP® nut offers an effortless seal up to 8,700+ psi (600+ bar)—no tools needed! For a reliable 20,000+ psi (1,400+ bar) UHPLC connection with either fitting style, simply wrench-tighten an extra 1/4 to 1/2 turn.

EXP® ferrules should only be used with genuine EXP® nuts. When used with an EXP® nut, the EXP® ferrule provides repeated ZDV (zero dead volume) connections to any 10-32 female threaded port, including Restek® LC columns, 6-port injection valves, and more. To accommodate varying port depths, simply hold the tubing fully bottomed in the port and tighten as instructed.

WARNING: Do not use EXP® ferrules with standard nuts. Failure to use EXP® fittings according to the included instructions may result in unsafe UHPLC connections and/or non-ZDV connections.

EXP® Hand-Tight Fittings

Description	qty.	cat.#
EXP Hand-Tight Fitting (Nut w/Ferrule)	ea.	25937
EXP Hand-Tight Fitting (Nut w/Ferrule)	10-pk.	25938
EXP Hand-Tight Nut (w/o Ferrule)	ea.	25939

EXP® Hex-Head Fittings

Description	qty.	cat.#
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	ea.	25926
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25927
EXP Short Hex-Head Fitting (Nut w/Ferrule)	ea.	25928
EXP Short Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25929
EXP Long Hex-Head Fitting (Nut w/Ferrule)	ea.	25930
EXP Long Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25931
EXP Std. Hex-Head Nut (w/o Ferrule)	ea.	25932
EXP Short Hex-Head Nut (w/o Ferrule)	ea.	25933
EXP Long Hex-Head Nut (w/o Ferrule)	ea.	25934

EXP® Hand-Tight Coupler

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

EXP® Titanium Hybrid Replacement Ferrules

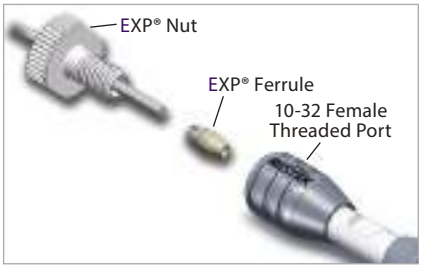
Description	qty.	cat.#
EXP Titanium Hybrid Ferrule	ea.	25935
EXP Titanium Hybrid Ferrule	10-pk.	25936

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

A Raptor™ LC guard column cartridge in an EXP® holder is the Ultimate in Column Protection.

See **pages 155–159**.

Raptor™ LC Columns
Selectivity Accelerated



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(shown assembled)

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Universal 10-32 PEEK Column Connectors and Plugs

Universal PEEK connectors allow easy installation of all 1/16" tubing, including stainless steel, up to 5,000 psi.

Description	qty.	cat.#
PEEK Column Connector (beige, round body)	10-pk.	25015
PEEK Column Plug (black)	10-pk.	25016
PEEK Finger-Tight Fittings (blue, flat-sided)	10-pk.	25324

Rheodyne® Style Nut and Ferrule

Replacement long nut for connecting stainless steel tubing to a Rheodyne® 6-port valve or other Rheodyne® part.

Description	qty.	cat.#
1/16" Rheodyne Style Nut	10-pk.	25095
1/16" Rheodyne Style Ferrule	10-pk.	25096

20147

Zero Dead Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. Made of 300-series stainless steel. For use with 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZU1T	ea.	20150

25323

PEEK Union Connector

Quickly and reliably connect two pieces of 1/16" tubing. 0.3 mm union bore. End fittings included.

Description	qty.	cat.#
PEEK Union Connector 1/16"	2-pk.	25323

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LC-MS Gas Generators From Restek

Affordable
Generators are cost-effective and quickly pay for themselves.

Reliable
Dependably produce a continuous supply of high-purity carrier and fuel gas.

Safe
Eliminate hazardous cylinders and free up valuable lab space.

See **page 345**.

www.restek.com/**gas**

LC Stainless Steel Capillary Tubing

- 316-grade stainless steel.
- Precise precut lengths.
- Smooth surface finish.
- Ultra clean.

Whether you need to replace system tubing as part of your troubleshooting or want to reduce the dwell volume of your system as you move to narrower columns, Restek has the quality tubing in the lengths and IDs you need. Each ID is color coded, so it is easy to identify and replace correctly.

Length	qty.	0.005" ID (red) max. 21,600 psi cat.#	0.007" ID (gray) max. 20,900 psi cat.#	0.010" ID (blue) max. 19,700 psi cat.#	0.020" ID (yellow) max. 15,800 psi cat.#
1/16" OD Tubing					
5 cm	3-pk.	25240	25244	25248	25252
10 cm	3-pk.	25241	25245	25249	25253
20 cm	3-pk.	25242	25246	25250	25254
30 cm	3-pk.	25243	25247	25251	25255

20188

Tubing Dressing Tool

Opens stainless steel tubing bore and removes burrs. For 1/16" OD tubing or 1/8" OD tubing.

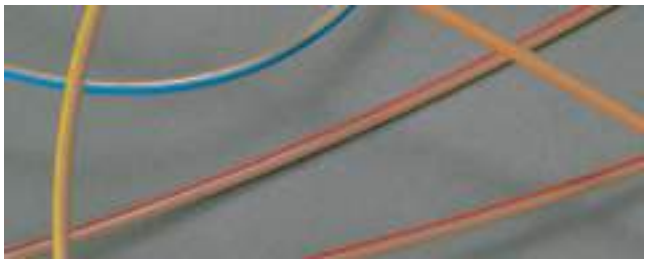
Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191

25306

PTFE Tubing

- Ideal for mobile phase inlet lines.
- Chemically inert.
- Use to 500 psi (3,447 kPa) and 80 °C.

Description	OD	ID	Length	qty.	cat.#
PTFE Tubing	1/8"	0.063" (1.6 mm)	3 m	3 m	25306
PTFE Tubing	1/8"	0.094" (2.4 mm)	3 m	3 m	25307



Inert PEEK Tubing

- Replaces stainless steel, titanium, PTFE, or Tefzel® tubing.
- Less oxygen permeable and more temperature resistant (to 100 °C) than PTFE or Tefzel® tubing.
- Use with PEEK finger-tight or flangeless fittings.
- Use tubing ≤ 0.007" to 7,000 psi; tubing ≥ 0.010" ID to 5,000 psi.

Description	OD	ID	Length	Color Code	qty.	cat.#
PEEK Tubing	1/16"	0.0025"	1 m	pink dash stripe	3-pk.	25320
PEEK Tubing	1/16"	0.005"	3 m	red stripe	ea.	25065
PEEK Tubing	1/16"	0.007"	3 m	yellow stripe	ea.	25066
PEEK Tubing	1/16"	0.010"	3 m	blue stripe	ea.	25067
PEEK Tubing	1/16"	0.020"	3 m	orange stripe	ea.	25068

Clean-Cut Tubing Cutter

- Burr-free, perpendicular cuts that will not distort the tubing OD or close the ID.
- Use on PEEK, PTFE, Tefzel®, and other polymeric tubing.

25069

Description	qty.	cat.#
Clean-Cut Tubing Cutter	ea.	25069
Replacement Blade for Clean-Cut Cutter	ea.	25070

Tubing Clip

Securely holds 1/16" or 1/8" tubing in beaker, flask, or bottle up to 4 mm thick.

25310

Description	qty.	cat.#
Tubing Clip	5-pk.	25310

25308

25309

PEEK Tubing Elbows

Tubing elbows (90° and 180°) are ideal for routing 1/16" PEEK tubing through your system. Simply snap the tubing into the elbow. Prevent pinching of PEEK tubing, which can cause high pressure.

Description	qty.	cat.#
PEEK Tubing Elbow, 90°	5-pk.	25308
PEEK Tubing Elbow, 180°	5-pk.	25309

Flow Splitters & Lab Organizers

25336

25328

QuickSplit Post-Column Flow Splitters

Fluid resistor technology eliminates adjustments to capillary tubing for optimizing split ratio. Wide range of interchangeable resistors available.

Fixed Flow Splitters for HPLC & LC-MS

- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 10,000 psi (68,948 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

Adjustable Flow Splitter

- Adjustable metering valve gives convenient control of split ratio.
- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 5,000 psi (34,474 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

Description	Split Ratio	qty.	cat.#
Binary Fixed, Post Column	100:1	ea.	25326
	50:1	ea.	25327
	20:1	ea.	25328
	10:1	ea.	25329
	5:1	ea.	25330
Replacement Fixed Resistor Set, Post Column	100:1	ea.	25331
	50:1	ea.	25332
	20:1	ea.	25333
	10:1	ea.	25334
	5:1	ea.	25335
Adjustable, Post Column	5:1 to 100:1	ea.	25336
	1:1 to 20:1	ea.	25337
	50:1 to 1000:1	ea.	26416
Replacement Adjustable Resistor Set, Post Column*	5:1 to 100:1	ea.	25338
	1:1 to 20:1	ea.	25339

*QuickSplit post-column flow splitter serial number required for replacement resistor set to ensure compatibility. Every resistor is manufactured per serial number. The serial number is located on top of the splitter.

LCLocker LC Organizer

Deluxe BenchBooster Organizer

Mini pHPerch Storage Unit

LC 30-Column Storage Cabinet

Book Holders

Open Supply Bins, 13-bin unit

TopLoader Balance-Bank Storage Unit

Glove Box Dispensers

LC Organizers

Description	Dimensions	qty.	cat.#
LCLocker	24 x 12 x 6"	ea.	25149
BenchBooster	24 x 7 x 12"	ea.	25150
Mini pHPerch	13 x 12 x 6"	ea.	25147
TopLoader	12 x 12 x 7"	ea.	25148
30 Column Cabinet	17 x 15 x 3"	ea.	25159
Book Holder, 0.75" ID (Small)	4 1/2 x 6 x 1 1/4"	ea.	25151
Book Holder, 1.5" ID (Large)	4 1/2 x 6 x 1 3/4"	ea.	25152
Open Supply Bin	24 x 12 x 10" (4-Bin Unit)	ea.	25153
Open Supply Bin	12 x 16 x 10.5" (5-Bin Unit)	ea.	25154
Open Supply Bin	12 x 12 x 7.5" (13-Bin Unit)	ea.	25155
Glove Box Dispenser	5 1/8 x 11 x 4 1/4" (Single)	ea.	25156
Glove Box Dispenser	10 1/8 x 11 x 4 1/4" (Double)	ea.	25157
Glove Box Dispenser	15 1/8 x 11 x 4 1/4" (Triple)	ea.	25158

*Please note: Accessories and supplies in photographs are not included.

PEEK Fitting Extractor

Drill into the broken fitting, then screw the extractor into the fitting and remove it easily. Eliminates the need for heat or other techniques that could damage your column.

Description	qty.	cat.#
PEEK Fitting Extractor	ea.	25325

ValvTool Wrench

The ValvTool is a time-saving device that provides easy access to many hard-to-reach Rheodyne® or Valco® valves. For 1/4" nuts.

Description	qty.	cat.#
ValvTool Wrench	ea.	25321

Use the flat side of the piston seal insertion tool to seat a Waters face seal.

LC Piston Seal Insertion Tool

Simplify pump maintenance: use one end to remove your old seal, then simply slip your new seal on the other end and push it flush into position. The tool cannot mar the surrounding metal surface of the pump housing.

Remove a seal

Seat a seal

Description	qty.	cat.#
LC Piston Seal Insertion Tool	ea.	21356

Hub-Cap 4-Liter Bottle Tops

Hub-Cap bottle tops are a great way to neatly keep your mobile phase lines where they belong. Use them instead of plastic paraffin film, aluminum foil, or tape on your mobile phase reservoirs.

26541

Description	qty.	cat.#
Hub-Cap (assembly of the bottle cap and plug)	kit	26541
Hub-Cap Multi-Pack	3-pk.	26542

Hub-Cap Adaptors

Allow the use of the Opti-Cap® Top with 4-liter solvent bottles.

Description	qty.	cat.#
Hub-Cap Adaptor (allows use of the Opti-Cap w/4 L solvent bottles)	ea.	26538
Hub-Cap Adaptor Multi-Pack	3-pk.	26539
Hub-Cap Adaptor and Opti-Cap (for use w/GL-45 solvent bottles)	kit	26540

Related Items and Replacement Parts for Hub-Cap 4-Liter Bottle Tops

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319

Opti-Cap® GL-45 Bottle Tops

The most economical way to helium-sparge and deliver LC mobile phases. Opti-Cap® tops fit all standard GL-45 bottles and have two 1/8" holes and one 1/16" hole for tubing. All three openings are designed for threaded PEEK plugs.

25303

Description	qty.	cat.#
Opti-Cap (Cap and PEEK Plug)	ea.	25300
Opti-Cap Kit	kit	25301
Opti-Cap Kit with 1 L Bottle	kit	25302
Opti-Cap Kit with 2 L Bottle	kit	25303

27197 26551

Opti-Cap® Adaptors

Allow the use of the Hub-Cap Top with GL-45 solvent bottles.

Description	qty.	cat.#
Opti-Cap Adaptor (allows use of Hub-Cap w/GL-45 solvent bottles)	ea.	27197
Opti-Cap Adaptor Multi-Pack	3-pk.	27198
Opti-Cap Adaptor w/Hub-Cap	kit	26551

Related Items and Replacement Parts for Opti-Cap® GL-45 Bottle Tops

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319
1 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25304
2 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25305

Which Bottle Top Do I Need?

I have a 4-Liter bottle...

Option 1: Hub-Cap Top (cat.# 26541)

or

Option 2*: Opti-Cap® Top (cat.# 25300) *plus* Hub-Cap Adaptor (cat.# 26538)

**Also available as a kit (cat.# 26540)*

Option 1

26541

Option 2*

25300 + 26538

**Also available as a kit (cat.# 26540)*

I have a GL-45 bottle...

Option 1: Opti-Cap® Top (cat.# 25300)

or

Option 2*: Hub-Cap Top (cat.# 26541) *plus* Opti-Cap® Adaptor (cat.# 27197)

**Also available as a kit (cat.# 26551)*

Option 1

25300

Option 2*

26541 + 27197

**Also available as a kit (cat.# 26551)*

Bottle not included.

Waste Overflow Indicator for LC Systems

- Avoid messy pooling around mobile phase waste containers.
- Audible alarm instantly alerts user, preventing overflow.
- Compact, battery-operated unit.
- Available for 4-liter and GL-45 solvent bottles.

The Restek® waste overflow indicator will help keep your mobile phase waste where it belongs—in the waste container! Compact, battery-operated unit fits securely on solvent bottles and accommodates two waste streams. An audible alarm is given as the solvent waste container approaches capacity, giving you time to empty or change the container. Another innovative design from Restek!

Description	qty.	cat.#
Waste Overflow Indicator for LC Systems, 4 Liter	ea.	26543
Waste Overflow Indicator for LC Systems, GL-45	ea.	26550
Replacement AA Battery for the Waste Overflow Indicator	ea.	26544
Replacement AA Batteries for the Waste Overflow Indicator	3-pk.	26545

Extend the life of columns and pump seals with Restek's Bluestem glass solvent filter

See **page 343**.

tech tip

Mobile Phase Additives with LC-MS
Mobile phase additives such as triethylamine, trifluoroacetic acid, and ion-pairing reagents can compete with sample ions, decreasing sensitivity and, in some cases, reducing sample ion intake into the MS. To obtain symmetric peaks and/or sufficient retention, use base deactivated silica, like Pinnacle® DB or high purity silicas like Ultra or Raptor™, that minimize the need for additives.

26395

Polypropylene Membrane Filters

25925

Hub-Cap Filter Kit

Kit includes: bottle adaptor, bottle adaptor nut, filter inlet cap, grid support, vacuum hose barb, tube compression fitting, 47 mm grid, 47 mm 0.22 µm filter membrane, 47 mm 0.45 µm filter membrane, 1/4" OD x 1/8" ID ultra chemical resistant, FEP-lined Tygon® tubing (3'), 6" x 6" box with shrink-wrap insert.

Includes universal threads designed for 4 L or Wheaton bottles. Use with GL-45 bottles requires Opti-Cap® adaptor (sold separately).

Bottle not included.

Assembles quickly and easily!

Unscrew and lift off top.

Place membrane filter on top of grid.

Reattach top.

Connect vacuum line to side port.

Description	qty.	cat.#
Hub-Cap Filter Kit for 4 L or Wheaton bottles	kit	26395
Replacement Parts	**qty.**	**cat.#**
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399
Hub-Cap Filter Hose Barb	ea.	25925

Last Drop Filter

The flat filter element sits parallel to the bottom of the mobile phase reservoir, allowing the filter to draw 98% of the mobile phase without drawing air into the system. Conventional cylindrical mobile phase filters begin to draw air into the system when approximately 10% of the solvent remains in the reservoir. The Last Drop filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. 22.1 mm OD.

25314

Description	qty.	cat.#
Last Drop Filter, 2 µm	ea.	25314
Last Drop Filter, 10 µm	ea.	25315

25008

Low-Pressure Slip-On Inlet Filter for Mobile Phase Reservoir

A 316 stainless steel tip with a Tefzel® collar seals to a corrosion-resistant 316 stainless steel filter element. The slip-on filter easily attaches to the pump inlet line, without the use of wrenches. The universal 1/8" OD tip accommodates standard PTFE tubing inner diameters. The cylindrical filter is standard 10 µm porosity. Fits Altex, ISCO, LDC, Varian, Waters, PerkinElmer, and other pumps.

Description	qty.	cat.#
Slip-On Inlet Filter	ea.	25008

Mobile Phase Sparge Filters

The sparge filter is an inexpensive way to prepare and maintain mobile phases free of dissolved gas. Filters are made from 316 stainless steel and PEEK, and they are compatible with most solvents. Connects to standard 1/8" OD (3.2 mm) PTFE tubing.

25311

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
Mobile Phase Sparge Filter, 20 µm	ea.	25313

UHP Pulse Dampener

UHPLC compatible

The UHP pulse dampener provides minimal flow pulsation at system pressures up to 18,000 psi. Its low dead volume (220 µL at atmospheric pressure) reduces overall system volume for UHP applications. The UHP pulse dampener has a stainless steel fluid path.

26549

Specifications:

Operating Pressure:	0–18,000 psi
Pulsation Dampening:	3:1 reduction in pulsation (dependent on pump characteristics and system volume and pressure)
Fluid Path Volume:	220 µL (atmospheric pressure)
	+44 µL (per 1,000 psi system pressure)
Wetted Materials:	316 SS; PTFE
Dimensions:	2.5" diameter x 2.0" high

Description	qty.	cat.#
UHP Pulse Dampener	ea.	26549

MiniPulse Pulse Dampener

25238

- Compact unit (2.5" x 1.5") can be placed almost anywhere.
- Small, 160 µL dead volume at atmospheric pressure.
- PEEK unit can withstand pressures to 5,000 psi (34,474 kPa).
- 316 stainless steel unit can withstand pressures to 6,000 psi (41,369 kPa).

Improve system baseline stability while increasing the total system volume by only 160 µL. The MiniPulse pulse dampener is ideal for applications where minimizing the total system volume is critical. Stainless steel and PEEK options for a wide range of applications.

Description	qty.	cat.#
MiniPulse Pulse Dampener, Stainless Steel	ea.	25238
MiniPulse Pulse Dampener, PEEK	ea.	25239

Solvent Debubbler

Bubbles in an LC system can cause check valve malfunctions and pump cavitation, seriously affecting pump performance. The debubbler removes bubbles from the fluid stream before it enters the pump.

25014

Special geometry at the base of the housing allows bubbles entrained in the inlet fluid stream to rise and be trapped in the reservoir. The gas/liquid interface is easily visible through the translucent wall of the device. Loosening the airtight cap releases the trapped gas. The debubbler features a polypropylene body and bracket; universal inlet and outlet connecting tips are made of 316 stainless steel and accept 0.063", 0.085", and 0.125" ID tubing.

Description	qty.	cat.#
Solvent Debubbler With Bracket	ea.	25014

NEW!

26431

26392

Bluestem Glass Solvent Filter

- Restek® Bluestem glass solvent filter provides clean mobile phase to extend the life of columns and pump seals.
- 15 µm borosilicate glass frit sits lower than conventional glass filters to draw more mobile phase from each bottle.
- Blue filter stem allows instant visual confirmation of upright filter orientation.
- Connects to standard 1/8" OD (3.2 mm) PTFE tubing using your existing frit adaptor (also sold separately as cat.# 26392).

Prevent the particulates and microbial growth in your LC solvents from entering your instrument with the new Restek® Bluestem glass solvent filter.

Description	Similar to Agilent Part #	qty.	cat.#
Glass Solvent Filter, 15 µm frit	5041-2168	ea.	26431
Frit Adaptor, PTFE	5062-8517	4-pk.	26392

Mixers

- Reduced baseline noise.
- Increased sensitivity.
- Improved gradient accuracy for more reproducible results.
- Increased reaction efficiency in post-column derivatization.

An efficient cross-flow shearing mechanism and interchangeable cartridges produce vortex shear mixing over a wide range of flows.

HyperShear Static In-Line Mixers

Stainless steel or PEEK.

25342

Volume	Stainless Steel qty.	Stainless Steel cat.#	PEEK qty.	PEEK cat.#
1 µL	ea.	26409	ea.	26410
25 µL	ea.	26411	ea.	26412
50 µL	ea.	25341	ea.	26413
150 µL	ea.	25342	ea.	26414
250 µL	ea.	25343	ea.	26415

Ternary Tee Mixer

Stainless steel.

25138

Description	Volume	qty.	cat.#
Ternary Tee Mixer	25 µL	ea.	25138

Polypropylene Membrane Filters

Membrane Microfiltration Glassware

KT953825-0000

This 47 mm filtration apparatus with fritted glass support is recommended for routine filtration of corrosive liquids and removal of particles from LC solvents. The ground joint connection eliminates phthalate contamination that can occur when using silicone or neoprene stoppers. The support base has a coarse-porosity glass frit and an integral vacuum connection, located above the drip tip to prevent contamination of the vacuum line with filtrate droplets. Each apparatus includes a funnel, an anodized aluminum clamp, a 47 mm fritted glass support base, and a filtration flask.

All-Glass Microfiltration Apparatus	qty.	cat.#
300 mL Funnel, 1,000 mL Flask	ea.	KT953825-0000
500 mL Funnel, 2,000 mL Flask	ea.	KT953835-0000
1000 mL Funnel, 4,000 mL Flask	ea.	KT953845-0000
Replacement Parts for Microfiltration Apparatus	**qty.**	**cat.#**
40/35 PTFE Joint Sleeve	6-pk.	KT676001-4035
Flask Cap, 40/35 Outer Joint	ea.	KT953830-0000
Fritted Glass Support, 47 mm, 40/35 Joint	ea.	KT953826-0000
Glass Funnel, 47 mm, 100 mL	ea.	KT953761-0000
Glass Funnel, 47 mm, 300 mL	ea.	KT953751-0000
Glass Funnel, 47 mm, 500 mL	ea.	KT953771-0000
Glass Funnel, 47 mm, 1,000 mL	ea.	KT953781-0000
Flask, 1,000 mL, 40/35 Joint	ea.	KT953827-0000
Flask, 2,000 mL, 40/35 Joint	ea.	KT953828-0000
Flask, 4,000 mL, 40/35 Joint	ea.	KT953829-0000
Aluminum Clamp, 47 mm	ea.	KT953753-0000
Membrane Filters	**qty.**	**cat.#**
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399

Mobile Phase Degasser

Dissolved oxygen can cause flow rate instability and increased baseline noise. Also, it has a quenching effect on fluorescence detection and increases the background of UV detectors. Dissolved gases can out-gas in the LC system, forming bubbles in check valves, at connections, or in detector flow cells.

In-line vacuum degassing is more effective at removing dissolved gas from mobile phases than sonication or helium sparging. In-line degassers work by withdrawing gas across a gas-permeable membrane encased in a sealed chamber. Traditionally, the membrane has been made of PTFE tubing, but the Degasys Ultimate Degasser uses tubing composed of an amorphous fluoropolymer (AF) that is 200 to 300 times more gas permeable than PTFE. This translates into the ability to use shorter tubing for removing dissolved gas. This new material also has better tubular burst strength than PTFE. To prevent cross contamination, each channel on this Degasys unit is individually encased within its own vacuum chamber.

Description	Voltage	qty.	cat.#
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	110V	ea.	25189
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	220V	ea.	25194

25189

Specifications:

Residual Oxygen[1]	0.9 ppm
Pressure Loss[1]	0.24 psi (1.65 kPa)
Internal Volume	500 µL
Wetted Parts	AF, PTFE, ETFE, PPS
Max Flow Rate	7 mL/min/channel

[1] At a flow rate of 1 mL/min

To prevent system damage, do not use the Degasys system with solutions containing TFA at concentrations greater than 5%.

26516 CE 26517

Sidewinder LC Column Heater

- Easy to set up!
- Operation range: 5 °C above ambient to 85 °C, ±1 °C.
- Lightweight, compact design fits in small spaces.
- Column holder can be placed in any orientation.

This unique design completely encloses any LC analytical column up to 25 cm in length. Two lengths of heater jackets are available: the short column holder accommodates columns up to 10 cm in length, while the long column holder holds columns up to 25 cm in length. The control module provides optimum heating performance, accuracy to within 1 °C, and stability to within 0.1 °C. The new Sidewinder controller has fast 10 Hz sampling for improved responsiveness. The RS232 control allows external programming.

Description	Length	qty.	cat.#
Temperature Control Module and Column Holder	Long (25 cm)	ea.	26516
Temperature Control Module and Column Holder	Short (10 cm)	ea.	26517

26518 CE

Sidewinder LC Heater/Cooler Temperature Control Module and Column Holder

- Operation range: 5–55 °C, ±0.2 °C.
- Ability to program multiple temperature points.
- Accommodates columns up to 30 cm in length and 7.8 mm ID.
- Compact design.

The Sidewinder heater/cooler unit has a doubly insulated cover to maintain the programmed temperature to within 0.2 °C. The 24 V control unit provides maximum stability and rapid equilibration times. RS232 control allows external programming.

Description	qty.	cat.#
Sidewinder Heater/Cooler Temperature Control Module and Column Holder	ea.	26518

All Sidewinder temperature control products carry the globally recognized CE mark. Each unit meets the demanding electromagnetic emission standards of the new European Union Directives, United States standards, and Canadian standards.

Power requirements: All Sidewinder heater and heater/cooler units utilize a 24 VDC input to energize the system. This voltage is generated from a universal power supply included with each Sidewinder unit. Also included with each Sidewinder unit is a power cable (also known as a mains cable) for use in the U.S. The power cable supplies current from a wall or bench receptacle to the provided universal 24 VDC universal power supply.

FOR USE OUTSIDE THE U.S. If the Sidewinder unit is intended for use outside the U.S., an appropriate power cable must be purchased separately (not available from Restek).

Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.

CE 22130

CE 22129

Specifications	NitroFlow Lab	N2-04	N2-14	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min	36 L/min	N2-22: 44 L/min N2-22A: 29 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	None	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	75 lb (34 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS Includes: Oxygen analyzer and audible alarm (monitors oxygen in nitrogen stream and signals high or low concentrations)	N2-35A Model, 44 L/min max. flow	ea.	22134
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Maintenance Kit Includes: carbon filter	for NitroFlow Lab	kit	22156
6-Month Maintenance Kit* Includes: 1st stage prefilter, 2nd stage prefilter, and final filter (1 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	21648
6-Month Maintenance Kit With Carbon Filter* Includes: 1st stage prefilter, 2nd stage prefilter, hydrocarbon scrubber, and final filter (1 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	22135
Generator Maintenance Kit Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)	kit	21647

*The manufacturer recommends maintenance for this unit every 6 months.
International power cords are available. Contact Customer Service or your Restek® representative to order.

CE 20677

Need to clean up your nitrogen stream for LC-MS?

Check out our Restek® Super Clean® gas trapping system.

See **page 288**.

www.restek.com/gas

22061
22062

26400

26401

26402

26404

26403

26406

26407

Valves for HPLC

Our valves have low internal volumes and are rated to 15,000 psi (103,421 kPa). They feature a two-piece stem assembly in which the rotating upper shank is coupled through a ball joint to a static lower stem. Only finger-tight torque is required to make the seal.

Description	qty.	cat.#
Through Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26400
Angle Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26401
Bottom Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26402
Side Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26403
Dual-Stem Three-Way Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26404
Prime/Purge Valve for HPLC, 1/4-28 Flanged Seat, Stainless Steel, with Tubing and Fittings	ea.	26406
Prime/Purge Valve Repair Kit for Prime/Purge Valve (includes: soft seal (2), PTFE O-ring (2), 7/32 hex key)	kit	26407

25017

25020

25018

Backpressure Regulators

Backpressure regulators can improve detector performance by preventing bubble formation in the detector flow cell. They also are useful in post-column reaction lines and between detectors and fraction collectors in preparatory work. Regulators are superior to more specific alternative solutions, like small-bore tubing, in which pressure varies with flow rate.

Our end-of-line and flow-through backpressure regulators are adjustable to ensure constant backpressure over a wide range of mobile phase viscosities and flow rates. The end-of-line model is available with 1/4-28 plastic flange-type fittings or high-pressure 1/16" compression fittings; this design adjusts from 15 to 60 psi (103 to 414 kPa). The flow-through design has 1/16" compression fittings and is adjustable from 7 to 75 psi (48 to 517 kPa).

Description	qty.	cat.#
Backpressure Regulator: end-of-line, 1/16" OD tubing, flanged	ea.	25017
Backpressure Regulator: end-of-line, high-pressure seat	ea.	25018
Backpressure Regulator: flow-through, 5 µL internal volume	ea.	25020

also available

Dampeners.

See **page 342**.

Restek® Pack in a Box Kit

Restek's Pack in a Box kit is a complete column-packing system. Everything you need to pack your own analytical HPLC columns is included: pump, 20 mL reservoir, column hardware (150 x 4.6 mm, 316 stainless steel tubing with end-fittings, frits, nuts, and ferrules for two complete, empty columns), and system control software (computer not included). Detailed packing instructions and a DVD are also included. The packing pump is electric, so no pressurized air is required. AC input requirement: 85–265 VAC. 10,000 psi maximum pressure.

26408

Description	qty.	cat.#
Pack in a Box Kit	kit	26408

Bio-Safe Column System (PEEK)

- Completely biocompatible.
- 100% metal free.
- Stable to 8,000 psi.

Bio-Safe columns are biocompatible and precision-machined from virgin PEEK (polyetheretherketone), a strong, inert polymer material.

Product Specs
- 4.6 mm ID x 30 mm length column with end fittings.
- 2.0 µm frits.

Description	qty.	cat.#
Bio-Safe Column System, PEEK, 4.6 mm x 30 mm, 2.0 µm	ea.	26546

HPLC Column Tubing

Restek® tubing is manufactured from fine, chromatographic-grade 316 stainless steel. It is corrosion resistant, ultrasonically cleaned, and passivated. We polish the tubing and promise a burr-free cut. You can use this tubing immediately—there is no need for additional treatment.

Length	2.1 mm ID cat.#	3.2 mm ID cat.#	4.6 mm ID cat.#
1/4" OD Tubing			
30 mm	25100	25106	25112
50 mm	25101	25107	25113
100 mm	25102	25108	25114
150 mm	25103	25109	25115
200 mm	25104	25110	25116
250 mm	25105	25111	25117

Empty Chromatography Columns

- 316 stainless steel tubing complete with end-fittings, frits, nuts, and ferrules.
- Preassembled prior to shipment, unless otherwise requested.
- Internal 1/16" seats are compatible with Valco® and Parker fittings.

Length	2.1 mm ID cat.#	3.2 mm ID cat.#	4.6 mm ID cat.#
1/4" OD Tubing			
30 mm	25118	25124	25130
50 mm	25119	25125	25131
100 mm	25120	25126	25132
150 mm	25121	25127	25133
200 mm	25122	25128	25134
250 mm	25123	25129	25135

Column End-Fittings

- Fittings with distribution cone are intended for use on 3.0–4.6 mm ID HPLC columns.
- Fittings with flat bottom are intended for use on 1.0–3.0 mm ID HPLC columns.

These 1/4" compression end-fittings are compatible with 1/16" connecting tubing using Valco® and Parker fittings.

Description	qty.	cat.#
Column End-Fitting with Distribution Cone	ea.	25077
Column End-Fitting with Flat Bottom	ea.	25078

Packing particle size:	Use this pore size:
3–4 µm:	0.5 µm
5–20 µm:	2.0 µm

1/4" HPLC Frits

We manufacture our frits from fine, chromatographic-grade 316 stainless steel, and we offer sizes to fit most column and pore sizes. To choose the correct frit, check its pore size compatibility with the particle size of the packing in the column. If the packing has a smaller particle size than the pore size of the frit, the packing can clog the frit.

ID	Pore Size	qty.	cat.#
4.6 mm	2.0 µm	10-pk.	25071
4.6 mm	0.5 µm	10-pk.	25072
3.2 mm	2.0 µm	10-pk.	25073
3.2 mm	0.5 µm	10-pk.	25074
2.1 mm	2.0 µm	10-pk.	25075
2.1 mm	0.5 µm	10-pk.	25076

22292

Syringe for Hitachi LC Autosamplers

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292

22297

Syringes for PerkinElmer LC Autosamplers

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298

22294

Syringe for Waters WISP LC Autosamplers

PTFE-tipped plungers

Hamilton

Volume	Hamilton Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294

22746

Syringes for CTC LC Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748

*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

22737

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742

*Gas-tight syringe.

Guide to Needle Termination Codes

Hamilton:

(N) Cemented Needle

SGE:

(F) Fixed Needle

(R) Removable Needle

also available

More syringes!

See **page 394**.

Well Plates

- Polypropylene plates with round-bottom wells reduce liquid retention; conical bottom provides optimal recovery of reagents.
- Nunc® shared wall technology allows increased well volume for optimum storage capacity and improved mixing.
- Round well shape is ideal for applications that require vortexing.
- Ideal for sample collection, storage, sampling, and combinatorial chemistry and library applications.
- Fits most autosampler compartments.
- All microplates manufactured by Nunc® meet the recommendation of American National Standards Institute (ANSI) (ANSI/SBS 1-2004).

Description	Well Shape	Well Bottom	qty.	cat.#
0.45 mL 96-Well Plates	round	conical	20-pk.	26497
0.45 mL 96-Well Plates	round	conical	case of 120	26496
1.3 mL 96-Well Plates	round	round	5-pk.	26495
1.3 mL 96-Well Plates	round	round	case of 50	26494
2.0 mL 96-Well Plates	round	round	5-pk.	26493
2.0 mL 96-Well Plates	round	round	case of 60	26492

26496

26494

26492

Universal Sealing Mats

- Protect contents and prevent carryover with pre-slit cap mats.
- Chemically resistant, silicone mats are excellent for compound storage to -80 °C.
- Pre-slit mats pierceable by autosampler needle, pipette tip, or probe.
- Universal mat for sealing 0.45, 1.3, and 2.0 mL plates.

Description	qty.	cat.#
Universal Sealing Mat	10-pk.	26499
Universal Sealing Mat	case of 50	26498

26498

Thomson SINGLE StEP® Filter Vials

Sample filtration that's economical, eco-friendly, and fast!

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12x32 mm autosamplers, including UHPLC instruments.

See **page 410**.

www.restek.com/**singlestep**

Vials

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Filter Vials, Sampling Valves for Vials 370
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Septum Selection Guide

Materials	Compatibility	Incompatibility	Resealability	Max. Temp.
Red Rubber (synthetic)	acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	90 °C
PTFE/ Natural Rubber	PTFE: resistance until punctured Rubber: acetone, ACN, alcohols, diethylamine, DMF, DMSO, phenol	aromatics, carbon disulfide, chlorinated solvents, hydrocarbon solvents	very good	90 °C
PTFE/Silicone PTFE/Silicone/PTFE	PTFE: resistance until punctured Silicone: acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	205 °C
Polyethylene	Good resistance to solvents and weak acids or bases. Unreactive with most chemicals, but some solvents cause softening or swelling.	hydrocarbon solvents	one-time use	175 °C
Gray Chlorobutyl	acids or bases, water solutions, buffer solutions, oxygenated solvents, vegetable oils	aliphatic or aromatic hydrocarbons, halogenated solvents, mineral oils, strong acids	very good	100 °C

Abbreviations: ACN = acetonitrile, DMF = dimethylformamide, DMSO = dimethylsulfoxide, THF = tetrahydrofuran
NOTE: This chemical resistance chart is intended only as a guideline. It does not cover all compounds or all solvents. Tests were done at room temperature on pure, single solvents, and there is no data on solvent combinations. Always confirm the compatibility of your vial, closure, and chemical combination prior to sample preparations.

Instrument Reference Chart

Manufacturer	Instrument/Model #	11 mm Crimp-Top	9 mm Short Cap Screw-Thread	Headspace	8 mm Screw-Thread	10 mm Screw-Thread	4 mL WISP A8 Style	1 mL WISP 96 Style
A.I.M.	CPS-100, 200	x			x			
A.I.	42 Vial Tray	x						
A.I.	Headspace (HS: 10, 20 mL)			x				
Agilent	1042, 1050, 1080, 1082, 1084, 1090, 1100, 5890, 6850, 6890, 7670A, 7671A, 7672, 7673A/B, 7683, 7890, 8042	x	x					
Agilent	Headspace (HS: 6, 10, 20 mL, Flat)			x				
Alcott	738	x			x	x		
Alltech	570	x			x	x		
Alltech	580 (standard tray)	x						
Altex		x				x		
AMS	42	x						
Antek	736 Unisampler, 738	x						
ASC		x			x	x		
Beckman	501, 502, 507				x	x		
Bruker	LC 51						x	
Bruker/Varian	8100/8200	x	x		x	x		
Bruker/Varian	Marathon	x	x					
Bruker/Varian	8035, 8000 Series, 8055, 8085, 3800 GC				x			
Bruker/Varian	9100/9090/9095	x			x			
Bruker/Varian	Genesis (HS: 10, 20 mL Rounded)			x				
Bruker/Varian/Rainin	Dynamax AI-IA, AI-200, Dynamax AI-3	x						
Bruker/Varian/Rainin	Dynamax AI-3AI-IA, AI-2W				x			
Carlo Erba/Fisons	42 vial tray AS 800	x						
Carlo Erba/Fisons	AS 800		x					
Carlo Erba/Fisons	AS 800, 8000				x			
Carlo Erba	HS 500, HS 800 (HS: 6, 10, 20 mL, Flat)			x				
Carnegie	CMA-250/200	x						
Chrompack	CP 9000 GC Series	x						
Cueni	Headspace (HS: 10, 20 mL)			x				
CTC	CTC A105S	x						
CTC	Headspace (HS: 20 mL, Flat)			x				
Dani	ALS 39.80, 86.80	x	x		x			
Dani	HSS 39.50, HSS 86.50 (HS: 10, 20 mL)			x				
Dani	SPT 37.50 (HS: 20 mL)			x				
Delsi		x						
Dynatech	42 vial tray	x	x		x			
Dynatech	LC2000		x					
Fisons	42 vial tray, AS800	x						
GBC		x						
Gerstel		x						
Gilson	231 XL, 232 XL, 233 XL, Aspec XL	x	x		x			
Gilson	Asted XL	x			x			
Gynkotek	Gina, others	x			x			
Hitachi	AS-2000, AS-6000	x	x					
Hitachi	S6551				x			
Hitachi	L-7200				x		x	x
Hitachi	L-7250				x		x	
IBM		x			x			
ICI	other than LC 1600	x			x			
Infochroma		x			x			
Jasco	851-AS, AS-950	x			x			
Jasco	LC800 & 900 series				x			
Kipp		x			x			
Kontron	360	x			x			
Kontron	460				x			
LDC	Marathon, Promis	x	x		x			
LDC	other than 713	x			x			
L.E.A.P. Technologies	CTC A105S	x						
L.E.A.P. Technologies	CTC A200S	x	x		x	x		
L.E.A.P. Technologies	HS 500 (HS: 10, 20 mL Rounded)			x				
Magnus Scientific		x			x			
PerkinElmer	AI-1	x	x					
PerkinElmer	Autosystem GC (HS: 10, 20 mL, Rounded)	x		x	x			
PerkinElmer	F40, F45, HS 6, HS 40 (HS: 10, 20 mL, Rounded)			x				
PerkinElmer	Integral 4000 (HS: 10, 20 mL, Rounded)	x		x				
PerkinElmer	ISS 100, LC 600 42 vial tray	x	x					
PerkinElmer	ISS 200 (HS: 6 mL)	x	x	x				
PerkinElmer	420/B, 4900	x			x			
Pharmacia LKB	2157-010	x			x			
Phillips	4247, 4710	x			x			
Phillips	LC-XP	x			x		x	
Polymer-Labs	GPC 110/210	x						
Precision Sampling	GC111, GC 311, LC 241-60	x			x			
Pye	LCXP	x						
S.G.E.	M280D	x			x			
Sedere		x			x			
Shimadzu	AOC 20i	x				x		
Shimadzu	AOC-14/1400, AOC-17				x		x	
Shimadzu	AOC-8B/9, SIL-6A, SIL-6B, -9A, -8A				x			
Shimadzu	HSS-2B (HS: 27 mL)			x				
Shimadzu	SIL-2AS						x	
Shimadzu	SIL-10A, 10Ai, 10AxL	x	x		x	x		
Siemens	AS 32, AS 200	x						
Spark Holland	SPH 125	x	x					
Spark Holland	Marathon, Promis	x	x		x			
Spark Holland	Triathlon, Midas	x			x			
Spectra-Physics	8875, 8880	x	x		x			
Talbot		x			x			
Tekmar	7000, 7000/7050 (HS: 10, 20 mL, Rounded)			x				
Thermo Scientific	TRACE GC 2000, AS2000	x	x					
TOA	ICA5450				x			
Tosca 1		x						
TosoHaas	TSK-6080, AS-8010, AS-8020	x			x		x	
Tracor	770, 771, 772	x						
TSP	8875, 8880, AS 100/1000, AS 300/3000	x			x			
Unicam	4710	x						
Unicam	4700LC				x			
Unicam	4247	x			x			
Unicam	LC-XP	x			x		x	
United Technologies		x			x			
Waters	Alliance 2690	x	x		x	x		
Waters	710, 717+						x	x
Waters	48-pos. M700						x	
Waters	96-pos. M700							x

Vial Size Quick Reference Chart

All vials pictured are actual size with description, Restek catalog number, and page number for quick reference.

WISP Vials

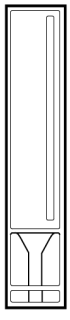
4.0 mL Screw-Thread Step Vial

24654, 24655
24656, 24657
Page 364

4.0 mL Clear Crimp-Top

24658, 24659
Page 364

700 µL Limited Volume



24680,
24681
Page 365

96 Style

24662, 24663,
24664, 24665,
24678, 24679
Page 365

Headspace Vials

10 mL Clear Flat Bottom

24683,
24684
Page 367

10 mL Clear Rounded Bottom

21164,
21165
Page 367

20 mL Clear Flat Bottom

24685,
24686
Page 367

20 mL Clear Rounded Bottom

21162,
21163
Page 367

Vial Size Quick Reference Chart

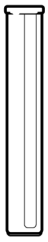
All vials pictured are actual size with description, Restek catalog number, and page number for quick reference.

Limited Volume Inserts

250 µL Big Mouth Insert

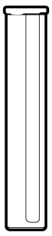
24516, 21779
Page 355

250 µL Glass Flat Bottom



24510
Page 355

350 µL Glass Flat Bottom Inserts

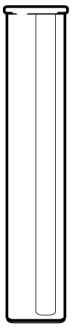


21780, 24517
Page 355

w/ID Ring

24692, 24693
Page 355

500 µL Glass WISP Flat Bottom



21787, 21788
Page 356

100 µL Glass or Polypropylene w/ Polypropylene Bottom Spring

24508, 21775
24512
Page 355

250 µL Glass or Polypropylene w/ Bottom Spring

21776, 21777, 24518
Page 355

8 mm Screw-Thread Vials

2.0 mL Clear or Amber w/ White Graduated Marking Spot

24619, 24620, 24621, 24622
Page 360

9 mm Short-Cap Vials

2.0 mL Clear or Amber w/ White Graduated Marking Spot

21154*, 21155*
*w/o white graduated marking spot
21140, 21141
21142, 21143
Page 359

10 mm Screw-Thread Vials

2.0 mL Big Mouth Step Clear or Amber

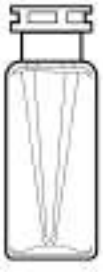
24626, 24627, 24628, 24629
Page 362

11 mm Crimp-Top Vials

Limited Volume 100 µL Glass Insert, Clear Plastic Vial

24653
Page 357

Limited Volume 100 µL Polypropylene



24651, 24652
Page 357

2.0 mL Snap Seal Style Clear or Amber Glass

21152, 21153, 24383, 24384, 24385, 24386
Page 357

We put quality and a personal commitment to you in all our products.

Microsampling Vials and Inserts

Microsampling vials and inserts are ideal for applications where sample volume is limited because they provide maximum sample extraction and minimal sample waste. One-piece interlock vials offer less handling of vial components and reduce the chance of sample loss due to spillage. Limited-volume inserts are designed to work in 2 mL vials.

Interlock Vials

Interlock limited volume vials offer the performance and convenience of a one-piece microvial for a fraction of the cost. A 300 µL insert is fused into a 12 x 32 mm clear or amber glass vial. This one-piece design reduces the potential for contamination.

Description	Type	Volume	Color	Material	100-pk.	500-pk.
Interlock Vial	9 mm Thread	300 µL	Clear	Glass	22433	22434
Interlock Vial	9 mm Thread	300 µL	Amber	Glass	22435	22436
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Clear	Glass	22437	22438
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Amber	Glass	22439	22440

21050 21051

Micro-Vials with Screw Threads

- Two sizes available.
- Tapered for high recovery of contents.
- Work with Mininert® sampling valves.

Description	Volume	Screw Thread Size	qty.	cat.#
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	1.0 mL	13 mm/425	12-pk.	21050
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	3.0 mL	20 mm/400	12-pk.	21051

also available

Mininert® sampling valves

See **page 370.**

Inserts for 2.0 mL, 11 mm Crimp-Top & 2.0 mL, 9 mm Short-Cap, Screw-Thread Vials
(Vials shown on pages 357–359.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	50 µL	Glass	24513	21782
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Big Mouth Insert w/Glass Flange (Step Design)*	250 µL	Glass	24516	21779
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Bottom Spring	250 µL	Polypropylene	24518	—
Big Mouth Insert w/Bottom Spring & Graduated Markings	250 µL	Polypropylene	24518A	—
Big Mouth Insert, Top Flange	250 µL	Polypropylene	24519	—
Big Mouth Insert, No Spring	250 µL	Polypropylene	24520	—

*Big Mouth insert w/glass flange (step design) not to be used with 9 mm screw-thread vials.

also available
Crimpers & Decappers
See **page 371.**

Inserts for 2.0 mL, 8 mm Screw-Thread Vials
(Vials shown on page 360.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert w/Polypropylene Bottom Spring	100 µL	Glass	24508	21775
Insert, Flat Bottom	250 µL	Glass	—	24510
Insert, Flat Bottom w/ID Ring	250 µL	Glass	—	24691
Insert, No Spring	100 µL	Polypropylene	24511	—
Insert w/Bottom Spring	100 µL	Polypropylene	24512	—

Inserts for 2.0 mL, 10 mm Big Mouth Step Design Screw-Thread Vials
(Vials shown on page 362.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Glass Flange (Step Design)*	250 µL	Glass	24516	21779

Polypropylene inserts available on request (1,000-packs only).
*Big Mouth insert w/glass flange (Step design) not to be used with 9 mm screw-thread vials.

Sky®
Inlet Liners

100%
Satisfaction
Guaranteed

Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

Inserts for 4.0 mL WISP 48 Screw-Thread Step Vials
(Vials shown on page 364.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert for WISP 48 Vials, Flat Bottom**	500 µL	Glass	21787	21788

Polypropylene inserts available on request (1,000-packs only).
**Also fit 4.0 mL Snap Seal vials. See page 364.

Limited Volume Inserts for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm
(Vials shown on page 365.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777

free literature

How to Choose the Right Vial for Chromatography Applications

Download your free copy from
www.restek.com

lit. cat.#
GNAR2018-UNV

Inserts for Versa Vials™
(Vials shown on page 368.)

Description	Volume	Material	100-pk.	1,000-pk.
Versa Vial Insert w/Glass Flange	250 µL	Glass	22707	—
Versa Vial Insert w/Flange	250 µL	Polypropylene	22709	22710
Versa Vial Insert, Flat Bottom	250 µL	Glass	22711	22712

2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

Choose with or without graduated marking spots.

24383

24385

21152

also available
Crimpers & Decappers
See **page 371.**

2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

Description	Color	Material	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	Clear	Glass	24383	24384
Vial w/Blue Graduated Marking Spot	Clear	Glass	—	24384B
Vial w/Green Graduated Marking Spot	Clear	Glass	—	24384G
Vial w/Rust Graduated Marking Spot	Clear	Glass	—	24384R
Vial w/Yellow Graduated Marking Spot	Clear	Glass	—	24384Y
Vial w/White Graduated Marking Spot	Amber	Glass	24385	24386
Vial without Graduated Marking Spot	Clear	Glass	21152	21153

24651

24653

2.0 mL Crimp-Top Vial With 100 µL Insert

- Plastic vial.
- Choice of glass or polypropylene fused insert.

Description		100-pk.	1,000-pk.
Clear Plastic Vial	w/100 µL Polypropylene Insert	24651	24652
Clear Plastic Vial	w/100 µL Glass Insert	24653	—

21174 24351 24353 24355 24357
24359 24361 24363 24365 24367 24369

21724

2.0 mL, 11 mm Aluminum Crimp Seals With Septa

Seal Color	Septa Material	100-pk.	500-pk.	1,000-pk.
Silver	PTFE/Natural Rubber	21174	—	21175
Blue	PTFE/Red Rubber	24351	—	24352
Green	PTFE/Red Rubber	24353	—	24354
Red	PTFE/Red Rubber	24355	—	24356
Yellow	PTFE/Red Rubber	24357	—	24358
Mixed	PTFE/Rubber	—	21724	—
Silver	PTFE/Silicone	24359	—	24360
Blue	PTFE/Silicone	24361	—	24362
Green	PTFE/Silicone	24363	—	24364
Red	PTFE/Silicone	24365	—	24366
Yellow	PTFE/Silicone	24367	—	24368
Mixed	PTFE/Silicone	—	21725	—
Silver	PTFE/Silicone/PTFE	24369	—	24370
Silver	PTFE/Silicone w/Slit	26562	—	26563

26562

NEW!

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

also available

Limited Volume Inserts
for 2.0 mL, 11 mm Crimp-Top Vials

See **page 355.**

2.0 mL, 11 mm Poly Crimp Seal Caps: Snap-On or Crimp

The Poly Crimp seal is versatile, working as either a snap-on or crimp-top cap. Simply use a standard crimping tool to secure the Poly Crimp seal onto any crimp-top vial. It's that easy!

Seal Color	Septa Material	100-pk.	400-pk.	1,000-pk.
Clear	PTFE/Butyl Rubber	24433	—	24434
Clear	PTFE/Silicone	24443	—	24444
Blue	PTFE/Silicone	24445	—	24446
Clear	PTFE/Silicone/PTFE	24453	—	24454
Blue	PTFE/Silicone/PTFE	24455	—	24456
Mixed	PTFE/Silicone/PTFE	—	21728	—
Clear	PTFE/Silicone w/Slit	26564	—	26565
Clear	PTFE/Silicone/PTFE w/Starburst	26566	—	26567
Clear	PTFE/Silicone w/Starburst	26568	—	26569
Blue	PTFE/Silicone w/Starburst	26570	—	26571

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

NEW!

2.0 mL, 11 mm GC Snap Ring Cap With Septum

- Snaps on any crimp-style vial.
- Save money! Use this snap cap when you don't need to crimp.

Description	Septa Material	100-pk.	1,000-pk.
Polypropylene Snap Ring Cap w/Liner	PTFE, 10 mil	21729	21730
Polypropylene Snap Ring Cap w/Septum	PTFE/Butyl Rubber	21731	21732
Polypropylene Snap Ring Cap w/Septum	PTFE/Silicone	21733	21734

Restek Recommends!

24673

2.0 mL Crimp Vial Convenience Kits (Vials, Caps, & Septa)

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24671	24672
Amber 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24673	24674
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21196	21197
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21198	21199
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24646	24647
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24648	24649

2.0 mL Sample Vial Racks

- Racks feature alphanumeric indexing for easier vial identification.
- Racks can be stacked for efficient storage.
- Fits most 2.0 mL, 12 x 32 mm vials (vials sold separately).

22856

Description	Capacity	qty.	cat.#	qty.	cat.#
Polypropylene Storage Rack for 12 x 32 mm Vials	50 vials, 5 x 10	ea.	22856	5-pk.	22857

2.0 mL, 9 mm Short-Cap, Screw-Thread Vials, 12 x 32 mm

Fit all 2.0 mL, 12 x 32 mm, crimp-top vial-based autosamplers.

Ideal for Agilent 7673, 7683, and 7693 autosamplers.

also available

Limited Volume Inserts
for 2.0 mL, 9 mm Short-Cap Screw-Thread Vials

See **page 355.**

2.0 mL, 9 mm Short-Cap, Screw-Thread Vials (vial only)

Description	Color	100-pk.	1,000-pk.
Short-Cap Vial w/White Graduated Marking Spot	Clear	21140	21141
Short-Cap Vial w/White Graduated Marking Spot	Amber	21142	21143
Short-Cap Vial without Graduated Marking Spot	Clear	21154	21155

2.0 mL, 9 mm Short-Cap, Screw-Vial Closures (Polypropylene, preassembled)

Cap Color	Septa Material	100-pk.	500-pk.	1,000-pk.
Blue	PTFE/Butyl Rubber	24473	—	24474
Mixed	PTFE/Butyl Rubber	—	24668	—
Blue	PTFE/Silicone	24485	—	24486
Green	PTFE/Silicone	24487	—	24488
Yellow	PTFE/Silicone	24493	—	24494
Mixed	PTFE/Silicone	—	24669	—
Blue	PTFE/Silicone/PTFE	24497	—	24498
Black	PTFE/Silicone/PTFE	24495	—	24496
Natural	PTFE/Silicone/PTFE	24501	—	24502
Red	PTFE/Silicone/PTFE	24503	—	24504
Green	PTFE/Silicone/PTFE	24499	—	24500
Yellow	PTFE/Silicone/PTFE	24505	—	24506
Mixed	PTFE/Silicone/PTFE	—	24670	—
Black	PTFE/Silicone w/Slit	26572	—	26573
Green	PTFE/Silicone w/Slit	26574	—	26575
Red	PTFE/Silicone w/Slit	26576	—	26577
Blue	PTFE/Silicone w/Slit	26578	—	26579
Yellow	PTFE/Silicone w/Slit	26580	—	26581

NEW!

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

2.0 mL Screw-Thread Vial Convenience Kits (Vials, Caps, & Septa)

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk. cat.#	1,000-pk. cat.#
Clear Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Butyl Rubber Liner	26590	26591
Clear Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Silicone Liner	26592	26593
Amber Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Butyl Rubber Liner	26594	26595
Amber Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Silicone Liner	26596	26597

NEW!

Restek Recommends!

26592

2.0 mL Screw-Thread Vials, 12 x 32 mm, 8 mm/425 Thread

- Fit all 2.0 mL, 12 x 32 mm, screw-thread 8 mm/425 vial-based autosamplers.

24619

24621

2.0 mL, 8 mm Screw-Thread Vials (vial only)

These vials provide the most secure environment for your sample because evaporation is minimized.

Description	Volume	Color	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	2.0 mL	Clear	24619	24620
Vial w/White Graduated Marking Spot	2.0 mL	Amber	24621	24622

All vials undeactivated unless otherwise noted.

24623

24625

2.0 mL, 8 mm Screw-Thread Vials with 100 µL Insert

- Plastic vials.
- Choice of glass or fused polypropylene insert.

Description	Color	100-pk.	1,000-pk.
Plastic Vial w/100 µL Polypropylene Insert	Clear	24623	24624
Plastic Vial w/100 µL Glass Insert	Clear*	24625	—

*Amber plastic vial with clear glass insert available on request. (1,000-packs only)

also available
Limited Volume Inserts
for 2.0 mL, 8 mm Screw-Thread Vials
See **page 355.**

21149

21721

26582

26584

2.0 mL, 8 mm Caps and Septa (preassembled)

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

Cap Color	Septa Material	100-pk.	1,000-pk.
Black	Red PTFE/Silicone, 0.065"	21149	21720
Black Top Hat	PTFE/Silicone	21721	21722
NEW! Black	Red PTFE/Silicone, 0.060" w/Slit	26582	26583
Black Flangeless	Red PTFE/Silicone, 0.060" w/Slit	26584	26585

21176

21179

21147

Caps and Septa for 2.0 mL, 8 mm Screw-Thread Vials

Description	Septa Material	100-pk.	1,000-pk.
Black Polypropylene, Open-Hole Caps		21176	21177
Septa, 8 mm x 0.060"	Red PTFE/Silicone	21178	21179
Septa, 8 mm x 0.065"	Red PTFE/White Silicone	21795	21147

also available
Mininert® sampling valves
See **page 370.**

2.0 mL Autosampler Vial Convenience Kits

- Vials packaged in a clear-lid tray. Preassembled caps with septa packaged separately in a plastic bag.
- Black polypropylene open-hole caps and 8 mm red PTFE/silicone septa, 0.065".

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Silcote Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24638	24639
Amber 2.0 mL Vial, Silcote Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24640	24641
Clear 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21192	21193
Amber 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21194	21195

Restek Recommends!

24638

2.0 mL Preassembled Vial Kits

8 mm/425 Screw-Thread, Unmarked Vials, Septa, and Caps

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24630	24631
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24632	24633
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24634	24635
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24636	24637

*Best fit for Shimadzu.

**Best fit for Varian.

24630

24632

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FIND A LOCAL DISTRIBUTOR www.restek.com/**distributor**

2.0 mL Big Mouth Step Design Screw-Thread Vials, 12 x 32 mm, 10 mm/425 Thread

- 40% larger opening than other vials.
- Step profile automatically centers glass flange limited volume inserts.
- Preassembled caps with septa, with or without vials.
- Designed for Waters Alliance® autosamplers.

The Big Mouth Step vial system has a larger ID than conventional vials and incorporates a neck finish that is uniquely designed to allow the insert to be precisely aligned in the center of the vial. This precise alignment provides maximum sample withdrawal and eliminates any chance of missed injections.

also available

Limited Volume Inserts
for 2.0 mL, 10 mm Big Mouth Step Design Screw-Thread Vials

See **page 355.**

24626

24628

2.0 mL Big Mouth Step Screw-Thread Vials (vial only)

Description	Volume	Color	100-pk.	1,000-pk.
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Clear	24626	24627
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Amber	24628	24629

21723

24677

26586

Caps and Septa for 2.0 mL Big Mouth Step Vials (preassembled)

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

NEW!

Description	Septa Material	100-pk.	1,000-pk.
Caps and Septa, Preassembled	PTFE/Silicone/PTFE, 0.040"	—	21723
Caps and Septa, Preassembled	Red PTFE/White Silicone, 0.060"	—	24677
Vial Caps & Septa	Red PTFE/Silicone, 0.060" w/Slit	26586	26587

21148

Septa for 2.0 mL Big Mouth Step Vials

Description	Septa Material	qty.	cat.#
Septa Only	Red PTFE/White Silicone, 0.060"	1,000-pk.	21148

24675

24644

2.0 mL Big Mouth Step Vial Kits w/Black Caps (preassembled)

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, PTFE/Silicone/Red PTFE Septa, 0.040"	24675	24676
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24642	24643
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24644	24645

Certified Autosampler Vial Kits

Certified 2.0 mL Screw-Thread Vials

- Certificates enclosed with each kit.
- Vials of clear or amber borosilicate glass with ID marking spots.
- Closures with pre-inserted septa.
- Each kit sealed for integrity.

Certification Parameters Include:

Vial Dimensions: Height, diameter, bottom thickness, neck length, thread profile, and annealing

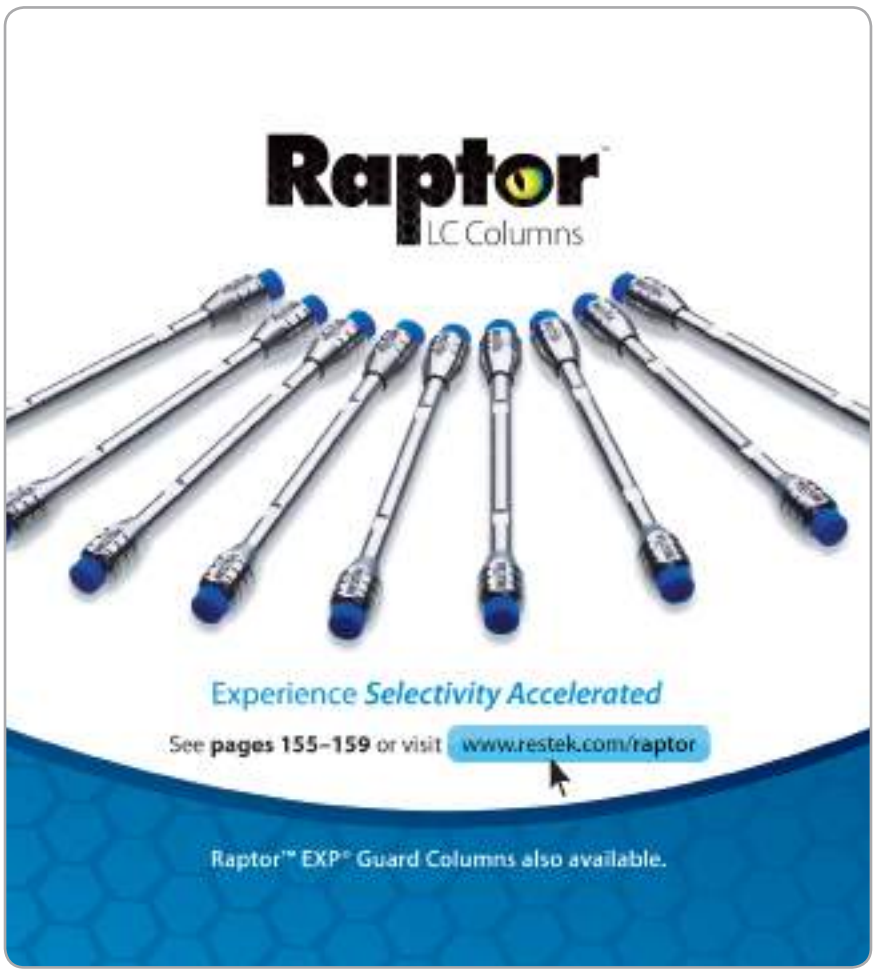
Cap/Septum: Diameter, height, thread integrity, center flash, septa insertion, sealing/resealing test, residue by headspace GC, and extractables

Chemical Test: LC Test: nonvolatile residue
GC Test: volatile residue

22788

22792

Description	100-pk.
Assembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22789
Assembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22788
Unassembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22792
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22790
Unassembled Clear 2.0 mL High-Recovery Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22793
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22791



4.0 mL WISP 48 Crimp-Top 13 mm Vials, 15 x 45 mm, Snap Seal

4.0 mL WISP 48 Snap Seal Crimp-Top Vial (vial only)

Description	Volume	Color	100-pk.	1,000-pk.
WISP 48 Snap Seal Vial w/White Graduated Marking Spot	4.0 mL	Clear	24658	24659

also available
Limited Volume Inserts
for 4.0 mL WISP 48 Screw-Thread Step Vials
See **page 356.**

Aluminum Seals w/Septa for 4.0 mL WISP Crimp-Top Vials

Seal Color	Septa Material	100-pk.	1,000-pk.
Silver	PTFE/Butyl Rubber	21753	21754
Silver	PTFE/Silicone	21755	

4.0 mL WISP 48 Screw-Thread Step Vials, 15 x 45 mm, 13/425

4.0 mL WISP 48 Screw-Thread Step Vials (vials only)

Description	Volume	Material	100-pk.	1,000-pk.
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Clear	24654	24655
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Amber	24656	24657

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

NEW!

4.0 mL WISP 48 Caps and Septa

Description	Septa Material	100-pk.	1,000-pk.
WISP 48 Caps and Septa, Top Hat	PTFE/Silicone	21745	21746
WISP 48 Caps and Septa, Preassembled	Red PTFE/Silicone, 0.065"	21743	21744
Vial Caps & Septa, Black Polypropylene, Open-Hole	Red PTFE/Silicone, 0.060" w/Slit	26588	26589
WISP 48 Caps, Black Polypropylene, Open-Hole		21741	21742
Septa	Red PTFE/Silicone/PTFE, 0.040"	21751	21752
Septa	Red PTFE/Silicone, 0.060"	21749	21750

1.0 mL WISP 96 Style Shell Vials, 8 x 40 mm

Available in three styles.

also available

Limited Volume Inserts
for 1.0 mL WISP 96 Style Shell Vials

See **page 356.**

1.0 mL WISP 96 Style, 8 x 40 mm Shell Vials

Description	Volume	Color	Material	200-pk.	1,000-pk.
WISP 96 Style Vial	1.0 mL	Clear	Glass	24662	24663
WISP 96 Style Vial	1.0 mL	Amber	Glass	24664	24665
WISP 96 Style Vial	1.0 mL	Clear	Polypropylene	24678	24679
WISP 96 Style Vial	700 µL Limited Volume	Clear	Polypropylene	24680	24681

8mm Starburst Plugs sold separately.

8 mm Starburst Plugs for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm

Description	Color	Material	200-pk.	1,000-pk.
Starburst Snap Plugs for Shell Vials	Clear	Polyethylene	21769	21770
Starburst Snap Plugs for Shell Vials, Conical	Clear	Polyethylene	21771	21772
Starburst Snap Plugs for Shell Vials, Silicone-Lined	Clear	Polyethylene	21773	21774

Headspace Vials

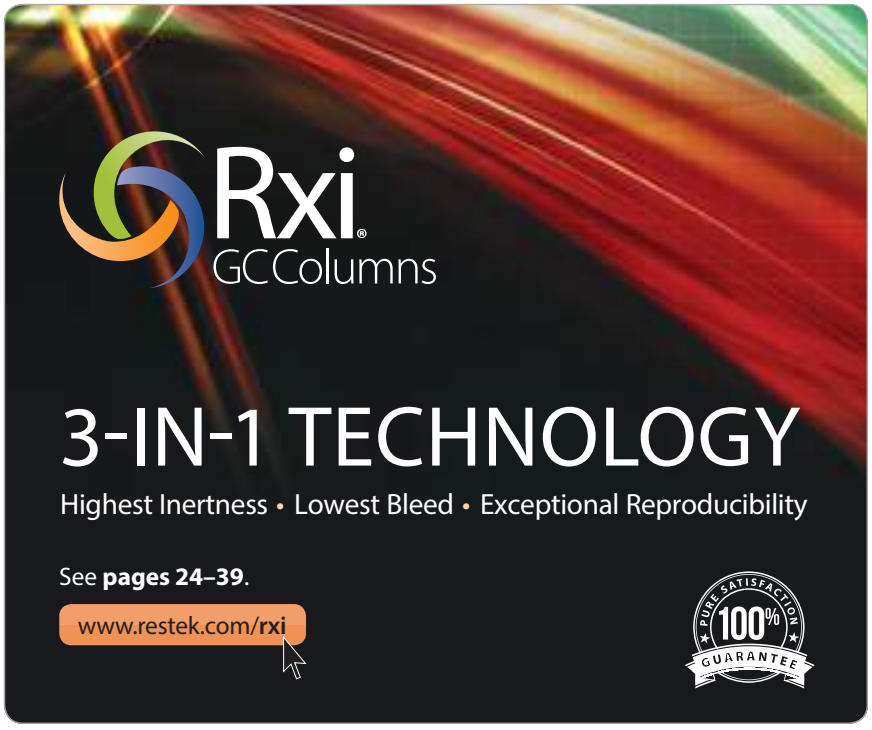
Headspace Screw-Thread Vials (18 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	10 mL	Clear	22 x 45 mm	23084	23085
Headspace Vial	10 mL	Amber	22 x 45 mm	23088	23089
Headspace Vial	20 mL	Clear	22 x 75 mm	23082	23083
Headspace Vial	20 mL	Amber	22 x 75 mm	23086	23087

Caps not included (sold separately).

Magnetic Screw-Thread Caps (18 mm)

Description	Septa Material	100-pk.	1,000-pk.
Magnetic Caps and Septa for SPME	Blue PTFE/Silicone, 1.5 mm thick	23090	23091
Magnetic Caps and Septa	Red PTFE/Silicone, 1.9 mm thick	23092	23093
Magnetic Caps and Septa	PTFE/Red Chlorobutyl	23094	23095



Headspace Crimp Vials (20 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	6 mL	Clear	22 x 38 mm	21166	21167
Headspace Vial, Flat Bottom	10 mL	Clear	23 x 46 mm	24683	24684
Headspace Vial, Rounded Bottom	10 mL	Clear	23 x 46 mm	21164	21165
Headspace Vial, Flat Bottom	20 mL	Clear	23 x 75 mm	24685	24686
Headspace Vial, Rounded Bottom	20 mL	Clear	23 x 75 mm	21162	21163
Headspace Vial	27 mL	Clear	30 x 60 mm	21160	21161

Vial-to-instrument compatibility is designated in instrument reference chart. See page 351.

Aluminum Seals w/Septa (20 mm, preassembled)

Description	Cap Color	Septa Material	100-pk.	1,000-pk.
Seals w/Septa	Silver	PTFE/Gray Butyl Rubber	21761	21762
Seals w/Septa	Silver	PTFE/Silicone	21763	21764
Pressure Release Seals w/Septa*	Silver	PTFE/Gray Butyl Rubber	21765	21766
Pressure Release Seals w/Septa*	Silver	PTFE/Silicone	21767	21768

*Pressure release point: 3.0 bar ± 0.5 bar

Magnetic Seals w/Septa (20 mm, preassembled)

Description	Cap Color	Septa Material	100-pk.	1,000-pk.
Magnetic Seals w/Septa, with 5 mm Hole	Gold	PTFE/Silicone	22833	22834
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Silicone	22831	22832
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Butyl	22835	22836
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Red/Silver	PTFE/Silicone	22441	22442
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Blue/Silver	PTFE/Silicone	22443	22444

5 mm hole is compatible with the following systems: Carlo Erba HS500/HS800, CTC 500, Fisons HS500/HS800, and Bruker/Varian/Chrompack 9020/25. 8 mm hole is compatible with the Combi Pal. BiMetal magnetic seals are easier to crimp and decap than standard 20 mm magnetic seals.

2.0 mL Versa Vials™, Glass, 12 x 32 mm

- Elongated neck allows for consistent, reliable autosampler pick up.
- 9 mm opening is ideal for sampling and pipette use.

Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	2.0 mL	Clear	Glass	22701	22702
Versa Vial	2.0 mL	Amber	Glass	22697	—
Versa Vial w/Marking Spot	2.0 mL	Clear	Glass	22703	22704
Versa Vial w/Marking Spot	2.0 mL	Amber	Glass	22699	22700

also available
Versa Vial™ Inserts
See **page 356.**

1.5 mL Versa Vials™, Polypropylene, 12 x 32 mm

Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	1.5 mL	Clear	Polypropylene	22705	22706

Versa Vial™ Plugs (12 mm)

Description	Color	Plug Material	100-pk.	1,000-pk.
Versa Vial Plug	Green	Polyethylene	22713	22714
Versa Vial Plug	Grey	Chlorobutyl/Siliconized	22715	22716
Versa Vial Plug	White	PTFE/Silicone	22717	22718
Versa Vial Plug	White	PTFE/Silicone Plug w/Slit*	22719	22720

*Eliminates needle damage to plug.

Precleaned Volatile Organic Analyte (VOA) Sampling Vials

- Container, liner, and closure cleaned, assembled, and lot traceable.
- Open-top caps.
- PTFE faced 0.125" silicone septa.
- Cleaned to U.S. EPA Protocol B specifications.

24694

Description	Volume	Color	Material	Screw-Thread Size	qty.	cat.#
Precleaned VOA Vials	20 mL	Clear	Glass	24 mm/400	72-pk.	21798
Precleaned VOA Vials	20 mL	Amber	Glass	24 mm/400	72-pk.	21799
Precleaned VOA Vials	40 mL	Clear	Glass	24 mm/400	72-pk.	21796
Precleaned VOA Vials	40 mL	Amber	Glass	24 mm/400	72-pk.	21797
Collection Vials for ASE 200	60 mL	Clear	Glass	24 mm/400	72-pk.	26121
Collection Vials for ASE 200	60 mL	Amber	Glass	24 mm/400	72-pk.	26122
Replacement Septa, 24 mm x 0.125"			PTFE-lined silicone		100-pk.	24694

21798 26122

Restek® Certified
Reference Materials

Crack open the best organic reference standards in the industry by choosing:

- *ISO Quality*
- *Custom Flexibility*
- *Easy-to-Find Documentation*

See **pages 464-465**.

www.restek.com/**crm**

Filter Vials, Sampling Valves for Vials

Simply squeeze particulates and contaminants out of your sample!

Thomson SINGLE StEP® Filter Vials

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12 x 32 mm autosamplers, including UHPLC instruments.

25891 25892 25897 25898

25893 25894 25895 25896

Porosity	Color	qty.	cat.#
Nylon			
0.2 µm	black cap	100-pk.	25891
0.45 µm	pink cap	100-pk.	25892
PES (polyethersulfone)			
0.2 µm	grey cap	100-pk.	25897
0.45 µm	orange cap	100-pk.	25898
PTFE (polytetrafluoroethylene)			
0.2 µm	green cap	100-pk.	25893
0.45 µm	blue cap	100-pk.	25894
PVDF (polyvinyldifluoride)			
0.2 µm	red cap	100-pk.	25895
0.45 µm	yellow cap	100-pk.	25896

Patent No. 7,790,117

See **pages 410–411** for a compatibility chart.

24900 24901 24902 24903 24904

24905

24907

Mininert® Precision Sampling Valves for Vials

Mininert® valves are very convenient for repetitive sampling and limit content exposure to the silicon septum. Models are available for screw-cap and crimp-top vials. The crimp-top valve for 20 mm ID glassware slides into the neck of the vial. Turn the threaded flange to secure a tight fit.

Description	Type	Thread Size	qty.	cat.#
Mininert Precision Sampling Valves	Screw-Thread	13 mm/425	12-pk.	24900
Mininert Precision Sampling Valves	Screw-Thread	15 mm/425	12-pk.	24901
Mininert Precision Sampling Valves	Screw-Thread	18 mm/400	12-pk.	24902
Mininert Precision Sampling Valves	Screw-Thread	20 mm/400	12-pk.	24903
Mininert Precision Sampling Valves	Screw-Thread	24 mm/400	12-pk.	24904
Mininert Precision Sampling Valves	Crimp-Top	—	12-pk.	24905
Replacement Septa			50-pk.	24906
Septum Insertion Tool			ea.	24907

Electronic Rechargeable Crimpers and Decappers

- Easy to use; comfortable grip.
- Hundreds of operations from one charge.
- Adjustable crimping force.
- Large battery allows for faster charge cycle.
- All kits include a universal plug set for the battery charger.
- For 11 mm and 20 mm caps.
- One-year warranty.

These electronic crimpers and decappers have a rechargeable 6.4-volt battery installed. The large battery allows for quick, powerful operation and a faster charge cycle, minimizing downtime. Charging the battery takes thirty minutes to two hours. The universal plug set includes U.S., European, UK, and Australian plug clips.

Description	Size	qty.	cat.#
Electronic Crimper	11 mm	kit	22358
Electronic Crimper	20 mm	kit	22359
Electronic Decapper	11 mm	kit	22360
Electronic Decapper	20 mm	kit	22361
Replacement Battery for Electronic Crimpers and Decappers		ea.	22362

Universal plug set for battery charger included in all kits.

Easy Grip Manual Crimpers and Decappers

Our Easy Grip crimpers and decappers feature tough, light, plastic bodies with curved handles that improve hand comfort during use. The bottom-pull handle allows for a steadier hold than top-push handles. An easily viewed adjustment knob is located at the head of the product. The clearly shown + and – symbols, along with directional arrows, simplify adjusting the intensity of the crimp/decap as needed. The knob is also designed to indicate when the crimp setting has been reached, when it fully contacts the body of the product.

Description	Size	qty.	cat.#
Crimper	11 mm	ea.	23396
Crimper	20 mm	ea.	23398
Decapper	11 mm	ea.	23397
Decapper	20 mm	ea.	23399

Safer than removing caps with pliers, knives, or screwdriver blades!

Syringes

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- For Bruker/Varian 378
- For CTC 379–380
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did you know?

Syringes and needles manufactured by Hamilton Company and SGE are intended for scientific research and laboratory use only and are not intended for human *in vivo* use.

Syringe Basics

Needle Gauge Chart

Gauge	Nominal OD		Nominal ID	
26s	0.019 in	0.47 mm	0.0050 in	0.13 mm
26	0.018 in	0.46 mm	0.0102 in	0.26 mm
25	0.021 in	0.51 mm	0.0102 in	0.26 mm
23s	0.025 in	0.64 mm	0.0060 in	0.15 mm
23	0.025 in	0.64 mm	0.0132 in	0.34 mm
22s	0.028 in	0.72 mm	0.0060 in	0.15 mm
22	0.028 in	0.72 mm	0.0162 in	0.41 mm

s (after gauge) = smaller ID with thicker walls

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Needle Point Style

Restek offers several different point styles on syringe and needle products. Choose one based on your application.

Point Style 2, BV: beveled needle tip. Recommended for optimum septum penetration and reduction of septum coring.

Point Style 3, LC: square/blunt needle tip. For use with HPLC injection valves and for sample pipetting.

Point Style 5, S/Hole, Bevel: conical needle with side hole. Liquid samples are filled and dispensed through the side hole.

Point Style H, Dome: domed needle tip with side hole. Liquid samples are filled and dispensed through the side hole. The solid tip minimizes septum damage.

Point Style Agilent, Cone, AS: special conical style needle point used exclusively on syringes for autosamplers.

Syringe Termination Types

From cemented to removable needles, and from PTFE luer lock to special syringe fittings, syringe barrel terminations create the interface between a syringe and its mating connection. For your reference, we describe the most common Hamilton/SGE terminations below.

N, Cemented Needle / F, Fixed:
Needle cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Not autoclavable.

KH, Knurled Hub / R, Removable:
Used on 7000 series Hamilton syringes, exclusively. Knurled hub enables 6,000 psig maximum injection pressures and the attachment of a spacer for repeatable-depth injections. Autoclavable when disassembled.

RN, Removable Needle / R, Removable:
Needle seats precisely to the zero graduation mark of the syringe. Allows the use of different specification needles on the same syringe barrel. Autoclavable when disassembled.

TLL, PTFE Luer Lock / LL, Luer Lock / LT, Luer Tip:
Male luer taper with nickel-plated brass hub accepts and locks into place luer hub needles and connectors. Autoclavable when disassembled.

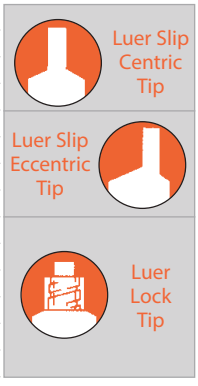
NORM-JECT® Plastic Syringes

NORM-JECT® syringes are latex-free, contain no rubber, no silicone oil, styrene or DEHP, and are DNA-free. These syringes are the choice for any situation needing an inert, nonreactive syringe. Because of their composition, they are ideal for chromatography and many other laboratory procedures. They are more chemically resistant than rubber-tipped syringes and are manufactured from only laboratory grade polypropylene and polyethylene. These unique plastic syringes have a positive safety stop to prevent accidental spills. NORM-JECT® syringes are individually sterile strip packed.

Not recommended for human use.

Description	qty.	cat.#
1 mL Luer Slip Tuberculin[1]	100-pk.	22766
3 mL Luer Slip Centric Tip	100-pk.	22767
5 mL Luer Slip Centric Tip[2]	100-pk.	22768
10 mL Luer Slip Eccentric Tip[2]	100-pk.	22769
20 mL Luer Slip Eccentric Tip[2]	100-pk.	22770
30 mL Luer Slip Eccentric Tip	50-pk.	22771
50 mL Luer Slip Eccentric Tip[2]	30-pk.	22772
3 mL Luer Lock Tip	100-pk.	22773
5 mL Luer Lock Tip[2]	100-pk.	22774
10 mL Luer Lock Tip[2]	100-pk.	22775
20 mL Luer Lock Tip[2]	100-pk.	22776
30 mL Luer Lock Tip	50-pk.	22777
50 mL Luer Lock Tip[2]	30-pk.	22778

[1]Dose saver design with low dead space plug on the piston to minimize waste.
[2]The 5 mL has graduations to 6 mL, 10 mL has graduations to 12 mL, 20 mL has graduations to 24 mL, and 50 mL has graduations to 60 mL.



Great for use with Restek syringe filters!
See page 408.

20167

24785

Standard Microliter Syringes

for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
0.5 µL	ASRN	23s	1.71"	Agilent	7000.5	86276	ea.	24895
0.5 µL	ASRN	26s	1.71"	Agilent	7000.5	86274	ea.	21221
5 µL	ASRN	23s	1.71"	Agilent	75	87957	ea.	20172
5 µL	ASN	23s	1.71"	Agilent	75	87987	ea.	20168
5 µL	ASN	23s	1.71"	Agilent	75	87990	6-pk.	20170
5 µL	ASN	26s	1.71"	Agilent	75	87988	ea.	24592
5 µL	ASN	26s	1.71"	Agilent	75	87989	6-pk.	21230
5 µL	ASRN	23s–26s	1.71"	Agilent	75	87959	ea.	21223
5 µL	ASN	23s–26s	1.71"	Agilent	75	87993	ea.	24593
5 µL	ASN	23s–26s	1.71"	Agilent	75	87994	6-pk.	24594
10 µL	ASRN	23s	1.71"	Agilent	701	80357	ea.	20171
10 µL	ASN	23s	1.71"	Agilent	701	80387	ea.	20167
10 µL	ASN	23s	1.71"	Agilent	701	80390	6-pk.	20169
10 µL	ASRN	26s	1.71"	Agilent	701	80358	ea.	24597
10 µL	ASN	26s	1.71"	Agilent	701	80388	ea.	24595
10 µL	ASN	26s	1.71"	Agilent	701	80389	6-pk.	24599
10 µL	ASRN	23s–26s	1.71"	Agilent	701	80359	ea.	24598
10 µL	ASN	23s–26s	1.71"	Agilent	701	80393	ea.	24596
10 µL	ASN	23s–26s	1.71"	Agilent	701	80391	6-pk.	24600

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-HP-0.63	000410	ea.	24791
0.5 µL	R	26	42 mm	Cone	0.5BR-HP-0.47	000400	ea.	24790
5 µL	F	23	42 mm	Cone	5F-HP-0.63	001810	ea.	24781
5 µL	F	23	42 mm	Cone	SK-5F-HP-0.63	001814	6-pk.	24783
5 µL	F	26	42 mm	Cone	5F-HP-0.47	001800	ea.	24780
5 µL	F	26	42 mm	Cone	SK-5F-HP-0.47	001804	6-pk.	24782
5 µL	F	23–26s	42 mm	Cone	5F-HP-0.63/0.47	001821	ea.	21210
5 µL	F	23–26s	42 mm	Cone	SK-5F-HP-0.63/0.47	001822	6-pk.	21214
10 µL	R	23	42 mm	Cone	10R-HP-0.63	002815	ea.	24795
10 µL	F	23	42 mm	Cone	10F-HP-0.63	002810	ea.	24785
10 µL	F	23	42 mm	Cone	SK-10F-HP-0.63	002814	6-pk.	24787
10 µL	R	26	42 mm	Cone	10R-HP-0.47	002805	ea.	24794
10 µL	F	26	42 mm	Cone	10F-HP-0.47	002800	ea.	24784
10 µL	F	26	42 mm	Cone	SK-10F-HP-0.47	002804	6-pk.	24786
10 µL	F	23–26	42 mm	Cone	10F-HP-0.63/0.47	002821	ea.	21212
10 µL	F	23–26	42 mm	Cone	SK-10F-HP-0.63/0.47	002822	6-pk.	21215
Large Volume								
50 µL	R	23	42 mm	Cone	50R-HP-0.63	004665	ea.	24799

Gas-Tight PTFE-Tipped Syringes

for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	ASN	23s	1.71"	Agilent	1701	80080	ea.	24894
10 µL	ASRN	23s	1.71"	Agilent	1701	80087	ea.	21224
10 µL	ASRN	26s	1.71"	Agilent	1701	80088	ea.	21228
10 µL	ASRN	23s–26s	1.71"	Agilent	1701	80089	ea.	21229

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	23	42 mm	Cone	10F-HP-GT-0.63	002812	ea.	24789
10 µL	F	23–26	42 mm	Cone	10F-AG-GT-0.63/0.47C	002826	ea.	22256
10 µL	R	23–26	42 mm	Cone	10R-HP-GT-0.63/0.47	002829	ea.	21220

NEW!

24894

24789

Replacement Needles

for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–10 µL	23s	1.71"	Agilent	7786-01	6-pk.	20164
5–10 µL	26s	1.71"	Agilent	7786-02	6-pk.	20165
5–10 µL	23s–26s	1.71"	Agilent	7785-01	6-pk.	20166

SGE

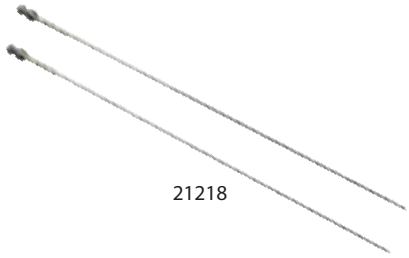
Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033715	ea.	24821
0.5 µL	26	42 mm	Cone	033708	ea.	24820
5 µL	23	42 mm	Cone	036720	2-pk.	24823
10 µL	23	42 mm	Cone	037717	2-pk.	24825
10 µL	26	42 mm	Cone	037715	2-pk.	24824
25–250 µL	23	42 mm	Cone	038717	2-pk.	24826

Do not reuse PTFE washers.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



21218

Replacement Plunger Assembly, PTFE-Tipped

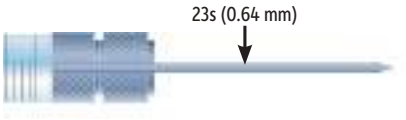
for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

SGE

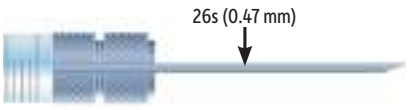
Syringe Volume	Needle Term.	SGE cat.#	qty.	Restek cat.#
10 µL	F	031808	2-pk.	21218
10 µL	R	031809	2-pk.	21284

Needle Gauge for Agilent 7673, 7683, 7693A, and 6850 Syringes

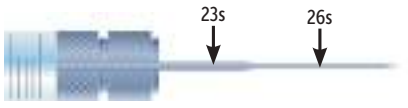
Single Gauge Needle (23s)
- The most popular gauge for Agilent 7673.
- Best for Merlin Microseal septum and standard septum-equipped GCs.
- Packed column injection ports.
- Split/splitless injection ports.

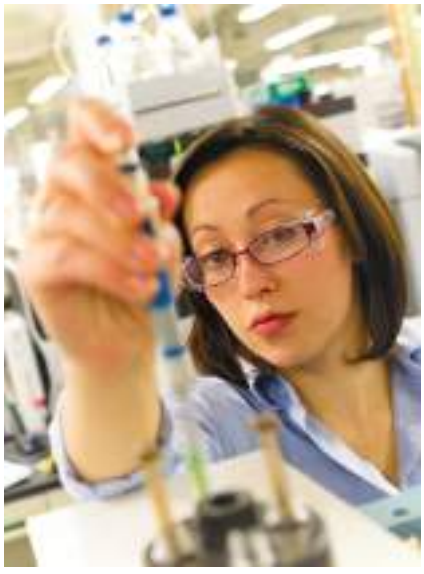


Single Gauge Needle (26s)
- On-column injection ports.
- Split/splitless injection ports.



23s-26s—Dual Gauge (tapered)
- Durability of a 23s gauge needle.
- Ability of a 26s gauge needle to perform split/splitless and on-column injections.





Precision in all we do ensures quality for you.

Cross-Reference for Agilent Syringes

Similar to Agilent Part #	Restek Part #	Description	Page
5181-1267	21212, 24596	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge	374
5181-1273	21210, 24593	5 µL Standard Syringe, Fixed Needle, 23-26 Gauge	374
5181-3319	20166	Needle for 10 µL Standard Syringe, 23-26 Gauge	375
5181-3321	24598	10 µL Standard Syringe, Removable Needle, 23-26 Gauge	374
5181-3358	24919	PTFE-Tipped Plunger for 10 µL Standard Syringe, Removable Needle	390
5181-3360	21215, 24600	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge (6-pk.)	374
5181-3365	21218	PTFE-Tipped Plunger for 10 µL Standard Syringe, Fixed Needle	376
5181-8809	24894, 24789	10 µL Gas-tight Syringe, Fixed Needle, 23 Gauge	375
5181-8811	20164, 24825	Needle for 10 µL Gas-tight Syringe, 23 Gauge	375
5181-8813	21224	10 µL Gas-tight Syringe, Removable Needle, 23 Gauge	375
5182-0830	24821	Needle for 0.5 µL Standard Syringe, 23 Gauge	375
5182-0832	20166	Needle for 5-10 µL Autosampler Syringe, 23-26 Gauge	375
5182-0834	20172	5 µL Standard Syringe, Removable Needle, 23 Gauge	374
5182-0835	21223	5 µL Standard Syringe, Removable Needle, 23-26 Gauge	374
5182-0875	20170, 24783	5 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	374
9301-0713	20167, 24785	10 µL Standard Syringe, Fixed Needle, 23 Gauge	374
9301-0714	24595, 24784	10 µL Standard Syringe, Fixed Needle, 26 Gauge	374
9301-0725	20169, 24787	10 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	374
9301-0891	24592, 24780	5 µL Standard Syringe, Fixed Needle, 26 Gauge	374
9301-0892	20168, 24781	5 µL Standard Syringe, Fixed Needle, 23 Gauge	374

Merlin MicroShot Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.

22226

Description	Merlin cat.#	qty.	Restek cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

*Syringe not included. Requires Agilent-style (ball-end plunger) autosampler syringe.

100% Satisfaction Guaranteed

Sky® Inlet Liners

True Blue Performance

Exceptionally inert Sky® inlet liners with state-of-the-art deactivation improve trace-level analysis—**and now come with a 100% satisfaction guarantee!***

See **page 193–202**.

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RESTEK

* For details on our 100% satisfaction guarantee, visit **www.restek.com/sky**

24956

Autosampler Syringes for Bruker/Varian 8000 Series GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
Bruker/Varian 8100/8200 Syringes								
10 µL	RN	26s	1.99"	5	701 Varian	202880	ea.	24956

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
Bruker/Varian 8035, 8100, & 8200 Syringes								
10 µL*	R	25	53 mm	S/Hole	10R-VA8X-II	002924	ea.	24852
Bruker/Varian CP 8400, CP8410 Syringes								
10 µL	F	23	50 mm	Cone	10F-VA8400-5/0.63C	002951	ea.	24923
10 µL	F	26	50 mm	Bevel	10F-VA8400-5/0.47	002950	ea.	21202
10 µL	R	26	50 mm	Cone	10R-VA8400-5/0-0.47C	002952	ea.	24930

*Gas-tight syringe.

24857

Replacement Needles for Bruker/Varian 8000 Series Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	23	53 mm	S/Hole	037779	2-pk.	24857
10 µL*	25	53 mm	S/Hole	037780	ea.	24858
10 µL**	25	53 mm	S/Hole	037777	ea.	24854
10 µL	25	53 mm	2	037776	2-pk.	24855

*Straight needle shaft, 0.20 mm ID needle, for use with viscous samples.
**Tapered needle shaft, 0.12 mm ID needle.

High Dynamic (HD) Headspace Syringes

for CTC CombiPAL Autosamplers

- High Dynamic (HD) plunger optimized for higher throughput in the headspace technique.
- Excellent performance over a large range of temperatures and temperature gradients.
- Increased lifetime, as compared to traditional headspace syringes.
- Increased accuracy and reproducibility of headspace GC analysis.

26554

Hamilton

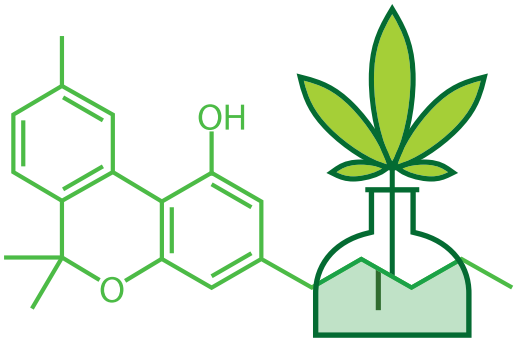
Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
1.0 mL	N	23	2"/51 mm	5	1001	203082	ea.	26552
2.5 mL	N	23	2"/51 mm	5	1002	203084	ea.	26553
5.0 mL	N	23	2"/51 mm	5	1005	203086	ea.	26554
1.0 mL	N	26	2"/51 mm	5	1001	203141	ea.	26555
2.5 mL	N	26	2"/51 mm	5	1002	203181	ea.	26556
5.0 mL	N	26	2"/51 mm	5	1005	203182	ea.	26557

Replacement Plungers for HD-Type CTC CombiPAL AS Syringes

Hamilton

Volume	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
1.0 mL	1001	207114	ea.	26558
5.0 mL	1005	207116	ea.	26560

26560



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Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Autosampler Syringes

22757

24922

Autosampler Syringes for CTC GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
1.2 µL	N	26	2"/51 mm	AS	7701.2N	203185	ea.	22755
5 µL	N	26s	2"/51 mm	AS	75N	203189	ea.	22756
10 µL	N	23s	2"/51 mm	AS	701N	203361	ea.	22757
10 µL	N	23s–26s	2"/51 mm	AS	701N	203362	ea.	22758
10 µL	N	23s	2"/51 mm	2	701N	203363	ea.	22759
10 µL	N	26s	2"/51 mm	AS	701N	203205	ea.	22761
10 µL	N	26s	2"/51 mm	2	701N	203269	6-pk.	22762
25 µL*	N	26s	2"/51 mm	AS	1702N	203043	ea.	22763
25 µL*	N	26s	2"/51 mm	AS	1702N Slim Line**	203074	ea.	22764
100 µL*	N	26s	2"/51 mm	AS	1710N Slim Line**	203076	ea.	22765

Due to collar design, Hamilton syringes may not work with older generation LEAP autosamplers.
*Gas-tight syringe.
**Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
5 µL	F	23	50 mm	Cone	5F-C/F-5/0.63	001981	ea.	24921
5 µL	F	26	50 mm	Cone	5F-BT-5/0.47	0019821	ea.	24920
10 µL*	F	23	50 mm	Cone	10F-BT-GT-5/0.63C	0029871	ea.	22749
10 µL	R	23	50 mm	Cone	10R-BT-0.63	0029841	ea.	24932
NEW! 10 µL*	F	23	50 mm	Cone	10F-C/T-GT-5/0.63C	002987	ea.	22254
NEW! 10 µL	F	23	50 mm	Cone	10F-C/T-5/0.63C	002981	ea.	22255
10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
10 µL	F	26	50 mm	Cone	SK-10F-BT-5/0.47C	0029861	6-pk.	24925
NEW! 10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002980	ea.	22252
NEW! 10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002986	6-pk.	22253
NEW! 25 µL*	F	23	50 mm	Cone	25F-C/T-GT-5/0.63C	003987	ea.	23897
25 µL*	F	23	50 mm	Cone	25F-BT-GT-5/0.63C	0039871	ea.	22751
NEW! 25 µL*	R	26	50 mm	S	25R-C/T-GT-5/0.47H	003988	ea.	23899
100 µL*	F	23	50 mm	Cone	100F-C/T-GT-5/0.63C	005335	ea.	22753
100 µL*	R	26	50 mm	Cone	100R-C/T-GT-5/0.47C	005333	ea.	22754

*Gas-tight syringe.

24933

23900

Replacement Needles for CTC Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	50 mm	Cone	033772	kit	24929
10 µL	23	50 mm	Cone	037787	2-pk.	24933

Replacement Plungers for CTC Autosampler Syringes

NEW!

SGE

Syringe Volume	Needle Term.	SGE Model	cat.#	qty.	Restek cat.#
25 µL	F	P25F-C/T-GT	031817	ea.	23907
25 µL	F	25F-BT-GT	0318171	ea.	23900

Autosampler Syringes for PerkinElmer Autosystem and Clarus 500 GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
5 µL	ASN	23	2.756"	3	75ASN/PE	88035	ea.	24953
5 µL	ASN	26	2.756"	3	75ASN/PE	88040	ea.	24952

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	70 mm	Cone	0.5BR-PE-0.63	000478	ea.	24811
0.5 µL	R	26	70 mm	Cone	0.5BR-PE-0.47	000475	ea.	24810
5 µL	F	23	70 mm	Cone	5F-PE-0.63	001954	ea.	24813
5 µL*	F	23	70 mm	Cone	5F-PE-GT-0.63	001957	ea.	24815
5 µL	F	26	70 mm	Cone	5F-PE-0.47	001953	ea.	24812
5 µL*	F	26	70 mm	Cone	5F-PE-GT-0.47	001955	ea.	24814
50 µL	F	23	70 mm	Cone	50F-PE-0.63	004670	ea.	24816

*Gas-tight.

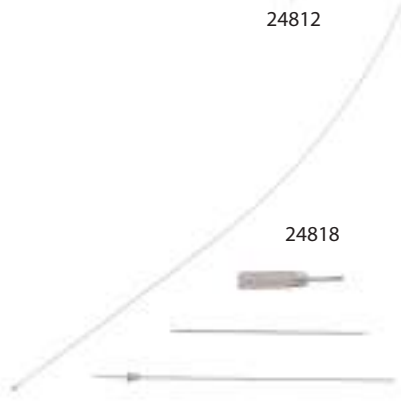
24952

24812

Replacement Needle and Plunger Kit for PerkinElmer Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	70 mm	Cone	033765	kit	24818



24818

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

24530

24843

Autosampler Syringes for Shimadzu GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

for Shimadzu AOC 9 GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530

SGE

for Shimadzu AOC 14, 17, 20, and 20i GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-S-0.63	000445	ea.	24841
0.5 µL	R	26	42 mm	Cone	0.5BR-S-0.47	000440	ea.	24840
5 µL	F	23	42 mm	Cone	5F-S-0.63	001988	ea.	24843
10 µL	R	23	42 mm	Cone	10R-S-0.63	002898	ea.	24845
10 µL*	R	23	42 mm	Cone	10R-S-GT-0.63	002902	ea.	24846
10 µL	R	26	42 mm	Cone	10R-S-0.47	002897	ea.	24844

*Gas-tight syringe.

24749

Replacement Needles for Shimadzu Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033745	ea.	24747
10 µL	23	42 mm	Cone	037747	2-pk.	24749
10 µL	26	42 mm	Cone	037745	2-pk.	24748

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Syringes for Thermo Scientific RSH Autosampler

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
5 µL	F	23	57 mm	Cone	5F-RTC/RSH-5.7/0.63C	001861	ea.	23908
5 µL	F	23	85 mm	Cone	5F-RTC/RSH-8.5/0.63C	001863	ea.	23909
5 µL	F	26	57 mm	Cone	5F-RTC/RSH-5.7/0.47C	001865	ea.	23910
5 µL	F	26	85 mm	Cone	5F-RTC/RSH-8.5/0.47C	001867	ea.	23911
5 µL	R	23	57 mm	Cone	5R-RTC/RSH-5.7/0.63C	001871	ea.	23912
5 µL	R	23	85 mm	Cone	5R-RTC/RSH-8.5/0.63C	001873	ea.	23913
5 µL	R	26	57 mm	Cone	5R-RTC/RSH-5.7/0.47C	001875	ea.	23914
5 µL	R	26	85 mm	Cone	5R-RTC/RSH-8.5/0.47C	001877	ea.	23915
10 µL	F	23	57 mm	Cone	10F-RTC/RSH-5.7/0.63C	002861	ea.	23916
10 µL*	F	23	57 mm	Cone	10F-RTC/RSH-GT-5.7/0.63C	002862	ea.	23917
10 µL	F	23	85 mm	Cone	10F-RTC/RSH-8.5/0.63C	002863	ea.	23918
10 µL*	F	23	85 mm	Cone	10F-RTC/RSH-GT-8.5/0.63C	002864	ea.	23919
10 µL	F	26	57 mm	Cone	10F-RTC/RSH-5.7/0.47C	002865	ea.	23920
10 µL*	F	26	57 mm	Cone	10F-RTC/RSH-GT-5.7/0.47C	002866	ea.	23921
10 µL	F	26	85 mm	Cone	10F-RTC/RSH-8.5/0.47C	002867	ea.	23922
10 µL*	F	26	85 mm	Cone	10F-RTC/RSH-GT-8.5/0.47C	002868	ea.	23923
10 µL	R	23	57 mm	Cone	10R-RTC/RSH-5.7/0.63C	002871	ea.	23924
10 µL*	R	23	57 mm	Cone	10R-RTC/RSH-GT-5.7/0.63C	002872	ea.	23925
10 µL	R	23	85 mm	Cone	10R-RTC/RSH-8.5/0.63C	002873	ea.	23926
10 µL*	R	23	85 mm	Cone	10R-RTC/RSH-GT-8.5/0.63C	002874	ea.	23927
10 µL	R	26	57 mm	Cone	10R-RTC/RSH-5.7/0.47C	002875	ea.	23928
10 µL*	R	26	57 mm	Cone	10R-RTC/RSH-GT-5.7/0.47C	002876	ea.	23929
10 µL	R	26	85 mm	Cone	10R-RTC/RSH-8.5/0.47C	002877	ea.	23930
10 µL*	R	26	85 mm	Cone	10R-RTC/RSH-GT-8.5/0.47C	002878	ea.	23931
25 µL*	F	26	57 mm	Cone	25F-RTC/RSH-GT-5.7/0.47C 2	003866	ea.	23932
50 µL*	F	26	57 mm	Cone	50F-RTC/RSH-GT-5.7/0.47C	004866	ea.	23933
100 µL*	F	26	57 mm	Cone	100F-RTC/RSH-GT-5.7/0.47(0.11)C	005866	ea.	23934
250 µL*	F	26	57 mm	Cone	250F-RTC/RSH-GT-5.7/0.47C	006866	ea.	23935

*Gas-tight syringe.

23909

23928

Replacement Needles for Thermo Scientific RSH Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
5 µL	23	57 mm	Cone	N5-RSH-5.7/0.63C 2-pk	036871	2-pk.	23942
5 µL	23	85 mm	Cone	N5-RSH-8.5/0.63C 2-pk	036873	2-pk.	23943
5 µL	26	57 mm	Cone	N5-RSH-5.7/0.47C 2-pk	036875	2-pk.	23944
5 µL	26	85 mm	Cone	N5-RSH-8.5/0.47C 2-pk	036877	2-pk.	23945
10 µL	23	57 mm	Cone	N10-RSH-5.7/0.63C 2-pk	037871	2-pk.	23946
10 µL	23	85 mm	Cone	N10-RSH-8.5/0.63C 2-pk	037873	2-pk.	23947
10 µL	26	57 mm	Cone	N10-RSH-5.7/0.47C 2-pk	037875	2-pk.	23948
10 µL	26	85 mm	Cone	N10-RSH-8.5/0.47C 2-pk	037877	2-pk.	23949

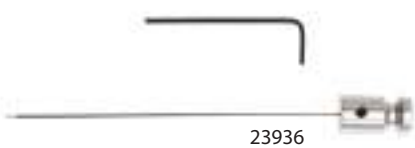
23945

Replacement Plungers for Thermo Scientific RSH Autosampler Syringes

SGE

Syringe Volume	Needle Term.	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	P10F-RSH-GT	032810	ea.	23936
25 µL	F	P25F-RSH-GT	032815	ea.	23938
50 µL	F	P50F-RSH-GT	032821	ea.	23939
100 µL	F	P100F-RSH-GT	032825	ea.	23940
250 µL	F	P250F-RSH-GT	032831	ea.	23941

Note: Compatible with Thermo Scientific gas-tight syringes only.



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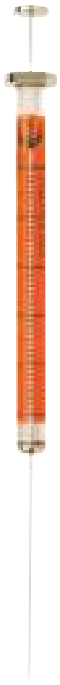
24962



24924

Autosampler Syringes for Thermo Scientific GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	25s	2"	2	701SN	80320	ea.	24961
10 µL	N	26s	3.15"	AS	701SN	80318	ea.	24962

SGE

	Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
	0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
	0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
NEW!	5 µL	F	26	50 mm	Cone	5F-C/T-5/0.47C	001982	ea.	22251
NEW!	10 µL	F	23	50 mm	Cone	10F-C/T-5/0.63C	002981	ea.	22255
NEW!	10 µL	R	23	50 mm	Cone	10R-BT-0.63	0029841	ea.	24932
NEW!	10 µL	R	23	50 mm	Cone	10R-C/T-0.63C	002984	ea.	23903
NEW!	10 µL*	F	23	50 mm	Cone	10F-C/T-GT-5/0.63C	002987	ea.	22254
NEW!	10 µL	F	25	50 mm	Cone	10F-C/T-5/0.5C	002967	ea.	23902
NEW!	10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002980	ea.	22252
	10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
NEW!	10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002986	6-pk.	22253
	10 µL	F	26	50 mm	Cone	SK-10F-BT-5/0.47C	0029861	6-pk.	24925
	10 µL	F	26	80 mm	Cone	10F-BT-8/0.47C	0029921	ea.	24924
NEW!	10 µL	F	26	80 mm	Cone	10F-C/T-8/0.47C	002992	ea.	23904
	10 µL	R	26	80 mm	Cone	10R-BT-8/0-0.47C	0029931	ea.	24934
NEW!	10 µL	R	26	80 mm	Cone	10R-C/T-8/0.47C	002993	ea.	23901

*Gas-tight syringe.

Replacement Needle and Plunger Kit for Thermo Scientific Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	26	50 mm	Cone	033770	kit	24927
0.5 µL	23	50 mm	Cone	033772	kit	24929

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Replacement Needles for Thermo Scientific Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	26	50 mm	Cone	033770	kit	24927
0.5 µL	23	50 mm	Cone	033772	kit	24929
10 µL	26	80 mm	Cone	031535	3-pk.	24935
10 µL	23	50 mm	Cone	037787	2-pk.	24933

Replacement Plungers for Thermo Scientific Autosampler Syringes

NEW!

SGE

Syringe Volume	Needle Term.	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	P10F-C/T-GT	0318120	2-pk.	23905

instrument reference

Autosampler Syringes for Thermo Scientific GCs

Autosampler syringes for TriPlus, AS3000, AS2000, AS200/800 GCs. The following autosamplers are compatible with the respective SGE and Hamilton syringes. For further information or questions, contact your Restek sales representative or technical service.

SGE Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24928	380, 384
•	•			24926	380, 384
•				23901	384
•				23902	384
•				23903	384
•				23904	384
•				22251	384
•				22252	384
•				22253	384
•				22254	384
•				22255	384
•				24921	380
	•	•	•	24922	380, 384
	•	•	•	24925	380, 384
	•	•	•	24932	380, 384
	•	•		24920	380
		•		22749	380
		•		24924	384
		•		24934	384

Replacement Needles for SGE Syringes for Thermo Scientific GCs

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24929	380, 384, 385
•	•			24927	384, 385
•	•	•	•	24933	380, 385
•		•	•	24935	385

Replacement Plungers for SGE Syringes for Thermo Scientific GCs

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•				23905	385

Hamilton Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
		•	•	24962	384

24532

24703

Manual Microliter Syringes

- Economical.
- Available with cemented needles (N/F) or removable needles (RN/R).
- Each syringe plunger and barrel assembly is manufactured as one working unit; components are not interchangeable or individually replaceable.

Hamilton 700 Series

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
10 µL	N	26s	2"/51 mm	2	701N	80300	ea.	20174
10 µL	N	26s	2"/51 mm	2	701N	80366	6-pk.	20175
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530
25 µL	N	22s	2"/51 mm	2	702N	80400	ea.	24531
10 µL	N	26s	2"/51 mm	5	701NPT5	80339	ea.	24967
25 µL*	RN	22s	2"/51 mm	2	702RN	80430	ea.	24532
50 µL	N	22s	2"/51 mm	2	705N	80500	ea.	24533
50 µL*	RN	22s	2"/51 mm	2	705RN	80530	ea.	24534
100 µL	N	22s	2"/51 mm	2	710N	80600	ea.	24535
100 µL*	RN	22s	2"/51 mm	2	710RN	80630	ea.	24536
250 µL	N	22s	2"/51 mm	2	725N	80700	ea.	24537
250 µL*	RN	22s	2"/51 mm	2	725RN	80730	ea.	24538
500 µL	N	22	2"/51 mm	2	750N	80800	ea.	24539
500 µL*	RN	22	2"/51 mm	2	750RN	80830	ea.	24540

*Replacement RN/R needles available. See page 390.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5F**	001000	ea.	24700
5 µL*	R	26	50 mm	2	5R**	001050	ea.	24701
10 µL	F	26	50 mm	2	10F**	002000	ea.	24702
10 µL	F	26	50 mm	2	SK-10F**	002030	6-pk.	24715
10 µL*	R	26	50 mm	2	10R**	002050	ea.	24703
10 µL*	R	26	50 mm	2	SK-10R**	002080	6-pk.	24716
25 µL	F	25	50 mm	2	25F	003000	ea.	24704
25 µL*	R	25	50 mm	2	25R	003050	ea.	24705
50 µL	F	25	50 mm	2	50F	004000	ea.	24706
50 µL*	R	25	50 mm	2	50R	004050	ea.	24707
100 µL	F	25	50 mm	2	100F	005000	ea.	24708
100 µL*	R	25	50 mm	2	100R	005050	ea.	24709
250 µL	F	25	50 mm	2	250F	006000	ea.	24710
250 µL*	R	25	50 mm	2	250R	006050	ea.	24711
500 µL	F	25	50 mm	2	500F	007000	ea.	24712
500 µL*	R	25	50 mm	2	500R	007050	ea.	24713

*Replacement RN/R needles available. See page 390.

**With plunger protection.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

SuperfleX Flexible Plunger Microliter Syringes

- The SuperfleX syringe features a super-elastic plunger that returns to its original shape if twisted or bent.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5FX	001100	ea.	24720
10 µL	F	26	50 mm	2	10FX	002100	ea.	24722
10 µL	F	26	50 mm	2	SK-10FX	002130	6-pk.	24718
10 µL	R	26	50 mm	2	SK-10RX	002180	6-pk.	24719

Reinforced Plunger Microliter Syringes

- Reinforcing extends the life of fragile, small diameter plungers.
- Economical because of longer life—even in rugged applications.
- Hand-lapped plunger ensures a perfect seal with the barrel.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
5 µL	N	26s	2"/51 mm	2	95	87920	ea.	24541
5 µL*	RN	26s	2"/51 mm	2	95	87925	ea.	24542
10 µL	N	26s	2"/51 mm	2	901	80360	ea.	24543
10 µL*	RN	26s	2"/51 mm	2	901	80370	ea.	24544

*Replacement RN/R needles available. See page 390.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5F-GP	001400	ea.	24769
5 µL*	R	26	50 mm	2	5R-GP	001450	ea.	24766
10 µL	F	26	50 mm	2	10F-GP	002400	ea.	24767
10 µL*	R	26	50 mm	2	10R-GP	002450	ea.	24768

*Replacement RN/R needles available. See page 390.

24542

24769

24548

24773

Micro-Volume, Positive Displacement Syringes

- Sample is contained in the needle with full plunger displacement, ensuring no dead volume.
- High precision and accuracy down to 0.1 µL.
- Seal between the plunger and the needle can be tightened for high-pressure injection.
- Replaceable needle/plunger kits and barrels (available on request).

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
0.5 µL	KH	25	2.75"/70 mm	2	7000.5	86259	ea.	24545
0.5 µL	KH	25	2.75"/70 mm	3	7000.5	86250	ea.	24546
1.0 µL	KH	22s	2.75"/70 mm	2	7101	86211	ea.	24549
1.0 µL	KH	25s	2.75"/70 mm	2	7001	80135	ea.	24547
1.0 µL	KH	25s	2.75"/70 mm	3	7001	80100	ea.	24548
2.0 µL	KH	25	2.75"/70 mm	2	7002	88411	ea.	24551
5.0 µL	KH	24	2.75"/70 mm	2	7105	88011	ea.	24555
5.0 µL	KH	24	2.75"/70 mm	3	7105	88000	ea.	24556

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	70 mm	2	0.5BR-7BV	000311	ea.	24771
0.5 µL	R	23	70 mm	Cone	0.5BR-7	000310	ea.	24772
0.5 µL	R	26	70 mm	Cone	0.5BR-OC-7/0.47*	000376	ea.	24770
1.0 µL	R	23	70 mm	2	1BR-7BV	000506	ea.	24775
1.0 µL	R	23	70 mm	Cone	1BR-7	000505	ea.	24774
1.0 µL	R	23	50 mm	Cone	1BR-5	000500	ea.	24773
1.0 µL	R	26	70 mm	Cone	1BR-7/0.47*	000570	ea.	24776
5.0 µL	R	23	70 mm	2	5BR-7BV	000803	ea.	24779
5.0 µL	R	23	70 mm	Cone	5BR-7	000802	ea.	24778
5.0 µL	R	23	50 mm	Cone	5BR-5	000800	ea.	24777

*70 mm needle length, 0.47 mm OD, on-column syringe.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Replacement Plunger-in-Needle Kits

- Kits are supplied with both a plunger and a needle.
- Plunger and needle must be replaced together.

SGE

Volume	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	For Syringe cat.#	qty.	Restek cat.#
0.5 µL	23	70 mm	2	NP0.5B-7BV	033060	24771	kit	24831
0.5 µL	23	70 mm	Cone	NP0.5B-7C	033057	24772	kit	24830
1.0 µL	23	70 mm	2	NP1B-7BV	034060	24775	kit	24835
1.0 µL	23	70 mm	Cone	NP1B-7C	034057	24774	kit	24834
1.0 µL	23	50 mm	Cone	NP1B-5C	034055	24773	kit	24833
5.0 µL	23	70 mm	2	NP5B-7BV	035058	24779	kit	24839
5.0 µL	23	70 mm	Cone	NP5B-7C	035057	24778	kit	24838

PTFE Tip, Gas-Tight Syringes

- Suitable for gases or liquids.
- High accuracy of dispensed volumes.
- Interchangeable barrels, plungers, and tips extend performance and increase cost-effectiveness.

24558

24727

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	26s	2"/51 mm	2	1701	80000	ea.	24557
10 µL	RN	26s	2"/51 mm	2	1701	80030	ea.	24558
25 µL	N	22s	2"/51 mm	2	1702	80200	ea.	24559
25 µL	RN	22s	2"/51 mm	2	1702	80230	ea.	24560
50 µL	N	22s	2"/51 mm	2	1705	80900	ea.	24561
50 µL	RN	22s	2"/51 mm	2	1705	80930	ea.	24562
100 µL	N	22s	2"/51 mm	2	1710	81000	ea.	24563
100 µL	RN	22s	2"/51 mm	2	1710	81030	ea.	24564
250 µL	N	22s	2"/51 mm	2	1725	81100	ea.	24567
250 µL	RN	22s	2"/51 mm	2	1725	81130	ea.	24568
500 µL	LTN	22	2"/51 mm	2	1750	81217	ea.	24571
500 µL	RN	22	2"/51 mm	2	1750	81230	ea.	24572
1 mL	LTN	22	2"/51 mm	2	1001	81317	ea.	24575
1 mL	RN	22	2"/51 mm	2	1001	81330	ea.	24576
1 mL	TLL	*		w/o slots	1001	81320	ea.	24578
2.5 mL	TLL	*		w/o slots	1002	81420	ea.	24584
2.5 mL	RN	22	2"/51 mm	2	1002	81430	ea.	24582
2.5 mL	N	22	2"/51 mm	2	1002	81417	ea.	24581
5 mL	TLL	*		w/o slots	1005	81520	ea.	20178
10 mL	TLL	*		w/o slots	1010	81620	ea.	20179
25 mL	TLL	*		w/o slots	1025	82520	ea.	24591
50 mL	TLL	*		w/o slots	1050	85020	ea.	24717
100 mL	TLL	*		w/o slots	1100	86020	ea.	24724

*Needles sold separately. See page 390.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	26	50 mm	2	10F-GT	002200	ea.	24725
10 µL	R	26	50 mm	2	10R-GT	002250	ea.	24726
25 µL	F	25	50 mm	2	25F-GT	003200	ea.	24727
25 µL	R	25	50 mm	2	25R-GT	003250	ea.	24728
50 µL	F	25	50 mm	2	50F-GT	004200	ea.	24729
50 µL	R	25	50 mm	2	50R-GT	004250	ea.	24730
100 µL	F	25	50 mm	2	100F-GT	005200	ea.	24734
100 µL	R	25	50 mm	2	100R-GT	005250	ea.	24735
100 µL	LL	*			100F-LL-GT	005230	ea.	24737
250 µL	F	25	50 mm	2	250F-GT	006200	ea.	24738
250 µL	R	25	50 mm	2	250R-GT	006250	ea.	24739
250 µL	LL	*			250F-LL-GT	006230	ea.	24741
500 µL	F	25	50 mm	2	500F-GT	007200	ea.	24742
500 µL	R	25	50 mm	2	500R-GT	007250	ea.	24743
1 mL	R	23	50 mm	2	1MR-GT	008100	ea.	24750
1 mL	LL	*			1MDF-LL-GT	008025	ea.	24752
2.5 mL	LL	*			2.5MDF-LL-GT	008425	ea.	24755
5 mL	LL	*			5MDR-LL-GT	008760	ea.	24757
10 mL	LL	*			10MDR-LL-GT	008960	ea.	24759
25 mL	LL	*			25MDR-LL-GT	009462	ea.	24760
50 mL	LL	*			50MR-LL-GT	009660	ea.	24761
100 mL	LL	*			100MR-LL-GT	009760	ea.	24762

*Needles sold separately. See page 390.

24761

PTFE Tip, Gas-Tight Syringe Replacement Needles

for Removable Needle Syringes
Materials: stainless steel needle, nickel-plated brass hub.

24802

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–100 µL	26s	2"	2	7758-02	6-pk.	24939
5–100 µL	22s	2"	2	7758-03	6-pk.	24940
250 µL–10 mL	22	2"	2	7779-01	6-pk.	24942
250 µL–10 mL	26s	2"	2	7779-02	6-pk.	24943
250 µL–10 mL	22s	2"	2	7779-03	6-pk.	24944

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
5 µL	26	50 mm	2	036110	5-pk.	24802
10 µL	23	50 mm	2	037111	5-pk.	24804
10 µL	26	50 mm	2	037110	5-pk.	24803
25–500 µL	23	50 mm	2	038111	5-pk.	24806
25–500 µL	25	50 mm	2	038110	5-pk.	24805
1–2.5 mL	23	50 mm	2	039110	5-pk.	24807

24919

Replacement Plunger Assembly, PTFE-Tipped

for Agilent 7670, 7671, and 7672 ALS Autosampler Syringes

Hamilton

Syringe Volume	Needle Term.	Hamilton cat.#	qty.	Restek cat.#
10 µL	N, RN, LT/LTN	13205	ea.	24919

also available

Gas-Tight PTFE-Tipped Syringes for Agilent 7673, 7683, 7693A, and 6850 Autosamplers.

See **page 375**.

24606

24763

24765

Gas-Tight Syringe Replacement Needles for Luer Lock Syringes

Hamilton

Hub Material	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
metal	26s	2"/51 mm	2	90053	6-pk.	20133
metal	25s	1.97"	3	90049*	6-pk.	24605
metal	22s	2"/51 mm	2	90051	6-pk.	24606
Kel-F (PTFE tip)	26s	2"/51 mm	2	90153	6-pk.	24607
Kel-F (PTFE tip)	25s	1.97"	3	90149*	6-pk.	24608
Kel-F (PTFE tip)	22s	2"/51 mm	2	90151	6-pk.	24609

*For Waters U6K injection valve.

SGE

Hub Material	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
metal	23	50 mm	2	039802	5-pk.	24763
metal	18	50 mm	2	039842	5-pk.	24764
metal	22	2"/51 mm	3	039895**	2-pk.	24765

**For Rheodyne/Valco valves.

SGE Gas-Tight Syringes with Shut-off Valves

- Ideal for sample storage and transportation.
- Push-pull shut-off valve.

SGE

Syringe Fitted with Removable Needle and Valve

Volume	Model	SGE cat.#	qty.	Restek cat.#
50 µL	50R-V-GT	004279	ea.	24880
100 µL	100R-V-GT	005279	ea.	24881
250 µL	250R-V-GT	006279	ea.	24882
500 µL	500R-V-GT	007279	ea.	24883
1 mL	1MDR-V-GT	008110	ea.	24884
2.5 mL	2.5MDR-V-GT	008510	ea.	24885

SGE

Syringe Fitted with Luer Lock Valve*

Volume	Model	SGE cat.#	qty.	Restek cat.#
1 mL	1MR-VLL-GT	008160	ea.	24886
2.5 mL	2.5MDR-VLL-GT	008560	ea.	24887
5 mL	5MDR-VLLMA-GT	008770	ea.	24888
10 mL	10MDR-VLLMA-GT	008970	ea.	24889
25 mL	25MDR-VLLMA-GT	009472	ea.	24890
50 mL	50MR-VLLMA-GT	009670	ea.	24891
100 mL	100MR-VLLMA-GT	009770	ea.	24892

*Order needles separately.

24881

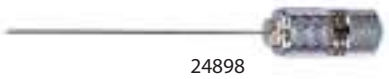
24887

Replacement Needles for Gas-Tight Syringes with Shut-off Valves

SGE

Model V Syringe Valve: fits any SGE removable needle syringe, 25 µL–2.5 mL

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
25 µL–2.5 mL	23	50 mm	Cone	V	031905	ea.	24898



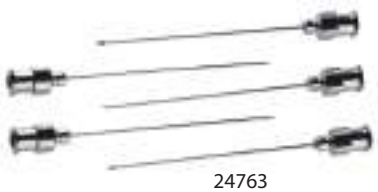
24898

SGE

Luer Lock Needles

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
1 mL–100 mL	23	50 mm	2	NLL-5/23	039802	5-pk.	24763
1 mL–100 mL	18	50 mm	2	NLL-5/18	039842	5-pk.	24764
1 mL–100 mL	22	2"/51 mm	3	NLL-LC**	039895	2-pk.	24765

**Fits Rheodyne & Valco injection valves.



24763

Economical Hamilton Syringe Guide*

- Prevents syringe plunger from bending.
- Adjustable stop prevents plunger damage.
- Easily installed.
- Used with syringe series 700/1700/1000.

Syringe Volume	Hamilton cat.#	qty.	Restek cat.#
25–500 µL	14906	ea.	24615
5–10 µL	14806	ea.	24616

*Syringe not included.

24616

Gas-Tight Syringes

For complete loop-fill, the syringe capacity should be >2X the loop volume.

21260

24868

24941

24808

Gas-Tight Syringes for Rheodyne® & Valco® Valves

- PTFE-tipped plungers.
- Removable needles.
- Replaceable syringe barrels, plungers, and plunger tips.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	RN	26s	2"/51 mm	3	1701	80065	ea.	21260
25 µL	RN	22s	2"/51 mm	3	1702	80265	ea.	21261
50 µL	RN	22s	2"/51 mm	3	1705	80965	ea.	21262
100 µL	RN	22s	2"/51 mm	3	1710	81065	ea.	21263
250 µL	RN	22s	2"/51 mm	3	1725	81165	ea.	21264

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	R	22	2"	3	10R-GT-LC	002313	ea.	24866
25 µL	R	22	2"	3	25R-GT-LC	003312	ea.	24867
50 µL	R	22	2"	3	50R-GT-LC	004312	ea.	24868
100 µL	R	22	2"	3	100R-GT-LC	005312	ea.	24869
250 µL	R	22	2"	3	250R-GT-LC	006312	ea.	24870
500 µL	R	22	2"	3	500R-GT-LC	007312	ea.	24871

Replacement Needles for Gas-Tight Syringes for Rheodyne® & Valco® Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–100 µL	22s	2"	3	7770-01	6-pk.	24941
250 µL–10 mL	22	2"	3	7780-04	6-pk.	24945

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	037250	5-pk.	24808
25–500 µL	22	2"	3	038250	5-pk.	24809

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

A-2 Luer Gas-Tight Syringes*

- For use with VOA-CYL 4 standards.
- Push-style on-off button valve.

Use to withdraw a gas sample from a high-pressure cylinder through a high-purity VOC single-stage regulator after attaching the appropriate adaptor (cat.# 21118) to the regulator. Use with luer syringe needles.

20162

High-purity VOC single-stage regulator is described on page 453 of the Air Sampling Products section.

Description	qty.	cat.#
100 µL Luer Syringe	ea.	20162
500 µL Luer Syringe	ea.	20163

*Restek's A-2 syringes have a luer tip.

Replacement Needles for A-2 Luer Gas-Tight Syringes

Description	Needle Gauge	Size	qty.	cat.#
Luer Syringe Needles for 100 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.006" ID x 2"	3-pk.	22783
Luer Syringe Needles for 500 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.012" ID x 2"	3-pk.	22784

Heavy Duty Purge & Trap Syringe Dynatech Precision Sampling

- Heavy-duty glass barrel with metal front and rear flanges.
- PTFE luer lock tip.
- Can fill and empty sparge tubes.
- Sample-Lok valve accepts standard luer lock needles.
- Suitable for purge & trap applications.

21208

Syringe	5 mL cat.#	10 mL cat.#
without Sample-Lok	21206	21209
with Sample-Lok	21208	21207

Luer Lock Valve Adaptors

Use a luer lock valve adaptor to connect a luer lock fitting to a Rheodyne® or Valco® valve.

21283

Description	SGE cat. #	qty.	Restek cat.#
Luer Lock Valve Adaptors	200010	2-pk.	21283

Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.

21276

Volume	Model	SGE cat.#	qty.	Restek cat.#
500 ml	500MAR-LL-GT	009910	ea.	21275
1000 ml	1000MAR-LL-GT	009920	ea.	21276
2000 ml	2000MAR-LL-GT	009930	ea.	21277

Syringe O-Rings

21279

21278

Syringe Volume	SGE cat.#	qty.	Restek cat.#
500 mL	032527	ea.	21278
1,000 mL	032532	ea.	21279

Septa also available (cat.# 27127, page 223).

21252

24860

Economical Microliter Liquid-Type Syringes

for Rheodyne® & Valco® Valves

- Cemented/fixed needles.
- Plungers and barrels are not interchangeable or replaceable.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	N	22s	2"	3	701	80365	ea.	21250
25 µL	N	22s	2"	3	702	80465	ea.	21251
50 µL	N	22s	2"	3	705	80565	ea.	21252
100 µL	N	22s	2"	3	710	80665	ea.	21253
250 µL	N	22s	2"	3	725	80765	ea.	21254

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	22	2"	3	10F-LC	002301	ea.	24860
25 µL	F	22	2"	3	25F-LC	003300	ea.	24861
50 µL	F	22	2"	3	50F-LC	004300	ea.	24862
100 µL	F	22	2"	3	100F-LC	005300	ea.	24863
250 µL	F	22	2"	3	250F-LC	006300	ea.	24864
500 µL	F	22	2"	3	500F-LC	007300	ea.	24865

21265

24759

Priming Syringes for Waters 6000, 6000A, 501, 510, 590, 610, and 610E HPLC Pumps

- Designed for maximum safety with metal flange and luer lock (LL) hub.
- PTFE-tipped plunger.

Hamilton

Volume	Needle Term.	Hamilton Model	Hamilton cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	TLL	1010W	81610	700 psig	ea.	21265

SGE

Volume	Needle Term.	SGE Model	SGE cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	LL	10MDR-LL-GT	008960	100 psig	ea.	24759

*Needles sold separately.

21257

Syringes for Waters U6K Valves

- Reinforced plungers.
- Removable needles.
- Replaceable plunger/barrel assemblies.
- Barrel stop prevents plunger blowout.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	RN	25s	1.97"	3	801	84815	ea.	21255
25 µL	RN	25s	1.97"	3	802	84816	ea.	21256
50 µL	RN	25s	1.97"	3	805	84817	ea.	21257
100 µL	RN	25s	1.97"	3	810	84818	ea.	21258
250 µL	RN	25s	1.97"	3	825	84819	ea.	21259

21270

Replacement Needles for Syringes for Waters U6K Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
10–100 µL	25s	1.97"	3	8647-01	6-pk.	21270
250 µL–10 mL	25s	1.97"	3	8648-01	6-pk.	21271

Syringes for LC Autosamplers

SGE
for Hitachi LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292

22292

SGE
for PerkinElmer LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298

22297

Syringes for Waters WISP LC Autosamplers
PTFE-tipped plungers

Hamilton

Volume	Hamilton Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294

22294

Syringes for CTC LC Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748

*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

22746

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742

*Gas-tight syringe.

22741

Sample Preparation

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Solid Phase Extraction Cartridges

from Restek

Proven Quality, Superior Cleanliness, and Method-Specific Performance

Resprep® solid phase extraction (SPE) cartridges are manufactured with specially cleaned sorbents and high-purity materials to minimize background and to help eliminate troublesome interference. In order to ensure reproducibility, raw materials and finished products go through rigorous QC testing, targeted to specific applications whenever possible, and an extensive certificate of analysis details the results.

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- **EPH Silica:** Petroleum
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Resprep® SPE Cartridges (Normal Phase)

Hydrophilic (polar) adsorbents used to extract hydrophilic analytes from nonpolar matrices, such as organic solvents (e.g., polar contaminants from sample extracts).

	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	15 mL/2 g (15-pk.)
Florisil (EPA SW 846 methods and CLP protocols)	24031 24032*	26086**	24034 26085**	26228
Silica (EPA SW 846 methods)	24035 24036*		24038	

*PTFE frits
**Glass tubes with PTFE frits

24031

All cartridges are manufactured using high-density polypropylene and have polyethylene frits unless otherwise noted.

Cartridges may be processed by any one or all of these techniques: positive pressure, sidearm flask, centrifuge, or vacuum manifold.

Resprep® SPE Cartridges (Bonded Reversed Phases)

Hydrophobic (nonpolar) silica-based adsorbents; used to extract hydrophobic analytes from polar matrices, such as water (e.g., pesticides from water).

	1 mL/100 mg (100-pk)	3 mL/200 mg (50-pk.)	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	60 mL/10 g (16-pk.)
C18 (high load, endcapped)	26030	26031	24050	24052	24051	26035

26030

Closed End SPE Cartridge: Activated Sodium Sulfate

- High quality anhydrous sodium sulfate.
- Approximately 2 grams prepackaged in a convenient capped cartridge with both male and female luer ends for easy connection to a variety of devices or equipment.
- The adsorbent is fully activated and ready to use for removal of excess water from organic solvent solutions, prior to many types of analysis.
- Capped cartridges will remain active for long periods of storage in the lab.

SPE Cartridge	Bed Weight	qty.	cat#
Activated Sodium Sulfate	2 g	50-pk.	26207

26207

CarboPrep® Reversing SPE Cartridges

- High adsorbent capacity (surface area ~200 m^2/g) for large volume sampling.
- Chromatographic grade graphitized carbon provides consistent and quantitative recoveries of a wide variety of semivolatiles, pesticides, and herbicides.
- 500 mg bed weight.

Reversing cartridge design allows convenient inverted elution of strongly retained analytes using minimum solvent volumes. Ideal design for extraction of pesticides in water.[1]

SPE Cartridge	Bed Weight	qty.	cat#
CarboPrep 200 Reversing Cartridge	500 mg	30-pk.	26206

[1]Crescenzi, C.; DiCorcia, A.; Guerriero, E.; and Saperi, R. "Development of a Multiresidue Method for Analyzing Pesticide Traces in Water Based on Solid-Phase Extraction and Electrospray Liquid Chromatography Mass Spectrometry", Environmental Science & Technology vol.31, no. 2 (1997) 479-488.
(Reference not available from Restek.)

26206

26091

Excellent for Pesticide Residue Cleanup!

Resprep® CarboPrep® SPE Cartridges

- Improved recovery of sulfonylurea herbicides, phenols, carbamates, and triazine herbicides, compared to C18 and C8 cartridges.
- Wide range of selectivity for both analytes and their metabolites or degradation products.
- Rapid sampling flow rates; uncompromised recoveries.
- Maximum capacity for contaminant cleanup.
- Controlled manufacturing improves cleanliness and ensures reproducible performance.
- Excellent performance removing pigments from samples.

CarboPrep® cartridges are manufactured from chromatographic-grade, nonporous, graphitized carbon. Our manufacturing process minimizes variability and improves recovery and cleanup procedures. We offer two types of carbons: CarboPrep® 90 has a surface area of approximately 90 m^2/g, and CarboPrep® 200 has a surface area of 200 m^2/g. Both have higher capacity than silica-based packings for a variety of compounds.

CarboPrep® cartridges can be used for sample extraction of organic compounds and extract cleanup to remove matrix interferences, including highly pigmented materials.

SPE Cartridge	Tube Volume, Bed Weight	qty.	cat.#
CarboPrep 90	3 mL, 250 mg	50-pk.	26091
CarboPrep 90	6 mL, 500 mg	30-pk.	26092
CarboPrep 200	3 mL, 250 mg	50-pk.	26088
CarboPrep 200	6 mL, 500 mg	30-pk.	26087

26194

26128

Pesticide Residue Cleanup SPE Cartridges

- Convenient, multiple adsorbent beds in a single cartridge.
- For use in multiresidue pesticide analysis to remove matrix interferences.
- Excellent for cleanup of dietary supplement extracts.

SPE Cartridge	qty.	cat.#
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg Aminopropyl, Polyethylene Frits	30-pk.	26193
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg PSA, Polyethylene Frits	30-pk.	26194
6 mL SPE Cartridge Packed with 500 mg PSA, Polyethylene Frits	30-pk.	26195
6 mL Combo SPE Cartridge Packed with 200 mg CarboPrep 200 and 400 mg PSA, PTFE Frits	30-pk.	26127
6 mL Combo SPE Cartridge Packed with 250 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26128
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26129

PSA–primary and secondary amine

Method Specific SPE Cartridges

These cartridges have been specifically designed to provide consistent and reproducible results for the method or application stated.

Description	Applications	Tube Volume, Bed Weight	qty.	cat.#
EPH Fractionation	Separation of aliphatic and aromatic hydrocarbons into distinct extract fractions. Specially treated to reduce contaminants and increase capacity. Silica packing.	20 mL, 5 g	15-pk.	26065
EPA Methods 521 & 522	For use in EPA Method 521: Nitrosamines in Drinking Water and EPA Method 522 for 1,4-Dioxane in Drinking Water. Activated charcoal packing.	6 mL, 2 g	30-pk.	26032
EPA Method 548.1	Extraction of endothall from aqueous samples. Weak anion exchange resin (BioRex 5) packing.	6 mL	30-pk.	26063
Ultra Quat SPE	For use in HPLC analysis of paraquat/diquat, as an alternative to EPA 549.2. For an HPLC column developed specifically for this application, see page 183.	6 mL, 500 mg	30-pk.	25499
Organo Tin	High-capacity cleanup of butyl and phenyl tin compounds from soil, water, and biota. Mixed bed.	60 mL	16-pk.	24049
RDX	Extraction of explosive compounds (similar to EPA Method 8095 and 8330 list) from water samples.	6 mL, 500 mg	30-pk.	26093

Resprep® SPE Tube Parts & Accessories

Empty Tubes (polypropylene)	Volume	qty.	cat.#
	1 mL	50-pk.	26010
	3 mL	50-pk.	26011
	6 mL	50-pk.	26012
	15 mL	50-pk.	26013
	sample reservoir, 25 mL	12-pk.	26014
	sample reservoir, 60 mL	12-pk.	26015
Frits (polyethylene), 20 µm	**Fits Tube Volume, Diameter**	**qty.**	**cat.#**
	1 mL, 6 mm	100-pk.	26016
	3 mL, 9 mm	100-pk.	26017
	6 mL, 1.2 cm	100-pk.	26018
	15 mL, 1.6 cm	100-pk.	26019
	25 mL, 2.0 cm*	100-pk.	26020
	60 mL, 2.6 cm	100-pk.	26021
Tube Caps (polyethylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	1 mL	12-pk.	26001
	3 mL	12-pk.	26002
	6 mL	12-pk.	26003
	15 mL	12-pk.	26004
	25 mL*	12-pk.	26005
Female Luer End Caps (polypropylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	universal	12-pk.	26000
Connectors (polypropylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	1, 3, 6 mL	12-pk.	26007
	15, 25 mL*	12-pk.	26008
	60 mL	12-pk.	26009

*For 20 mL packed tubes.

Resprep® tubes, frits, caps, and connectors for your method development needs.

26012

26018

26000

26003

26007

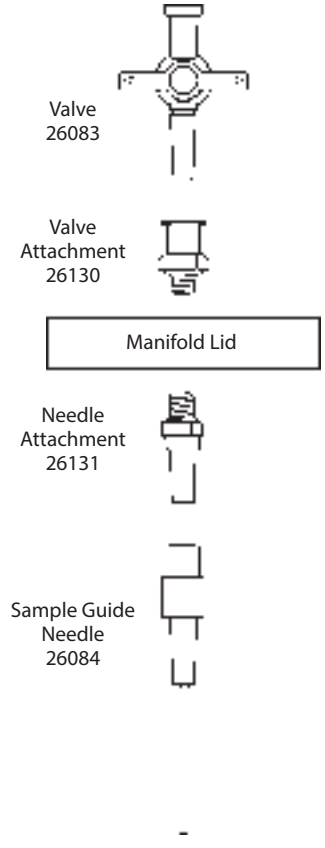
Manifolds & Replacement Parts

26077

Resprep® 12- or 24-Port SPE Manifolds

- Use with any standard male luer end SPE cartridges.
- Inert, PTFE sample guides reduce cross-contamination and carryover.
- Flexible sample collection rack will accommodate a variety of receiving vessels.
- Quick vacuum-release valve for better system control.
- Individual valves allow vacuum control for each cartridge, improving reproducibility.

Resprep® Manifold Replacement Parts



Description	qty.	cat.#
Complete Resprep SPE Manifold, 12-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 12 individual control valves, 12-position collection rack, 12 PTFE sample guides, and waste container.)	kit	26077
Complete Resprep SPE Manifold, 24-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 24 individual control valves, 24-position collection rack, and 24 PTFE sample guides.)	kit	26080

Resprep® Manifold Replacement Parts

Description	qty.	cat.#
Replacement Waste Container, 12-Port	ea.	24014
Replacement Vacuum Valve and Gauge Assembly	ea.	24008
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
Collection Rack		
Collection Rack, 12-Port	ea.	26079
Collection Rack, 24-Port	ea.	26082
Manifold Lid		
Replacement Manifold Lid (sample guides not included), 12-Port	ea.	26078
Replacement Manifold Lid (sample guides not included), 24-Port	ea.	26081
Manifold Lid Replacement Parts		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guide Needles, 12 or 24-Port	12-pk.	26084

*Waste container (shown in tank) and top shelf for round-bottom flasks are not included in 24-port manifold kit (cat.# 26080).

24002

Oil-Free Vacuum/Pressure Station for 12-Port Resprep® SPE Systems

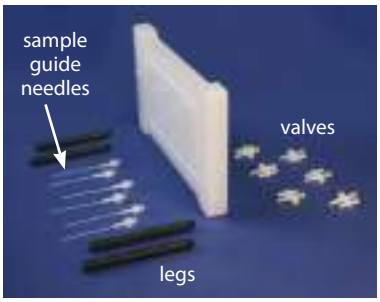
Allows switching from pressure to vacuum in a matter of seconds. Quiet, oil-free unit will not contaminate the extraction system or your samples. Provides 20" Hg (68 kPa) vacuum or 18 psi (124 kPa) pressure.

Description	qty.	cat.#
Oil-Free Vacuum/Pressure Station, 115VAC, 60Hz, US	ea.	24002
Oil-Free Vacuum/Pressure Station, 230VAC, 50Hz, Europe (CE certified)	ea.	24003
Vacuum Tubing (10 ft./3 m, 1/4" ID)	ea.	24016

Not recommended for use with 24-port manifold.
Warranty period is one year from date of purchase. Evaluation fee is charged for repairs out of warranty.

Resprep® 6-Port Disk Manifold Lid

- Low-cost option for disk extraction; fits standard 3 3/4" x 7 1/2" glass vacuum chambers.
- Doubles sample capacity—holds six disks, compared to standard 12-port manifolds, which only hold three.
- Individual vacuum control for each port improves reproducibility.
- Collection plate design secures variety of receiving vessels.



- Inert PTFE sample guides reduce cross-contamination and carryover.
- Compatible with any standard male luer end disk holder.

Description	qty.	cat.#
Resprep 6-Port Disk Manifold Lid* Includes: polypropylene lid with 6 ports, 6 nylon valves, 6 PTFE needle guides, 4 black lid legs, collection baseplate, collection plate for volumetric flasks, collection plate for concentrator tubes, 3 white collection plate posts, 12 collection plate retaining clips	kit	25992
Accessories		
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
Manifold Lid Replacement Parts		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guide Needles, 12 or 24-Port	12-pk.	26084
Gasket, 12-port	2-pk.	24011

*Vacuum chamber (cat.# 25991) not included.

Fully assembled unit shown with glass vacuum chamber (cat.# 25991) and disk holders (cat.# 24020).

Resprep® Sample Delivery System

- Compatible with Resprep® 1, 3, 6, and 15 mL SPE cartridges and Diskcover-47 extraction disk holder (cat.# 24020).
- Six PTFE transfer lines (1/8" OD x 1/16" ID x 36" long); each is banded with a different color for easy sample identification.
- Specified in EPA drinking water methods.
- Tested to pH of 1 to ensure no contaminants leach from system.

Use the Resprep® sample delivery system to transfer large volumes of low viscosity samples directly from a bottle to a solid phase extraction cartridge, or to a disk on a vacuum manifold system for extraction or cleanup. Each unit consists of six transfer lines with a stainless steel weight on one end and a color-coded screw fitting and polyethylene terephthalate (PET) adapter on the opposite end.

Description	qty.	cat.#
Resprep Sample Delivery System	6-pk.	26250

Resprep® disks & flow filters extract analytes of interest at high flow rates and significantly reduce clogging.

Resprep®-C18 and Resprep®-C8 SPE Disks

- Glass fiber disks embedded with C18 or C8 bonded silica.
- Extract semivolatile organic compounds.
- Deep-pore design reduces clogging and allows faster flow rates.
- Meet requirements for EPA Methods 525.1, 506, 550.1, and 549.1.
- Lower cost than PTFE disks.

Description	Diameter	qty.	cat.#
Resprep-C8	47 mm	24-pk.	24048
Resprep-C18	47 mm	20-pk.	24004
Resprep-C18	90 mm	12-pk.	25988

Resprep® Oil & Grease SPE Disks

- 47 mm glass fiber disks embedded with specialty bonded silica.
- Meet requirements for EPA Method 1664.*
- Reduce emulsion formation and amount of solvent required by previous EPA methods.
- No chlorofluorocarbons needed.

Description	qty.	cat.#
Resprep Oil & Grease SPE Disks	20-pk.	26022

*A sodium sulfate drying tube (cat.# 26207, page 397) and a 0.45 µm PTFE syringe filter (cat.# 26145, page 408) also may be used.

26024

Resprep® SPE Flow Filters

- Designed specifically to improve flow when filtering oil and grease samples.
- Use with Resprep® Diskcover-47 reservoir, or any 47 mm glass sample reservoir.

Description	qty.	cat.#
Resprep SPE Flow Filters	20-pk.	26024

26023

Resprep® Resin SPE Disks

- 47 mm glass fiber disks embedded with styrene/DVB resin.
- For chlorinated, benzidine-containing, or nitrogen-containing pesticides.
- Meet requirements of EPA Methods 515.2 and 553.

Description	qty.	cat.#
Resprep Resin SPE Disks	20-pk.	26023

Parts for Diskcover-47 Extraction System

Diskcover-47 Extraction Disk Holder

- Compatible with most vacuum manifold systems that accept 1/8-inch male luer fittings.
- Sample can be automatically introduced via 1/8-inch PTFE tubing or from the optional Diskcover-47 reservoir.

Description	qty.	cat.#
Diskcover-47 Extraction Disk Holder	ea.	24020
Diskcover-47 Extraction Disk Holder	6-pk.	24021
PTFE Tube Luer Adaptors (1/8" OD)	6-pk.	24017
PTFE Sample Tubing (2 ft./0.6 m, 1/8" OD)	6-pk.	24025

24020

24029

Diskcover-47 Reservoir*

The Diskcover-47 open-top reservoir allows you to pour up to 125 mL of sample directly onto the filter disk holder. It easily installs on top of the Diskcover-47 extraction disk holder.

Description	qty.	cat.#
Diskcover-47 Reservoir	ea.	24029
Diskcover-47 Reservoir	6-pk.	24030

*Must be used with the Diskcover-47 extraction disk holder.

Sodium Sulfate (Bulk Adsorbent)

- Ideal for removing water from sample extracts.
- Activate by heating to 400 °C for four hours before use.
- Packaged in recloseable 5 kg buckets.

Anhydrous sodium sulfate is the most common drying agent used to remove moisture from sample extracts. We package our 60 mesh material in recloseable buckets.

Description	qty.	cat.#
Sodium Sulfate	5 kg	26204

Florisil® PR (Bulk Adsorbent)

- Pesticide residue grade.
- Packaged in glass containers.

Florisil® PR is commonly used to remove polar interferences from pesticide residues. This bulk material is ideal for labs packing their own extraction cartridges for pesticide residue extractions.

Description	qty.	cat.#
Florisil PR, 60/100 mesh	500 g	26135

Granulated Activated Copper (Bulk Adsorbent)

- Convenient form for removing sulfur from environmental extracts.
- Acidified and activated—ready for use.

Activated copper effectively removes elemental sulfur from environmental extracts. Our acid-washed and activated material can be used right out of the package. The 30 mesh granular material eliminates the potential for fine copper particles in filtered extracts.

Description	qty.	cat.#
Granulated Activated Copper, 30 mesh	1 kg	26136

Ottawa Sand (Bulk Adsorbent)

- Sample medium for matrix spikes and laboratory control blanks.
- Packaged in convenient 5 kg buckets.

Ottawa sand is listed in several U.S. EPA methods as the specified medium for matrix spike and laboratory control blanks.

Description	qty.	cat.#
Ottawa Sand	5 kg	26137

Diatomaceous Earth (Bulk Adsorbent)

- Improves extraction efficiency.
- Adsorbs moisture from samples.

Diatomaceous earth is used as a filter aid to improve extraction efficiency of densely packed soils, such as clays. By mixing the sample with diatomaceous earth, recoveries can be improved and excess moisture can be absorbed. Packaged in a convenient 1 kg quantity.

Description	Similar to Dionex Part #	qty.	cat.#
Diatomaceous Earth, 30/40 mesh	062819	1 kg	26033

QuEChERS Products

Ideal for multiresidue pesticide analysis from food and other matrices.

Restek Q-sep® QuEChERS Products

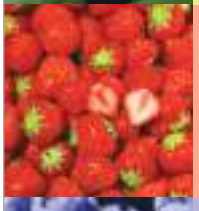
Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Ready-to-use tubes, no glassware required.
- Preweighed, ultra-pure sorbents.
- Support original unbuffered, AOAC (2007.01), European (EN 15662), and mini-multiresidue QuEChERS methods.

QuEChERS methods are fast, easy, and cost-effective, and Restek Q-sep® products make QuEChERS procedures even simpler. All extraction salts, sorbents, and sample tubes are included—no specialized equipment or glassware is required. Prepare samples more efficiently with a complete line of QuEChERS supplies from Restek.

	Mini-Luke or Modified Luke Method	QuEChERS	Savings with QuEChERS
Estimated time to process 6 samples (min)	120	30	4x faster
Solvent used (mL)	60-90	10	6-9x less solvent
Chlorinated waste (mL)	20-30	0	Safer, cheaper, greener
Glassware/specialized equipment	capacity for 200 mL, quartz wool, funnel, water bath or evaporator	none	Ready-to-use

Selection Guide for Q-sep® QuEChERS dSPE Tubes

Commodity types and examples	AOAC 2007.01	EN 15662	Mini-multiresidue	Additional products
Low fat & low pigment fruits & vegetables • Celery • Cucumber • Head lettuce • Melon	**2 mL, 100-pk.** (cat.# 26124) **15 mL, 50-pk.** (cat.# 26220)	**2 mL, 100-pk.** (cat.# 26215) **15 mL, 50-pk.** (cat.# 26223)	**2 mL, 100-pk.** (cat.# 26215)	
Fatty or waxy fruits & vegetables • Cereals • Avocado • Nuts & seeds • Dairy	**2 mL, 100-pk.** (cat.# 26125) **15 mL, 50-pk.** (cat.# 26221)		**2 mL, 100-pk.** (cat.# 26216)	**15 mL, 50-pk.** (cat.# 26226) **2 mL, 100-pk.** (cat.# 26242) **15 mL, 50-pk.** (cat.# 26244)
 **Pigmented fruits & vegetables** • Strawberries • Sweet potatoes • Tomatoes	**15 mL, 50-pk.** (cat.# 26222)	**2 mL, 100-pk.** (cat.# 26217) **15 mL, 50-pk.** (cat.# 26224)	**2 mL, 100-pk.** (cat.# 26217)	**2 mL, 100-pk.** (cat.# 26123)
Highly pigmented fruits & vegetables • Red peppers • Spinach • Blueberries	**2 mL, 100-pk.** (cat.# 26219)	**2 mL, 100-pk.** (cat.# 26218) **15 mL, 50-pk.** (cat.# 26225)	**2 mL, 100-pk.** (cat.# 26218)	**15 mL, 50-pk.** (cat.# 26126)
Universal use Wide range of commodities, including fatty & pigmented fruits & vegetables.				**2 mL, 100-pk.** (cat.# 26243) **15 mL, 50-pk.** (cat.# 26245)
Download free instructions at **www.restek.com/quechers**	Instruction sheet# 805-01-002	Instruction sheet# 805-01-001	Instruction sheet# 805-01-001	Generic dSPE 805-01-003

Q-sep® QuEChERS Extraction Salts

- Salt packets eliminate the need for a second empty tube to transfer salts.
- Go green by using packets with reusable tubes.
- Convenient and easy to use.

Description	Material	Methods	qty.	cat.#
Q-sep QuEChERS Extraction Kit (Original)	4 g $MgSO_4$, 1 g NaCl with 50 mL Centrifuge Tube	original unbuffered	50 packets & 50 tubes	23991
Q-sep QuEChERS Extraction Salt Packets Only (Original)	4 g $MgSO_4$, 1 g NaCl	original unbuffered	50 packets	23992
Q-sep QuEChERS Extraction Kit (EN)	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS with 50 mL Centrifuge Tube	European EN 15662	50 packets & 50 tubes	26235
Q-sep QuEChERS Extraction Salt Packets Only (EN)	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS	European EN 15662	50 packets	26236
Q-sep QuEChERS Extraction Kit (AOAC)	6 g $MgSO_4$, 1.5 g NaOAc with 50 mL Centrifuge Tube	AOAC 2007.01	50 packets & 50 tubes	26237
Q-sep QuEChERS Extraction Salt Packets Only (AOAC)	6 g $MgSO_4$, 1.5 g NaOAc	AOAC 2007.01	50 packets	26238
Empty 50 mL Centrifuge Tube, Polypropylene			50-pk.	26239
Empty 50 mL Centrifuge Tube, FEP			2-pk.	23997

TSCD—trisodium citrate dihydrate
DHS—disodium hydrogen citrate sesquihydrate
NaOAc—sodium acetate

Q-sep® QuEChERS dSPE Tubes for Extract Cleanup

Packaged in foil subpacks of 10 for enhanced protection and storage stability.

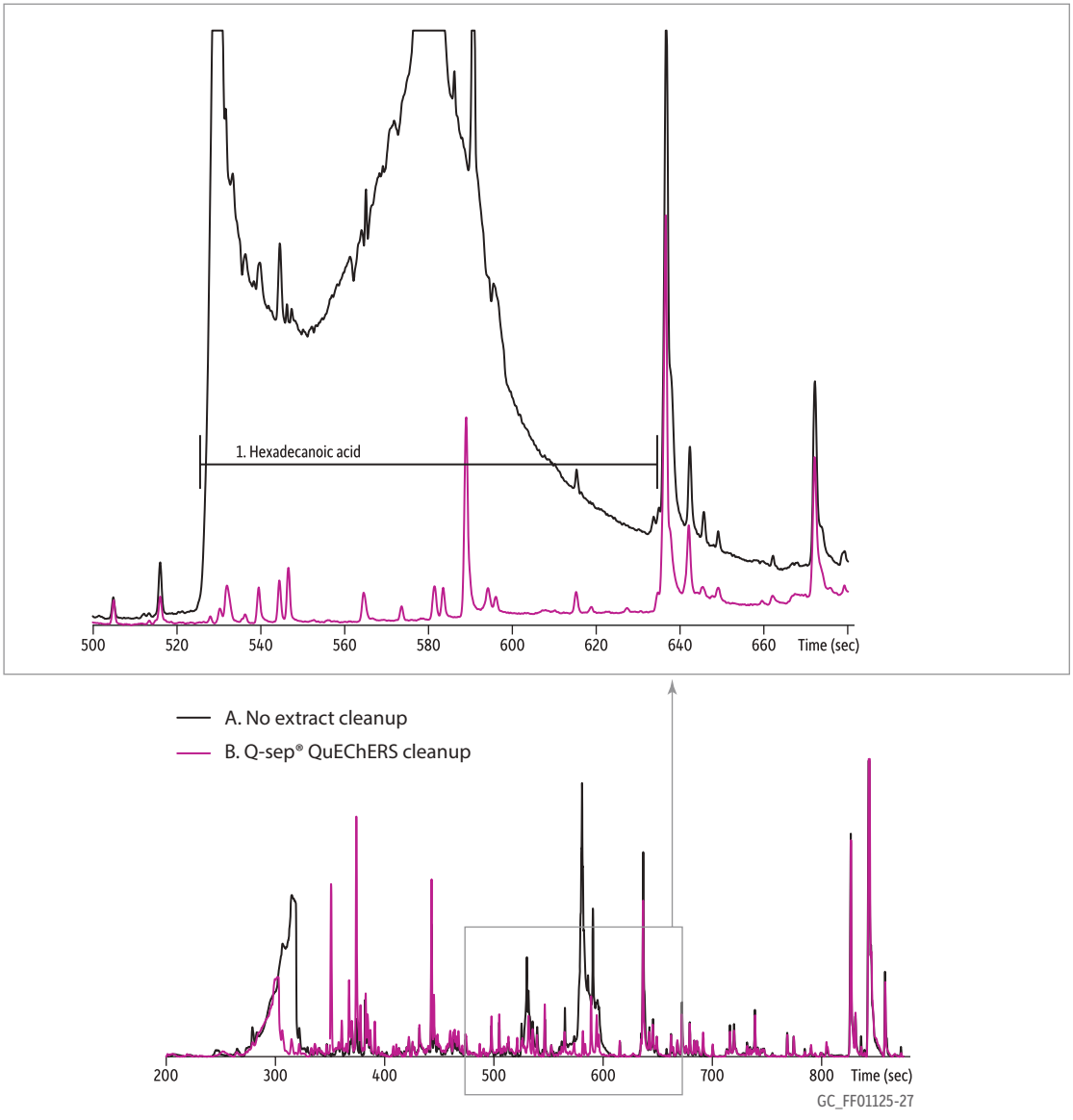
Description	Methods	qty.	cat.#
2 mL Micro-Centrifuge Tubes Prefilled with dSPE Materials for Cleanup (1 mL Extract)			
150 mg $MgSO_4$, 25 mg PSA	original unbuffered, mini-multi-residue, European EN 15662	100-pk.	26215
150 mg $MgSO_4$, 25 mg PSA, 25 mg C18	mini-multiresidue	100-pk.	26216
150 mg $MgSO_4$, 25 mg PSA, 2.5 mg GCB	mini-multiresidue, European EN 15662	100-pk.	26217
150 mg $MgSO_4$, 25 mg PSA, 7.5 mg GCB	mini-multiresidue, European EN 15662	100-pk.	26218
150 mg $MgSO_4$, 50 mg PSA	AOAC 2007.01	100-pk.	26124
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18	AOAC 2007.01	100-pk.	26125
150 mg $MgSO_4$, 50 mg PSA, 50 mg GCB	AOAC 2007.01	100-pk.	26123
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18, 50 mg GCB	AOAC 2007.01	100-pk.	26219
150 mg $MgSO_4$, 50 mg C18	NA	100-pk.	26242
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18, 7.5 mg GCB	universal	100-pk.	26243
15 mL Centrifuge Tubes Prefilled with dSPE Materials for Cleanup (6 mL and 8 mL Extract)			
1,200 mg $MgSO_4$, 400 mg PSA	AOAC 2007.01	50-pk.	26220
1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18	AOAC 2007.01	50-pk.	26221
1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18, 400 mg GCB	AOAC 2007.01	50-pk.	26222
1,200 mg $MgSO_4$, 400 mg C18	similar to AOAC 2007.01	50-pk.	26244
900 mg $MgSO_4$, 150 mg PSA	original unbuffered, European EN 15662	50-pk.	26223
900 mg $MgSO_4$, 150 mg PSA, 15 mg GCB	European EN 15662	50-pk.	26224
900 mg $MgSO_4$, 150 mg PSA, 45 mg GCB	European EN 15662	50-pk.	26225
900 mg $MgSO_4$, 150 mg PSA, 150 mg C18	similar to European EN 15662	50-pk.	26226
900 mg $MgSO_4$, 300 mg PSA, 300 mg C18, 45 mg GCB	similar to European EN 15662	50-pk.	26245
900 mg $MgSO_4$, 300 mg PSA, 150 mg GCB	NA	50-pk.	26126

PSA—primary and secondary amine
GCB—graphitized carbon black

Multiple sorbents are used to extract different types of interferences.

$MgSO_4$	removes excess water
PSA	removes sugars, fatty acids, organic acids, and anthocyanine pigments
C18	removes nonpolar interferences
GCB	removes pigments, sterols, and nonpolar interferences

Use Q-sep® QuEChERS tubes to easily remove matrix interferences.



Column	Rxi®-5Sil MS, 20 m, 0.18 mm ID, 0.18 µm (cat.# 43602)
Sample	Sweet potato spiked with pesticide mix and extracted with acetonitrile and Q-sep® QuEChERS EN Method 15662 extraction salts
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1 min)
Liner:	Single taper (4 mm) w/deact. wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	72.5 °C (hold 1 min) to 350 °C at 20 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	
Transfer Line Temp.:	300 °C
Analyzer Type:	TOF
Ionization Mode:	EI
Acquisition Range:	45-550 amu
Instrument	Agilent/HP6890 GC
Notes	A. Extract (without cleanup step) acidified with formic acid to pH 5 B. Extract with cleanup using Q-sep® QuEChERS dSPE cleanup tube (cat.# 26124) acidified with formic acid to pH 5. Scan range: m/z 60, 73, 87, 129, 256 plotted

Q-sep® 3000 Centrifuge for QuEChERS

- Meets or exceeds requirements of original unbuffered, AOAC, and European QuEChERS methodology.
- Supports 50 mL, 15 mL, and 2 mL centrifuge tubes.
- Small footprint requires less bench space.
- Safe and reliable—UL, CSA, and CE approved; 1-year warranty.

Priced to fit your laboratory's budget, the Q-sep® 3000 centrifuge is the first centrifuge specifically designed for QuEChERS methodology. This compact, quiet, yet powerful unit spins at the 3,000 g force required by the European method.

Centrifuge includes 50 mL tube carriers (six), 50 mL conical tube inserts (six), 4-place 15 mL tube carriers (six), and 2 mL tube adaptors (24).

Specifications:

Motor Speed and Force Rating: 4,130 rpm, 3,000 xg
Maximum Capacity with 6-Place Horizontal Rotor: 6 x 50 mL tubes, 18 x 15 mL tubes, 24 x 2 mL tubes
Motor: 1/2 H.P. brushless DC
Nominal Acceleration Time: 45 seconds
Nominal Braking Time: 60 seconds
Timer (electronic): 1 to 30 minutes +/-1%
Requirement: 2.0 or 1.0 amps
Current Voltage Requirement: 115 or 230 (+/-10%) volts
Frequency: 50 / 60 Hz
Centrifuge Protection Breaker: 4 amp resettable
Overall Dimensions: 9" h x 14.5" w x 17" d (22.9 cm x 36.8 cm x 43.2 cm)
Weight: 39 lb (17.7 kg)

26230

Dimensions: 9" h x 14.5" w x 17" d
(22.9 cm x 36.8 cm x 43.2 cm)

Description	qty.	cat.#
Q-sep 3000 Centrifuge, 110V	ea.	26230
Q-sep 3000 Centrifuge, 220V	ea.	26231
Replacement Accessories		
50 mL Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26232
50 mL Conical Tube Insert for Q-sep 3000 Centrifuge	6-pk.	26249
15 mL 4-Place Tube Carrier for Q-sep 3000 Centrifuge (fits four 15 mL tubes)	2-pk.	26233
2 mL Tube Adaptors for Q-sep 3000 Centrifuge	4-pk.	26234

26232

26233

26234

26249

Q-sep® Tube Racks

- Available for 2 mL, 15 mL, and 50 mL tubes.
- Alphanumerical grid reference on top tier for easy identification of samples.
- Easy to assemble; simply fold and snap together securely.

Description	Size	Material	qty.	cat.#
Q-sep Tube Rack for 2 mL Centrifuge Tube	Holds 100	Polypropylene, White	ea.	23995
Q-sep Tube Rack for 15 mL Centrifuge Tube	Holds 60	Polypropylene, White	ea.	23993
Q-sep Tube Rack for 50 mL Centrifuge Tube	Holds 24	Polypropylene, White	ea.	23994

23994

23995

Q-sep® Bottle Top Solvent Dispenser

- Adjustment knob offers 56 output volume settings from 2.5 mL to 30 mL per stroke (0.5 mL increments)—ideal for QuEChERS methods!
- Base features 30 mm threads and includes four adaptors (25 mm, 28 mm, 38 mm, and 45 mm).
- Individually calibrated in accordance with ISO 8655 standards (certificate included) and can also be recalibrated by the user.
- PTFE, glass, and polypropylene construction for excellent chemical compatibility and 100% autoclavability.
- Integral safety discharge reduces risk of accidental dispensing, and nozzle cap prevents dripping.
- Easy to disassemble for cleaning and servicing.

Accurately and precisely dispense liquids for QuEChERS extractions with this versatile pump. A quick, simple adjustment lets you set the output volume anywhere from 2.5 mL to 30 mL per stroke, and the included adaptors will accommodate most reagent bottles.

Description	qty.	cat.#
Q-sep Bottle Top Solvent Dispenser, 2.5 mL–30 mL	ea.	23990

23990
Bottle not included.

Sample Filtration

Cut costs, not quality!

Syringe Filters with Luer Lock Inlet

- Luer lock inlet offers leak-tight syringe connection.
- Variety of filter types, porosities, and diameters.
- Color coded for easy identification.
- Rugged polypropylene housing.
- Autoclavable to 121 °C for 15 minutes.
- Quantity break pricing for greater savings.

Size	Porosity	Color	qty.	cat.#
Cellulose Acetate				
4 mm	0.22 µm	green	100-pk.	23972
4 mm	0.45 µm	blue	100-pk.	23973
13 mm	0.22 µm	red	100-pk.	26156
13 mm	0.45 µm	red	100-pk.	26155
25 mm	0.22 µm	red	100-pk.	26158
25 mm	0.45 µm	red	100-pk.	26157
30 mm	0.22 µm	red	100-pk.	23982
30 mm	0.45 µm	red	100-pk.	23983
Nylon				
4 mm	0.22 µm	yellow	100-pk.	23970
4 mm	0.45 µm	pink	100-pk.	23971
13 mm	0.22 µm	pink	100-pk.	26146
13 mm	0.45 µm	pink	100-pk.	26147
25 mm	0.22 µm	pink	100-pk.	26148
25 mm	0.45 µm	pink	100-pk.	26149
30 mm	0.22 µm	pink	100-pk.	23980
30 mm	0.45 µm	pink	100-pk.	23981
PES (polyethersulfone)				
4 mm	0.22 µm	white	100-pk.	23978
4 mm	0.45 µm	blue	100-pk.	23979
13 mm	0.22 µm	green	100-pk.	23966
13 mm	0.45 µm	green	100-pk.	23967
25 mm	0.22 µm	green	100-pk.	23968
25 mm	0.45 µm	green	100-pk.	23969
30 mm	0.22 µm	green	100-pk.	23988
30 mm	0.45 µm	green	100-pk.	23989
PTFE (polytetrafluoroethylene)				
4 mm	0.22 µm	purple	100-pk.	23974
4 mm	0.45 µm	orange	100-pk.	23975
13 mm	0.22 µm	white	100-pk.	26142
13 mm	0.45 µm	white	100-pk.	26143
25 mm	0.22 µm	white	100-pk.	26144
25 mm	0.45 µm	white	100-pk.	26145
30 mm	0.22 m	white	100-pk.	23984
30 mm	0.45 µm	white	100-pk.	23985
PVDF (polyvinyldifluoride)				
4 mm	0.22 µm	brown	100-pk.	23976
4 mm	0.45 µm	red	100-pk.	23977
13 mm	0.22 µm	blue	100-pk.	26150
13 mm	0.45 µm	blue	100-pk.	26151
25 mm	0.22 µm	blue	100-pk.	26152
25 mm	0.45 µm	blue	100-pk.	26153
30 mm	0.22 µm	blue	100-pk.	23986
30 mm	0.45 µm	blue	100-pk.	23987

Syringe filters are for laboratory use only.

Membrane selection guide

Membrane	Properties	Applications	Incompatible with
Cellulose Acetate	hydrophilic	aqueous solutions	organic solvents
Nylon	hydrophilic, low protein binding	bases, HPLC solvents, alcohols, aromatic hydrocarbons	acids, aggressive halogenated hydrocarbons, proteins
PES	hydrophilic, low protein binding, fast flow rates	filtration of buffers & culture media	—
PTFE	hydrophobic	organic solvents, acids, alcohols, bases, aromatics	aqueous samples without pre-wetting (to avoid high backpressure)
PVDF	hydrophilic, low protein binding	alcohols, biomolecules	bases, esters, ethers, ketones

Cellulose Acetate, Nylon, PES, PVDF—hydrophilic applications
PTFE—hydrophobic applications

Syringe Filters Compatibility Chart

Group of Substance & Chemical Reagents	Cellulose Acetate	Nylon	PES	PTFE	PVDF
ACIDS					
Acetic, 5%	L	R	R	R	R
Acetic, 10%	L	R	R	R	R
Acetic, 25%	N	L	R	R	R
Acetic, Glacial	N	N	R	R	R
Boric	-	L	-	R	-
Formic 25%	L	N	-	R	-
Hydrochloric 15%	L	L	R	R	L
Hydrochloric 25%	N	N	R	R	-
Hydrochloric concentrated	N	N	L	R	N
Hydrofluoric 10%	N	N	-	-	-
Hydrofluoric 35%	N	N	-	R	-
Nitric 25%	N	N	R	R	-
Nitric 6N, 38%	N	N	L	R	R
Nitric concentrated	N	N	N	R	N
Phosphoric 25%	L	N	R	R	-
Sulfuric 25%	N	N	N	R	-
Sulfuric 6N, 29%	N	N	N	R	-
Sulfuric concentrated	N	N	N	R	N
Trichloroacetic 10%	N	N	-	R	R
ALKALINES					
Ammonium Hydroxide 25%	N	R	R	R	L
Formalin 30%	L	L	R	-	-
Sodium Hydroxide 3N, 12%	N	R	R	R	R
ALCOHOLS					
Amyl Alcohol	L	R	N	R	R
Benzyl Alcohol	L	L	L	L	L
Butyl Alcohol	L	R	L	R	R
Butyl Cellosolve	N	L	-	L	-
Ethanol 70%	L	R	L	R	R
Ethanol 98%	N	R	N	R	R
Ethylene glycol	L	R	R	R	R
Glycerol	L	R	R	R	R
Isobutyl Alcohol	L	L	L	L	L
Isopropanol, *n*-Propanol	L	R	R	R	R
Methanol 98%	N	R	L	R	R
Methyl Cellsolve	L	L	-	L	-
Propylene glycol	L	-	R	R	R
Phenol, Aqueous 10%	-	R	-	R	R
HYDROCARBONS					
Hexane	L	R	L	R	R
Xylene	L	R	N	R	R
Kerosene, Gasoline	L	R	R	R	R
Tetrakin, Decalin	N	R	-	R	R
Toluene, benzene	L	R	N	R	R
HALOGENATED HYDROCARBONS					
Carbon Tetrachloride	N	N	N	N	N
Chloroform	N	N	N	R	R
Methylene Chloride	N	L	N	R	N
Monochlorobenzene	N	N	-	R	-
Trichloethylene	N	N	N	R	R
KETONES					
Acetone	N	R	N	R	N
Cyclohexanone	N	L	N	R	N
Isopropylacetone	-	R	-	R	N
Methyl Ethyl Ketone	N	R	N	R	N
Methyl Isobutyl Ketone	N	R	-	R	N
ESTERS					
Amyl Acetate	N	R	L	R	-
Amyl Propyl & Butyl Acetate	L	-	-	R	-
Benzyl Benzoate	-	-	-	R	-
Butyl Acetate	N	-	N	-	-
Ethyl Acetate & Methyl Acetate	N	R	N	R	R/L
Isopropyl Myristate	-	-	-	R	-
Methyl Cellosolve Acetate	N	-	-	R	-
Propylene Glycol Acetate	-	-	-	R	-
Tricresyl Phosphate	-	-	-	R	-
Isopropyl Acetate	L	R	-	-	R
OXIDES - ETHERS					
Dimethylsulfoxide (DMSO)	N	R	N	R	N
Dioxane & Tetrahydrofuran	N	R	L	R	L
Ethyl Ether	L	R	R	R	R
Isopropyl Ether	-	-	-	R	R
SOLVENTS WITH NITROGEN					
Acetonitrile	N	R	N	R	N
Aniline	N	-	-	R	-
Diethylacetamide	N	L	N	R	N
Dimethyl Formamide	N	R	N	R	N
Pyridine	N	R	N	R	-
Triethanolamine	-	R	-	R	N
MISCELLANEOUS					
Formaldehyde Solution 30%	L	R	R	R	R
Hydrogen Peroxide 30%	N	L	N	R	R
Pyridine	N	R	N	R	R
Silicone Oil & Mineral Oil	R	R	R	R	R

R = Recommended. No significant change observed in flow rate or bubble point of the membrane, nor visible indication of chemical attack.

L = Limited Recommended Use. Moderate changes in physical properties. The filter may be suitable for short term, non-critical use.

N = Not Recommended. The membrane may be unstable.

- = Insufficient Data. Information is not available. Trial testing is recommended.

Sample Filtration

Simply squeeze particulates and contaminants out of your sample!

Thomson SINGLE StEP® Filter Vials

NEW! Now available in convenient 100-pks.

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12 x 32 mm autosamplers, including UHPLC instruments.

25891 25892 25897 25898

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Porosity	Color	qty.	cat.#
Nylon			
0.2 µm	black cap	100-pk.	25891
0.45 µm	pink cap	100-pk.	25892
PES (polyethersulfone)			
0.2 µm	grey cap	100-pk.	25897
0.45 µm	orange cap	100-pk.	25898
PTFE (polytetrafluoroethylene)			
0.2 µm	green cap	100-pk.	25893
0.45 µm	blue cap	100-pk.	25894
PVDF (polyvinyldifluoride)			
0.2 µm	red cap	100-pk.	25895
0.45 µm	yellow cap	100-pk.	25896

Patent No. 7,790,117

Filter Vials Compatibility Chart

Most solvents and mobile phases used in liquid chromatography are also compatible with SINGLE StEP® filter vials.

Solvent / Mobile Phase	HOUSINGS	FILTERS			
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Acetic Acid (glacial) *acid, organic*	L	R	R	R	N
Acetone *ketone*	R	R	N	N	R
Acetonitrile (ACN) *nitrile*	R	R	L	N	R
Alconox, 1% *surfactant/detergent*	L	L	L	L	L
Ammonium Hydroxide *caustic*	L	R	R	N	L
Ammonium Sulfate (saturated) *salt, aqueous solution*	R	R	N	L	R
Amyl Acetate *ester*	L	R	R	R	L
Amyl Alcohol *alcohol*	R	R	R	R	L
Benzene *HC, aromatic*	N	R	R	N	R
Benzyl Alcohol *HC aromatic/alcohol*	N	R	R	L	L
Boric Acid (aqueous solution) *acid, inorganic*	R	R	L	R	R
Butyl Acetate *ester*	L	R	L	N	R

Solvent / Mobile Phase	HOUSINGS	FILTERS			
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Butyl Alcohol *alcohol*	R	R	R	R	R
Carbon Tetrachloride *HC, halogenated*	N	R	R	N	L
Cellosolve (ethyl) *glycol ether*	R	R	L	R	R
CHAPS (aqueous solution) *surfactant/detergent*	L	L	L	L	L
Chloroform *HC, halogenated*	N	R	R	N	N
Cyclohexanone *ketone*	N	R	N	N	R
Diethyl Pyrocarbonate, 0.2% *carboxylic anhydride*	L	L	L	L	L
Dimethyl Sulfoxide (DMSO) *sulfoxide*	R	R	N	N	R
Dimethylacetamide *amide*	R	R	N	N	N
Dimethylformamide *amide*	R	R	N	L	R
Dioxane *ether*	R	R	R	L	R
Ethers *ether*	N	R	R	L	R

Continued on next page

Filter Vials Compatibility Chart

Continued from previous page

Solvent / Mobile Phase	HOUSINGS	FILTERS			
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Ethyl Acetate *ester*	L	R	R	N	R
Ethyl Alcohol *alcohol*	R	R	R	R	L
Ethylene Glycol *glycol*	R	R	R	R	R
Formaldehyde *aldehyde*	R	R	R	L	R
Formic Acid, 50% *acid, organic*	R	R	R	L	N
Freon® (TF or PCA) *HC, halogenated*	R	R	R	L	R
Gasoline *HC*	N	R	R	R	R
Glycerine (Glycerol) *glycol*	R	R	R	R	R
Guanidine Hydrochloride, 6M *salt, aqueous solution*	L	R	L	L	L
Guanidine Thiocyanate, 5M *salt, aqueous solution*	L	R	L	L	L
Helium *gas*	R	R	L	L	R
Hexane *HC, aliphatic*	N	R	R	R	R
Hydrochloric Acid, 1N (HCL) *acid, inorganic*	R	R	R	R	R
Hydrochloric Acid, 6N (HCL) *acid, inorganic*	L	R	L	R	L
Hydrochloric Acid, conc. (HCL) *acid, inorganic*	N	R	N	L	N
Hydrofluoric Acid *acid, inorganic*	N	R	N	N	N
Hydrogen *gas*	R	R	R	L	R
Hydrogen Peroxide, 3% *peroxide*	R	R	R	L	R
Hydrogen Peroxide, 30% *peroxide*	L	R	R	L	L
Hydrogen Peroxide, 90% *peroxide*	R	R	R	L	N
HYPO (aqueous solution) *salt, aqueous solution*	R	R	R	L	R
Isobutyl Alcohol *alcohol*	R	R	R	R	L
Isopropyl Acetate *ester*	L	R	R	N	R
Isopropyl Alcohol *alcohol*	R	R	R	R	L
Kerosene *HC*	L	L	R	R	R
Lactic Acid, 50% *acid, organic/alcohol*	R	R	L	L	L
Lubrol PX (aqueous solution) *surfactant/detergent*	L	L	L	L	L
Methyl Ethyl Ketone (MEK) *ketone*	R	R	N	N	R
Mercaptoethanol, 0.1M *alcohol/mercaptan*	L	L	L	L	L
Methyl Acetate *ester*	L	R	N	N	R
Methyl Alcohol *alcohol*	R	R	R	R	L
Methylene Chloride *HC, halogenated*	N	R	N	N	L

Solvent / Mobile Phase	HOUSINGS	FILTERS			
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Methyl Isobutyl Ketone (MIBK) *ketone*	N	R	N	N	R
Mineral Spirits *HC*	N	R	R	R	R
Nitric Acid, 6N *acid, inorganic*	L	R	R	R	N
Nitric Acid (concentrated) *acid, inorganic*	N	L	N	L	N
Nitrobenzene *HC, aromatic*	N	R	R	L	R
Nitrogen *gas*	L	R	R	L	R
Nonidet-P40 (aqueous solution) *surfactant/detergent*	L	L	L	L	L
Ozone *gas*	N	R	R	L	N
Paraldehyde *aldehyde*	L	R	L	L	R
Pentane *HC, aliphatic*	N	R	R	R	R
Petroleum Ether *ether*	L	R	R	L	R
Phenol (aqueous solution) *phenol*	N	R	R	L	N
Potassium Hydroxide, 3N *caustic*	R	R	R	L	R
Pyridine *amine*	R	R	N	N	L
Silicone Oils *silicone*	R	R	R	L	R
Sodium Carbonate (aqueous solution) *salt, aqueous solution*	R	R	R	L	L
Sodium Chloride (aqueous solution) *salt, aqueous solution*	R	R	R	L	R
Sodium Dodecyl Sulfate *surfactant/detergent*	L	L	L	L	L
Sodium Hydroxide, 3N *caustic*	R	R	R	R	R
Sodium Hydroxide (concentrated) *caustic*	R	R	R	R	N
Sulfuric Acid (concentrated) *acid, inorganic*	N	R	L	N	N
TCA (aqueous solution) *acid, organic*	R	R	R	L	L
Tetrahydrofuran (THF) *ether*	N	R	N	L	R
Toluene *HC, aromatic*	N	R	R	R	R
Trichloroethane *HC, halogenated*	N	R	L	N	L
Trichloroethylene *HC, halogenated*	N	R	R	N	L
Tween 20 (aqueous solution) *surfactant/detergent*	L	R	L	L	L
Urea, 8M *salt, aqueous solution*	R	R	R	L	R
Water (Brine) *salt, aqueous solution*	R	R	R	L	R
Xylene *HC, aromatic*	N	R	R	L	R

R = Recommended. No significant change observed in flow rate or bubble point of the membrane, nor visible indication of chemical attack.

L = Limited Recommended Use. Moderate changes in physical properties. The filter may be suitable for short term, non-critical use.

N = Not Recommended. The membrane may be unstable.

- = Insufficient Data. Information is not available. Trial testing is recommended.

Accelerated Solvent Extraction (ASE)

Accelerated solvent extraction is a common technique for fast and reliable extraction of organic materials from solid matrices using EPA SW-846 Method 3545, Pressurized Fluid Extraction (PFE). Restek offers a wide range of replacement parts to keep your extraction system running smoothly. All parts are economically priced to save you money and are designed to meet or exceed the performance of the original manufacturer's parts.

Replacement Parts for ASE® 150/350 Systems, Manufacturer's Design

Extraction Cell Bodies for ASE® 150/350 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.

Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	cat.#
1 mL for ASE 150/350	068261	ea.	25993
5 mL for ASE 150/350	068262	ea.	25994
10 mL for ASE 150/350	068263	ea.	25995
22 mL for ASE 150/350	068264	ea.	25996
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132

Extraction Cell Caps for ASE® 150/350 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Stainless Steel qty.	cat.#
Replacement Extraction Cell End Caps for ASE 150/350	2-pk.	25997

Q-sep® QuEChERS Products

Quick, Easy, Cheap, Effective, Rugged and Safe!

Standards Available!

Standards for AOAC QuEChERS Method 2007.01

See **page 575** for:

- AOAC IS Solution .....cat.# 31963
- AOAC TPP Solution.....cat.# 31964
- AOAC QC Spike Mix.....cat.# 31999

www.restek.com/**quechers**

Replacement Parts for ASE® 200 Systems, Manufacturer's Design

Extraction Cell Bodies for ASE® 200 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.

Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	cat.#
1 mL for ASE 200	054973	ea.	26110
5 mL for ASE 200	054974	ea.	26112
11 mL for ASE 200	048820	ea.	26114
22 mL for ASE 200	048821	ea.	26098
33 mL for ASE 200	048822	ea.	26116

Cell bodies are serialized for easy sample identification.

Extraction Cell Caps & Replacement Parts for ASE® 200 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Similar to Dionex Part #	Stainless Steel qty.	cat.#
Replacement Extraction Cell End Caps for ASE 200	049450	2-pk.	26096
Threaded Cap Inserts for ASE 200	—	2-pk.	26166
Replacement Frits for ASE 200	049453	10-pk.	26100
Replacement Frits for ASE 200	049453	100-pk.	25959

26166

Description	Similar to Dionex Part #	qty.	cat.#
Snap Rings for Caps for ASE 200	049456	10-pk.	26184
Funnel for ASE 200	056958	ea.	26180
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188

26180

PEEK Washers for ASE® 200 Systems

- Meet original equipment manufacturer's performance.
- Available in four quantities.

Description	Similar to Dionex Part #	qty.	cat.#
PEEK Washers for ASE 200	049454	12-pk.	25256
		48-pk.	25257
		250-pk.	26120
		1,000-pk.	26229

25256

20 mm Filters for ASE® 200 Extraction Cells

- Cellulose or glass fiber construction.
- Fit 11 mL, 22 mL, and 33 mL cells.
- Cellulose filters available in economical 1,000-packs.

Description	Similar to Dionex Part #	qty.	cat.#
Cellulose Filters for ASE 200	049458	100-pk.	26118
Cellulose Filters for ASE 200	049458	1,000-pk.	26190
Glass Fiber Filters for ASE 200	047017	100-pk.	26119

26119

60 mL Sample Collection Vials for ASE® 200 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex Part #	qty.	cat.#
60 mL Collection Vials for ASE 200	Clear	048784	72-pk.	26121
60 mL Collection Vials for ASE 200	Amber	048781	72-pk.	26122
Replacement Septa, 24 mm x 0.125", PTFE-lined silicone		—	100-pk.	24694

26122

26121

Replacement Parts for ASE® 100/300 Systems, Manufacturer's Design

26167

26169

Extraction Cell Bodies for ASE® 100/300 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.

Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	cat.#
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132

26187

26174 26188

Extraction Cell Caps & Replacement Parts for ASE® 100/300 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Similar to Dionex Part #	Stainless Steel qty.	cat.#
Replacement Extraction Cell End Caps for ASE 300	056921	2-pk.	26170
Threaded Cap Inserts for ASE 300	——	2-pk.	26167
Replacement Frits for ASE 100/300	——	6-pk.	26174

Description	Similar to Dionex Part #	qty.	cat.#
Snap Rings for Caps for ASE 100/300	056778	12-pk.	26134
Funnel for ASE 100/300	056699	ea.	26169
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188

25393

PEEK Washers for ASE® 100/300 Systems

- Meet original equipment manufacturer's performance.
- Available in two quantities.

Description	Similar to Dionex Part #	qty.	cat.#
PEEK Washers for ASE 100/300	061687	12-pk.	25393
		48-pk.	25394

26168

30 mm Filters for ASE® 100/300 Extraction Cells

- Cellulose or glass fiber construction.

Description	Similar to Dionex Part #	qty.	cat.#
Cellulose Filters for ASE 100/300	056780	100-pk.	26168
Glass Fiber Filters for ASE 100/300	056781	100-pk.	26189

26191 26260

250 mL Sample Collection Bottles for ASE® 100/300 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex Part #	qty.	cat.#
250 mL Collection Bottles for ASE 100/300	Clear	056284	12-pk.	26191
250 mL Collection Bottles for ASE 100/300	Amber	—	12-pk.	26260
Replacement Septa, 24 mm x 0.125", PTFE-lined silicone		—	100-pk.	24694

Valves for ASE® 100/200/300 Systems

- Fits ASE® 100, 200, 300 systems.
- Meets original equipment manufacturer's performance.

Description	Similar to Dionex Part #	qty.	cat.#
Pressure Relief Valve for ASE 100/200/300	048889	ea.	26159
Static Valve for ASE 100/200/300	048778	ea.	26160

26159

26160

Autoseal Tip Assembly for ASE® 200/300 Systems

- Meets original equipment manufacturer's performance.
- Choose original equipment–equivalent stainless steel or Siltek® deactivation for improved inertness and extended lifetime.

Description	Similar to Dionex Part #	Stainless Steel qty.	Stainless Steel cat.#	Siltek Treated qty.	Siltek Treated cat.#
Autoseal Tip Assembly for ASE 200	048811	ea.	26162	ea.	26161
Autoseal Tip Assembly for ASE 300	056641	ea.	26246	ea.	26247

26162

26161

Tubing Assembly for ASE® 200/300 Systems

- Great value and improved design.
- Eliminates the need for the adaptor fitting on the static and purge valves.

Description	Similar to Dionex Part #	qty.	cat.#
Tubing Assembly for ASE 200	049311	ea.	26251
Tubing Assembly for ASE 300	057059	ea.	26248

26251

Cell Organizer for ASE® Parts

- Convenient storage of extraction cell parts and consumables.
- Thirteen open bins provide easy visibility and organization for small and large pieces.
- Small footprint conserves valuable lab bench and drawer space.

Description	qty.	cat.#
Cell Organizer for ASE Parts, blue 13-bin unit, 12" l x 12" h x 7.5" d	ea.	23998

23998

Carrier Basket for ASE® Cells

- Sturdy stainless steel construction to carry full or empty ASE® cells and caps.
- Can hold twelve complete 33 mL cell assemblies and more of smaller sizes.

Description	qty.	cat.#
Carrier Basket for ASE Cells	ea.	23996

23996

26181

26182

26183

Resprep® Tools for ASE® Systems

- Use to insert filter in extraction cell or O-ring in cell cap.
- Fits all extraction cells, except 1 mL size.

Inserting a Filter Using Filter Insertion Attachment on Resprep® Tool Handle
(ASE® 100/200/300 systems)

Screw the appropriate size attachment onto the end of the Resprep™ tool handle.

Place a filter at the top of the extraction cell.

Push the filter to the bottom of the extraction cell.

Inserting an O-Ring Using Resprep® Tool Handle
(ASE® 100/200/300 systems)

Place the O-ring over the tip of the tool.

Insert the tool into the center hole of the extraction cell cap.

Press the tool firmly inside the cap until the O-ring snaps into place.

Description	qty.	cat.#
2-in-1 Filter/O-Ring Insertion Tool Kit for ASE 100/200/300 (includes Resprep Tool Handle and Filter Insertion Attachments)	kit	26181
Resprep Tool Handle for ASE 100/200/300	ea.	26182
Filter Insertion Attachments (1 mL, 5 mL, 11 mL, 33 mL) for ASE 100/200/300	4-piece set	26183

26185

Retaining Ring Pliers for ASE® 100/200/300 Systems

- Can be used for internal or external retaining rings.
- Works to remove retaining ring in all ASE® cell caps.

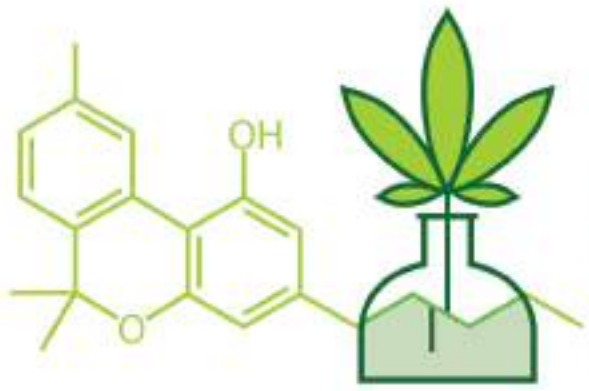
Description	qty.	cat.#
Retaining Ring Pliers for ASE 100/200/300	ea.	26185

23999

Cell Cleaning Brushes for ASE® 100/200/300 Cells

- Firm nylon bristle brushes for easy cell cleaning and removal of solid samples.
- Range of sizes to fit all extraction cells for ASE® 100, 200, and 300.

Description	qty.	cat.#
Cell Cleaning Brushes	3-pk.	23999



Growing Analytical Solutions for Medical Cannabis Labs

PRODUCTS AND EXPERTISE FOR **ACCURATE, RELIABLE RESULTS** EVERY TIME

Whether you are an experienced potency testing chemist or a manager starting up a new lab, Restek has the products and expertise you need for successful medical cannabis analyses. We are proud to have helped medical cannabis labs establish sound analytical practices from the beginning, and we will continue to be there for you every step of the way as the testing landscape changes.

- **High-Throughput Methods and Recommended Columns for:**
  - Potency Testing
  - Residual Solvents
  - Terpene Profiling
  - Pesticide Residues
- **Certified Reference Materials**
  Comprehensive suite of top-quality reference standards helps you report more accurate results.
- **Q-sep® QuEChERS Sample Prep Products**
  For fast, easy removal of matrix components that contaminate inlets and columns and interfere with analysis.
- **Trusted Expertise and Technical Support**

Explore our solutions at www.restek.com/cannabis

Air Sampling

Canisters & Accessories
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Air Canisters for VOC Sampling

SilcoCan® & TO-Can® Air Sampling Canisters

- Get high-performance canisters from the innovators of silicon coating technology.
- Variety of options available, including SUMMA can equivalent.
- Standard fittings compatible with all instrumentation and accessories.
- Exclusive manufacturer of 1 L spherical canister.
- Repair service available to extend canister life.

Canister Options	
Sizes	1, 3, 6, 15 L
Valves	RAVE™ diaphragm, Parker® diaphragm, Swagelok® bellows
Interior Coating	Electropolished, Siltek®-treated
Gauges	3 vacuum/pressure ranges

Applications	
Ambient Air	U.S. EPA TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, NJ DEP Low Level TO-15
Indoor Air	IP-1A, NJ DEP Low Level TO-15
Vapor Intrusion	
Emergency Response	

Dimensions/Weights of Air Canisters

Can Volume	Dimensions (height x sphere diameter)		Weight	
1 liter	8.5 x 5.25"	21.6 x 13.3 cm	2.25 lb	1.02 kg
3 liter	11.5 x 7.25"	29.2 x 18.4 cm	3.5 lb	1.59 kg
6 liter	12.5 x 9.25"	31.8 x 23.5 cm	5.75 lb	2.61 kg
15 liter	17 x 12.25"	43.2 x 31.1 cm	11.75 lb	5.33 kg

See **pages 421–422** for canister product listings or go to **www.restek.com/air** for more air sampling products and solutions.

Anatomy of a SilcoCan® Canister

Optional gauge

- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 110 °C during cleaning.

Newest surface technology
To ensure sample stability, SilcoCan® canisters are deactivated with innovative Siltek® surface treatment, which chemically bonds a silicon layer to the metal inner surface of the canister. This layer offers unsurpassed inertness for active compounds, including polar and sulfur-containing molecules. It will not crack, chip, or flake off, despite harsh handling in the field or during transport.

Enhanced valve and canister bracket
Canister holder and valve bracket protect canister, tube stub, and valve.

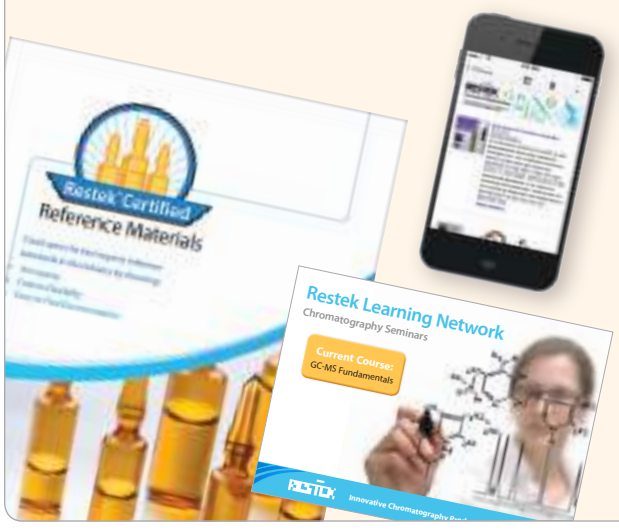
1/4" tube stub
Allows user to interchange valves.

Serial-controlled label
For quick, sure identification.

Rugged stainless steel
Canisters and valves are made of 304 and 316 stainless steel to withstand the rigors of field work.

Custom Coatings Available from Restek

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high-nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion-resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.



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It's quick and easy to have word of our new releases, applications, events, seminars, and so much more sent to you via print or e-mail. Subscribe to Restek and stay on the cutting edge today!

www.restek.com/**subscribe**

Introduce Your Sampling Canisters to Restek® Air Valve Excellence (RAVE™)

RAVE™ valves feature proven long life, leak-free performance, and effortless operation. Now standard on our full line of SilcoCan®, TO-Can®, and miniature air sampling canisters, these newly redesigned valves are also great for upgrading existing canisters.

RAVE™ Diaphragm Air Valves

- **Proven long life**—durable design is engineered to exceed 15,000 cycles.
- **Leak-free performance**—every valve is helium leak-tested to $1x10^{-6}$ mL/sec.
- **Effortless operation**—easily finger-turn to achieve full valve closure (only 10 in-lb).
- **Enhanced damage-resistance**—W-type valve seats are work-hardened and wetted surfaces contain no moving parts.

Available options:

- Rugged stainless steel construction with or without Siltek® treatment for added inertness.
- Choose 2 or 3 ports to accommodate optional gauge.
- Diaphragm rebuild kits available to extend the life of your valves.

Turn to your trusted partner for air sampling and chromatography. Order Restek® Air Valve Excellence for your air sampling canisters today.

See **pages 421–423.**

www.restek.com/air

SilcoCan® Air Sampling Canisters with RAVE™ Valve

Ideal for low-level reactive sulfur (5–20 ppb), TO-14A, or TO-15 compounds

- Siltek®-treated canister with optional Siltek®-treated valve offers unsurpassed inertness, even for sulfur-containing or brominated compounds.
- High-quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms prevent sample adsorption for more-accurate results.
- Canisters and valves made of 304 and 316 stainless steel to withstand the rigors of field work.
- Both 2-port and 3-port valves available; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).
- Now featuring the proven long life, leak-free performance, and effortless operation of the new RAVE™ valve. (See page 420 for more information.)

For ultimate inertness, SilcoCan® air sampling canisters feature our unique Siltek® treatment technology. Even highly active components, at low parts-per-billion concentrations, can be readily sampled and stored without loss. The RAVE™ valve is a high-quality, metal-to-metal seal, 2/3-turn valve with metal diaphragms to prevent sample adsorption for more-accurate results. Both stainless steel and Siltek®-treated RAVE™ valves are available, in both the 2-port and 3-port configurations. Each canister is slightly pressurized with contaminant-free nitrogen prior to shipment.

Whether you are sampling for TO-14A, TO-15, or reactive sulfur compounds, SilcoCan® canisters are your best choice for inertness. In Tedlar® bags, the stability of low-level (100 ppbv) sulfur volatile organic compounds (VOCs) is poor, even within 24 hours of sampling. Sulfur compounds react with the metal surface in electropolished canisters, so they are unsuitable for collecting and storing low-level sulfur VOCs. SilcoCan® air sampling canisters, which feature a Siltek®-treated surface, offer excellent storage stability for sulfur VOCs at very low levels (5–20 ppbv), under dry or humid conditions. The versatility of the SilcoCan® canister makes it an excellent choice for collecting and storing TO-14A or TO-15 compounds.

Description	1 L Volume cat.#	3 L Volume cat.#	6 L Volume cat.#	15 L Volume cat.#
2-Port RAVE Valve	27400	27404	27408	27412
2-Port Siltek-Treated RAVE Valve	27401	27405	27409	27413
3-Port RAVE Valve with Gauge*	27402	27406	27410	27414
3-Port Siltek-Treated RAVE Valve with Gauge*	27403	27407	27411	27415
without Valve	22090	22091	22092	22093

*Range of standard gauge is –30" Hg to 60 psi.

Do not exceed canister maximum pressure of 40 psig (2.75 bar).

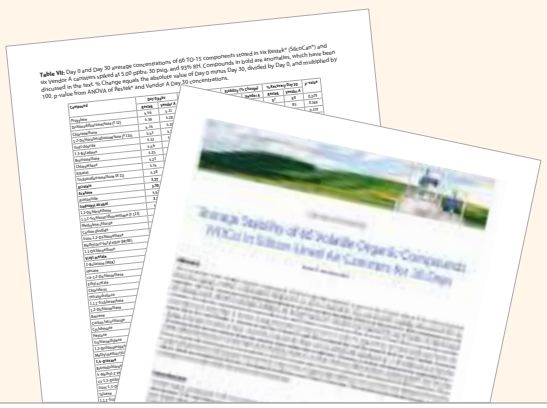
Note: If attaching any of Restek's passive sampling kits to a 3 L canister, use a Siltek®-treated (cat.# 563646) or stainless steel (cat.# 563647) connector between the two components. Please contact Restek® Customer Service or your local Restek® representative to order.

Canisters are the gold standard for ambient VOC sampling.

Volume discounts?

Call Restek® Customer Service or your local Restek® representative!

Get the ultimate insurance plan—order your SilcoCan® canister with a Siltek®-treated valve.



Stable Storage of 66 VOCs for 30 Days With SilcoCan® Air Sampling Canisters

Download the free application note by searching for "EVAN2066-UNV" at

www.restek.com

TO-Can® Air Sampling Canisters with RAVE™ Valve

Optimized for Methods TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, and NJ DEP Low Level TO-15

- Proprietary electropolished surface maintains compound stability.
- High-quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms prevent sample adsorption for more-accurate results.
- Both 2-port and 3-port valves available; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).
- SUMMA canister equivalent.
- Now featuring the proven long life, leak-free performance, and effortless operation of the new RAVE™ valve. (See page 420 for more information.)

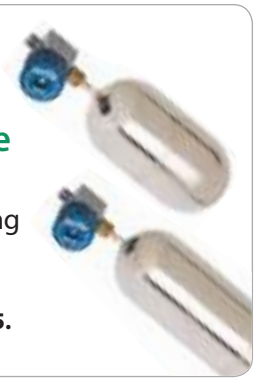
U.S. EPA Methods TO-14A and TO-15 regulate the collection, storage, and analysis of volatile organic compounds (VOCs) using treated air sampling canisters. Restek offers a complete line of TO-Can® canisters (SUMMA can equivalent), electropolished using a proprietary process and extensively cleaned using an ultrasonic method. This ensures a high-quality, passivated surface that maintains the stability of TO-14A/TO-15 compounds during storage. A frame surrounds the electropolished canister, eliminating the need for weld marks on the sphere, thereby preventing active sites on the canister. The RAVE™ valve supports the excellent performance of the canister.

A unique holder attaches the handle and base to the canister without welds and protects the canister, tube stub, and valve. The 2/3-turn diaphragm valve has a metal-to-metal seat and a temperature limit of 250 °C. Each canister is slightly pressurized with contaminant-free nitrogen prior to shipment.

Quickly confirm vacuum or pressure by ordering your SilcoCan® or TO-Can® canisters with high-quality premounted gauges.

Description	1 L Volume cat.#	3 L Volume cat.#	6 L Volume cat.#	15 L Volume cat.#
2-Port RAVE Valve	27416	27418	27420	27422
3-Port RAVE Valve with Gauge*	27417	27419	27421	27423
without Valve	22094	22095	22096	22097

*Range of standard gauge is –30" Hg to 60 psi.
Do not exceed canister maximum pressure of 40 psig (2.75 bar).



also available

Miniature Air Sampling Canisters

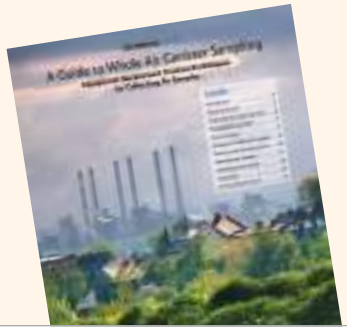
See **page 435.**

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is –30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
–30" Hg/15 psi	-651
–30" Hg/30 psi	-652

*No price difference for these substituted gauges.



free literature

A Guide to Whole Air Canister Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

In this guide, we focus on collecting whole air samples in canisters, a flexible technique with many applications.

Download your free copy from **www.restek.com** by searching for "EVTG1073A"

Valves and Gauges for Air Sampling Applications

Replacement RAVE™ Diaphragm Valves

NEW!

- Proven long life—durable design is engineered to exceed 15,000 cycles.
- Leak-free performance—every valve is helium leak-tested to $1x10^{-6}$ mL/sec.
- Effortless operation—easily finger-turn to achieve full valve closure (only 10 in-lb).
- Enhanced damage-resistance—W-type valve seats are work-hardened and wetted surfaces contain no moving parts.
- Now standard on our full line of SilcoCan®, TO-Can®, and miniature air sampling canisters.

Description	qty.	Siltek-treated cat.	Stainless Steel cat.
1/4" Replacement Diaphragm Valve, RAVE (2-port)	ea.	26386	26385
1/4" Replacement Diaphragm Valve, RAVE (3-port)	ea.	26388	26387
RAVE Diaphragm Rebuild Kit (includes: 3 diaphragms)	kit	26390	26389

Replacement Swagelok® SS4H Bellows Valve

- All metal flow path prevents sample adsorption, giving more accurate results.
- Unique serial number on each valve for complete traceability.
- Withstands temperatures of up to 300 °C.
- Rugged performance in the field.
- Fast delivery from Restek!

Description	qty.	cat.
Replacement 1/4" Swagelok SS4H Bellows-Sealed Valve (2-port)	ea.	24148

Replacement 1/4" Swagelok SS4H bellows-sealed valves are available on SilcoCan canisters as a custom product. Contact Technical Service for more information.

24148

Replacement Combination Vacuum/Pressure Gauges

2-inch vacuum/pressure gauges, 316 stainless steel with 1/8" NPT fitting and center back mount. Recommended for use with canisters.

Description	qty.	cat.#
–30" Hg/15 psi Vacuum/Pressure Gauge	ea.	24100
–30" Hg/30 psi Vacuum/Pressure Gauge	ea.	24104
–30" Hg/60 psi Vacuum/Pressure Gauge	ea.	24108

24108

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is –30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
–30" Hg/15 psi	-651
–30" Hg/30 psi	-652

*No price difference for these substituted gauges.

Vacuum Gauges

High-quality vacuum gauges with 316 stainless steel wetted surfaces. –30" Hg to 0" Hg. Recommended for use with passive sampling kits. All are rear mount.

Description	Fittings	qty.	cat.#
2" Vacuum Gauge	1/8" NPT	ea.	24269
2" Vacuum Gauge	1/4" NPT	ea.	24270
1 1/2" Vacuum Gauge	1/8" NPT	ea.	24120

24120

24285

24268

Ashcroft® Test Gauges

- Accurate measurement of vacuum to –30" Hg and pressure to 60 psi.
- Available in both analog and digital formats.
- Accuracy to +/– 0.25%.
- Gauge connector to canister valve available.

High-accuracy test gauges are recommended for verifying the vacuum/pressure in canisters before and after sampling. The 6-inch face on the analog gauge allows for easy reading. The digital gauge operates on two AAA batteries and offers an unambiguous readout. Both gauges have an accuracy of +/– 0.25% and all-metal wetted parts.

Description	qty.	cat.#
Analog Test Gauge, 6" diameter, 1/4" NPT	ea.	24285
Digital Test Gauge, 3" diameter, 1/4" NPT	ea.	24268
Ashcroft Gauge Connector to Canister Valve, stainless steel, connects 1/4" male NPT to 1/4" male compression fitting	ea.	22121

Choose the Appropriate Device for Your Sampling Needs

	Canister	Gas Sampling Bag	Thermal Desorption Unit (TDU) Tube
Media Type	whole air	whole air	adsorption
Sensitivity	ppb	ppm	ppm
Technique	passive (no pump)	active	active
Sample Type	grab or integrated	grab	integrated
Analyte	wide range of VOCs	wide range of VOCs & permanent gases	sorbent-specific
Applications	ambient, IAQ, emergency response, IH	ambient, IAQ emission	IAQ, IH
Durability	reusable	one-time use	one-time use
Inertness	excellent	fair	fair
Stability	30 day	48 hours	varies by analyte
Sample Volume	0.4–6 L	0.5–100 L	varies by analyte
Sampling Time	minutes to days	minutes to hours	minutes to hours

See pages 421–422 for canisters. See page 436 for gas sampling bags.
See page 438 for canister and thermal desorption tube comparison.

Passive Air Sampling Kits—Integrated (Stainless Steel & Siltek®-Treated)

Superior Performance—an Excellent Restek® Value

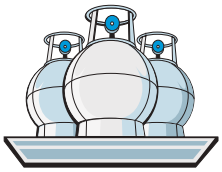
- Provide accurate integrated sampling without a sampling pump.
- Siltek®-treated components ensure accurate sampling of active components.
- Excellent for sampling times from 0.5 hour to 125 hours.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.* The improved filter design greatly reduces the number of potential leak sites.

The passive air sampling kit is available in seven sampling flow ranges and in stainless steel or Siltek®-treated finish. The stainless steel kit is ideal to partner with the Restek® TO-Can® air sampling canister for TO-14A and TO-15 methods. Use the Siltek®-treated version with the Restek® SilcoCan® air sampling canister when collecting low-level volatile sulfur compounds or other active compounds.

Canister Volume/Sampling Time						Orifice	Siltek-Treated	Stainless Steel
400 cc	1 Liter	3 Liter	6 Liter	15 Liter	Flow	Size	cat.#	cat.#
8 hour	24 hour	48 hour	125 hour	—	0.5–2 mL/min	0.0008"	24217	24216
2 hour	4 hour	12 hour	24 hour	60 hour	2–4 mL/min	0.0012"	24160	24165
1 hour	2 hour	6 hour	12 hour	30 hour	4–8 mL/min	0.0016"	24161	24166
—	1 hour	4 hour	8 hour	20 hour	8–15 mL/min	0.0020"	24162	24167
—	—	2 hour	3 hour	8 hour	15–30 mL/min	0.0030"	24163	24168
—	—	1 hour	1.5 hour	4 hour	30–80 mL/min	0.0060"	24164	24169
—	—	—	0.5 hour	1 hour	80–340 mL/min	0.0090"	22101	22100

*Vacuum/pressure gauge included in kit; air sampling canisters sold separately.



also available

- See **page 434** for miniature air sampling kits.
- See **page 433** for canister and flow controller repair service.

1. Veriflo® SC423XL flow controller

This flow controller is the heart of the sampling train. It is a high-quality device designed to maintain a constant mass flow as the pressure changes from –30" Hg to 7" Hg (we recommend you stop sampling at or before 7" Hg of vacuum). All wetted parts of the flow controller can be Siltek® treated.

2. Stainless steel vacuum gauge, 1/8-inch NPT

Fitted to the flow controller, the gauge monitors canister vacuum change during sampling.

3. 1/4-inch Siltek® sample inlet

The 0.3 m x 1/4" tubing includes a stainless steel nut on the inlet end to prevent water droplets from accumulating at the edge of the tubing, where they could be pulled into the sampling train.

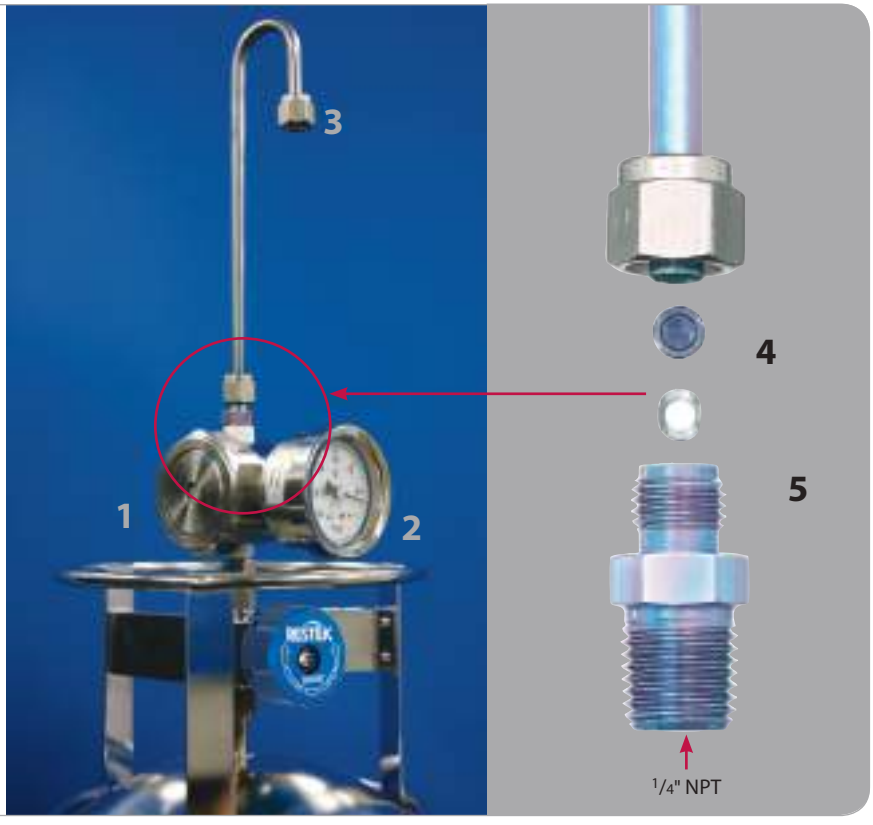
4. 2-micron frit filter and washer

Located prior to the critical orifice to prevent airborne particles from clogging the critical orifice. Replaceable. Available in stainless steel or Siltek® treated for optimum inertness.

5. Interchangeable critical orifice

An interchangeable ruby critical orifice allows you to control the flow with very high precision.

Note: All fitting connections are 1/4" tube, except where noted.



Stock up or buy only the parts you need now!

24249

24171

24170

Replacement Orifices

Use these orifices with a Veriflo® 423XL flow controller to change the flow range for alternative sampling times.

Description	Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
Replacement Orifice	0.5–2 mL/min	0.0008"	24219	24218
Replacement Orifice	2–4 mL/min	0.0012"	24233	24245
Replacement Orifice	4–8 mL/min	0.0016"	24234	24246
Replacement Orifice	8–15 mL/min	0.0020"	24235	24247
Replacement Orifice	15–30 mL/min	0.0030"	24236	24248
Replacement Orifice	30–80 mL/min	0.0060"	24237	24249
Replacement Orifice	80–340 mL/min	0.0090"	22099	22098

2 µm Frit Filters

For use in critical orifice fitting. Includes washers.

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Replacement Frit Filter	3-pk.	24171	24170

Veriflo® Flow Controllers

Veriflo® 423XL flow controllers are offered in a Siltek®-treated and stainless steel version. The flow device is available with or without a critical orifice. (Vacuum gauge sold separately.)

The critical orifice in a Veriflo® flow controller is interchangeable. Order orifices for alternate sampling times, or replacement orifices, separately.

24262

Description	Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
Veriflo Flow Controller	0.5–2 mL/min	0.0008"	24232	24229
Veriflo Flow Controller	2–4 mL/min	0.0012"	24255	24260
Veriflo Flow Controller	4–8 mL/min	0.0016"	24256	24261
Veriflo Flow Controller	8–15 mL/min	0.0020"	24257	24262
Veriflo Flow Controller	15–30 mL/min	0.0030"	24258	24263
Veriflo Flow Controller	30–80 mL/min	0.0060"	24259	24264
Veriflo Flow Controller	80–340 mL/min	0.0090"	22103	22102
Veriflo Flow Controller	——	without orifice	24238	24239

24266

7 µm In-Line Filter

This 316 stainless steel filter is designed to collect particles larger than 7 microns. We offer Siltek®-treated and stainless steel versions (1/4" compression fitting on both ends).

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
7 µm In-Line Filter	ea.	24265	24266

Note: frit is not replaceable.

26211

26209

Sample Inlets

- Inlets have 1/4" stainless steel compression fitting on each end.
- One end connects to flow controller or canister; nut on other end serves as rain guard.
- Includes nuts and ferrules.
- Two different lengths for use with large canisters and miniature canisters.

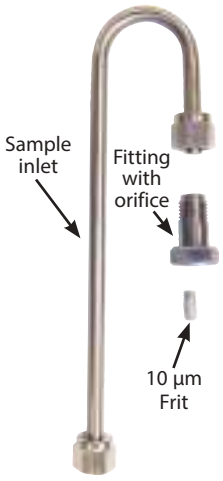
Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Sample Inlet, 6" Length	ea.	26210	26209
Sample Inlet, 1.5" Length	ea.	26212	26211

Passive Air Sampling Kits—Grab (Stainless Steel & Siltek®-Treated)

- Use with 1, 3, or 6 L canisters for grab air sampling.
- Variety of orifice sizes for fast sampling from 5 to 60 minutes.
- Connect 1/4" compression fitting directly to canister valve inlet.
- Replaceable frit protects orifice and valve from particulates.
- Sample inlet design minimizes water entry into sampling train.
- Individual replacement components available.

Canister Volume/Sampling Time (min)					Siltek-Treated	Stainless Steel
1 Liter	3 Liter	6 Liter	Flow	Orifice Size	cat.#	cat.#
60	—	300	15 mL/min	0.0018"	26280	26263
45	—	240	20 mL/min	0.0020"	26281	26264
15	60	120	45 mL/min	0.0030"	26282	26265
10	30	60	80 mL/min	0.0040"	26283	26266
5	15	30	150 mL/min	0.0055"	26284	26267
—	—	15	300 mL/min	0.0080"	26285	26268
—	5	10	390 mL/min	0.0090"	26286	26269
—	3	5	>1,000 mL/min	0.0130"	26287	26270

Air sampling canisters sold separately.



Unassembled kit components

Assembled kit on canister
Air sampling canisters sold separately.

Replacement Fittings for Grab Sampling Kits

Includes fitting and orifice.

Description	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
Replacement Fitting for Grab Sampling Kit	0.0018"	26288	26271
Replacement Fitting for Grab Sampling Kit	0.0020"	26289	26272
Replacement Fitting for Grab Sampling Kit	0.0030"	26290	26273
Replacement Fitting for Grab Sampling Kit	0.0040"	26291	26274
Replacement Fitting for Grab Sampling Kit	0.0055"	26292	26275
Replacement Fitting for Grab Sampling Kit	0.0080"	26293	26276
Replacement Fitting for Grab Sampling Kit	0.0090"	26294	26277
Replacement Fitting for Grab Sampling Kit	0.0130"	26295	26278

Replacement 10 µm Frits for Grab Sampling Kits

Description	qty.	Siltek-Treated cat.#	Stainless Steel cat.#
10 µm Frit for Grab Sampling Kit	3-pk.	26296	26279

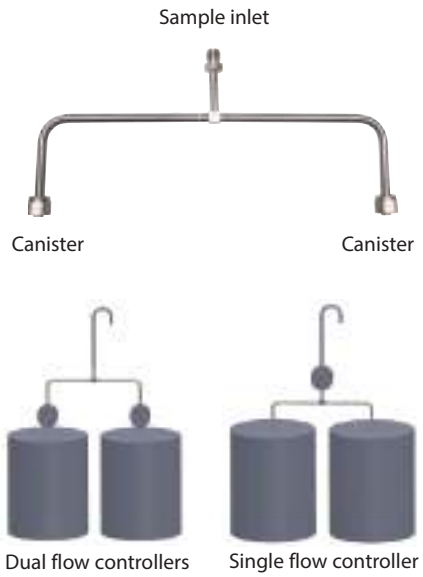
Dual Canister Sampling Manifold (Stainless Steel & Siltek®-Treated)

- Duplicate sampling with all canister sizes using one or two flow controllers.
- Precise dimensions (9.5" wide x 3.5" high) provide accurate splitting of sample between two canisters.
- One-piece design means fewer leaks.
- Thick-walled stainless steel tubing is rugged enough for field use.
- Uses 1/4" compression connections.

Field duplicates of canister samples frequently result in analyte concentrations with high relative standard deviations. In addition, field duplicates do not differentiate laboratory performance from sampling variability. Restek's dual canister sampling manifold (DCSM) minimizes sampling variability through a single sample inlet and flow controller by which the sample is evenly collected between two canisters. Use of a single flow controller eliminates flow rate variability, as well as environmental variables common with collocated samples. The DCSM may also be used with two flow controllers to monitor individual canister vacuum.

Description	qty.	Siltek-Treated cat.#	Stainless Steel cat.#
Dual Canister Sampling Manifold	ea.	24999	24998

Note: Do not use the DCSM as a handle to pick up 2 canisters!



Passive Air Sampling Kits

22930

Assembled kit on canister

Air sampling canisters sold separately.

Passive Air Sampling Kits—Soil Gas (Stainless Steel & Siltek®-Treated)

This unique grab sampler is specifically designed for soil gas sampling by allowing the connection of tubing coming from the soil gas sample port. The innovative design minimizes connections and leaks and houses a critical orifice in the tee fitting. It also incorporates a vacuum gauge and 2 µm frit filter.

Assembled sampler includes:

- Stainless steel tee with orifice.
- Variety of orifice sizes for sampling from 4 minutes to 10 hours.
- 1 1/2" vacuum gauge (–30" Hg to 0" Hg).
- 2 µm frit filter for insertion into 1/4" compression sample inlet.

The 1/4" compression inlet and outlet allows easy connection to the canister valve and also to the tubing from the sample port. Several orifice sizes provide sampling times from 4 minutes to 10 hours on a 6 L canister. Individual replacement parts are available, providing a cost-effective alternative to replacing the entire sampler.

Canister Volume/Sampling Time				Siltek-Treated	Stainless Steel
1 Liter	6 Liter	Flow	Orifice Size	cat.#	cat.#
4 min	20 min	210 mL/min	0.0065"	22935	22930
6 min	30 min	150 mL/min	0.0055"	22936	22931
10 min	1 hr	80 mL/min	0.0040"	22937	22932
30 min	3 hr	30 mL/min	0.0025"	26337	26336
45 min	4 hr	19 mL/min	0.0020"	22938	22933
2 hr	10 hr	6 mL/min	0.0014"	22939	22934

Air sampling canisters sold separately.

22940

Replacement Tees w/Orifice for Soil Gas Sampler Kits

Description	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
Soil Gas Sampler Replacement Tee w/Orifice	0.0065"	22945	22940
Soil Gas Sampler Replacement Tee w/Orifice	0.0055"	22946	22941
Soil Gas Sampler Replacement Tee w/Orifice	0.0040"	22947	22942
Soil Gas Sampler Replacement Tee w/Orifice	0.0025"	26339	26338
Soil Gas Sampler Replacement Tee w/Orifice	0.0020"	22948	22943
Soil Gas Sampler Replacement Tee w/Orifice	0.0014"	22949	22944

24120

24171

24170

(Frits do not control flow.)

Replacement Parts for Soil Gas Sampler Kits

Description	qty.	cat.#
Vacuum Gauge, 1 1/2"	ea.	24120
Replacement Frit Filter, Stainless Steel	3-pk.	24170
Replacement Frit Filter, Siltek-Treated	3-pk.	24171
Port Connector, 1/4", Siltek/Sulfinert-Treated	ea.	21549
Port Connector, 1/4", Stainless Steel	2-pk.	21936
Nut & Ferrule Set, 1/4", Stainless Steel	5-pk.	21911
Nut, 1/4", Stainless Steel	10-pk.	21902

also available

VCO® Fittings

- Use VCO® fittings for rapid assembly to cleaning system.
- Protect canister valves, flow controllers, and cleaning system fittings.

See **page 316**.

Alicat M-Series Flow Calibrators

- Accurate—NIST-traceable and rated at 0.8% of the reading + 0.2% full-scale repeatability; calibration documents provided with each unit.
- Fast—5 ms response speed with no warm-up required.
- Convenient—no computer connection or software required and all data is visible on one screen.
- Tough—stainless steel construction; unaffected by bumps, humidity, or changes in orientation and supported by an Alicat lifetime warranty.*
- Downloadable—data can be recorded on a computer via RS-232 connection (unit has no on-board data logging).
- Long-lasting—portable models with lithium-ion battery offer 5 hours (color) or 18 hours (monochrome) of use between charges; rated for 500 cycles before decline to 85%.**

Quickly and precisely verify flow rates generated by vacuum or pressure before going into the field. These compact, convenient units are ideal for real-time calibration of air flow controllers, passive sampling kits, air canisters, sampling pumps, and more. They measure absolute pressure, mass flow, volumetric flow, and temperature of 30 different gases across a wide range of flows. Choose a lab-based or convenient battery-powered portable model.

26437

NEW!

26438

Monochrome display shown; also available in color.

Specifications:

Accuracy at Calibration Conditions After Tare:	± 0.8% of reading + 0.2% of full scale
High Accuracy at Calibration Conditions After Tare:	± 0.4% of reading + 0.2% of full scale
Accuracy for Bidirectional Meters at Calibration Conditions After Tare:	± 0.8% of reading + 0.2% of total span from positive full scale to negative full scale
Repeatability:	± 0.2% full scale
Zero Shift and Span Shift:	0.02% full scale / °C / atm
Operating Range / Turndown Ratio:	0.5% to 100% full scale / 200:1 turndown
Maximum Measurable Flow Rate:	128% full scale
Typical Response Time:	10 ms (adjustable)
Warm-Up Time:	<1 second
Operating Temperature:	–10 to +50 °C
Humidity Range (non-condensing):	0 to 100%
Maximum Internal Pressure (static):	145 psig
Wetted Materials:	303 & 302 stainless steel, Viton®, silicone RTV (rubber), glass-reinforced nylon, aluminum
Programmed Gases:	Acetylene, air, argon, butane, carbon dioxide, carbon monoxide, ethane, ethylene (ethene), helium, hydrogen, iso-butane, krypton, methane, neon, nitrogen, nitrous oxide, oxygen, propane, sulfur hexafluoride, xenon, A-25, A-75, A1025, C-2, C-8, C-10, C-25, C-75, P-5, Star29
Dimensions:	cat.#s 26434 & 26438: 3.9" H x 2.4" W x 1.1" D; 0.8 lb
	cat.#s 26435 & 26439: 4.1" H x 2.4" W x 1.1" D; 1.0 lb
	cat.#s 26432 & 26436: 6.4" H x 2.4" W x 1.1" D; 1.0 lb
	cat.#s 26433 & 26437: 6.7" H x 2.4" W x 1.1" D: 1.2 lb

Description	Flow capacity	qty.	Color Display cat.#	Monochrome Display cat.#
Portable Mass Flow Calibrator	0–50 sccm	ea.	26432	26436
Portable Mass Flow Calibrator	0–500 sccm	ea.	26433	26437
Lab-Based Mass Flow Calibrator	0–50 sccm	ea.	26434	26438
Lab-Based Mass Flow Calibrator	0–500 sccm	ea.	26435	26439

Monochrome display shown; also available in color.

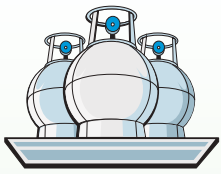
*Restek Recommends: Recalibrate your Alicat flow calibrator once every year to maintain lifetime warranty. Prolonged failure to recalibrate your unit may result in increased error. To always get the most accurate measurements, contact Restek® Customer Service to send in your flow calibrator for service, recertification, and recalibration (cat.# 26462).
** NOTE: Handling, removing, or replacing the battery will void the Alicat warranty.

coming soon
Mesa Labs Flow Calibrators

www.restek.com

TO-Clean Canister Cleaning System High capacity, fully automated, easy-to-use canister cleaning oven dramatically increases lab efficiency.

- Oil-free pump lowers risk of contamination.
- EPA Method TO-14A/15 compliant.
- Powerful 6i pump can achieve 50 mTorr in <25 minutes for twelve 6 L canisters; higher power 10i option also available.
- Custom-built trays for different canister sizes.
- Humidifier provides humidified nitrogen to improve cleaning process.
- One-year limited warranty.
- Fully assembled and ready to use.



Feature	Benefit
Large capacity—holds twelve 6 L cans or twenty-four 1 L cans.	Twice the capacity of other ovens for faster turnaround.
Embedded touch screen controller.	No separate computer needed.
Adjustable oven control up to 110 °C.	Cleans canisters AND valves faster and more completely than heating bands.
Ten user defined methods.	Each cleaning cycle parameter can be configured separately to minimize overall cycle time.
Oil-free Edwards vacuum pump.	Cheaper to run and maintain than 2-pump alternatives; lowers risk of contamination.
Humidifier	Provides humidified nitrogen to improve cleaning process.
Dimensions: 44" H x 48" W x 27" D.	Small footprint saves valuable lab space.
Oven cart available as option.	Saves bench space and provides convenient mobility.

	Restek	Competitor A
Capacity	Twelve 6 L cans	Six 6 L cans
Software	Included	Separate

www.restek.com/air

for more info

Search for **EVTS1186A-UNV** at **www.restek.com**

Cut Cleaning Time in Half

Get finished cleaning faster—the high capacity interior holds twice as many canisters as similar models, which lets you finish cleaning in half the time. EPA Method TO-14A/15 compliant unit holds up to twelve 6-liter or twenty-four 1-liter canisters.

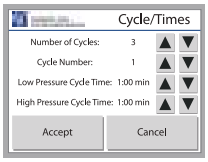
Oven Control at Your Fingertips

Isothermal oven cleans both canisters and valves faster and more completely than a heating band system. Temperature is adjustable up to 110 °C.

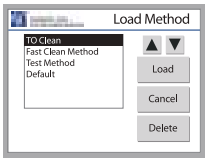
Easily Create Custom Cleaning Programs

Create up to 10 different methods using the on-board touch screen controller. Define the number of cycles, pressure, and soak times; then save the method for later use. Ensures consistent procedures are followed and makes operation as simple as pressing "start".

Easily create custom methods.

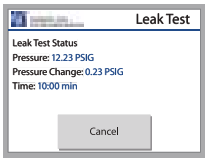


Choose a saved method for a fast start and consistent process.



Ensure Performance with Easy, On-Board Diagnostics

With embedded diagnostic software, you can check for leaks and test valve operation at the touch of a button. Quick and easy system verification ensures effective cleaning. No separate computer needed.



Specifications:

TO-Clean Oven
Dimensions: 44" H x 48" W x 27" D
Weight: 525 lb

Cart
Dimensions: 29" H x 48" W x 30" D
Weight: 340 lb

	Description	Type	Voltage	qty.	cat.#
	TO-Clean Oven w/Oil Free Pump	Edwards nXDS6i Dry Scroll Pump	120 V, 60 hz	ea.	26379
NEW!	TO-Clean Oven w/Oil Free Pump	Edwards nXDS6i Dry Scroll Pump	220/230 V, 50/60 hz	ea.	26380
NEW!	TO-Clean Oven w/Oil Free Pump	Edwards nXDS10i Dry Scroll Pump	120 V, 60 hz	ea.	26381
NEW!	TO-Clean Oven w/Oil Free Pump	Edwards nXDS10i Dry Scroll Pump	220/230 V, 50/60 hz	ea.	26382
	Optional Accessories (not included with TO-Clean Oven)			**qty.**	**cat.#**
	Oil-free Pump Silencer			ea.	26383
NEW!	Oil-free Pump Exhaust Tubing for customer exhaust (10' PVC tubing, clamps, adapters, O-rings)			ea.	26384
	Oven Cart, 29" H x 48" W x 30" D, 12 gauge steel, push handle and casters			ea.	22919
	1 L Option: includes tubing, fittings, and inserts for twenty-four 1 L canisters			ea.	22920
	3 L Option: includes tubing, fittings, and inserts for twelve 3 L canisters			ea.	22126
	Mini-Can Option: includes tubing, fittings, and inserts for either forty-eight 400 cc or forty-eight 1,000 cc mini-canisters			ea.	22127

Shipping: FedEx Ground, unless otherwise requested. Costs vary depending on ship-to location.

Note: Ovens are built on demand; therefore, a ten-week lead time is required on all orders. A limited cancellation and return policy applies to TO-Clean ovens; contact Restek® Customer Service for details.

Humidification Chamber

When cleaning SilcoCan® or TO-Can® canisters, it is important to use humidified air or nitrogen to help remove volatile organic contaminants. Restek's humidification chamber is made of acrylic and withstands pressure up to 90 psi. The 1/4-inch inlet and outlet compression fittings allow easy connection to pressure lines on your cleaning system. Our humidification chamber also has an easy-to-open lid for filling with water.

Description	qty.	cat.#
Humidification Chamber	ea.	24282

24282

Restek's canister cleaning system with humidification chamber.

Canister Air Sampling Timer

- Program up to 12 timed events!
- Capable of both manual and automated operation.
- Perfect for either grab or time-integrated sampling.
- Long battery life; recharges conveniently using the USB port on any PC.
- All stainless steel sample flow path ensures inertness, improving accuracy.

These timers are designed to simplify both automated and manual air sampling. The easy-to-use keypad and graphic display facilitate the programming of up to 12 timed events. They offer the convenience of remote start/stop sampling and permit intermittent sampling throughout a test period. The LCD remains in sleep mode when not in use, greatly extending battery life. Timers are compatible with any canister and flow controller.

Features include solenoid valve for sampling control, 1/4" inlet and outlet fittings, highly inert stainless steel flow path, and waterproof exterior for outdoor use.

Description	qty.	cat.#
Canister Air Sampling Timer	ea.	24267

Simplify automated and manual air sampling with a sampling timer.

Canister and passive air sampling kit must be purchased separately.

Restek's Innovations and Technical Service Groups feature several chemists with hands-on EPA and environmental lab experience, particularly with air sampling and testing—and they are ready to help.

Air canister tripod conveniently holds two air canisters.

Air Canister Tripod

- Lightweight (12 lb) and compact for easy storage and transport.
- Extends from 6' to 9' high.
- Large base provides enhanced stability without additional supports.
- Sturdy, rugged metal design for outdoor sampling and transport.

Restek's air canister tripod holds two canisters simultaneously for collocated ambient air sampling. The custom-designed bracket holds most 1, 3, and 6 L canisters* securely without any tools.

Description	qty.	cat.#
Air Canister Tripod	ea.	24151

*Air sampling canisters sold separately.

Restek canisters are shipped in boxes with handles for easy transportation.

Canister Carrying Supplies

Canister Carrying Box Kit

6-liter carrying boxes with plastic handles simplify canister transport. Four carrying boxes and one shipping box per kit.

Description	qty.	cat.#
Canister Carrying Box Kit	kit	24215

Canister Carrying Case

- Heavy-duty, all-aluminum design fits two 6 L SilcoCan® or TO-Can® canisters tightly without foam.
- Weight: 9 lb.
- Inside dimensions: length 18", width 9 1/8", height 12 1/2" (46 x 23 x 32 cm).
- No organic contaminants from foam or plastics.

Description	qty.	cat.#
Deluxe Canister Carrying Case	ea.	24226

How to Extend Canister Life

What reduces canister performance and longevity? Leakage is the most common reason for canister retirement, but contamination and damage to the silicon lining can also send canisters to the scrapyard prematurely. Here are some tips to protect your investment:

1. Prevent leaks

Use proper handling to avoid these three leading causes of leaks.

a. Particles in the valve

You can prevent particles from entering the valve by always using a 2 or 7 µm particulate filter during sampling and on your canister-cleaning equipment. Also, protect the valve inlet by replacing the brass dust cap when not in use. The EPA-recommended metal-to-metal sealing valves provide the greatest inertness, but tend to be more sensitive to particulate damage than other valve types.

b. Galled thread fittings

Avoid galled thread fittings by using a gap gauge to prevent overtightening of compression fittings. Turning only ¼ turn past finger-tight is another rule of thumb to prevent overtightening. Use brass compression fittings on stainless steel during nonsampling activities, such as cleaning or calibration, to minimize thread damage. Galled threads may also cause a poor connection to vacuum/pressure gauges, resulting in inaccurate measurement and the misleading conclusion that canister leakage exists.

c. Overtightened valve

Canister valves are designed to close securely with hand tightening only. Overtightening a valve closure with a wrench may damage the valve seat where the seal is made.

2. Reduce contamination

a. Segregate high concentration (ppm) cans and trace concentration (ppb) cans. Use dedicated canisters, or gas sampling bags, for ppm-level sampling, since it is extremely difficult to remove impurities from ppm sampling to a level suitable for trace sampling.

b. Clean the entire sampling train as you would the can to minimize introduction of contaminants into a clean can. Maximum temperature is 110 °C on the gauge and 130 °C on Restek's Veriflo® flow controller.

c. High-temperature (>100 °C) humidified air (steam cleaning) provides the most effective way to remove contamination from electropolished cans (TO-Can® or SUMMA canisters), but can damage silicon-lined cans (SilcoCan® canisters).

3. Avoid damage to silicon-lined cans

Be sure to follow method recommendations when cleaning your canisters to avoid oxygen damaging the silicon lining. Cleaning studies of SilcoCan® canisters using humidified air and heat at 80 °C and 125 °C have shown reduced recoveries of sulfur compounds when compared to using nitrogen under the same conditions. This irreversible damage is due to oxidation of the surface, creating active sites that may affect the recovery of reactive or polar compounds. Strong acids and bases may also result in damage to the internal can surface.

Canister and Flow Controller Repair Service

Save money and increase performance with Restek's canister and flow controller repair service.

Normal wear and tear on canisters and components can result in damage and leakage. Restek's repair service allows you to extend the life of your equipment for much less than the cost to replace with new products. Contact Restek® Customer Service or your local Restek® representative to take advantage of this service. You will be given instructions and an RMA # to return the parts and completed health & safety declaration to us.

Sampling Kit/Flow Controller Repair

Includes all new rubber seals in flow controller and orifice and frit replacement
cat.# 550131

Canister Repair

Includes valve replacement, leak test & cleaning

for RAVE™ valve:	cat.# 569604
for Parker:	cat.# 560838
for Swagelok:	cat.# 563801

Expand Air Sampling with Mini-Cans & Accessories

- Grab and integrated sampling without a sampling pump.
- Possible to perform 8-hour integrated sample with 400 cc mini-can.
- Siltek® coating delivers high level of inertness for H_2S and other reactive compounds.
- Versatile enough for many applications:
  - Indoor air
  - Industrial hygiene
  - Soil gas
  - Emergency response

Replacement Parts ..... Page #
Flow Controller 426
Gauge 423
Orifices 426
Sample Inlet 426

26252

Miniature Air Sampling Kits (Stainless Steel & Siltek®-Treated)

- Provide accurate integrated sampling without a sampling pump.
- Convenient smaller size connects easily to miniature canisters.
- Available in stainless steel or with Siltek® treatment for greater inertness.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.* Kit includes flow controller, critical orifice, 2 µm frit filter, vacuum gauge, and sample inlet. The gauge (cat.# 24120) and sample inlet (cat.#s 26211, 26212) are downsized for use with smaller canisters.

Canister Volume/Sampling Time			Orifice	Siltek-Treated	Stainless Steel
400 cc	1 Liter	Flow	Size	cat.#	cat.#
8 hour	24 hour	0.5–2 mL/min	0.0008"	26253	26252
2 hour	4 hour	2–4 mL/min	0.0012"	26255	26254
1 hour	2 hour	4–8 mL/min	0.0016"	26257	26256
—	1 hour	8–15 mL/min	0.0020"	26259	26258

*Air sampling canisters sold separately.

Mini-Can Accessories

Sampling Belt:

- Adjustable up to 50".
- Two reclosable hook-and-loop straps securely hold mini-can or other sampling device.
- Straps slide anywhere on belt.
- Versatile design, perfect for personal wear or hang for area sampling.

Sampling belt & personal sample inlet

Personal Sample Inlet:

- 3' long x 1/16" OD all PTFE tubing.
- Convenient clip can be moved along length of tubing for proper attachment in breathing zone.
- PTFE reducing ferrule allows direct connection from 1/16" tubing to 1/4" flow controller without another fitting.

22124
Mini-Can Stand

Mini-Can and Sampling Kit not included.

Mini-Can Stand:

- Collapsible for easy storage and transport.
- Two out of three legs move to accommodate uneven surfaces.
- Holds 2 3/4" diameter cans securely.
- Small footprint—12" diameter x 6.5" height.

These accessories enhance mini-can usage and provide flexibility in their application, from personal, to area, to vapor intrusion sampling.

Description	qty.	cat.#
Sampling Belt	ea.	22122
Personal Sample Inlet (includes: 3' x 1/16" OD PTFE tubing, Clip, PTFE Reducing Ferrule, 1/4" SS nut)	ea.	22123
Mini-Can Stand	ea.	22124

Miniature Air Sampling Canisters

- Ideal for indoor air, personal, emergency response, or soil gas sampling.
- Choose 400 cc or 1,000 cc.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- New option: the proven long life, leak-free performance, and effortless operation of the RAVE™ valve.

These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers. The 1,000 cc canister is suitable for sampling volatile organic compounds in air according to methods TO-14A, TO-15, IP-1A, ASTM 5466, OSHA PV 2120, and NJ DEP Low Level TO-15.

Restek offers these products in stainless steel or with Siltek® treatment, for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Siltek®-treated canister to achieve the ultimate in analyte stability.

Description	qty.	400 cc cat.#	1,000 cc cat.#
Miniature Canister with Quick-Connect Stem Fitting			
Electropolished Stainless Steel Canister with Quick-Connect Stem Fitting	ea.	24188	24194
Siltek-Treated Canister with Quick-Connect Stem Fitting	ea.	24189	24195
Siltek-Treated Canister with Siltek-Treated Quick-Connect Stem Fitting	ea.	24190	24196
Miniature Canister with RAVE Valve			
Electropolished Stainless Steel Canister with RAVE Valve	ea.	26456	26459
Siltek-Treated Canister with RAVE Valve	ea.	26457	26460
Siltek Treated Canister with Siltek-Treated RAVE Valve	ea.	26458	26461
Miniature Canister without Valve			
Electropolished Stainless Steel	ea.	24205	24206
Siltek-Treated	ea.	24207	24208

NEW!

Do not exceed canister maximum pressure of 40 psig.

Dimensions:
400 cc = 2.75" diameter, 5.35" long (7 x 13.6 cm), 1.25 lb (0.567 kg)
1,000 cc = 2.75" diameter, 11.92" long (7 x 30 cm), 2.00 lb (0.91 kg)

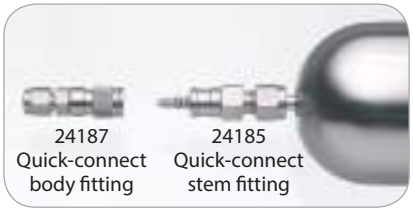
Swagelok® Quick-Connect Fittings for Miniature Air Sampling Canisters

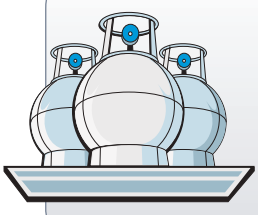
Attach quick-connect body fitting to stem fitting to open canister. Attach quick-connect stem protector to stem fitting when not sampling to prevent canister from accidentally opening.

Connection: 1/4" tube fitting.

Description	qty.	cat.#
Quick-Connect Stem Fitting	ea.	24185
Quick-Connect Stem Fitting, Siltek-Treated	ea.	24186
Quick-Connect Stem Protector, Stainless Steel	ea.	24121
Quick-Connect Body Fitting	ea.	24187

Note: Quick-connect body fitting (cat.# 24187) must be ordered separately to sample with quick-connect stem fitting.





Get Mini!

Mini-Can Options

Sizes	400 cc or 1,000 cc
Valves	RAVE™ diaphragm, quick connect
Interior Coating	Electropolished, Siltek®-treated
Sample Inlets	Area, personal
Flow ranges	0.5–15 mL/min

tech tip

Use a gap inspection gauge to confirm fittings are sufficiently tightened. See page 319.

Gas Sampling Bags

Sampling bags are a low-cost, whole-air sampling device for high-level VOCs and permanent gases. Several EPA, NIOSH, and OSHA methods exist for bag sampling for a variety of applications: stationary sources emissions, workplace atmospheres, ambient, indoor air quality, and breath analysis. Choose the film type appropriate for your application. All our bags feature a polypropylene combo valve with hose connection to fit $^{3}/_{16}$" ID tubing and syringe port with replaceable septum. A single eyelet provides handling convenience.

Tedlar® Sampling Bags

22050 22039

- Find the bags you need—we offer sizes from 0.5 L to 100 L.
- Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- Polypropylene or stainless steel valve.
- Both valves conveniently connect to $^{3}/_{16}$" ID PTFE tubing.
- Continuous sampling temperature up to 225 °F (107 °C); short term (1–2 hours) temperature up to 350 °F (176 °C).

Description	Size	qty.	Polypropylene Valve cat.#	Stainless Steel Valve cat.#
0.5 L Tedlar Sampling Bag	6" x 6"	10-pk.	22049	22038
1 L Tedlar Sampling Bag	7" x 7"	10-pk.	22050	22039
3 L Tedlar Sampling Bag	9.5" x 10"	10-pk.	22051	22040
5 L Tedlar Sampling Bag	12" x 12.5"	10-pk.	22052	22041
10 L Tedlar Sampling Bag	11.75" x 22"	10-pk.	22053	22042
12 L Tedlar Sampling Bag	13" x 24"	10-pk.	22054	22043
25 L Tedlar Sampling Bag	17.5" x 24"	5-pk.	22055	22044
40 L Tedlar Sampling Bag	24" x 24.25"	5-pk.	22056	22045
80 L Tedlar Sampling Bag	28.25" x 30.5"	5-pk.	22057	22046
100 L Tedlar Sampling Bag	28" x 36"	3-pk.	22058	22047

Description	qty.	cat.#
PTFE Faced Silicone Replacement Septum, 4 mm diameter	10-pk.	22104

Multi-Layer Foil Gas Sampling Bags

22950 22953

- Good stability for low molecular weight compounds, such as methane, CO, CO_2, and permanent gases.
- Chemically inert with light and moisture protection.
- Not recommended for low ppm VOCs due to background levels.
- Protective 5-layer barrier minimizes gas permeability.
  - 60 gauge nylon (outer layer)
  - Metalized aluminum
  - Polyethylene
  - 0.0003" aluminum foil
  - 0.002" polyethylene (inner layer)
- Continous sampling temperature up to 190 °F (88 °C) indefinitely; do not exceed 190 °F for any period of time.

Volume	Size	qty.	cat.#
1 L	7" x 7"	5-pk.	22950
3 L	10" x 10"	5-pk.	22951
5 L	12" x 12"	5-pk.	22952
10 L	12" x 22"	5-pk.	22953
12 L	13" x 24"	5-pk.	22966
25 L	18" x 24"	5-pk.	22967
40 L	24" x 24.5"	5-pk.	22968
PTFE Faced Silicone Replacement Septum, 4 mm diameter		10-pk.	22104

also available

ALTEF gas sampling bags

www.restek.com/air

Vacuum Bag Sampler

- Fast bag sampling without sample passing through pump.
- Bag capacity up to 10 L.

The model 1062 vacuum bag sampler provides fast sampling with zero cross-contamination. A vacuum created in the box draws air into the sampling bag without drawing it through the vacuum pump first, as is the case with standard air sampling pumps, thereby preventing contamination of the sample. This bag sampler can fill a 10 L bag in two minutes with an automatic shut-off switch, which stops the sample bag from overfilling. The filling rate is adjusted with a vent rotometer valve. An external battery-recharging port enables continuous operation with battery charger. In addition, the quick exhaust valve allows for fast removal of the sampling bag. The sampler comes with a universal power adaptor/charger, battery, instruction manual, and 1-year limited warranty.

Specifications:

Sampling Bag:	1 bag up to 10 L size
Running Time:	8 hours
Flow Rate (Fill Rate):	1-5 L/min
Power Requirements:	12 V battery, 4.5 amp
Charge Time:	9 hours
Dimensions:	9" x 14.6" x 21.7"
Weight:	17 lb

22118

Features:

- Observation window on case lid.
- Sample inlet accepts 1/4" OD tubing.
- Case designed for rugged outdoor use.
- CE certified.

Description	qty.	cat.#
Vacuum Bag Sampler Model 1062 (includes: power adaptor, battery, manual)	ea.	22118
Replacement Battery for Vacuum Bag Sampler Model 1062	ea.	22119
Universal Battery Charger for Vacuum Bag Sampler Model 1062 (115/230 VAC)	ea.	22120

Physical Specifications of Gas Sampling Bags

	Tedlar® bags	ALTEF Bags	Multi-Layer Foil Bags
Composition	polyvinyl fluoride (PVF) polymer resin	Proprietary PVDF film	5-layer
Thickness	0.002"	0.003"	0.005"
Tensile Strength	8,000 psi	6,100 psi	24 lb/inch (CD)
Max. Operating Temp.	204 °C	150 °C	87 °C
Specific Gravity	1.7 g/mL	1.78 g/mL	1.09 g/mL
Oxygen Permeability	50 cc/m² x day	58 cc/m² x day	0.0006 cc/m²/day
Water Vapor Permeability	9–57 g/m² x day	12–15 g/m² x day	0.0006 g/100 in² x day
Carbon Dioxide Permeability	172 cc/m² x day	172 cc/m² x day	0.0005 cc/100 in² x day

General Guidelines for Bag Sampling

Follow these basic considerations for trouble-free air sampling using gas sampling bags.

Before Sampling

- Store unused bags in a clean environment, sealed in an outer bag to prevent adsorption of contaminants.
- Preclean bags before use by flushing with high-purity nitrogen.
- For validation, compounds must be stable at >80% for 72 hours.
- Leak rate must not exceed 0.1" Hg/min.

During Sampling

- Be sure the PTFE tubing used for bag connection is clean.
- Use a vacuum box sampler for direct bag filling in order to avoid contamination from a sampling pump.
- Typical flow rate is 3 L/min.
- Do not fill bags more than 80%.

After Sampling

- Bags are intended for a single use due to potential sample adsorption onto the bag film.
- Hold times are typically 48 hours unless validation study demonstrates longer stability.
- Protect samples from direct sunlight and store above 0 °C to prevent condensation.
- Transport in rigid, opaque container to prevent bag puncture; do not ship by air unless samples will be kept in a pressurized area.

free literature

A Guide to Whole Air Canister Sampling:
Equipment Needed and Practical Techniques for Collecting Air Samples

Download your free copy from
www.restek.com
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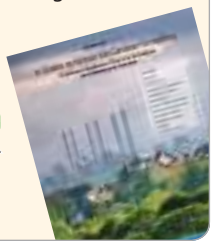

tech guides

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Thermal Desorption Unit (TDU) Tubes vs. Canister Sampling

Which VOC Sampling Technique is Right for You?

Thermal desorption unit (TDU) tubes provide a complementary option to canisters for sampling VOCs. Both techniques have advantages and disadvantages, and their features must be evaluated for suitability relative to the sampling environment and analytical capabilities. Table I outlines the similarities and differences between these techniques; use this handy comparison to determine which equipment is best for you.

Table I: Comparison of thermal desorption tube and canister sampling for VOCs.

Similarities Between Thermal Desorption Tubes and Canisters

- Reusable sampling device.
- Long product lifetime.
- Long-term sample stability.
- Blank certification required prior to sampling.
- Sample concentration required before GC-MS analysis.
- Dry purge helpful to remove moisture before GC injection.
- ppt sensitivity.
- Method acceptance.
- Collection of wide range of VOCs with single device.
- Useful for screening of unknowns.
- Leak tightness critical to maintaining sample integrity and preventing contamination of a clean device.

Differences Between Thermal Desorption Tubes and Canisters

	Thermal Desorption Tubes	Canisters
Methods	U.S. EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549	U.S. EPA TO-14A, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft
	World-wide acceptance	Gold standard for U.S. ambient air market
Applications	Ambient air, indoor air, industrial hygiene Material emissions Food & flavor Chemical weapons	Ambient air, indoor air, vapor intrusion, emergency response
	C3 to C30	<C3 to ~C10
Handling	Lightweight for personal sampling and general ease of use	Larger and heavier; more costly to ship
Sampling	Active sampling with sampling pump or diffusive sampling without pump is possible with determined diffusion coefficients for each compound.	Passive sampling, no sampling pump required. Long-term sampling possible without battery to recharge.
	Integrated sampling only	Grab & integrated sampling
	Concentrated sample	Whole air
	Proper sorbent selection recommended in methodology.	N/A
	Must sample below sorbent breakthrough volumes to avoid sample loss and irreversible adsorption on sorbent	N/A
	Large sample volumes >100L	Sample volume is function of canister size, 15 L max
Analysis	Tube dimensions are instrument specific	Compatible with all manufacturer sample concentrators
	One injection, more injections possible for some instrumentation	Multiple sample injections
	Concentration range ppt to ppm	ppt to ppm
	Some sorbents prone to artifact formation.	Low blanks when properly cleaned.
Storage	Sample storage at 4 °C recommended for multibed tubes to prevent potential migration of compounds to more retentive sorbent, which may be difficult to recover.	Room temperature
Cleaning	Analytical process automatically cleans tube for reuse. Cleans as it analyzes. Conditioning/cleaning and analysis incorporated in one thermal desorption unit.	Canister cleaning requires separate equipment as additional step prior to background certification and sampling.
Cost	$50–130 each	$200–700 each

Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs.
- Use corrosion-resistant glass tubes for excellent inertness; allow monitoring of sorbent bed condition.
- Choose stainless steel tubes for greater durability in the field. No sampling pump necessary for passive sampling with diffusion caps.
- Individually etched with unique serial number for convenient sample identification.
- Robust barcode—the most reliable "code 128" format—on tube for recording and tracking.
- Each tube has an arrow indicating flow direction to reduce errors during use.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption for most applications.

High-quality thermal desorption tubes are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, personal, and industrial hygiene environments. Fit Markes (ULTRA and UNITY™), PerkinElmer, and Shimadzu thermal desorbers. Packed tubes come with a report detailing the total mass of sorbent in the tube; conditioned tubes also include a blank chromatogram.

Thermal Desorption Tube Sorbent	Vapor Phase Organics Applications
Tenax TA	C6/7 to C26
Graphitized Carbon	C5/6 to C14
Tenax GR/Carbopack B	*n*-C5/6 to *n*-C20 (EPA Methods TO-14A/TO-15/TO-17)
Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C12/14 (EPA Methods TO-14A/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C16/20 (EPA Methods TO-14A/TO-15/TO-17)

Tenax is a trademark of Buchem BV. Carbopack, Carbosieve, and Carboxen are trademarks of Sigma-Aldrich.

method applications

Method	Application
U.S. EPA	TO-17
ASTM	D6196
NIOSH	2549
DIN EN ISO	16017

Specifications

Dimensions: 1/4" OD x 3 1/2" long
Low sampling rates: 0.01–0.20 L/min (<10 L total volume)
Long-term storage caps are supplied with conditioned tubes

Thermal Desorption Unit Tubes (Unconditioned and Conditioned & Capped)

		Unconditioned		Conditioned & Capped	
Sorbent Description	qty.	Stainless Steel cat.#	Glass cat.#	Stainless Steel cat.#	Glass cat.#
Tenax TA (35/60 mesh)	10-pk.	24056	24062	24080	24086
Graphitized Carbon (20/40 mesh)	10-pk.	24057	24063	24081	24087
Tenax GR (35/60 mesh)/ Carbopack B (60/80 mesh)	10-pk.	24058	24064	24082	24088
Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24059	24065	24083	24089
Tenax TA (35/60 mesh)/ Graphitized Carbon (40/60 mesh)/ Carboxen 1000 (60/80 mesh)	10-pk.	24060	24066	24084	24090
Carbopack C (60/80 mesh)/ Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24061	24067	24085	24091

24061

24062

24067

24054

24055

Thermal Desorption Unit Tubes (Empty)

- Empty tubes for direct desorption of VOCs from liquids, solids, or pastes.
- Stainless steel: front sorbent-retaining gauze, rear gauze, and gauze retaining spring supplied; or glass: glass frit positioned 15 mm from sampling end.
- Can be packed with any sorbent to suit any application.

Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Empty	10-pk.	24054	24055

Thermal Desorption Unit Tubes (Calibration)

Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Calibration, Tenax TA 1 cm Bed (35/60 mesh)	10-pk.	24075	24076

Description	qty.	cat.
Calibration Solution Loading Rig	ea.	24077
Calibration Solution Loading Rig Replacement Septa, 9.5 mm	10-pk.	24078
Certified Reference Standard, 100 ng BTX on Tenax TA	10-pk.	24079

Thermal Desorption Unit Tubes

24071

24072

24070

24074

Thermal Desorption Unit Tubes (Accessories)

Description	Benefits/Uses	qty.	cat.
1/4" Brass Cap and PTFE Ferrules	Long-term storage of blank/sampled tubes.	20-pk.	24068
1/4" PTFE Ferrules	Long-term storage caps.	20-pk.	24069
CapLok Tool	Use for tightening long-term storage caps.	ea.	24070
Pen Clip		10-pk.	24071
TubeMate Tool	Assists with tube packing.	ea.	24072
1/4" Stainless Steel Union and PTFE Ferrules	Use for connecting tubes in series.	10-pk.	24073
Diffusion Caps	Required for diffusive sampling with stainless steel tubes.	10-pk.	24074

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Polyurethane Foam (PUF) Cartridges

- Use for collection of semivolatiles (pesticides, PCBs, PAHs).
- Both large high-volume (220–280 L/min) and small low-volume (1–5 L/min) PUFs available.
- Suitable for ambient, indoor, and industrial hygiene applications.
- PUF/XAD-2 "sandwiches" capture a wider range of semivolatiles.

method applications

Method	Applications	cat.#
EPA TO-10A	Organochlorine and organophosphorus pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
EPA IP-7	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA IP-8	Organochlorine and organophosphorus pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
ASTM D4861	Organochlorine and organophosphorus pesticides, PCB	22116
ASTM D4947	Chlordane and heptachlor residues	22116
Research	Pesticides	22117
EPA TO-4A	Organochlorine pesticides, PCBs	22114
EPA TO-9A	Polychlorinated dibenzo-*p*-dioxins (PCDDs)	22114
EPA TO-13A	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA 600/8-80-038	Organochlorine pesticides, PCBs, PAHs	22115
ASTM D6209	Polycyclic aromatic hydrocarbons (PAHs)	22114

22114

22115

22116

22117

Cleaned Polyurethane Foam (PUF) Cartridges

Precleaned and ready to use.

Description	qty.	cat.#
Cleaned PUF Plug (7.6 cm length, 6 cm diameter)	ea.	24295
Large PUF Cartridge, 65 mm OD x 125 mm length, 75 mm PUF	ea.	22114
Large PUF/XAD Cartridge, 65 mm OD x 125 mm length, 25 mm PUF/10 g XAD-2/50 mm PUF	ea.	22115
Small PUF Cartridge, 22 mm OD x 100 mm length, 76 mm PUF	ea.	22116
Small PUF/XAD Cartridge, 22 mm OD x 100 mm length, 30 mm PUF/1.5 g XAD-2/30 mm PUF	ea.	22117

22954

22955

Raw Polyurethane Foam (PUF) Plugs

- Unwashed PUF plugs for both low-volume and high-volume sampling.
- Flame retardant free—making them easier to clean for trace analysis.
- Compliant with EPA and ASTM methods—0.022 g/cm^3 density.
- Glass holders sold separately.

Description	Size	qty.	cat.#
Large PUF Plug, Unwashed	6 cm OD x 7.6 cm length	10-pk.	22954
Large PUF Plug, Unwashed	6 cm OD x 5.1 cm length	10-pk.	22955
Large PUF Plug, Unwashed	6 cm OD x 2.5 cm length	10-pk.	22956
Small PUF Plug, Unwashed	22 mm OD x 7.6 cm length	10-pk.	22957

22957

22956

PUF Glass Holders

Durable and reusable, PUF glass holders reduce waste and are a cost-effective alternative to precleaned packed cartridges.

- Fit either 6 cm or 22 mm OD PUF plug or can be used with bulk SDVB resin.
- Large glass holder fitted with double stainless steel screens for support.
- Small glass holder has stem designed for secure 1/4" ID tubing connection to sampling pump.

Description	Size	qty.	cat.#
Large PUF Glass Holder	fits 6 cm OD PUF Plug (4.9" L x 2.5" OD)	ea.	22964
Small PUF Glass Holder	fits 22 mm OD PUF Plug (4.4" L x 0.9" OD)	ea.	22965

22964

22965

Resins, Glass Impingers

Restek's Ultra-Clean resin typically eliminates the hassle of cleaning and testing resin for air sampling.

method applications

Method	Applications
EPA TO-13A	PAHs in Ambient Air
ASTM D6209	PAHs in Ambient Air
EPA Method 23	Dioxins in Stationary Source Emissions
EPA Method 0010	Semivolatiles in Stationary Source Emissions

Ultra-Clean Resin Equivalent to XAD-2 Resin—Exclusively from Restek!

- For adsorbing semivolatiles in air.
- Cleaned and GC tested.
- Available in 100 gram quantities.

Frequently Asked Questions

- **Is Restek's Ultra-Clean resin really the same as XAD®-2 resin?**
  Yes. Restek's resin has been manufactured to match the original XAD®-2 specifications of composition, pore size, and surface area. You will experience identical sampling performance for all semivolatile compounds.
- **Does Restek's Ultra-Clean resin need to be baked-out prior to use?**
  No. Restek's resin is precleaned and prebaked. Unlike other resins, Restek's resin is rigorously cleaned and baked prior to being bottled. When we say our Ultra-Clean resin is precleaned, you can count on it!

Although resin is an excellent adsorbent for trapping PAHs, it requires extensive clean-up because many of its impurities are PAH compounds. To enable you to eliminate time-consuming cleanup, we do the cleaning for you! We test each batch by capillary GC–flame ionization detector (FID) to ensure cleanliness. However, depending on your application, additional cleaning may be required.

Description	cat.#
Ultra-Clean Resin, 100 grams	24230

24053

SDVB Resin

- Styrene/divinylbenzene, equivalent to XAD®-2 resin.
- Untreated, packaged in 1 kg plastic containers.
- Spherical, 20 to 60 mesh particles.

Description	qty.	cat.#
SDVB Resin	1 kg	24053

23388

23389

Midget Glass Impingers

Use with a sampling pump to trap air contaminants into liquid collection media, as specified in OSHA and NIOSH industrial hygiene methods. Both dispersion and fritted nozzles are available as bubblers.

Description	Volume	Taper Size	qty.	cat.#
Midget Glass Impinger w/Fritted Tube	30 mL	24/40	kit	23388
Midget Glass Impinger w/Dispersion Tube	30 mL	24/40	kit	23389

Environmental Air Sampling Gas Standards

Our high-quality air sampling gas calibration standards are provided by Spectra/Linde and Scott/Air Liquide—meeting lab requirements for two separate sources of calibration standards. Each comes with a certificate of analysis and unique serial number. All cylinders are disposable and do not require rental or demurrage fees. Recertification of cylinders is available directly with our suppliers. All cylinders are drop-shipped from our suppliers to provide fast delivery and the "freshest" standard possible. Minimum 12-month stability on all cylinders.

TO-14A Internal Standard Mix (3 components)

Bromochloromethane
Chlorobenzene-d5
1,4-Difluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34412 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26352 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34412-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34427 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26353 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34427-PI (ea.)

No data pack available.

TO-14A Internal Standard/Tuning Mix (4 components)

Bromochloromethane
1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)
Chlorobenzene-d5
1,4-Difluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34408 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26354 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34408-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34425 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26355 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34425-PI (ea.)

No data pack available.

TO-14A GC-MS Tuning Mix

4-Bromofluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34406 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26346 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34406-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34424 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26347 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34424-PI (ea.)

No data pack available.

TO-14A Aromatics Mix (14 components)

Benzene
Chlorobenzene
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
Ethyl benzene
Styrene
Toluene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34404 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26348 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34404-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34423 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26349 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34423-PI (ea.)

No data pack available.

TO-14A Chlorinated Hydrocarbon Mix (19 components)

Carbon tetrachloride
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethylene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethyl chloride
Hexachloro-1,3-butadiene
Methyl chloride
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34402 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26350 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34402-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34422 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26351 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34422-PI (ea.)

No data pack available.

See pages 452–453 for cylinder and regulator information.

please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Gas Calibration Standards

TO-14A CFC/HCFC Mix (4 components)

Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-Dichlorotetrafluoroethane (Freon 114)

1 ppm in nitrogen, 104 liters @ 1,800 psig
cat.# 34410 (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psig
cat.# 34426 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34410-PI (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26356 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34426-PI (ea.)

No data pack available.

TO-14A Calibration Mix (39 components)

Benzene
Bromomethane
Carbon tetrachloride
Chlorobenzene
Chloroform
Chloromethane
1,2-Dibromoethane
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Dichlorotetrafluoroethane
Ethyl benzene
Ethyl chloride
Hexachloro-1,3-butadiene
Methylene chloride
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,1,2-Trichlorotrifluoroethane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34400 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26340 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34400-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34421 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26341 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34421-PI (ea.)

No data pack available.

TO-14A 41 Component Mix (41 components)

Acrylonitrile
Benzene
Bromomethane
1,3-Butadiene
Carbon tetrachloride
Chlorobenzene
Chloroform
Chloromethane
1,2-Dibromoethane
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Dichlorotetrafluoroethane
Ethyl benzene
Ethyl chloride
Hexachloro-1,3-butadiene
Methylene chloride
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,1,2-Trichlorotrifluoroethane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34430 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26342 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34430-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34431 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26343 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34431-PI (ea.)

No data pack available.

2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

A. Spectra (Linde) 104 L Cylinders
B. Scotty (Air Liquide) 110 L Cylinders
C. Scotty (Air Liquide)110 L Cylinders
(Pi-marked Cylinders for EU Regulations)

See pages 452–453 for cylinder and regulator information.

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please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

TO-14A 43 Component Mix (43 components)

Acrylonitrile
Benzene
Bromomethane
1,3-Butadiene
Carbon tetrachloride
Chlorobenzene
Chloroform
Chloromethane
3-Chloropropene
1,2-Dibromoethane
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Dichlorotetrafluoroethane
Ethyl benzene
Ethyl chloride
4-Ethyltoluene
Hexachloro-1,3-butadiene
Methylene chloride
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,1,2-Trichlorotrifluoroethane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34432 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26344 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34432-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34433 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26345 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34433-PI (ea.)

No data pack available.

TO-15 Subset 25 Component Mix (25 components)

Acetone
Allyl chloride
Benzyl chloride*
Bromodichloromethane
Bromoform
1,3-Butadiene
2-Butanone (MEK)
Carbon disulfide*
Cyclohexane
Dibromochloromethane
trans-1,2-Dichloroethene
1,4-Dioxane
Ethyl acetate
4-Ethyltoluene
Heptane
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone
Methyl *tert*-butyl ether (MTBE)
2-Propanol
Propylene
Tetrahydrofuran
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34434 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26357 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34434-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34435 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26358 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34435-PI (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

TO-15 65 Component Mix (65 components)

Acetone
Acrolein
Benzene
Benzyl chloride*
Bromodichloromethane
Bromoform
Bromomethane
1,3-Butadiene
2-Butanone (MEK)
Carbon disulfide*
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Cyclohexane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,4-Dioxane
Ethanol*
Ethyl acetate
Ethyl benzene
Ethylene dibromide (1,2-dibromoethane)
4-Ethyltoluene
Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-Dichlorotetrafluoroethane (Freon 114)
Heptane
Hexachloro-1,3-butadiene
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Methylene chloride
Methyl *tert*-butyl ether (MTBE)
Methyl methacrylate
Naphthalene
2-Propanol
Propylene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrahydrofuran
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl acetate
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34436 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26359 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34436-PI (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26360 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34437-PI (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

Gas Calibration Standards

75 Comp TO15 + NJ Mix

(75 components)

Acetone
Acrolein
Benzene
Benzyl chloride*
Bromodichloromethane
Bromoform
Bromomethane
1,3-Butadiene
n-Butane
2-Butanone (MEK)
tert-Butyl alcohol
Carbon disulfide*
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
3-Chloroprene
2-Chlorotoluene
Cumene
Cyclohexane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,4-Dioxane
Ethanol*
Ethyl acetate
Ethyl benzene
Ethylene dibromide (1,2-dibromoethane)
4-Ethyltoluene
Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-Dichlorotetrafluoroethane (Freon 114)
Heptane
Hexachloro-1,3-butadiene
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Methylene chloride
Methyl *tert*-butyl ether (MTBE)
Methyl methacrylate
Naphthalene
n-Nonane
n-Pentane
2-Propanol
n-Propylbenzene
Propylene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrahydrofuran
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

NEW!

1 ppm in nitrogen, 104 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34396 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34392 (ea.)

100 ppb in nitrogen, 110 liters @ 1800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34393 (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

10 Comp NJ Subset Test Mix (10 components)

n-Butane
tert-Butyl alcohol
3-Chloroprene
2-Chlorotoluene
Cumene
n-Nonane
n-Pentane
n-Propylbenzene
2,2,4-Trimethylpentane
Vinyl bromide

NEW!

1 ppm in nitrogen, 104 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34398 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34394 (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34399 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34395 (ea.)

No data pack available.

74 Comp TO15 + NJ Mix, (no Acrolein)

(74 components)

Acetone
Benzene
Benzyl chloride*
Bromodichloromethane
Bromoform
Bromomethane
1,3-Butadiene
n-Butane
2-Butanone (MEK)
tert-Butyl alcohol
Carbon disulfide*
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
3-Chloroprene
2-Chlorotoluene
Cumene
Cyclohexane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,4-Dioxane
Ethanol*
Ethyl acetate
Ethyl benzene
Ethylene dibromide (1,2-dibromoethane)
4-Ethyltoluene
Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-Dichlorotetrafluoroethane (Freon 114)
Heptane
Hexachloro-1,3-butadiene
Hexane
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Methylene chloride
Methyl *tert*-butyl ether (MTBE)
Methyl methacrylate
Naphthalene
n-Nonane
n-Pentane
2-Propanol
n-Propylbenzene
Propylene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrahydrofuran
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

NEW!

100 ppb in nitrogen, 104 liters @ 1,800 psig
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34397 (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

A. Spectra (Linde) 104 L Cylinders
B. Scotty (Air Liquide) 110 L Cylinders
C. Scotty (Air Liquide)110 L Cylinders
(Pi-marked Cylinders for EU Regulations)

See pages 452–453 for cylinder and regulator information.

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Massachusetts APH Mix (26 components)

Benzene
1,3-Butadiene
Butylcyclohexane
Cyclohexane
n-Decane
2,3-Dimethylheptane
2,3-Dimethylpentane
n-Dodecane
Ethylbenzene
n-Heptane
n-Hexane
Isopentane
Isopropylbenzene
p-Isopropyltoluene
Methyl *tert*-butyl ether
1-Methyl-3-ethylbenzene
Naphthalene
n-Nonane
n-Octane
Toluene
1,2,3-Trimethylbenzene
1,3,5-Trimethylbenzene
n-Undecane
o-Xylene
m/*p*-Xylene (combined)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34540 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26366 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig (Pi-marked cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34540-PI (ea.)

No data pack available.

See pages 452–453 for cylinder and regulator information.

Ozone Precursor Mixture/PAMS (57 components)

Acetylene
Benzene
n-Butane
1-Butene
cis-2-Butene
trans-2-Butene
Cyclohexane
Cyclopentane
n-Decane
m-Diethylbenzene
p-Diethylbenzene
2,2-Dimethylbutane
2,3-Dimethylbutane
2,3-Dimethylpentane
2,4-Dimethylpentane
n-Dodecane
Ethane
Ethylbenzene
Ethylene
m-Ethyltoluene
o-Ethyltoluene
p-Ethyltoluene
n-Heptane
n-Hexane
1-Hexene
Isobutane
Isopentane
Isoprene
Isopropylbenzene
Methylcyclohexane
Methylcyclopentane
2-Methylheptane
3-Methylheptane
2-Methylhexane
3-Methylhexane
2-Methylpentane
3-Methylpentane
n-Nonane
n-Octane
n-Pentane
1-Pentene
cis-2-Pentene
trans-2-Pentene
Propane
n-Propylbenzene
Propylene
Styrene
Toluene
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2,2,4-Trimethylpentane
2,3,4-Trimethylpentane
n-Undecane
o-Xylene
m/*p*-Xylene (combined)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34420 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26368 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34420-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34429 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26369 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34429-PI (ea.)

No data pack available.

Japan Calibration Mix (9 components)

Acrylonitrile
Benzene
1,3-Butadiene
Chloroform
1,2-Dichloroethane
Dichloromethane
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34418-PI (ea.)

No data pack available.

Custom Gas Calibration Standards Quote
www.restek.com/customgas

Ozone Precursor/PAMS Mix

(57 components at EPA concentrations: ppbC)

Acetylene	40	Isopropylbenzene	40
Benzene	30	Methylcyclohexane	30
n-Butane	40	Methylcyclopentane	25
1-Butene	30	2-Methylheptane	25
cis-2-Butene	35	3-Methylheptane	25
trans-2-Butene	25	2-Methylhexane	25
Cyclohexane	40	3-Methylhexane	25
Cyclopentane	20	2-Methylpentane	20
n-Decane	30	3-Methylpentane	40
m-Diethylbenzene	40	*n*-Nonane	25
p-Diethylbenzene	25	*n*-Octane	30
2,2-Dimethylbutane	40	*n*-Pentane	25
2,3-Dimethylbutane	50	1-Pentene	25
2,3-Dimethylpentane	50	*cis*-2-Pentene	35
2,4-Dimethylpentane	40	*trans*-2-Pentene	25
n-Dodecane	40	Propane	40
Ethane	25	*n*-Propylbenzene	30
Ethylbenzene	25	Propylene	25
Ethylene	20	Styrene	40
m-Ethyltoluene	25	Toluene	40
o-Ethyltoluene	30	1,2,3-Trimethylbenzene	25
p-Ethyltoluene	40	1,2,4-Trimethylbenzene	40
n-Heptane	25	1,3,5-Trimethylbenzene	25
n-Hexane	30	2,2,4-Trimethylpentane	30
1-Hexene	60	2,3,4-Trimethylpentane	25
Isobutane	25	*n*-Undecane	30
Isopentane	40	*o*-Xylene	25
Isoprene	40	*m*/*p*-Xylene (combined)	40

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 104 liters @ 1,800 psi
cat.# 34445 (ea.)

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26370 (ea.)

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34445-PI (ea.)

No data pack available.

please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Gas Calibration Standards

Sulfur 5-Component Mix (5 components)

Stability is 12 months from date of manufacture. +/– 10% accuracy.

Carbonyl sulfide
Dimethyl sulfide
Ethyl mercaptan
Hydrogen sulfide
Methyl mercaptan

1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 34561 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) Blend tolerance: ±10%; Analytical accuracy: ±5% cat.# 34561-PI (ea.)

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34414 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26361 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder) Blend tolerance: ±10%; Analytical accuracy: ±5% cat.# 34414-PI (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34428 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi Blend tolerance: ±20%; Analytical accuracy: ±10% cat.# 26362 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder) Blend tolerance: ±20%; Analytical accuracy: ±10% cat.# 34428-PI (ea.)

No data pack available.

BTEX and MTBE Gas Mix (7 components)

Benzene
Ethylbenzene
Methyl *tert*-butyl ether (MTBE)
Toluene
m-Xylene
o-Xylene
p-Xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34541 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi Blend tolerance: ±10%; Analytical accuracy: ±5% cat.# 26363 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) Blend tolerance: ±20%; Analytical accuracy: ±10% cat.# 34541-PI (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34542 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi Blend tolerance: ±20%; Analytical accuracy: ±10% cat.# 26364 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) Blend tolerance: ±10%; Analytical accuracy: ±5% cat.# 34542-PI (ea.)

No data pack available.

2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

A. Spectra (Linde) 104 L Cylinders
B. Scotty (Air Liquide) 110 L Cylinders
C. Scotty (Air Liquide)110 L Cylinders
(Pi-marked Cylinders for EU Regulations)

See pages 452–453 for cylinder and regulator information.

www.restek.com/air

Reference Standards Search

Search by compound name, synonym, or CAS #.

www.restek.com/**reference**

Natural Gas and Refinery Gas Standards

- Each available in three varying concentrations.
- Mini-regulator designed specially for these standards.

Natural Gas Standards

Available in three mixes, from lean to rich. Each has an extended list of C6+ components.

	Natural Gas Standard #1 cat.# 34438, ea. % each compound*	Natural Gas Standard #2 cat.# 34439, ea. % each compound*	Natural Gas Standard #3 cat.# 34440, ea. % each compound*
nitrogen	1.000	2.500	5.000
carbon dioxide	0.500	1.000	1.500
methane UHP	94.750	85.250	70.000
ethane UHP	2.000	5.000	9.000
propane	0.750	3.000	6.000
isobutane	0.300	1.000	3.000
n-butane	0.300	1.000	3.000
isopentane	0.150	0.500	1.000
n-pentane	0.150	0.500	1.000
hexanes plus	0.100	0.250	0.500
Concentration	mole	mole	mole
Volume	13.16 L @ 200 psig (1,379 kPa)	13.16 L @ 200 psig (1,379 kPa)	5.5 L @ 75 psig (517 kPa)
Ideal Heating Value (Dry BTU/SCF)	1,048 gross	1,142 gross	1,317 gross

Ideal Heating Value: Dry BTU/SCF @ 14.696 psia & 60 °F.

*Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

Refinery Gas Standards

Available in three mixes with varying C5 unsaturates or extended C6+ components.

	Refinery Gas Standard #1 cat.# 34441, ea. % each compound*	Refinery Gas Standard #2 cat.# 34442, ea. % each compound*	Refinery Gas Standard #5 cat.# 34443, ea. % each compound*
hydrogen	40.750	12.500	12.500
argon	0.500	1.000	1.000
nitrogen	4.000	37.200	37.200
carbon monoxide	1.000	1.000	1.000
carbon dioxide	3.000	3.000	3.000
methane	8.500	5.000	5.000
ethane	6.000	4.000	4.000
ethylene	2.000	2.000	2.000
acetylene	—	1.000	1.000
propane	7.000	6.000	6.000
propylene	3.000	3.000	3.000
propadiene	0.850	1.000	1.000
cyclopropane	—	0.040	—
isobutane	6.000	5.000	5.000
n-butane	4.000	4.000	4.000
isobutylene	2.000	1.000	1.000
1,3 butadiene	3.000	3.000	3.000
cis-2-butene	2.000	2.000	2.000
trans-2-butene	2.000	3.000	3.000
1-butene	2.000	2.000	2.000
2-methyl-2-butene	—	0.200	0.200
isopentane	1.000	1.000	1.000
n-pentane	1.000	1.000	1.000
cis-2-pentene	—	0.400	0.400
trans-2-pentene	—	0.160	0.200
pentene-1	—	0.400	0.400
n-hexane	0.500	0.100	—
hexanes plus	—	—	0.100
Concentration	mole	mole	mole
Volume	5.2 L @ 70 psig (483 kPa)	4.9 L @ 60 psig (414 kPa)	4.6 L @ 60 psig (414 kPa)

*Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

please note

Gas standards on this page are not available in Pi-marked cylinders for EU countries.

cylinder design

DCG Partnership Cylinders:

Size: 7.6 x 24 cm
Connection: CGA-170/110
U.S. DOT Specs: DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.

also available

See **page 453** for regulators.

Gas Calibration Standards

Scott/Air Liquide Transportable Pure Gases and Mixtures

in 14 L, 48 L, and 110 L Sizes

We offer a wide range of Scott/Air Liquide transportable gases, from pure gases for purging or calibrating to multicomponent mixes, which are ideal for peak identification work.

The 14 L container has a CGA 160 connection for more precise integration with analytical systems. The 48 L cylinder has a CGA 165 connection and can deliver large volumes of sample. The 110 L cylinder has a CGA 180 connection.

See **pages 452–453** for cylinder and regulator information.

NOTE: Scotty 14 and Scotty 48 cylinders are not approved for use in Canada.

Description	Product Grade	Shelf Life	Scotty 14 (14 L) cat.#	Scotty 48 (48 L) cat.#	Scotty 110 (110 L) cat.#
Pure Gases					
Air, zero	THC < 1 ppm	—	34448	34449	34449-PI
Argon	99.995%	—	34457	—	34457-PI
Carbon dioxide	99.80%	—	34451	34452	34452-PI
Hydrogen	99.99%	—	34453	—	34453-PI
Methane	99.00%	—	34454	—	34454-PI
Oxygen	99.60%	—	34455	—	—
Two-Component Mixtures					
Benzene in air (1 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34458	34458-PI
Benzene in air (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34459	34459-PI
1,3-Butadiene in nitrogen (10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34460	34461	34461-PI
Carbon dioxide in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34462	—	34462-PI
Carbon dioxide in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34463	34464	34464-PI
Carbon dioxide in nitrogen (1,000 ppm)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34465	34466	34466-PI
Ethylene in air (8–10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34467	34468	34468-PI
Ethylene in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34489	—	34489-PI
Hydrogen in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34469	—	34469-PI
Hydrogen in nitrogen (1%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34471	34472	34472-PI
Hydrogen in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34473	34474	34474-PI
Methane in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34476	34477	34477-PI
Methane in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34478	—	34478-PI
Methane in nitrogen (1%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34482	34483	34483-PI
Nitrogen in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34479	—	34479-PI
Nitrous oxide in nitrogen (1 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34484	34485	34485-PI

Description	Product Grade	Shelf Life	Scotty 14 (14 L) cat.#	Scotty 48 (48 L) cat.#	Scotty 110 (110 L) cat.#
Two-Component Mixtures					
Oxygen in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34480	—	34480-PI
Oxygen in nitrogen (2%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34487	34488	34488-PI
Oxygen in nitrogen (6%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34491	34492	34492-PI
1,1,1-Trichloroethane in nitrogen (10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34493	34493-PI
Trichloroethylene in nitrogen (10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34494	34495	34495-PI
Vinyl chloride in nitrogen (1 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34496	34497	34497-PI
Vinyl chloride in nitrogen (10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34498	34499	34499-PI
Vinyl chloride in nitrogen (50 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34500	—	34500-PI
Vinyl chloride in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34501	—	34501-PI
Vinyl chloride in nitrogen (1,000 ppm)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34502	—	34502-PI
Multi-Component Mixtures					
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (0.5% each)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34504	34505	34505-PI
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (1% each)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34507	34508	34508-PI
Carbon monoxide, carbon dioxide, methane, ethane, ethylene, and acetylene in nitrogen (1% each)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	—	34511	34511-PI
Carbon monoxide, carbon dioxide, nitrogen, and oxygen (5% each), and methane and hydrogen (4% each) in helium	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34512	—	34512-PI*
Carbon monoxide (7%), carbon dioxide (15%), and oxygen (5%) in nitrogen	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34514	—	34514-PI
Carbon monoxide (7%), oxygen (4%), carbon dioxide (15%), and methane (4.5%) in nitrogen	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34515	34516	34516-PI
C1–C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (15 ppm each)	Blend tolerance: ±20%; Analytical accuracy: ±10%	3 yr	34518	34519	34519-PI
C1–C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (100 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34521	34522	34522-PI
C1–C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (1,000 ppm each)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34524	34525	34525-PI
C1–C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (100 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34527	34528	34528-PI
C2–C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium (100 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34529	34530	34530-PI
C2–C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen (100 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34531	34532	34532-PI
Branched Paraffins: 2,2-dimethylbutane, 2,2-dimethylpropane, isobutane, 2-methylbutane, 2-methylpentane, 3-methylpentane in nitrogen (15 ppm each)	Blend tolerance: ±20%; Analytical accuracy: ±10%	3 yr	34534	—	34534-PI
Methane, ethane, ethylene, acetylene, propane, propylene, *n*-butane, propyne in nitrogen (15 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34537	34537-PI
n-butane, isobutane, *cis*-2-butene, *trans*-2-butene, 1-butene, iso-butylene, 1,3-butadiene, ethyl acetylene in nitrogen (15 ppm each)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34539	34539-PI

*Cat.# 34512-PI is 30 L at 500 psig (34.5 bar).

Our Pi-marked gas standards from Scott/Air Liquide meet the requirements of the Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Gas Calibration Standards

DCG Partnership Cylinders:
Size: 7.6 x 24 cm
Connection: CGA-170/110
U.S. DOT Specs: DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.

Recommended regulator:
cat.# 22032

Scotty® (Air Liquide) 110 L (Pi-marked Cylinders for EU Regulations):
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
Outlet Fitting: CGA-180
Weight: 2.2 lb/1 kg
DOT Specifications: 3AL2216

Recommended regulators:
cat.# 26371, 26372, 21572, or 21572-R100

Spectra (Linde) 104 L:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Outlet Fitting: CGA-180
Weight: 1.5 lb/0.7 kg

Recommended regulators:
cat.# 21572, 21572-R100, 26371, or 26372

Scotty® (Air Liquide) 110 L
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
Outlet Fitting: CGA-180
Weight: 2.2 lb/1 kg
DOT Specifications: 3AL2216

Recommended regulators:
cat.# 26371, 26372, 21572, or 21572-R100

Scotty® (Air Liquide) 14 L
Contents: 14 liters
Pressure: 240 psig (17 bar)
Outlet Fitting: CGA-160
Weight: 1.5 lb/0.7 kg
Dimensions: 3" diameter x
11" height (7.6 x 28 cm)
DOT Specifications: 4B240

Please note: This cylinder is not approved for use in Canada.

Recommended regulators:
cat.# 22690

Scotty® (Air Liquide) 48 L
Contents: 48 liters
Pressure: 300 psig (21 bar)
Outlet Fitting: CGA-165
Weight: 1.75 lb/0.8 kg
Dimensions: 4" diameter x
16 1/4" height (10.2 x 41 cm)
DOT Specifications: 39 NRC

Please note: This cylinder is not approved for use in Canada.

Recommended regulators:
cat.# 22691

24129

Small Cylinder Stand

- Supports and stabilizes disposable gas cylinders.
- Fits cylinders up to 3 3/8" (8 cm) in diameter.
- Adjustable screw secures cylinder in place.

This cylinder stand is designed to support small-diameter cylinders, such as 104 L and 110 L disposable cylinders. It is a simple, safe, and economical way to stabilize the position of small cylinders, while keeping them within close proximity. The stand is constructed of heavyweight painted steel and includes an adjustable screw for safely securing cylinders.

Description	qty.	cat.#
Small Cylinder Stand	ea.	24129

Mini-Regulator for natural gas and refinery gas standards

- 0–300 psig inlet pressure range.
- 0–15 psig outlet pressure range.
- Supplied with 0–15 psig outlet pressure gauge, brass CGA 170 nut and nipple, and 1/8-inch compression outlet.

Description	qty.	cat.#
Mini-Regulator	ea.	22032

22032

High-Purity VOC Regulators

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- Stainless steel diaphragm and Kel-F® seat.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.

Spectra Gas 7621 High-Purity VOC Regulators

Specifications:
Maximum Inlet Pressure: 3,000 psig
Outlet Connection: 1/8" tube compression
Internal Volume: 3.03 cc

Description	qty.	cat.#
0–30 psig outlet pressure gauge	ea.	21572
0–100 psig outlet pressure gauge	ea.	21572-R100

21572

Air Liquide High-Purity VOC Regulators

Specifications:
Maximum Inlet Pressure: 3,000 psig
Outlet Connection: 1/4" NPT female
Internal Volume: 3.03 cc

Description	qty.	cat.#
CGA-180 (0–30 psig)	ea.	26371
CGA-180 (0–100 psig)	ea.	26372

26371

Regulators for use with 14 L and 48 L Scott/Air Liquide transportable gases

Use the CGA-160 inlet connection with 14 L Scott/Air Liquide transportable gases. Use the CGA-165 inlet connection with 48 L Scott/Air Liquide transportable gases.

Specifications:
Maximum Inlet Pressure: 300 psig
Outlet Pressure Range: 2–10 psig
Maximum Delivery Pressure: 25 psig
Operating Temperature Range: 35 °F to 150 °F (2 °C to 65 °C)
Outlet Connection: 1/4" female NPT

Materials of Construction:
Body: Brass
Diaphragm: Viton®
Seat: Acetal
Seal: Viton®

Description	qty.	cat.#
Regulator, CGA-160 Inlet Connection	ea.	22690
Regulator, CGA-165 Inlet Connection	ea.	22691

22690

also available
Single-Stage and Dual-Stage Ultra-High Purity Gas Regulators
See **pages 301–303.**

Syringe Adaptor Kit for Single-Stage VOC Regulator

Use to withdraw sample from a high-pressure cylinder after pressure reduction through the high-purity VOC single-stage regulator.

Kit contains one nickel-plated brass 1/4" NPT to female luer fitting, which can be used with an A-2 Luer syringe (cat.# 20162 or 20163), and one stainless steel 1/4" NPT x 1/8" compression fitting with septum (can be used with any syringe needle).

Description	qty.	cat.#
Syringe Adaptor Kit	kit	21118

21118

Gas Sampling

Sample Cylinders.....454
Sample Cylinder Valves.....455
Sample Cylinder Accessories.....456
Gas Sampling Valves & Loops.....457

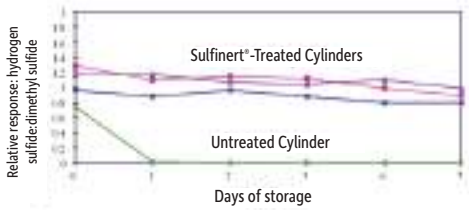
Sample Cylinders

- All cylinders have 1/4" female NPT threads on both ends.
- TPED compliant cylinders available for EU community.

Swagelok® sample cylinders are made of 304L and 316L stainless steel to resist corrosion and DOT rated to 1,800 and 5,000 psig (TPED cylinders rated to 1,450 and 4,350 psig), which allows sampling at gas wellheads as well as on-site refineries. Each cylinder is hydrostatically tested to at least 5/3 the working pressure.

Sulfur compounds are stable in Sulfinert®-treated stainless steel systems.

17 ppbv hydrogen sulfide in 500 mL cylinders



Applications:

- ASTM D1265
- Hydrocarbon sampling in refineries & petrochemical plants

Analyzing sulfur or mercury?

- Sulfinert® coating provides stable storage of sulfur and mercury at ppb levels.
- Inert coating doesn't flake; more durable than PTFE.

also available

Certificates are available upon request.

Sample Cylinders, High Pressure (Stainless Steel & Sulfinert®-Treated)

- 304L stainless steel; DOT rating to 1,800 psig (TPED cylinders to 1,450 psig).
- Range of cylinder sizes, 75 cc to 2,250 cc.

	1,800 psig (12,411 kPa), 304L SS		TPED, 1,450 psig (9,997 kPa), 304L SS	
Size	Stainless Steel cat.#	Sulfinert-Treated cat.#	Stainless Steel cat.#	Sulfinert-Treated cat.#
75 cc	22921	24130	22921-PI	24130-PI
150 cc	22922	24131	22922-PI	24131-PI
300 cc	22923	24132	22923-PI	24132-PI
500 cc	22924	24133	22924-PI	24133-PI
1,000 cc	22925	24134	22925-PI	24134-PI
2,250 cc	22926	21394	22926-PI	21394-PI

Sample Cylinders, Ultra-High Pressure (Stainless Steel & Sulfinert®-Treated)

- 316L stainless steel; DOT rating to 5,000 psig (TPED cylinders to 4,350 psig).
- Range of cylinder sizes, 150 cc to 500 cc.

	5,000 psig (34,474 kPa), 316L SS		TPED, 4,350 psig (29,992 kPa), 316L SS	
Size	Stainless Steel cat.#	Sulfinert-Treated cat.#	Stainless Steel cat.#	Sulfinert-Treated cat.#
150 cc	22927	22111	22927-PI	22111-PI
300 cc	22928	22112	22928-PI	22112-PI
500 cc	22929	22113	22929-PI	22113-PI

Sample Cylinder Valves (Stainless Steel & Sulfinert®-Treated)

- Multiple valve configurations, including dip tube and rupture discs.
- Large, durable, Kel-F® seat ensures leak-free operation.
- Temperature range: –40 °C to 120 °C
- 303 stainless steel.

Alta-Robbins' unique valve design incorporates a fully contained soft seat that provides durability and longer lifetime. Tight shut-off is easily achieved with very low torque, yet the valve is rugged enough to withstand overtightening.

21400

21401

Multiple valve configurations are available for both high-pressure and ultra-high-pressure sample cylinders. An outage tube or dip tube provides a headspace above liquefied gases so that, should expansion occur with an increase in temperature, the pressure is not dramatically increased. Outage is expressed as a percent of the total cylinder volume, based on the ratio of the length of headspace to the total length of the cylinder, with a maximum available outage of 50%. The dip tube is welded directly to the male inlet of the valve and cut to a length of up to 5.25 inches. Rupture discs function to protect sample cylinders from over-pressurization by venting to the atmosphere. The pressure rating on the rupture disc should always be lower than the cylinder.

21402

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
3,500 psig (24,132 kPa) DOT Pressure Rating		
1/4" Male NPT x 1/4" Male NPT	26297	21400
1/4" Male NPT x 1/4" Female NPT	26298	26299
1/4" Male NPT x 1/4" Male Compression	26300	21401
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26301	21402*
1/4" Male NPT x 1/4" Male NPT w/1,800 psi (12,411 kPa) Rupture Disc	26302	26303
1/4" Male NPT x 1/4" Female NPT w/1,800 psi (12,411 kPa) Rupture Disc	26304	26305
Replacement Rupture Disc, 1,800 psig (12,411 kPa)	26320	—
5,000 psig (34,474 kPa) DOT Pressure Rating		
1/4" Male NPT x 1/4" Male NPT	26306	26307
1/4" Male NPT x 1/4" Female NPT	26308	26309
1/4" Male NPT x 1/4" Male Compression	26310	26311
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26312	26313
1/4" Male NPT x 1/4" Male NPT w/2,850 psi (19,650 kPa) Rupture Disc	26314	26315
1/4" Male NPT x 1/4" Female NPT w/2,850 psi (19,650 kPa) Rupture Disc	26316	26317
Replacement Rupture Disc, 2,850 psig (19,650 kPa)	26324	—

26298

26300

26314

*To order a sample cylinder valve with dip tube, please call Restek® Customer Service at 800-356-1688, ext. 3, or contact your Restek® representative. Specify dip tube length or % outage when ordering (maximum length = 5.25"/ 13.3 cm).
Note: End of part will not be treated after cutting tube to length.

Rupture Disc Tee (Stainless Steel & Sulfinert®-Treated)

Unlike other designs, Alta-Robbins rupture disc tee is NOT permanently soldered to the disc, making the discs replaceable. Discs are easily changed without removing the valve or tee from the cylinder. These tees are designed to be installed into existing systems to provide reliable over-pressure protection.

26318

26323

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
1,800 psig DOT Pressure Rating		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26318	26319
Replacement Rupture Disc	26320	—
2,850 psig DOT Pressure Rating		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26322	26323
Replacement Rupture Disc	26324	—

26324

Metering Control Valves (Stainless Steel & Sulfinert®-Treated)

- Reduces pressure between sample cylinder and GC injector.
- Maintains fine metering control.
- Contains Kel-F® seat.

26326

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
3,500 psig (24,132 kPa) DOT Pressure Rating		
Metering Control Valve, 1/4" Male NPT x 1/4" Male NPT	26326	26327

Sample Cylinder Accessories

Description	Fittings	qty.	cat.#
Sample Cylinder Carrying Handle, 304 SS for 1.9" & 2" OD Cylinders (Includes handle and two attachment rings)	——	ea.	26373
Sample Cylinder Carrying Handle, 304 SS for 3.5" & 4" OD Cylinders (Includes handle and two attachment rings)	——	ea.	26374
Sample Cylinder 316 SS End Pipe Plug, Stainless Steel	1/4" Male NPT	ea.	26375
Sample Cylinder 316 SS End Pipe Plug, Sulfinert-Treated	1/4" Male NPT	ea.	26376
Sample Cylinder 316 SS Hollow Hex Plug	1/4" Male NPT	ea.	26377
Sample Cylinder SS Pipe Cap w/Lanyard	1/4" Female NPT & 20" Lanyard	ea.	26378
Sample Cylinder SS Pipe Cap, Stainless Steel	1/4" Female NPT	ea.	22969
Sample Cylinder SS Pipe Cap, Sulfinert-Treated	1/4" Female NPT	ea.	22970

SS=stainless steel

Protecting Your Sulfinert®-Treated Products

Cleaning Tips

When cleaning a treated part, rinse with a solvent that will dissolve probable surface contaminants (i.e., use a nonpolar solvent to remove hydrocarbon contaminants, or a more polar solvent to remove more active contaminants).

Avoid using cleaners containing abrasives as they can scratch the layer. Mild sonication may assist in contaminant removal, but do not oversonicate—this could damage the layer. Solids can be removed with a soft nylon bristle brush using light pressure.

Caution! Do not use basic solutions or soaps with pH>8. Do not steam clean Sulfinert®-treated components or lines as this could damage the layer.

Preventing Galling

As with any threaded fitting, galling may occur when assembling two treated parts. To prevent thread damage, use a PTFE tape.

A scouring pad can be used to remove coating from the threads to reduce galling.

Ferrules used in compression fittings should not be coated—leaks may occur.

Troubleshooting

Under normal use, your treated items should deliver outstanding performance for years to come. However, effective lifetime is dependent on the severity of the environment. Factors that can reduce performance are:

- *Contamination*—Failure to properly clean the surface can allow increased surface activity. If performance changes, thoroughly clean the surface and inspect the layer for damage.
- *Erosion*—Contact with abrasives can accelerate surface wear.
- *Bases*—Contact with a base (pH 8 or higher) can accelerate deterioration of the layer.

Surface finish and color should stay consistent throughout the life of the product. Changes in the finish or color may indicate a partial loss of the layer. To prevent further loss, ensure no exposure to bases or abrasives.

Gas Sampling Valves and Sample Loops (Sulfinert®-Treated)

- Ideal for samples containing low concentrations of sulfur or other active compounds.
- Sample loop sizes from 5 µL to 5 mL.

Sulfinert® treatment eliminates active sites in the valve or loop for better recovery of active compounds.

20585

Gas Sampling Valves & Replacement Rotors (Sulfinert®-Treated)

(1/16" Fittings, 0.40 mm Port Diameter; "W Type" Valve)

Description	qty.	cat.#
Sulfinert Gas Sampling Valve; 4-Port	ea.	20584
Sulfinert Gas Sampling Valve; 6-Port	ea.	20585
Sulfinert Gas Sampling Valve; 10-Port	ea.	20586

Replacement Rotors (Not Coated)

Description	qty.	cat.#
Replacement Rotor (not coated) for 4-Port Sulfinert Gas Sampling Valve	ea.	20587
Replacement Rotor (not coated) for 6-Port Sulfinert Gas Sampling Valve	ea.	20588
Replacement Rotor (not coated) for 10-Port Sulfinert Gas Sampling Valve	ea.	20589

20588

Gas Sample Loops (Sulfinert®-Treated)

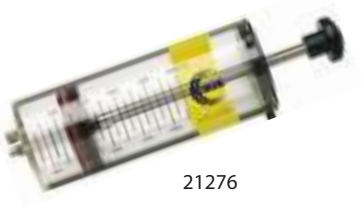
(1/16" fittings, 1 mm ID, for "W Type" valves)

Description	Size	qty.	cat.#
Sample Loops, Sulfinert-Treated	5 µL	ea.	22840
Sample Loops, Sulfinert-Treated	10 µL	ea.	22841
Sample Loops, Sulfinert-Treated	20 µL	ea.	22842
Sample Loops, Sulfinert-Treated	25 µL	ea.	22843
Sample Loops, Sulfinert-Treated	50 µL	ea.	22844
Sample Loops, Sulfinert-Treated	100 µL	ea.	22845
Sample Loops, Sulfinert-Treated	250 µL	ea.	22846
Sample Loops, Sulfinert-Treated	500 µL	ea.	22847
Sample Loops, Sulfinert-Treated	1 mL	ea.	22848
Sample Loops, Sulfinert-Treated	2 mL	ea.	22849
Sample Loops, Sulfinert-Treated	5 mL	ea.	22850

22848

Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.


21276

Volume	Model	SGE cat.#	qty.	Restek cat.#
500 mL	500MAR-LL-GT	009910	ea.	21275
1000 mL	1000MAR-LL-GT	009920	ea.	21276
2000 mL	2000MAR-LL-GT	009930	ea.	21277

Syringe O-Rings

Syringe Volume	SGE cat.#	qty.	Restek cat.#
500 mL	032527	ea.	21278
1,000 mL	032532	ea.	21279

21279
21278

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World-Class Certified

10 CRITICAL STEPS

Whether it's a stock, off-the-shelf reference standard or a one-of-a-kind, custom-formulated solution, there are 10 critical steps that Restek takes to separate our certified reference materials (CRMs) from the competition. For every CRM produced in Restek's ISO-accredited labs, we always:

1 Review Customer & Method Requirements

To determine which organic reference standards we should develop as stock products, Restek experts closely monitor government regulations and methods from around the globe and also actively engage with our customers and distributors. Once a product is chosen based on regulatory changes, customer needs, and our 20+ years of experience, a veteran Restek chemist formulates a stable standard containing an ideal mix of compounds and concentrations. All formulations are then subjected to a thorough review of accuracy, compatibility, and solubility by a second chemist.

2 Verify Compatibility & Stability

All raw materials used in our reference standards are held to strict purity criteria, and compound compatibility is scrutinized during both formulation and review. We also conduct on-going, long-term stability and short-term shipping stability studies in accordance with ISO Guide 34 and ISO Guide 35 to ensure reliability and accurate shelf-life reporting.

3 Characterize Raw Materials Thoroughly

Restek's Quality Control (QC) lab confirms the chemical identity and purity of mixture components and solvents using one or more of the following techniques: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

4 Calibrate Analytical Balances

All analytical balances are verified at seven mass levels daily using NIST* traceable weights and are also calibrated yearly by an ISO/IEC 17025:2005–accredited provider to guarantee accurate measurement.

5 Deactivate Glassware & Ampuls

Restek® reference standards are prepared using Class A volumetric flasks and/or Class A pipettes. Ampuls and vials used in preparation and packaging are deactivated to prevent the loss of target analytes.

6 Maintain ISO Accreditation

In 2011, the reference standard manufacturing and QC testing laboratories in Restek's state-of-the-art Bellefonte, PA, facility earned ISO Guide 34 and ISO/IEC 17025 accreditation. These accreditations—in addition to ISO 9001 registration, which we have maintained since 1994—serve as recognition that Restek and our labs meet the world-class quality standards established by the International Organization for Standardization (ISO). On-site manufacturing as well as raw material, qualitative, and quantitative analyses are completed in these ISO-accredited labs. *Restek's ISO-accredited labs offer a full line of both stock and custom CRMs.*

* National Institute of Standards and Technology

What are Certified Reference Materials (CRMs)?

A CRM from Restek is in an exclusive subset of reference standards that meets the following set of strict criteria defined under ISO Guide 34 and ISO/IEC 17025:

- Made of raw materials characterized via qualified methods on qualified instruments.
- Produced in an ISO-accredited lab under documented procedures.
- Falls under the manufacturer's scopes of accreditation.

To learn more about Restek's ISO quality credentials and to view our certificates (including scopes of accreditation), visit **www.restek.com/iso**

Reference Materials (CRMs)

7 Offer a Variety of Documentation

Restek exclusively offers three levels of fully ISO-compliant documentation for our CRMs, and most stock CRMs come with quantitative-level documentation.

Gravimetric: Product supplied with the gravimetric records listing purity of each material used, calculated concentration, and a unique lot number.

Qualitative (Certificate of Composition): A sample withdrawn from the packaged units is tested by the appropriate technique to verify mixture composition. Product supplied with a certificate of composition showing a chromatogram of the standard with each peak identified, raw material purity, and gravimetric concentration.

Quantitative (Certificate of Analysis): A sample of the packaged unit is analyzed in triplicate and the peak areas are statistically compared to a previous lot (if available) or a second lot. A detailed data pack is available at **www.restek.com/documentation** containing gravimetric documentation, all quantitative assay raw data, exact amount of each raw material used, total volume prepared, and statistics. Test results for raw material purity and identification are available upon request.

Documentation for all of your stock and custom Restek® CRMs is a few clicks away at **www.restek.com/documentation**

8 Package Securely & Label Clearly

Every Restek® CRM is placed in durable, high-quality packaging for dock-to-door protection. Labeling provides critical storage, safety, and shelf life information in an easy-to-read format—and now features bar-coded GHS labeling for added safety and easier compliance.

9 Protect Product Quality After Opening

To help preserve the integrity of our CRMs after they are opened, we include a deactivated screw-top vial (cat.# 24640) with each stock reference standard <5 mL for worry-free transfer and reliable temporary storage.

10 Manage Warehouse Inventory

To ensure the inventory is available when it's needed, Restek continually analyzes and maintains inventory of more than 1,500 catalog standards as well as multiple lots of the most commonly requested calibration standards. We pull inventory months before its expiration date to eliminate inadvertent delivery of expired or nearly expired reference standards.

www.restek.com/**crm**

Need a Custom CRM?

Our ISO-Accredited Labs Can Supply Them!

In addition to an extensive selection of reference standards that is in-stock and ready to ship, Restek's custom-formulated solutions also fall under our ISO Guide 34 and ISO/IEC 17025 accreditations. Satisfy all of your certified reference material needs—as well as order GC and LC columns, sample prep supplies, and accessories—using one reliable supplier: Restek.

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Establish a Blanket / Standing Order Today

- Significant cost savings.
- Fewer purchase orders and invoices.
- Less instrument downtime.
- Reduced inventory management.
- Flexibility to adjust to changing needs.

Contact Customer Service or your local Restek® representative to learn more and start saving!

www.restek.com/contact-us

Reference Standards

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
Acenaphthene	83-32-9	M	1,000	31267
Acenaphthylene	208-96-8	M	1,000	31268
Acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
Acetone	67-64-1	Neat		30012
Acetone	67-64-1	PTM	5,000	30245
Acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
Acetonitrile	75-05-8	PTM	1,000	30495
Acetophenone	98-86-2	PTM	5,000	30621
Acifluorfen	50594-66-6	M	1,000	32255
Acifluorfen methyl ester	50594-67-7	M	1,000	32256
Acrolein	107-02-8	PTM	5,000	30645
Acrolein	107-02-8	W	5,000	30646
Acrylamide	79-06-1	M	1,000	30494
Acrylonitrile	107-13-1	PTM	2,000	30246
Alachlor	15972-60-8	M	1,000	32204
Aldrin	309-00-2	M	1,000	32205
Allyl chloride	107-05-1	PTM	2,000	30248
Alprazolam	28981-97-7	PTM	1,000	34042
4-Amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
Aminomethyl phosphonic acid (AMPA)	1066-51-9	W	100	32428
Ammelide	645-93-2	DEA:W (20:80)	1,000	33249
Ammeline	645-92-1	DEA:W (20:80)	1,000	33250
Amobarbital	64-43-7	PTM	1,000	34028
d-Amphetamine	51-63-8	PTM	1,000	34020
tert-Amyl alcohol	75-85-4	PTM	10,000	30631
tert-Amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
5-α-Androstane	438-22-2	D	2,000	31065
Aniline	62-53-3	M	1,000	31470
Anthracene	120-12-7	A	1,000	31269
Anthracene-d10	1719-06-08	D	2,000	31037
Anthracene (5 mL)	120-12-7	ACN	100	33264
Antifoam agent for purge-and-trap	N/A	Neat	1 mL	31822
Aprobarbital	77-02-1	PTM	1,000	34029
Aramite	140-57-8	H	2,000	31624

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
Atrazine	1912-24-9	A	1,000	32208
Atrazine-d5	163165-75-1	ACN	100	31984
Aviation gas (5 mL)	8006-69-1	PTM	50,000	30208
Aviation gas	8006-69-1	PTM	50,000	30207
Azobenzene	103-33-3	D	1,000	31496
Barbital	57-44-3	PTM	1,000	34030
Bentazon	25057-89-0	M	1,000	32257
Benzaldehyde	100-52-7	D	2,000	33017
Benzene	71-43-2	DMSO	10 mg/mL	36282
Benzene	71-43-2	D	250	35262
Benzene	71-43-2	PTM	2,000	30249
Benzene-d6	1076-43-3	PTM	2,000	30025

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

Quantity Discounts Available

— Buy 3 Standards, Get 10% Off

— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Compound	CAS #	Solvent	Conc.	cat.#
Benzidine	92-87-5	M	1,000	31441
Benz(a)anthracene	56-55-3	M	1,000	31270
Benzo(a)pyrene	50-32-8	A	1,000	31271
Benzo(b)fluoranthene	205-99-2	A	1,000	31272
Benzo(ghi)perylene	191-24-2	D	1,000	31273
Benzo(k)fluoranthene	207-08-9	A	1,000	31274
Benzoguanamine	91-76-9	pyridine	1,000	33251
Benzoic acid	65-85-0	D	2,000	31879
Benzoic acid	65-85-0	M	1,000	31415
Benzoylecgonine	519-09-5	PTM	1,000	34016
Benzphetamine	5411-22-3	PTM	1,000	34022
Benzyl benzoate	120-51-4	H	5,000	31847
α-BHC	319-84-6	M	1,000	32206
β-BHC	319-85-7	A	1,000	32209
δ-BHC	319-86-8	M	1,000	32217
γ-BHC (lindane)	58-89-9	M	1,000	32226
Bis(2-ethylhexyl)adipate	103-23-1	M	1,000	31449
Bis(2-ethylhexyl)phthalate	117-81-7	D	1,000	31420
Bromazepam	1812-30-2	PTM	1,000	34043
Bromobenzene	108-86-1	PTM	2,000	30250
2-Bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-Bromobutyrate	3196-15-4	MTBE	2,000	31882
2-Bromochlorobenzene	694-80-4	PTM	2,000	30228
4-Bromochlorobenzene	106-39-8	PTM	2,000	30230
1-Bromo-2-chloroethane	107-04-0	PTM	2,000	30469
Bromochloromethane	74-97-5	PTM	2,000	30225
2-Bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
Bromodichloromethane	75-27-4	PTM	2,000	30251
4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)	672-99-1	M	100	32274
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	5,000	30003
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
Bromoform	75-25-2	PTM	2,000	30252
Bromomethane	74-83-9	PTM	2,000	30253
1-Bromo-2-nitrobenzene	577-19-5	A	1,000	32279
2-Bromopropionic acid	598-72-1	MTBE	1,000	31653
Butabarbital	125-40-6	PTM	1,000	34031
Butachlor ESA sodium salt		M	100	33202
1,3-Butadiene	106-99-0	PTM	2,000	30622
Butalbital	77-26-9	PTM	1,000	34032
1,4-Butanediol	110-63-4	M	1,000	34078
(s)-(-)-1,2,4-Butanetriol	42890-76-6	pyridine	1,000	33024
(s)-(-)-1,2,4-Butanetriol (5 mL)	42890-76-6	pyridine	1,000	33032
1-Butanol	71-36-3	PTM	50,000	30474
tert-Butanol (TBA)	75-65-0	PTM	50,000	30470
tert-Butanol-d9	25725-11-5	PTM	20,000	30618
2-Butanone (MEK)	78-93-3	PTM	5,000	30254
γ-Butyrolactone (GBL)	96-48-0	ACN	1,000	34077
Caffeine	58-08-2	W	5	31804
Caffeine	58-08-2	W	25	31803
Caffeine	58-08-2	W	125	31802
Caffeine	58-08-2	W	250	31801
Caffeine	58-08-2	W	500	31800
Caffeine	58-08-2	M	1,000	34084
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
ε-Caprolactam	105-60-2	D	2,000	31833
Carbaryl-d7	362049-56-7	ACN	100	31985
Carbazole	86-74-8	D	1,000	31836
Carbazole	86-74-8	M	1,000	31430
Carbendazim	10605-21-7	M	100	31981
Carbon disulfide	75-15-0	PTM	2,000	30258
Carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
Carbon tetrachloride	56-23-5	PTM	2,000	30259
Chloral hydrate	302-17-0	ACN	1,000	30609
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
cis-Chlordane	5103-71-9	M	1,000	32207
trans-Chlordane	5103-74-2	M	1,000	32227
Chlordiazepoxide	438-41-5	PTM	1,000	34044
4-Chloroaniline	106-47-8	D	2,000	31211
Chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
Chlorobenzene	108-90-7	PTM	2,000	30261
Chlorobenzene-d5	3114-55-4	PTM	2,000	30223
Chlorobenzilate	510-15-6	M	1,000	32211
Chloroethane	75-00-3	PTM	2,000	30263
2-Chloroethanol	107-07-3	PTM	2,000	30264
2-Chloroethyl vinyl ether	110-75-8	PTM	2,000	30265
1-Chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066
Chloroform	67-66-3	DMSO	0.3 mg/mL	36285
Chloroform	67-66-3	PTM	2,000	30266
Chloromethane	74-87-3	PTM	2,000	30267
2-Chloronaphthalene	91-58-7	M	1,000	31284
4-Chloro-3-nitrobenzotrifluoride	121-17-5	A	1,000	32282
1-Chlorooctadecane	3386-33-2	D	10,000	31098
1-Chlorooctane	111-85-3	PTM	10,000	30084
Chloroprene	126-99-8	PTM	5,000	30238
Chlorpyrifos	2921-88-2	M	1,000	32212
Chrysene	218-01-9	A	1,000	31275
Clobazam	22316-47-8	PTM	1,000	34045
Clonazepam	1622-61-3	PTM	1,000	34046
Cocaethylene	529-38-4	ACN	1,000	34066
Cocaine	53-21-4	PTM	1,000	34015
Codeine	76-57-3	PTM	1,000	34000
Cotinine	486-56-6	M	1,000	34086
Creosote oil	8001-58-9	D	50,000	31838
Cyanazine	21725-46-2	A	1,000	32215
Cyanuric acid	108-80-5	DEA:W (20:80)	1,000	33248
Cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
2,4-D (2,4-Dichlorophenoxyacetic acid)	94-75-7	M	1,000	32239
2,4-D methyl ester	1928-38-7	M	1,000	32240
DCPA methyl ester (Chlorthal-dimethyl)	1861-32-1	M	1,000	32216
Dalapon	75-99-0	ACN	1,000	32432
Dalapon	75-99-0	M	1,000	32253
Dalapon	75-99-0	M	2,000	32056
Dalapon methyl ester	17640-02-7	H	2,000	32057
2,4-DB	94-82-6	M	1,000	32241
DCPA diacid	2136-79-0	M	200	32261
2,4'-DDD	53-19-0	M	1,000	32098
4,4'-DDD	72-54-8	M	1,000	32201
2,4'-DDE	3424-82-6	M	1,000	32099
4,4'-DDE	72-55-9	M	1,000	32202
2,4'-DDT	789-02-6	M	1,000	32200
4,4'-DDT	50-29-3	M	1,000	32203

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

Solvent codes:

A = acetone
ACN = acetonitrile
C = carbon disulfide
Cy = cyclohexane
D = methylene chloride
DEA = diethylamine
DMSO = dimethyl sulfoxide
EA = ethyl acetate
H = hexane
I = isooctane
Ip = isopropanol
M = methanol
MTBE = methyl *tert*-butyl ether
PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
Decachlorobiphenyl (BZ #209) (5 mL)	2051-24-3	A	200	32030
Decachlorobiphenyl (BZ #209)	2051-24-3	A	200	32029
Decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289
Decafluorobiphenyl	434-90-2	A	1,000	31855
Decafluorobiphenyl	434-90-2	D	2,000	31041
Decafluorobiphenyl	434-90-2	ACN	1,000	31842
Decafluorotriphenylphosphine (DFTPP)	5074-71-5	D	2,500	31001
n-Decane	124-18-5	Neat	1 mL	31858
Dextromethorphan HBr monohydrate	6700-34-1	M	1,000	34081
Dextro-propoxyphene	1639-60-7	PTM	1,000	34008
Diazepam	439-14-5	PTM	1,000	34047
Diazinon-d10 (diethyl-d10)	100155-47-3	ACN	100	31986
Dibenz(a,h)anthracene	53-70-3	D	1,000	31276
4,4'-Dibromobiphenyl	92-86-4	EA	500	32092
Dibromochloromethane (chlorodibromochloromethane)	124-48-1	PTM	2,000	30271
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	PTM	2,000	30270
1,2-Dibromoethane	106-93-4	PTM	2,000	30272
Dibromomethane	74-95-3	PTM	2,000	30430
4,4'-Dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
4,4'-Dibromooctafluorobiphenyl	10386-84-2	H	250	32053
4,4'-Dibromooctafluorobiphenyl	10386-84-2	MTBE	2,000	31856
2,3-Dibromopropionic acid	600-05-5	MTBE	1,000	31655
2,5-Dibromotoluene	615-59-8	PTM	1,000	30435
2,5-Dibromotoluene	615-59-8	PTM	10,000	30453
Dibutylchlorendate	1770-80-5	A	200	32025
Dicamba	1918-00-9	M	1,000	32247
Dicamba methyl ester	6597-78-0	M	1,000	32248
1,2-Dichlorobenzene	95-50-1	M	1,000	31442
1,3-Dichlorobenzene	541-73-1	M	1,000	31443
1,4-Dichlorobenzene	106-46-7	ACN	1,000	30498
1,4-Dichlorobenzene	106-46-7	M	1,000	31444
1,2-Dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
3,3'-Dichlorobenzidine	91-94-1	D	2,000	31835
3,3'-Dichlorobenzidine	91-94-1	M	2,000	31026
1,4-Dichlorobutane	110-56-5	PTM	2,000	30227
trans-1,4-Dichloro-2-butene	110-57-6	PTM	2,000	30274
Dichlorodifluoromethane (CFC-12)	75-71-8	PTM	2,000	30275
1,1-Dichloroethane	75-34-3	PTM	2,000	30276
1,2-Dichloroethane	107-06-2	DMSO	25 mg/mL	36288
1,2-Dichloroethane	107-06-2	PTM	2,000	30277
1,2-Dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,1-Dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,1-Dichloroethene	75-35-4	PTM	2,000	30278
cis-1,2-Dichloroethene	156-59-2	PTM	2,000	30279
trans-1,2-Dichloroethene	156-60-5	PTM	2,000	30280
cis-1,2-Dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-Dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
2,6-Dichlorophenol	87-65-0	M	1,000	31409
2,4-Dichlorophenylacetic acid	19719-28-9	M	200	32049
2,4-Dichlorophenylacetic acid	19719-28-9	A	1,000	32439
2,4-Dichlorophenyl acetic acid methyl ester	55954-23-9	H	200	32050
1,2-Dichloropropane	78-87-5	PTM	2,000	30281
2,2-Dichloropropane	594-20-7	PTM	2,000	30283
cis-1,3-Dichloropropene	10061-01-5	PTM	2,000	30284
trans-1,3-Dichloropropene	10061-02-6	PTM	2,000	30285
2,3-Dichloropropionic acid	565-64-0	MTBE	1,000	31650
1,2-Dichlorotetrafluoroethane (CFC-114)	76-14-2	PTM	2,000	30476
Dichlorprop	120-36-5	M	1,000	32249
Dichlorprop methyl ester	57153-17-0	M	1,000	32250
Dichlorvos-d6	203645-53-8	A	100	31987
Dieldrin	60-57-1	M	1,000	32218

Compound	CAS #	Solvent	Conc.	cat.#
Diesel fuel #2 composite (5 mL)	68334-30-5	D	50,000	31259
Diesel fuel #2 composite	68334-30-5	D	5,000	31093
Diesel fuel #2 composite	68334-30-5	D	50,000	31258
Diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
Diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
Diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
Diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
Diesel:biodiesel (80:20)	67784-80-9	D	5,000	31880
Diethyl ether (ethyl ether)	60-29-7	PTM	2,000	30286
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Dimethachlor ESA sodium salt		M	100	33203
Dimethoate-d6	1219794-81-6	ACN	100	31988
1,2-Dimethoxyethane	110-71-4	DMSO	0.5 mg/mL	36291
N,N-Dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
Dimethyldichlorosilane (DMDCS) (25 mL)	75-78-5	Neat	25 mL	31861
N,N-Dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
1,4-Dinitrobenzene	100-25-4	ACN	2,000	33205
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol)	534-52-1	M	1,000	31292
2,4-Dinitrophenol	51-28-5	M	1,000	31291
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
Di-*n*-octyl phthalate	117-84-0	M	1,000	31426
Dinoseb	88-85-7	M	1,000	32251
Dinoseb methyl ether	6099-79-2	M	1,000	32252
Diolein (1,3-di[*cis*-octadecenoyl] glycerol)	2465-32-9	pyridine	5,000	33022
1,4-Dioxane	123-91-1	DMSO	1.9 mg/mL	36294
1,4-Dioxane	123-91-1	D	2,000	31853
1,4-Dioxane	123-91-1	PTM	2,000	30287
1,4-Dioxane-d8	17647-74-4	PTM	2,000	30614
1,2-Diphenylhydrazine	122-66-7	M	1,000	31497
Diuron	330-54-1	ACN	200	32450
Diuron-d6	1007536-67-5	ACN	100	31989
Ecgonine	5796-31-6	PTM	1,000	34017
Ecgonine methyl ester	38969-40-3	PTM	1,000	34018
EDDP perchlorate	66729-78-0	M	1,000	34069
EGDN*	628-96-6	M	1,000	31601
Endosulfan I	959-98-8	A	1,000	32465
Endosulfan II	33213-65-9	A	1,000	32466
Endosulfan sulfate	1031-07-8	A	1,000	32467
Endrin	72-20-8	A	1,000	32463
Endrin ketone	53494-70-5	A	1,000	32464
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
2-Ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
Ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
Ethylbenzene	100-41-4	PTM	2,000	30290
Ethylbenzene-d10	25837-05-2	PTM	2,000	30029
Ethylbenzene-d5	20302-26-5	PTM	2,000	30028
Ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Ethylenediamine	107-15-3	M	540	35222
Ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
Ethylene oxide	75-21-8	D	50 mg/mL	30620
Ethylene oxide	75-21-8	DMSO	500	36005
Ethylene oxide (5 mL)	75-21-8	PEG-200	0.005% w/w	30548
Ethyl methacrylate	97-63-2	PTM	2,000	30289
Fentanyl	437-38-7	M	1,000	34082
nor-Fentanyl oxalate	1609-66-1	M	1,000	34083

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

*Ships under Restek's USDOT explosives approval.

Compound	CAS #	Solvent	Conc.	cat.#
Fluazinam	79622-59-6	ACN	100	31982
Flunitrazepam	1622-62-4	PTM	1,000	34049
Fluoranthene	206-44-0	M	1,000	31277
Fluorene	86-73-7	M	1,000	31278
Fluorobenzene	462-06-6	PTM	2,000	30030
2-Fluorobiphenyl	321-60-8	D	2,000	31091
2-Fluorobiphenyl	321-60-8	D	10,000	31096
2-Fluorophenol	367-12-4	D	2,000	31047
Flurazepam	1172-18-5	PTM	1,000	34050
Formaldehyde-DNPH	1081-15-8	ACN	500	31837
Formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
Formamide	75-12-7	DMSO	1.1 mg/mL	36298
Fuel oil # 4	68476-31-3	D	5,000	31216
Fuel oil # 4	68476-31-3	D	50,000	31244
Fuel oil # 6	68553-00-4	D	5,000	31218
Fuel oil # 6	68553-00-4	D	50,000	31248
DL-Glutethimide	18389-24-7	PTM	1,000	34058
Glycerin	56-81-5	pyridine	500	33020
Glycolaldehyde-2,4-DNPH		ACN	100	33091
Glyphosate (5 mL)	1071-83-6	W	1,000	32427
Glyphosate	1071-83-6	W	1,000	32426
1,6-HDIP	72375-27-0	DMSO	1,000	33002
Heptachlor	76-44-8	M	1,000	32228
Heptachlor epoxide (isomer B)	1024-57-3	M	1,000	32230
Hexachlorobenzene	118-74-1	A	1,000	32231
Hexachloro-1,3-butadiene	87-68-3	M	1,000	31435
Hexachlorocyclopentadiene	77-47-4	M	1,000	32232
Hexachloroethane	67-72-1	M	1,000	31436
Hexachlorophene	70-30-4	D	2,000	31811
Hexane	8031-34-3	DMSO	1.45 mg/mL	36299
Hexobarbital	56-29-1	PTM	1,000	34033
HMX*	2691-41-0	ACN	1,000	31665
Hydramethylnon	67485-29-4	ACN	100	31979
Hydraulic oil	64741-89-5	D	50,000	31839
Hydrocodone	34195-34-1	PTM	1,000	34002
Hydromorphone	71-68-1	PTM	1,000	34063
Indeno(1,2,3-cd)pyrene	193-39-5	D	1,000	31279
Iodomethane	74-88-4	PTM	2,000	30292
Isobutyl alcohol	78-83-1	PTM	2,000	30293
Isobutylbenzene	538-93-2	PTM	1,000	30613
Isopropylbenzene	98-82-8	PTM	2,000	30294
Jet fuel A (5 mL)	64742-47-8	D	50,000	31243
Jet fuel A	64742-47-8	D	5,000	31215
Jet fuel A	64742-47-8	D	50,000	31242
JP-5 military fuel	8008-20-6	D	50,000	31252
JP-8 military fuel	94114-58-6	D	5,000	31262
JP-8 military fuel	94114-58-6	D	50,000	31254
Kerosene composite (5 mL)	84742-81-0	D	50,000	31257
Kerosene composite	84742-81-0	D	5,000	31094
Kerosene composite	84742-81-0	D	50,000	31256
Kerosene: 25% weathered	84742-81-0	D	5,000	31230
Kerosene: 50% weathered	84742-81-0	D	5,000	31231
Kerosene: 75% weathered	84742-81-0	D	5,000	31232
Kerosene: unweathered	84742-81-0	D	5,000	31229
Levorphanol	5985-38-6	PTM	1,000	34003
Linuron-d6	330-55-2	ACN	100	31990
Lorazepam	846-49-1	PTM	1,000	34051
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
4,4'-MDIP	72375-24-7	DMSO	1,000	33003
3,4-MDMA HCl	64057-70-1	M	1,000	34071
Melamine	108-78-1	DEA:W (20:80)	1,000	33247
Meperidine	50-13-5	PTM	1,000	34004
Mephobarbital	115-38-8	PTM	1,000	34034
Meprobamate	57-53-4	PTM	1,000	34059
Methacrylonitrile	126-98-7	PTM	2,000	30297
Methadone	1095-90-5	PTM	1,000	34005
(+)Methamphetamine	51-57-0	PTM	1,000	34021
Methanol	67-56-1	DMSO	15 mg/mL	36401
Methanol	67-56-1	W	10,000	30467
Methapyrilene hydrochloride	135-23-9	D	2,000	32460
Methaqualone	340-56-7	PTM	1,000	34064
Methohexital	151-83-7	PTM	1,000	34035
Methoxychlor	72-43-5	M	1,000	32233
2-Methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
Methyl arachidate	1120-28-1	Neat		35056
Methyl behenate	929-77-1	Neat		35062
Methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402
Methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
Methyl caprate	110-42-9	Neat		35041
Methyl caproate	106-70-7	Neat		35037
Methyl caprylate	111-11-5	Neat		35039
3-Methylcholanthrene	56-49-5	D	2,000	31996
Methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
Methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
Methyl eicosatrienoate	55682-88-7	Neat		35059
Methyl eicosenoate	2390-09-2	Neat		35057
Methyl erucate	1120-34-9	Neat		35063
Methyl heneicosanoate	6064-90-0	Neat		35061
Methyl heptadecanoate	1731-92-6	Neat		35050

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

*Ships under Restek's USDOT explosives approval.

Solvent codes:

A = acetone
ACN = acetonitrile
C = carbon disulfide
Cy = cyclohexane
D = methylene chloride
DEA = diethylamine
DMSO = dimethyl sulfoxide
EA = ethyl acetate
H = hexane
I = isooctane
Ip = isopropanol
M = methanol
MTBE = methyl *tert*-butyl ether
PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Restek Offers a Full Line of Certified Reference Materials

QUALITY ISO 9001 • 17025 • Guide 34

See **pages 464–465** or visit www.restek.com/iso

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
Methyl laurate	111-82-0	Neat		35043
Methyl lignocerate	2442-49-1	Neat		35064
Methyl linoleate	112-63-0	Neat		35053
Methyl linolenate	301-00-8	Neat		35054
Methyl methacrylate	80-62-6	PTM	2,000	30299
Methyl myristate	124-10-7	Neat		35045
1-Methylnaphthalene	90-12-0	M	1,000	31283
2-Methylnaphthalene	91-57-6	D	1,000	31285
Methyl nonadecanoate	1731-94-8	Neat		35055
Methyl oleate	112-62-9	Neat		35052
Methyl palmitate	112-39-0	Neat		35048
Methyl palmitoleate	1120-25-8	Neat		35049
4-Methyl-2-pentanone (MIBK)	108-10-1	PTM	5,000	30400
3-Methylphenol	108-39-4	M	1,000	31403
N-Methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
Methyl stearate	112-61-8	Neat		35051
Methyl tridecanoate	1731-88-0	Neat		35044
Methyl undecanoate	1731-86-8	Neat		35042
α-Methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
Methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
Methylene chloride (dichloromethane)	75-09-2	PTM	2,000	30401
Methyprylon	125-64-4	PTM	1,000	34060
Metribuzin	21087-64-9	A	1,000	32436
Mineral spirits: unweathered	8030-30-6	D	5,000	31225
Mineral spirits: unweathered	8030-30-6	D	50,000	31260
Monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)	111-03-5	pyridine	5,000	33021
Monopalmitin	524-44-9	pyridine	5,000	33026
Morphine	6211-15-0	PTM	1,000	34006
Motor oil composite	64742-47-8	D	50,000	31464
Naphthalene	91-20-3	M	1,000	31280
Naphthalene-d8	1146-65-2	D	2,000	31043
Nicarbazin (bis-nitrophenol urea) (5 mL)	330-95-0	ACN	10	33261
Nicotine	54-11-5	M	1,000	34085
Nitrazepam	146-22-5	PTM	1,000	34053
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
Nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
4-Nitrophenol	100-02-7	M	1,000	31296
2-Nitropropane	79-46-9	PTM	2,000	30403
N-Nitrosodimethylamine	62-75-9	M	1,000	31427
N-Nitrosodimethylamine-d6	17829-05-9	D	1,000	33910
N-Nitrosodiphenylamine	86-30-6	M	1,000	31429
N-Nitroso-di-*n*-propylamine	621-64-7	M	1,000	31428
N-Nitrosodi-*n*-propylamine-d14	93951-96-3	D	1,000	33911
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
n-Nonatriacontane (C39) (10 mL)	7194-86-7	C	3,000	31877
n-Nonatriacontane (C39)	7194-86-7	C	3,000	31456
n-Octacosane (C28)	630-02-4	D	10,000	31672
Oxazepam	604-75-1	PTM	1,000	34054
Oxycodone	124-90-3	PTM	1,000	34007
Oxymorphone	76-41-5	PTM	1,000	34065
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263

Compound	CAS #	Solvent	Conc.	cat.#
Pentachloroanisole	1825-21-4	M	1,000	32268
Pentachloroethane	76-01-7	PTM	2,000	30404
Pentachloronitrobenzene	82-68-8	EA	100	32091
Pentachlorophenol	87-86-5	M	1,000	31297
n-Pentacontane (C50)	6596-40-3	T	10	31685
Pentacosane (C25)	629-99-2	D	10,000	31487
Pentafluorobenzene	363-72-4	PTM	2,000	30031
Pentafluorophenol	771-61-9	D	2,000	31048
Pentazocine	64024-15-3	PTM	1,000	34062
Pentobarbital	76-74-4	PTM	1,000	34036
Perfluorotributylamine (PFTBA)	311-89-7	Neat	1 mL	30482
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Phenanthrene	85-01-8	M	1,000	31281
Phenanthrene-d10	1517-22-2	D	2,000	31045
Phencyclidine	956-90-1	PTM	1,000	34027
Phendimetrazine	50-58-8	PTM	1,000	34025
Phenmetrazine	1707-14-8	PTM	1,000	34026
Phenobarbital	50-06-6	PTM	1,000	34037
Phenol	108-95-2	M	1,000	31298
Phenol-d6	13127-88-3	D	2,000	31049
Phentermine	1197-21-3	PTM	1,000	34024
Picloram	1918-02-1	M	1,000	32265
Picloram methyl ester	14143-55-6	M	1,000	32266
Picric acid*	88-89-1	M	1,000	31499
Poly (ethylene glycol) 200 (10 mL)	25322-68-3	Neat		30549
Poly (ethylene glycol) 400 (10 mL)	25322-68-3	Neat		30559
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1,000	9002-88-4	Neat	1 g	36227
Prazepam	2955-38-6	PTM	1,000	34055
Propachlor	1918-16-7	M	1,000	32235
2-Propanol	67-63-0	W	50,000	30473
Propionitrile	107-12-0	PTM	2,000	30407
Pyrene	129-00-0	M	1,000	31282
Pyridine	110-86-1	DMSO	1 mg/mL	36407
Pyridine	110-86-1	PTM	2,000	30409

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

*Ships under Restek's USDOT explosives approval.
† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Compound	CAS #	Solvent	Conc.	cat.#
RDX*	121-82-4	ACN	1,000	31666
Secobarbital	29071-21-4	PTM	1,000	34038
Simazine	122-34-9	A	1,000	32236
Stearyl stearate (10 mL)	2778-96-3	Cy	2,000	31636
Stearyl stearate (10 mL)	2778-96-3	H	2,000	31681
Stearyl stearate	2778-96-3	Neat	100 mg	31860
Stoddard solvent	8052-41-3	PTM	10,000	30487
Styrene	100-42-5	PTM	2,000	30410
Sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
2,4,5-T methyl ester	1928-37-6	M	1,000	32244
Talbutal	115-44-6	PTM	1,000	34039
2,4-TDIP	72375-21-4	DMSO	1,000	33001
2,6-TDIP	195625-39-9	DMSO	1,000	33000
Temazepam	846-50-4	PTM	1,000	34056
o-Terphenyl	84-15-1	A	2,000	31066
o-Terphenyl	84-15-1	D	10,000	31097
p-Terphenyl	92-94-4	D	10,000	31095
p-Terphenyl-d14	1718-51-0	D	1,000	31828
α-Terpineol	98-55-5	D	2,000	33912
1,1,1,2-Tetrachloroethane	630-20-6	PTM	2,000	30411
1,1,2,2-Tetrachloroethane	79-34-5	PTM	2,000	30412
Tetrachloroethene	127-18-4	PTM	2,000	30413
2,3,4,6-Tetrachlorophenol	58-90-2	M	1,000	31402
2,4,5,6-Tetrachloro-*m*-xylene (5 mL)	877-09-8	A	200	32028
2,4,5,6-Tetrachloro-*m*-xylene	877-09-8	A	200	32027
n-Tetracontane (C40)	4181-95-7	Neat	100 mg	31859
Δ^8-Tetrahydrocannabinol (THC)	5957-75-5	PTM	1,000	34090
Tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
Tetrahydrofuran (THF)	109-99-9	PTM	2,000	30414
Tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
Tetralin	119-64-2	DMSO	0.5 mg/mL	36409
Tetra-*n*-propyltin	2176-98-9	D	2,000	31474
Tetryl*	479-45-8	ACN	1,000	31667
Δ^9-Tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068
Δ^9-Tetrahydrocannabinolic acid A (THCA-A)	23978-85-0	PTM	1,000	34093
Thebaine	115-37-7	PTM	1,000	34009
Tinuvin P	2440-22-4	Ip	52	31629
Toluene	108-88-3	DMSO	4.45 mg/mL	36410
Toluene	108-88-3	PTM	2,000	30415
Toluene-d8	2037-26-5	PTM	2,000	30224
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015
2,4,5-TP (Silvex)	93-72-1	M	1,000	32245
2,4,5-TP (Silvex) methyl ester	4841-20-7	M	1,000	32246
Transformer oil (PCB-free)	64742-53-6	Neat	50 mL	32425
Transformer oil (PCB-free)	64742-53-6	Neat	5 mL	32424
n-Triacontane-d62 (C30)	638-68-6	D	500	31816
Triazolam	28911-01-5	PTM	1,000	34057
2,4,6-Tribromophenol	118-79-6	M	1,000	31401
Tributylphosphate	126-73-8	A	1,000	32280
Tributyltin chloride	1461-22-9	D	2,000	31478
Tricaprin (1,2,3-tricaprinoylglycerol)	621-71-6	pyridine	8,000	33025
Tricaprin (1,2,3-tricaprinoylglycerol) (5 mL)	621-71-6	pyridine	8,000	33033
1,2,3-Trichlorobenzene	87-61-6	PTM	2,000	30416
1,2,4-Trichlorobenzene	120-82-1	M	1,000	31439
1,3,5-Trichlorobenzene	108-70-3	PTM	1,000	31081
1,1,1-Trichloroethane	71-55-6	DMSO	50 mg/mL	36411
1,1,1-Trichloroethane	71-55-6	PTM	2,000	30418
1,1,2-Trichloroethane	79-00-5	PTM	2,000	30419
Trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
Trichloroethene	79-01-6	PTM	2,000	30420
Trichlorofluoromethane (CFC-11)	75-69-4	PTM	2,000	30421
2,4,5-Trichlorophenol	95-95-4	A	1,000	32017
2,4,5-Trichlorophenol	95-95-4	M	1,000	31299
2,4,6-Trichlorophenol	88-06-2	M	1,000	31400
1,2,3-Trichloropropane	96-18-4	MTBE	1,000	31648
1,2,3-Trichloropropane	96-18-4	PTM	2,000	30429
1,1,2-Trichlorotrifluoroethane (CFC-113)	76-13-1	PTM	2,000	30462
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048
α,α,α-Trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-Trifluorotoluene	98-08-8	PTM	10,000	30083
Trifluralin	1582-09-8	M	1,000	32238
1,2,4-Trimethylbenzene	95-63-6	PTM	2,000	30422
1,3,5-Trimethylbenzene	108-67-8	PTM	2,000	30423
2,2,4-Trimethylpentane (isooctane)	540-84-1	nonane	5% vol/vol	30671
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrotoluene*	118-96-7	ACN	1,000	31669
Triolein (1,2,3-tri[*cis*-octadecenoyl] glycerol)	122-32-7	pyridine	5,000	33023
Tripentyltin chloride	3342-67-4	D	2,000	31477
Triphenylmethane (5 mL)	519-73-3	ACN	10	33260
Triphenylphosphate (5 mL)	115-86-6	ACN:acetic acid (99:1)	2	31964
Triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
Tri-*n*-propyltin chloride	995-25-5	D	2,000	31476
Triphenylphosphate	115-86-6	A	1,000	32281
Tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259
Unleaded gasoline composite (5 mL)	8006-61-9	PTM	50,000	30206
Unleaded gasoline composite	8006-61-9	PTM	2,500	30081
Unleaded gasoline composite	8006-61-9	PTM	50,000	30205
Unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
Unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
Unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
Unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
Unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
Used motor oil composite	64742-65-0	D	50,000	31465
γ-Valerolactone	108-29-2	ACN	1,000	34080
Vinyl acetate	108-05-4	PTM	2,000	30216
Vinyl chloride	75-01-4	PTM	2,000	30089
Vinyl chloride	75-01-4	PTM	2,500	30093
m-Xylene	108-38-3	DMSO	6.51 mg/mL	36414
m-Xylene	108-38-3	PTM	2,000	30424
o-Xylene	95-47-6	DMSO	0.97 mg/mL	36415
o-Xylene	95-47-6	PTM	2,000	30425
p-Xylene	106-42-3	DMSO	1.52 mg/mL	36416
p-Xylene	106-42-3	PTM	2,000	30426

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PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Reference Standards

Column & Detector Test Mixes & Reagents

Deactivating Agent..... 472
Derivatization Reagents..... 472–473
Detector Tuning Mixtures..... 473
GC Column & Detector Test Mixes.. 473–474
GPC Calibration Mixes..... 474
LC Column & Detector Test Mixes..... 475

Deactivating Agent

Dimethyldichlorosilane (DMDCS) Deactivating Agent

- Easy deactivation of liners and other glass surfaces.
- Convenient—25 mL bottle deactivates 60 inlet liners.
- Tested to ensure consistent quality and effectiveness.

Restek offers dimethyldichlorosilane (DMDCS) for deactivating liners and other glassware. DMDCS reacts with active hydroxyl groups on the glass surface to produce a deactivated surface. A simple, step-by-step procedure is included with the product.

Dimethyldichlorosilane (DMDCS) (75-78-5)

Neat, 25 mL/bottle

cat.# 31861 (ea.)

Ground transportation shipments only.
No data pack available.

Quantity Discounts Available

— Buy 3 Standards, Get 10% Off
— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Derivatization Reagents

Acylation Derivatization Reagents

- Most commonly used for electron capture detection.
- React with alcohols, amines, and phenols.
- Frequently used for drugs of abuse confirmation.

Acylation reagents offer the same advantage available from silylation reagents: creating less polar, more volatile derivatives. In comparison to silylating reagents, the acylating reagents can more readily target highly polar multifunctional compounds, such as carbohydrates and amino acids. In addition, acylating reagents offer the distinct advantage of introducing electron-capturing groups, thus enhancing detectability during analysis.

Compound	CAS #	cat.#
MBTFA (N-methyl-bis-trifluoroacetamide)		
10-pk. (10x1 g)	685-27-8	35616
25 g vial	685-27-8	35617
TFAA (trifluoroacetic acid anhydride)		
10-pk. (10x1 g)	407-25-0	35618
25 g vial	407-25-0	35619
PFAA (pentafluoropropionic acid anhydride)		
10-pk. (10x1 g)	356-42-3	35620
25 g vial	356-42-3	35621
HFAA (heptafluorobutyric acid anhydride)		
10-pk. (10x1 g)	336-59-4	35622
25 g vial	336-59-4	35623
PFPOH (pentafluoropropanol)		
10-pk. (10x1 g)	422-05-9	35624
25 g vial	422-05-9	35625

Derivatization Reagents, *cont.*

Silylation Derivatization Reagents

- Replace active hydrogen, reducing polarity and making the compounds more volatile.
- Increase stability of derivatives.

Silylation is the most widely used derivatization procedure for sample analysis by GC. In silylation, an active hydrogen is replaced by an alkylsilyl group such as trimethylsilyl (TMS) or *tert*-butyldimethylsilyl (*tert*-BDMS). Silyl derivatives are more volatile, less polar, and more thermally stable. As a result, GC separation is improved and detection is enhanced.

Both TMS and *tert*-BDMS reagents are suitable for a wide variety of compounds and can be used for many GC applications. (Note that silylation reagents are generally moisture-sensitive and must be sealed to prevent deactivation.)

Compound	CAS #	cat.#
MSTFA (N-methyl-N-trimethylsilytrifluoroacetamide)		
10-pk. (10x1 g)	24589-78-4	35600
25 g vial	24589-78-4	35601
MSTFA w/1% TMCS (N-methyl-N-trimethylsilytrifluoroacetamide w/1% trimethylchlorosilane)		
10-pk. (10x1 g)	24589-78-4	35602
25 g vial	24589-78-4	35603
BSTFA (N,O-bis[trimethylsilyl]trifluoroacetamide)		
10-pk. (10x1 g)	25561-30-2	35604
BSTFA w/1% TMCS (N,O-bis[trimethylsilyltrifluoroacetamide] w/1% trimethylchlorosilane)		
10-pk. (10x1 g)	25561-30-2	35606
25 g vial	25561-30-2	35607
MTBSTFA w/1% TBDMCS (N-methyl-N[tert-butyldimethylsilyl trifluoroacetamide] w/1% tert-butyldimethylchlorosilane)		
10-pk. (10x1 g)	77377-52-7	35608
25 g vial	77377-52-7	35610
TMCS (trimethylchlorosilane)		
10-pk. (10x1 g)	75-77-4	35611

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Detector Tuning Mixes

VOA Tuning Compound

1-Bromo-4-fluorobenzene (BFB) (460-00-4)

5,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30003 (ea.)

SV Tuning Compound

Decafluorotriphenylphosphine (DFTPP) (5074-71-5)

2,500 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul

cat.# 30482 (ea.)

No data pack available.

GC-MS Tuning Mixture (4 components)

Benzidine (92-87-5)
4,4'-DDT (50-29-3)
Decafluorotriphenylphosphine (DFTPP) (5074-71-5)
Pentachlorophenol (87-86-5)

1,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31615 (ea.)

GC Column & Detector Test Mixes

Amine Column Test Mix (8 components)

For Stabilwax®-DB, Rtx®-5 Amine, Rtx®-35 Amine, and Rtx®-Volatile Amine columns.

Decane (C10) (124-18-5)	0.60 mg/mL	Diethylenetriamine (111-40-0)	1.20
Dodecane (C12) (112-40-3)	0.60	2,6-Dimethylaniline (87-62-7)	0.60
1,2-Butanediol (26171-83-5)	0.60	2-Nonanol (628-99-9)	0.60
Diethanolamine (DEA) (111-42-2)	1.20	Pyridine (110-86-1)	0.60

In methylene chloride:methanol (1:1), 1 mL/ampul

cat.# 35002 (ea.)

No data pack available.

FID Performance Evaluation Standard (3 components)

n-Tetradecane (C14) (629-59-4)
n-Pentadecane (C15) (629-62-9)
n-Pexadecane (C16) (544-76-3)

0.03 w/w% each in hexane, 1 mL/ampul

cat.# 33908 (ea.)

GC-FID Test Mix (3 components)

n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)

20 µg/mL each in hexane, 1 mL/ampul

cat.# 35108 (ea.)

GC Column & Detector Test Mixes, *cont.*

Grob Test Mix (12 components)

For use with temperature-programmed conditions.

*n*C10-FAME (110-42-9)	0.42 mg/mL	Dicyclohexylamine (101-83-7)	0.31
*n*C11-FAME (1731-86-8)	0.42	2,6-Dimethylaniline (87-62-7)	0.32
*n*C12-FAME (111-82-0)	0.41	2,6-Dimethylphenol (576-26-1)	0.32
Decane (C10) (124-18-5)	0.28	2-Ethylhexanoic acid (149-57-5)	0.38
Undecane (C11) (1120-21-4)	0.29	Nonanal (124-19-6)	0.40
2,3-Butanediol (6982-25-8)	0.53	1-Octanol (111-87-5)	0.36

In methylene chloride, 1 mL/ampul

cat.# 35000 (ea.)

No data pack available.

Inter-Polar Column Test Mix (11 components)

n-Heptane (C7) (142-82-5)	1.25 mg/mL	1,2-Dichloropropane (78-87-5)	2.00
n-Octane (C8) (111-65-9)	1.40	Methanol (67-56-1)	1.25
n-Nonane (C9) (111-84-2)	2.00	1-Propanol (71-23-8)	1.25
Acetone (67-64-1)	1.25	Pyridine (110-86-1)	1.40
2-Butanone (MEK) (78-93-3)	1.25	Tetrachloroethylene (127-18-4)	3.25
Chlorobenzene (108-90-7)	2.00		

In methylene chloride, 1 mL/ampul

cat.# 35076 (ea.)

ISO-C14-C20 Column Test Mix (5 components)

n-Tetradecane (C14) (629-59-4)	*n*-Octadecane (C18) (593-45-3)
n-Pentadecane (C15) (629-62-9)	*n*-Eicosane (C20) (112-95-8)
n-Hexadecane (C16) (544-76-3)	

400 µg/mL each in cyclohexane, 1 mL/ampul

cat.# 35006 (ea.)

OQ/PV Headspace Standard (3 components)

tert-Butyl disulfide (110-06-5)	Nitrobenzene (98-95-3)
1,2-Dichlorobenzene (95-50-1)	

2,000 µg/mL each in ethanol, 1 mL/ampul

cat.# 33909 (ea.)

OQ Response Linearity Test Standard (6 components)

n-Heptadecane (C17) (629-78-7)	1.5 µg/mL	*n*-Eicosane (C20) (112-95-8)	100
n-Octadecane (C18) (593-45-3)	10	*n*-Docosane (C22) (629-97-0)	1,000
n-Nonadecane (C19) (629-92-5)	2	*n*-Tetracosane (C24) (646-31-1)	10,000

In isooctane, 1 mL/ampul

cat.# 33906 (ea.)

Polar ISO Column Test Mix (8 components)

n-Heptadecane (C17) (629-78-7)	2-Dodecanol (10203-28-8)
n-Nonadecane (C19) (629-92-5)	Methyl dodecanoate
Aniline (62-53-3)	2-Nonanone (821-55-6)
2-Chlorophenol (95-57-8)	1-Octanol (111-87-5)

250 µg/mL each in 1,2-dichloroethane, 1 mL/ampul

cat.# 35103 (ea.)

Q-BOND and U-BOND Column Test Mix (7 components)

n-Pentane (C5) (109-66-0)	Ethanol (64-17-5)
n-Hexane (C6) (110-54-3)	Ethyl acetate (141-78-6)
Acetone (67-64-1)	Methanol (67-56-1)
Diethyl ether (ethyl ether) (60-29-7)	

0.1% vol/vol each in heptane, 1 mL/ampul

cat.# 35202 (ea.)

Volatile Amine Column Test Mix (8 components)

n-Nonane (C9) (111-84-2)	900 µg/mL	Diethylenetriamine (111-40-0)	1,800
n-Dodecane (C12) (112-40-3)	900	2,6-Dimethylaniline (87-62-7)	900
1,2-Butanediol (26171-83-5)	900	2-Nonanol (628-99-9)	900
Diethanolamine (DEA) (111-42-2)	1,800	Pyridine (110-86-1)	900

In methanol:dichloromethane (50:50), 1 mL/ampul

cat.# 35008 (ea.)

XIL-350 Column Test Mix (8 components)

n-Tridecane (C13) (629-50-5)	2-Ethylhexanoic acid (149-57-5)
n-Tetradecane (C14) (629-59-4)	1,6-Hexanediol (629-11-8)
4-Chlorophenol (106-48-9)	1-Methylnaphthalene (90-12-0)
Dicyclohexylamine (101-83-7)	1-Undecanol (112-42-5)

350 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 35226 (ea.)

GPC Calibration Mixes

CLP GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

Bis(2-ethylhexyl) phthalate (117-81-7)	10 mg/mL	Methoxychlor (72-43-5)	2.0
		Perylene (198-55-0)	0.2
Corn oil (8001-30-7)	250	Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32023 (ea.)

No data pack available.

Revised GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

Bis(2-ethylhexyl) phthalate (117-81-7)	5 mg/mL	Methoxychlor (72-43-5)	1.0
		Perylene (198-55-0)	0.2
Corn oil (8001-30-7)	250	Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32042 (ea.)

No data pack available.

LC Column & Detector Test Mixes

LC Normal Phase Test Mix #1 (4 components)

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

Benzene (71-43-2)	1.00 mg/mL	Benzyl alcohol (100-51-6)	3.00
Benzaldehyde (100-52-7)	0.04	4-Methoxybenzyl alcohol (105-13-5)	2.00

In hexane, 1 mL/ampul

cat.# 35004 (ea.)

LC Reversed Phase Test Mix #1 (4 components)

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

Benzene (71-43-2)	3.00 mg/mL	Naphthalene (91-20-3)	0.50
Biphenyl (92-52-4)	0.06	Uracil (66-22-8)	0.02

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

cat.# 35005 (ea.)

LC Performance Test Mix (5 components)

- Highly effective for characterizing LC column parameters.
- Simple, easy, reliable approach to quality control (QC) evaluations or column classification.
- Monitor column performance over time.

The National Institute of Standards and Technology (NIST) has formulated a mixture that is highly effective for characterizing LC columns for efficiency, void volume, methylene selectivity, retentiveness, and activity toward chelators and organic bases. Results can be used for column classification, for column selection, for monitoring column performance over time, or for quality control. We test our material against the NIST 870 standard.

Amitriptyline hydrochloride (549-18-8)	2,800 µg/mL	Quinizarin (81-64-1)	94
		Toluene (108-88-3)	1,400
Ethylbenzene (100-41-4)	1,700	Uracil (66-22-8)	28

In methanol, 1 mL/ampul

cat.# 31699 (ea.)

Carbohydrate LC Performance Check Mix (5 components)

Performance qualification (PQ) determines the precision of the LC system. Our performance check mix for LC-RI consists of five simple sugars in varied concentrations. We prepare the reference material in water, dehydrate it, and package it dry for enhanced stability.

Glucose (50-99-7)	2.1 mg	Maltose (6363-53-7)	4.5
Fructose (57-48-7)	2.0	Sucrose (57-50-1)	4.0
Lactose (5989-81-1)	4.4		

Dry components in 4 mL screw-cap vial. Reconstitute in 1 mL acetonitrile:water (75:25) to 2.1, 2.0, 4.4, 4.5, 4.0 mg/mL, respectively.

cat.# 31809 (ea.)

No data pack available.

LC OQ Wavelength Accuracy Standard

Erbium perchlorate (14017-55-1)

10 mg/mL in water, 5 mL/ampul

cat.# 31053 (ea.)

No data pack available.

LC OQ Gradient Standard (Acetone)

Acetone (67-64-1)

Neat, 1 mL/ampul

cat.# 30012 (ea.)

No data pack available.

LC OQ Linearity Test Mix Kit

Linear detector responses to concentration variations are an important part of operation qualification (OQ) for LC instruments. Our kit of five aqueous solutions of caffeine can be used to generate simple plots of UV response versus concentration. Certificate of analysis includes caffeine concentration, calculated variance in preparing each mixture, a linearity plot, and coefficient of determination (r^2) for the linear plot.

Contains 1 mL each of these mixtures.
31804: Caffeine (caffeine at 5 µg/mL in water)
31803: Caffeine (caffeine at 25 µg/mL in water)
31802: Caffeine (caffeine at 125 µg/mL in water)
31801: Caffeine (caffeine at 250 µg/mL in water)
31800: Caffeine (caffeine at 500 µg/mL in water)
1 mL each of these mixtures.

kit

cat.# 31805 (kit)

No data pack available.

LC OQ Standards Kit

Contains the following:
30012: LC OQ Gradient Standard, 1 mL
31053: LC OQ Wavelength Accuracy Standard, 5 mL
31068: LC OQ Linearity Kit, 6 - 1 mL/ampuls

kit

cat.# 31069 (kit)

No data pack available.

Reference Standards

Clinical, Forensic & Toxicology

Blood Alcohol.....477
Exempted Drugs of Abuse.....478
Explosives.....479
Fire Debris Analysis.....479
Personal Care Products.....480
Weathered Petrochemical.....480–481

Blood Alcohol

Blood Alcohol Standards (Control)

Use to verify the retention time for each compound normally included in a blood alcohol test and to verify that the compounds are resolved from and do not interfere with one another.

Blood Alcohol Mix Resolution Control Standard

(8 components)

Acetaldehyde (75-07-0)
Acetone (67-64-1)
Acetonitrile (75-05-8)
Ethanol (64-17-5)
Ethyl acetate (141-78-6)
2-Propanol (Isopropanol) (67-63-0)
Methanol (67-56-1)
Methyl ethyl ketone (78-93-3)

0.100 g/dL each in water, 1 mL/ampul

cat.# 36256 (ea.)

BAC Resolution Control Standard n-P (6 components)

- Includes 1-propanol internal standard.
- Intended for qualitative use only.

Acetaldehyde (75-07-0)
Acetone (67-64-1)
Ethanol (BAC) (64-17-5)
Methanol (67-56-1)
1-Propanol (*n*-Propanol) (71-23-8)
2-Propanol (Isopropanol) (67-63-0)

100 mg/dL each in water, 1 mL/ampul

cat.# 36010 (ea.)

No data pack available.

BAC Resolution Control Standard t-B (6 components)

- Includes *tert*-butanol internal standard.
- Intended for qualitative use only.

Acetaldehyde (75-07-0)
Acetone (67-64-1)
tert-Butanol (TBA) (75-65-0)
Ethanol (BAC) (64-17-5)
Methanol (67-56-1)
2-Propanol (Isopropanol) (67-63-0)

100 mg/dL each in water, 1 mL/ampul

cat.# 36011 (ea.)

No data pack available.

Formulated and produced by our team of veteran chemists, 50,000+ batches of highly stable and accurate reference standards have left our facility over the last 20+ years.

Get Fast, Definitive Data for Blood Alcohol Testing

Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 Columns & Standards

- Optimized column selectivities.
- Robust and reproducible column chemistry.
- 2-minute analysis time.
- Product line also features resolution control standards.

See **page 65** for columns.

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Exempted Drug of Abuse

Exempted Drug of Abuse Reference Standards

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Benzodiazepines				
Alprazolam	28981-97-7	PTM	1,000	34042
Bromazepam	1812-30-2	PTM	1,000	34043
Chlordiazepoxide	438-41-5	PTM	1,000	34044
Clobazam	22316-47-8	PTM	1,000	34045
Clonazepam	1622-61-3	PTM	1,000	34046
Diazepam	439-14-5	PTM	1,000	34047
Flunitrazepam	1622-62-4	PTM	1,000	34049
Flurazepam	1172-18-5	PTM	1,000	34050
Lorazepam	846-49-1	PTM	1,000	34051
Nitrazepam	146-22-5	PTM	1,000	34053
Oxazepam	604-75-1	PTM	1,000	34054
Prazepam	2955-38-6	PTM	1,000	34055
Temazepam	846-50-4	PTM	1,000	34056
Triazolam	28911-01-5	PTM	1,000	34057
Cocaine & Metabolites				
Cocaethylene	529-38-4	ACN	1,000	34066
Cocaine	53-21-4	PTM	1,000	34015
Benzoylecgonine	519-09-5	PTM	1,000	34016
Ecgonine	5796-31-6	PTM	1,000	34017
Ecgonine methyl ester	38969-40-3	PTM	1,000	34018
Methadone & Metabolites				
EDDP perchlorate	66729-78-0	M	1,000	34069
Methadone	1095-90-5	PTM	1,000	34005
Amphetamines & Metabolites				
d-Amphetamine	51-63-8	PTM	1,000	34020
(+)Methamphetamine	51-57-0	PTM	1,000	34021
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
3,4-MDMA HCl	64057-70-1	M	1,000	34071
Opiates & Metabolites				
Codeine	76-57-3	PTM	1,000	34000
Dextromethorphan HBr monohydrate	6700-34-1	M	1,000	34081
Hydrocodone	34195-34-1	PTM	1,000	34002
Hydromorphone	71-68-1	PTM	1,000	34063
Morphine	6211-15-0	PTM	1,000	34006
Oxycodone	124-90-3	PTM	1,000	34007
Oxymorphone	76-41-5	PTM	1,000	34065
Cannabinoid & Metabolites				
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
Δ^9-Tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068
Barbiturates				
Amobarbital	64-43-7	PTM	1,000	34028
Aprobarbital	77-02-1	PTM	1,000	34029
Barbital	57-44-3	PTM	1,000	34030
Butabarbital	125-40-6	PTM	1,000	34031
Butalbital	77-26-9	PTM	1,000	34032
DL-Glutethimide	18389-24-7	PTM	1,000	34058
Hexobarbital	56-29-1	PTM	1,000	34033
Mephobarbital	115-38-8	PTM	1,000	34034
Methohexital	151-83-7	PTM	1,000	34035
Pentobarbital	76-74-4	PTM	1,000	34036
Phenobarbital	50-06-6	PTM	1,000	34037
Secobarbital	29071-21-4	PTM	1,000	34038
Talbutal	115-44-6	PTM	1,000	34039

Compound	CAS #	Solvent	Conc.	cat.#
GHB				
1,4-Butanediol	110-63-4	M	1,000	34078
γ-Butyrolactone (GBL)	96-48-0	ACN	1,000	34077
α-Methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
γ-Valerolactone	108-29-2	ACN	1,000	34080
Other				
Benzphetamine	5411-22-3	PTM	1,000	34022
Caffeine	58-08-2	M	1,000	34084
Cotinine	486-56-6	M	1,000	34086
Fentanyl	437-38-7	M	1,000	34082
nor-Fentanyl oxalate	1609-66-1	M	1,000	34083
Levorphanol	5985-38-6	PTM	1,000	34003
Meperidine	50-13-5	PTM	1,000	34004
Meprobamate	57-53-4	PTM	1,000	34059
Methaqualone	340-56-7	PTM	1,000	34064
Methyprylon	125-64-4	PTM	1,000	34060
Nicotine	54-11-5	M	1,000	34085
Pentazocine	64024-15-3	PTM	1,000	34062
Phencyclidine	956-90-1	PTM	1,000	34027
Phendimetrazine	50-58-8	PTM	1,000	34025
Phenmetrazine	1707-14-8	PTM	1,000	34026
Phentermine	1197-21-3	PTM	1,000	34024
Dextro-propoxyphene	1639-60-7	PTM	1,000	34008
Thebaine	115-37-7	PTM	1,000	34009

ACN = acetonitrile; M = methanol; PTM = purge-and-trap grade methanol

Forensic Drug Screen Test Mixture (8 components)

Amiodarone (19774-82-4)	10 µg/mL	Diazepam (439-14-5)	10
Amphetamine (51-63-8)	10	Doxepine (1229-29-4)	10
Caffeine (58-08-2)	10	Haloperidol (52-86-8)	1
Codeine (76-57-3)	10	Morphine (6211-15-0)	10

In P&T methanol, 1 mL/ampul

cat.# 36340 (ea.)

Forensic Drug Screen Internal Standard Solution 1 rev A (2 components)

Diazepam-d5
D5-doxepine

10 µg/mL each in P&T methanol, 10 mL/ampul

cat.# 36341 (ea.)

Restek Offers a Full Line of Certified Reference Materials

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www.restek.com/iso

See **pages 464–465**.

Explosives

Single-Component Explosives Solutions

- Supports U.S. Department of Defense base closures and remediation.
- Mixtures and singles supporting LC U.S. EPA Method 8330.
- Mixtures and singles supporting GC-ECD U.S. EPA Method 8095.
- Internal standards and surrogates to support both methods.

These materials support nitroaromatic, nitramine, and nitroester analyses by GC-ECD (Method 8095).[1,2] Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-Amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Picric acid*	88-89-1	M	1,000	31499
RDX*	121-82-4	ACN	1,000	31666
Tetryl*	479-45-8	ACN	1,000	31667
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; M = methanol

* Ships under Restek's USDOT explosives approval.
† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

References (Not available from Restek)

[1]U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.
[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406–416, August 1998.

Fire Debris Analysis (ASTM E1387 and E1618)

These materials also can be used for underground storage tank monitoring.

E1387 Column Resolution Check Mix (13 components)

n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
2-Ethyltoluene (611-14-3)
3-Ethyltoluene (620-14-4)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
p-Xylene (106-42-3)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31224 (ea.)

E1618 Test Mix (13 components)

Components in this mix (0.5 µL/mL or 0.05% volume/volume each) are at 10x the concentration of the final test solution specified in ASTM 1618 and ASTM 1387.

n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
2-Ethyltoluene (611-14-3)
3-Ethyltoluene (620-14-4)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
p-Xylene (106-42-3)

0.05% volume/volume each in methylene chloride, 1 mL/ampul
cat.# 31613 (ea.)

No data pack available.

please note

We can custom prepare weathered accelerants for fire debris analysis.

Please complete the custom reference material request form at **www.restek.com/solutions**

We'll be glad to work with you!

Compound Index for Reference Standards

See **pages 586–592.**

Personal Care Products

Ethylene Oxide Standards

- The industry's only suite of off-the-shelf reference standards for detecting ethylene oxide and 1,4-dioxane in PEG-based products.
- Formulated with concentrations needed by labs analyzing cosmetics and personal care products for possible carcinogens.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.

Ethylene Oxide/1,4-Dioxane Standard

NEW!

(2 components)

1,4-Dioxane (123-91-1)
Ethylene oxide (75-21-8)

0.001% w/w each in PEG-400, 5 mL/ampul

cat.# 30546 (ea.)

Ethylene Oxide/Acetaldehyde Standard

NEW!

(2 components)

Acetaldehyde (75-07-0)
Ethylene oxide (75-21-8)

0.001% w/w each in PEG-400, 5 mL/ampul

cat.# 30547 (ea.)

Ethylene Oxide Standard

NEW!

Ethylene oxide (75-21-8)

0.005% w/w in PEG-200, 5 mL/ampul

cat.# 30548 (ea.)

PEG-200 Standard

NEW!

Poly (ethylene glycol) 200 (25322-68-3)

Neat, 10 mL/ampul

cat.# 30549 (ea.)

PEG-400 Standard

NEW!

Poly (ethylene glycol) 400 (25322-68-3)

Neat, 10 mL/ampul

cat.# 30559 (ea.)

Weathered Petrochemical

Weathered Petrochemical Standards

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30487 (ea.)

We prepare our mineral spirit solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
Unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
Unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
Unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
Unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
Kerosene	**CAS #**	**Solvent**	**Conc.**	**cat.#**
Kerosene: unweathered	84742-81-0	D	5,000	31229
Kerosene: 25% weathered	84742-81-0	D	5,000	31230
Kerosene: 50% weathered	84742-81-0	D	5,000	31231
Kerosene: 75% weathered	84742-81-0	D	5,000	31232
Diesel Fuel #2	**CAS #**	**Solvent**	**Conc.**	**cat.#**
Diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
Diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
Diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
Diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
Mineral Spirits	**CAS #**	**Solvent**	**Conc.**	**cat.#**
Mineral spirits: unweathered	8030-30-6	D	5,000	31225
Mineral spirits: unweathered	8030-30-6	D	50,000	31260

D = methylene chloride
PTM = purge-and-trap grade methanol

Weathered Petrochemical, *cont.*

Weathered Gasoline Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.
30096: Unleaded Gasoline Standard
30097: Unleaded Gasoline Standard: 25% Weathered
30098: Unleaded Gasoline Standard: 50% Weathered
30099: Unleaded Gasoline Standard: 75% Weathered

cat.# 30100 (kit) — kit

Weathered Gasoline Kit #2

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.
30096: Unleaded Gasoline Standard
30097: Unleaded Gasoline Standard: 25% Weathered
30098: Unleaded Gasoline Standard: 50% Weathered
30099: Unleaded Gasoline Standard: 75% Weathered
30436: Unleaded Gasoline Standard: 99% Weathered

cat.# 30437 (kit) — kit

Weathered Kerosene Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.
31229: Kerosene Standard
31230: Kerosene Standard: 25% Weathered
31231: Kerosene Standard: 50% Weathered
31232: Kerosene Standard: 75% Weathered

cat.# 31238 (kit) — kit

Weathered Diesel Fuel #2 Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.
31233: Diesel Fuel #2 Standard
31234: Diesel Fuel #2 Standard: 25% Weathered
31235: Diesel Fuel #2 Standard: 50% Weathered
31236: Diesel Fuel #2 Standard: 75% Weathered

cat.# 31239 (kit) — kit

Reference Standards

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Acetates

8260B Acetate Mix (5 components)

n-Butyl acetate (123-86-4)
Ethyl acetate (141-78-6)
Isopropyl acetate (108-21-4)
n-Propyl acetate (109-60-4)
Vinyl acetate (108-05-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30477 (ea.)

8260B Acetate Mix (Revised) (7 components)

- Includes methyl acetate and *n*-amyl acetate.
- Contains 7 acetates.

n-Amyl acetate (628-63-7)
Butyl acetate (123-86-4)
Ethyl acetate (141-78-6)
Isopropyl acetate (108-21-4)
Methyl acetate (79-20-9)
Propyl acetate (109-60-4)
Vinyl acetate (108-05-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30489 (ea.)

Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

Alcohols

8240 Alcohols Mix (5 components)

Allyl alcohol (2-propen-1-ol) (107-18-6)
2-Chloroethanol (107-07-3)
Ethanol (64-17-5)
Isobutyl alcohol (78-83-1)
Propargyl alcohol (107-19-7)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30214 (ea.)

Aldehydes

Method 8315 (Aldehydes & Ketones DNPH by LC)

Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

Acetaldehyde-DNPH (1019-57-4)
Acetone-DNPH (1567-89-1)
Acrolein-DNPH (888-54-0)
Benzaldehyde-DNPH (1157-84-2)
n-Butyraldehyde-DNPH (1527-98-6)
Crotonaldehyde-DNPH (1527-96-4)
2,5-Dimethylbenzaldehyde-DNPH (152477-96-8)
Formaldehyde-DNPH (1081-15-8)
Hexaldehyde-DNPH (1527-97-5)
Isovaleraldehyde-DNPH (2256-01-1)
Propionaldehyde-DNPH (725-00-8)
m-Tolualdehyde-DNPH (2880-05-9)
o-Tolualdehyde-DNPH (1773-44-0)
p-Tolualdehyde-DNPH (2571-00-8)
Valeraldehyde-DNPH (2057-84-3)

15 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 31808 (ea.)

*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

Formaldehyde-DNPH Mix

500 µg/mL in acetonitrile, 1 mL/ampul*
cat.# 31837 (ea.)

*The reported concentrations reflect the amount of formaldehyde in the mixture. The concentration of derivatized formaldehyde is not reported.

Aldehydes, *cont.*

CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard (13 components)

Acetaldehyde-2,4-DNPH (1019-57-4)
Acetone-2,4-DNPH (1567-89-1)
Acrolein-2,4-DNPH (888-54-0)
Benzaldehyde-2,4-DNPH (1157-84-2)
n-Butyraldehyde-2,4-DNPH (1527-98-6)
Crotonaldehyde-2,4-DNPH (1527-96-4)
Formaldehyde-2,4-DNPH (1081-15-8)
Hexaldehyde-2,4-DNPH (1527-97-5)
Methacrolein-2,4-DNPH (5077-73-6)
Methyl ethyl ketone-2,4-DNPH (958-60-1)
Propionaldehyde-2,4-DNPH (725-00-8)
m-Tolualdehyde-2,4-DNPH (2880-05-9)
Valeraldehyde-2,4-DNPH (2057-84-3)

3 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 33093 (ea.)

*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

DNPH Reference Materials

Volume is 1 mL/ampul. Concentration is µg/mL.*

Compound	CAS #	Solvent	Conc.	cat.#
acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
glycolaldehyde-2,4-DNPH		ACN	100	33091

*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.
ACN = acetonitrile

ASTM Method 5197 (Formaldehyde and Other Carbonyl Compounds in Air)

See cat. #s 33093, 33074, 33082, and 33091 above.

Base, Neutral & Acid Extractable (BNA)/ Semivolatile Organics

See pages 532–544.

Benzidines

605 Benzidines Calibration Mix (2 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

8270 Benzidines Mix (3 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)
3,3'-Dimethylbenzidine (*o*-tolidine) (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

3,3'-Dichlorobenzidine

3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 31026 (ea.)
2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

BTEX

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

High-Purity VOC Regulators

See **page 453.**

Diesel Fuel

Diesel Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Chlorooctadecane	3386-33-2	D	10,000	31098
2-Fluorobiphenyl	321-60-8	D	10,000	31096
o-Terphenyl	84-15-1	D	10,000	31097
p-Terphenyl	92-94-4	D	10,000	31095

Recommended Internal Standards

Compound	CAS #	Solvent	Conc.	cat.#
5-α-Androstane	438-22-2	D	2,000	31065
o-Terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

Diesel Fuel #2 Standard

Prepared from a single-source (one-refinery) product.

Diesel fuel #2: unweathered (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31233 (ea.)

Certified PAHs in Diesel (7 components)

- Confirms diesel #2 TPH and priority PAHs in a single analysis.
- Certificate of analysis includes concentration of TPH and certified concentrations of individual PAHs.
- Complete data packs available.

Certified for:
Acenaphthene*
Acenaphthylene*
Fluorene*
1-Methylnaphthalene*
2-Methylnaphthalene*
Naphthalene*
Phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

Diesel Fuel, *cont.*

ISO/DIS 9377 Water Quality Testing (German H-53)

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

Diesel #2/Motor Oil (2 components)

Diesel fuel #2 composite (68334-30-5)
Motor oil (64742-65-0)

5,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31682 (ea.)

Diesel #2/Mineral Oil (2 components)

Diesel fuel #2 composite (68334-30-5)
Mineral oil (8042-47-5)

5,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31676 (ea.)

Standard Mixture Stock Solution (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)
Mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range) (8042-47-5)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point). Total hydrocarbon concentration is 10,000 µg/mL.
cat.# 31630 (ea.)

Quality Control Standard Mixture, Revised (2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

Diesel #2 (additive-free) (68334-30-5)
Motor oil (additive-free bp 325–460 or C18–C32 retention time range) (64742-65-0)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.
cat.# 31641 (ea.)

Quality Control Standard Mixture (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)
Mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range) (8042-47-5)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.
cat.# 31631 (ea.)

Disinfection By-Products

Chloral Hydrate

Chloral hydrate (302-17-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 30609 (ea.)

Disinfection By-Product Mix (7 components)

Bromochloroacetonitrile (83463-62-1)
Chloropicrin (76-06-2)
Dibromoacetonitrile (3252-43-5)
Dichloroacetonitrile (3018-12-0)
1,1-Dichloro-2-propanone (513-88-2)
Trichloroacetonitrile (545-06-2)
1,1,1-Trichloro-2-propanone (918-00-3)

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 30616 (ea.)

Drinking Water Odor

Drinking Water Odor Standard (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis: 100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt), and purge-and-trap analyses usually are used to quantify them.

(+/–)-Geosmin (16423-19-1)
2-Methylisoborneol (MIB) (2371-42-8)

100 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30608 (ea.)

Ethylene Oxide

Ethylene Oxide

Ethylene oxide (75-21-8)

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul
cat.# 30620 (ea.)

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at **www.restek.com/solutions**

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465**.

QUALITY ISO 9001 • 17025 • Guide 34

www.restek.com/iso

Explosives

Method 609 (Nitroaromatics & Isophorone)

609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-Dinitrotoluene (121-14-2)
Isophorone (78-59-1)
2,6-Dinitrotoluene (606-20-2)
Nitrobenzene (98-95-3)

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

Method 8095 (Explosives by GC)

8095 Matrix Spike Mix B (7 components)

3,5-Dinitroaniline (618-87-1)*
Nitrobenzene (98-95-3)
Nitroglycerin (55-63-0)
2-Nitrotoluene (88-72-2)
3-Nitrotoluene (99-08-1)
4-Nitrotoluene (99-99-0)
PETN (78-11-5)

1,000 µg/mL each in acetonitrile (*3,5-dinitroaniline at 200 µg/mL), 1 mL/ampul

cat.# 31610 (ea.)

Ships under Restek's USDOT explosives approval.

8095 Calibration Mix A (10 components)

2-Amino-4,6-dinitrotoluene (35572-78-2)
4-Amino-2,6-dinitrotoluene (19406-51-0)
1,3-Dinitrobenzene (99-65-0)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
HMX (2691-41-0)
RDX (121-82-4)
Tetryl (479-45-8)
1,3,5-Trinitrobenzene (99-35-4)
2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31607 (ea.)

Ships under Restek's USDOT explosives approval.

8095 Calibration Mix B (7 components)

3,5-Dinitroaniline (618-87-1)*
Nitrobenzene (98-95-3)
Nitroglycerine (55-63-0)
2-Nitrotoluene (88-72-2)
3-Nitrotoluene (99-08-1)
4-Nitrotoluene (99-99-0)
PETN (78-11-5)

5,000 µg/mL each in acetonitrile (*3,5-dinitroaniline at 1,000 µg/mL), 1 mL/ampul

cat.# 31608 (ea.)

Ships under Restek's USDOT explosives approval.

Method 8095 (Explosives by GC), *cont.*

Single-Component Explosives Solutions

- Supports U.S. Department of Defense base closures and remediation.
- Mixtures and singles supporting LC U.S. EPA Method 8330.
- Mixtures and singles supporting GC-ECD U.S. EPA Method 8095.
- Internal standards and surrogates to support both methods.

These materials support nitroaromatic, nitramine, and nitroester analyses by GC-ECD (Method 8095).[1,2] Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-Amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Picric acid*	88-89-1	M	1,000	31499
RDX*	121-82-4	ACN	1,000	31666
Tetryl*	479-45-8	ACN	1,000	31667
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; M = methanol

* Ships under Restek's USDOT explosives approval.
† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

References (Not available from Restek)

[1]U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.
[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406–416, August 1998.

Compound Index for Reference Standards

See **pages 586–592.**

Explosives, *cont.*

Method 8330 (Nitroaromatics and Nitramines by LC)

8330 Internal Standard

3,4-Dinitrotoluene (610-39-9)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31452 (ea.)

8330 Internal Standard

1,4-Dinitrobenzene (100-25-4)

2,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 33205 (ea.)

8330 Surrogate

1,2-Dinitrobenzene (528-29-0)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31453 (ea.)

8330B Nitroaromatics and Nitramine Mix

(17 components)*

2-Amino-4,6-dinitrotoluene (35572-78-2)
4-Amino-2,6-dinitrotoluene (19406-51-0)
3,5-Dinitroaniline (618-87-1)
1,3-Dinitrobenzene (99-65-0)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
HMX (2691-41-0)
Nitrobenzene (98-95-3)
Nitroglycerin (55-63-0)
2-Nitrotoluene (88-72-2)
3-Nitrotoluene (99-08-1)
4-Nitrotoluene (99-99-0)
PETN (78-11-5)
RDX (121-82-4)
Tetryl (479-45-8)
1,3,5-Trinitrobenzene (99-35-4)
2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 33204 (ea.)

Nitroaromatics and Nitramine Explosives by LC

(14 components)*

1,3-Dinitrobenzene (99-65-0)
2-Amino-4,6-dinitrotoluene (35572-78-2)
4-Amino-2,6-dinitrotoluene (19406-51-0)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
HMX (2691-41-0)
Nitrobenzene (98-95-3)
2-Nitrotoluene (88-72-2)
3-Nitrotoluene (99-08-1)
4-Nitrotoluene (99-99-0)
RDX (121-82-4)
Tetryl (479-45-8)
1,3,5-Trinitrobenzene (99-35-4)
2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 33905 (ea.)

*Ships under Restek's USDOT explosives approval.

8330 Calibration Mix #1 (7 components)*

1,3-Dinitrobenzene (99-65-0)
2,4-Dinitrotoluene (121-14-2)
HMX (2691-41-0)
Nitrobenzene (98-95-3)
RDX (121-82-4)
1,3,5-Trinitrobenzene (99-35-4)
2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31450 (ea.)

8330 Calibration Mix #2 (7 components)*

2-Amino-4,6-dinitrotoluene (35572-78-2)
4-Amino-2,6-dinitrotoluene (19406-51-0)
2,6-Dinitrotoluene (606-20-2)
2-Nitrotoluene (88-72-2)
3-Nitrotoluene (99-08-1)
4-Nitrotoluene (99-99-0)
Tetryl (479-45-8)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31451 (ea.)

*Ships under Restek's USDOT explosives approval.

did you know?

Obtaining pure, neat compounds for Method 8330 reference standards can be very difficult.

To ensure the highest quality standards, Restek's Quality Control (QC) lab confirms the chemical identity and purity of mixture components and solvents using one or more of the following techniques: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

More than 1/3 of the ampuls that leave our facility are custom-ordered reference standards, and almost all of them are certified reference materials (CRMs).

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Gases

624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

Method 8240 (Volatile Organic Compounds [VOCs])

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

tech tip

Achieving the Best Results From Gas Standards

In order to achieve the best results from gas standards, proper handling and storage of gas solutions is of vital importance. Use the following tips to help ensure trouble-free performance:

- Before opening the sealed ampul, gently invert the ampul several times. This will redissolve any gases that may have migrated into the headspace of the ampul.
- When diluting a gas standard, always add it to a solvent. Adding the gas standard to an empty vessel prior to adding solvent will result in the loss of gas compounds.
- Keep the gas standard cold throughout its use. Make sure it is cold before opening the ampul, work quickly to minimize heat transfer from hands or room, and only dilute the standard into a very cold solvent.
- When diluting a gas standard in solvent, make sure the pipette or needle tip is directly above, or immersed below, the solvent surface.
- We recommend that any unused portion of gas standard be disposed of after it has been removed from the sealed ampul. If it is necessary to store the unused portion, place it into a tightly capped vial with little to no headspace and store it in the freezer.
- We recommend that any gas solutions that have been stored outside of a sealed ampul be disposed of after 7 days.

For more gas calibration standards,
see **pages 443–451.**

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure: 104 liters of gas @ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure: 110 liters of gas @ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

Japan Calibration Mix (9 components)

Acrylonitrile
Benzene
1,3-Butadiene
Chloroform
1,2-Dichloroethane
Dichloromethane
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34418-PI (ea.)

No data pack available.

also available

High-Purity VOC Regulators

See **page 453.**

Gasoline

Gasoline Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
1-Chlorooctane	111-85-3	PTM	10,000	30084
α,α,α-Trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-Trifluorotoluene	98-08-8	PTM	10,000	30083

Recommended Internal Standard (PID) for EPA GRO Method

Compound	CAS #	Solvent	Conc.	cat.#
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

Unleaded Gasoline Standard

Prepared from a single-source (one-refinery) product.

Unleaded gasoline: unweathered (8006-61-9)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30096 (ea.)

Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

PVOC Mix (California) (7 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

GRO Mix (9 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
3-Methylpentane (96-14-0)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
2,2,4-Trimethylpentane (isooctane) (540-84-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30069 (ea.)

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX), *cont.*

GRO Mix (EPA) (9 components)

Benzene (71-43-2)	500 µg/mL	1,2,4-Trimethylbenzene (95-63-6)	1,000
Ethylbenzene (100-41-4)	500	2,2,4-Trimethylpentane	
Heptane (142-82-5)	500	(isooctane) (540-84-1)	1,500
2-Methylpentane (107-83-5)	1,500	*m*-Xylene (108-38-3)	1,000
Toluene (108-88-3)	1,500	*o*-Xylene (95-47-6)	1,000

In P&T methanol, 1 mL/ampul
cat.# 30065 (ea.)

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane	
Ethylbenzene (100-41-4)	500	(isooctane) (540-84-1)	1,500
Heptane (142-82-5)	500	*m*-Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	*o*-Xylene (95-47-6)	1,000
Toluene (108-88-3)	1,500	*p*-Xylene (106-42-3)	1,000
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

Certified BTEX in Unleaded Gas Composite Standard (9 components)

Certified for:
Benzene*
Ethylbenzene*
Isopropyl benzene*
Methyl *tert*-butyl ether (MTBE)*
Naphthalene*
Toluene*
m-Xylene*
o-Xylene*
p-Xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30237 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Certified Aromatics in Gasoline (16 components)

Certified for:
Benzene*
Ethylbenzene*
m-Ethyltoluene*
o-Ethyltoluene*
p-Ethyltoluene*
Isopropylbenzene*
Methyl *tert*-butyl ether (MTBE)*
Naphthalene*
n-Propylbenzene*
Toluene*
1,2,3-Trimethylbenzene*
1,2,4-Trimethylbenzene*
1,3,5-Trimethylbenzene*
m-Xylene*
o-Xylene*
p-Xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30485 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Glycols

Glycols Standard (2 components)

Ethylene glycol (107-21-1)
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

Haloacetic Acids

Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon)

Internal Standards and Surrogates for Method 552

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Internal Standard				
1,2,3-trichloropropane	96-18-4	MTBE	1,000	31648
Surrogates for Method 552, 552.1				
2,3-dichloropropionic acid	565-64-0	MTBE	1,000	31650
Surrogates for Method 552.2				
2-bromopropionic acid	598-72-1	MTBE	1,000	31653
2,3-dibromopropionic acid	600-05-5	MTBE	1,000	31655
methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
Surrogates for Method 552.3				
2-bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-bromobutyrate	3196-15-4	MTBE	2,000	31882

MTBE = methyl *tert*-butyl ether

Haloacetic Acid Mix (9 components)

Bromochloroacetic acid (5589-96-8)
Bromodichloroacetic acid (71133-14-7)
Chlorodibromoacetic acid (5278-95-5)
Dibromoacetic acid (631-64-1)
Dichloroacetic acid (79-43-6)
Monobromoacetic acid (79-08-3)
Monochloroacetic acid (79-11-8)
Tribromoacetic acid (75-96-7)
Trichloroacetic acid (76-03-9)

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31896 (ea.)

Haloacetic Acid Mix #1 (6 components)

Bromochloroacetic acid (5589-96-8)
Dibromoacetic acid (631-64-1)
Dichloroacetic acid (79-43-6)
Monobromoacetic acid (79-08-3)
Monochloroacetic acid (79-11-8)
Trichloroacetic acid (76-03-9)

2,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31644 (ea.)

Haloacetic Acids, *cont.*

Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon), *cont.*

Haloacetic Acid Methyl Ester Mix #1 (6 components)

Methyl bromochloroacetate (20428-74-4)
Methyl dibromoacetate (6482-26-4)
Methyl dichloroacetate (116-54-1)
Methyl monobromoacetate (96-32-2)
Methyl monochloroacetate (96-34-4)
Methyl trichloroacetate (598-99-2)

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31645 (ea.)

Haloacetic Acid Mix #2 (9 components)

Bromochloroacetic acid (5589-96-8)	400 µg/mL	Dibromoacetic acid (631-64-1)	200
Bromodichloroacetic acid (71133-14-7)	400	Dichloroacetic acid (79-43-6)	600
Chlorodibromoacetic acid (5278-95-5)	1,000	Monobromoacetic acid (79-08-3)	400
		Monochloroacetic acid (79-11-8)	600
		Tribromoacetic acid (75-96-7)	2,000
		Trichloroacetic acid (76-03-9)	200

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31646 (ea.)

Dalapon (2,2-dichloropropionic acid)

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Dalapon Methyl Ester

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

Herbicides, Chloroacetanilide Herbicide Degradates

Method 535 (Chloroacetanilide Herbicide Degradates)

Method 535 Internal Standard

Butachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul
cat.# 33202 (ea.)

Method 535 Surrogate Standard

Dimethachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul
cat.# 33203 (ea.)

Herbicides, Chlorinated Acids

Method 515, 515.4 (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-Dibromooctafluorobiphenyl (10386-84-2)

250 µg/mL in hexane, 1 mL/ampul
cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31856 (ea.)

Herbicide Surrogate

Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)

200 µg/mL in methanol, 1 mL/ampul
cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32439 (ea.)

Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)

200 µg/mL in hexane, 1 mL/ampul
cat.# 32050 (ea.)

Herbicide Lab Performance Check Mix (5 components)

Dinoseb methyl ether (6099-79-2)	4 µg/mL	3,5-Dichlorobenzoic acid methyl ester (2905-67-1)	600
DCAA methyl ester (55954-23-9)	500	4-Nitroanisole (100-17-4)	1,600
4,4'-Dibromooctafluorobiphenyl (10386-84-2)	250		

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32063 (ea.)

Method 515, 515.4 (Chlorinated Acid Herbicides), *cont.*

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D (94-75-7)
2,4-DB (94-82-6)
2,4,5-T (93-76-5)
2,4,5-TP (Silvex) (93-72-1)
Dicamba (1918-00-9)
Dichlorprop (120-36-5)
Dinoseb (88-85-7)

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester (1928-38-7)
2,4-DB methyl ester (18625-12-2)
2,4,5-T methyl ester (1928-37-6)
2,4,5-TP methyl ester (Silvex) (4841-20-7)
Dicamba methyl ester (6597-78-0)
Dichlorprop methyl ester (57153-17-0)
Dinoseb methyl ether (6099-79-2)

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Derivatized Form

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form

Acifluorfen (50594-66-6)
Bentazon (25057-89-0)
Chloramben (133-90-4)
DCPA diacid (tetrachloroterephthalic acid) (2136-79-0)
3,5-Dichlorobenzoic acid (51-36-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Picloram (1918-02-1)

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32061 (ea.)

Derivatized Form

Acifluorfen methyl ester (50594-67-7)
Bentazon methyl ester (61592-45-8)
Chloramben methyl ester (7286-84-2)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
3,5-Dichlorobenzoic acid methyl ester (2905-67-1)
4-Nitroanisole (100-17-4)
Pentachloroanisole (1825-21-4)
Picloram methyl ester (14143-55-6)

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32062 (ea.)

Herbicides, Chlorinated Acids, *cont.*

Method 515, 515.4 (Chlorinated Acid Herbicides), *cont.*

515.4 Calibration Mix (16 components)

Acifluorfen (50594-66-6)	50 µg/mL	3,5-Dichlorobenzoic acid (51-36-5)	50
Bentazon (25057-89-0)	100	Dichlorprop (120-36-5)	100
Chloramben (133-90-4)	50	Dinoseb (88-85-7)	100
2,4-D (94-75-7)	100	Pentachlorophenol (87-86-5)	10
Dalapon (75-99-0)	100	Picloram (1918-02-1)	50
2,4-DB (94-82-6)	100	Quinclorac (84087-01-4)	50
DCPA diacid (tetrachloroterephthalic acid) (2136-79-0)	50	2,4,5-T (93-76-5)	25
Dicamba (1918-00-9)	50	2,4,5-TP (Silvex) (93-72-1)	25

In acetone, 1 mL/ampul

cat.# 32443 (ea.)

515.4 Methylated Chlorinated Acids Mix

(16 components)

Acifluorfen methyl ester (50594-67-7)	50 µg/mL	3,5-Dichlorobenzoic acid methyl ester (2905-67-1)	50
Bentazon methyl ester (61592-45-8)	100	Dichlorprop methyl ester (57153-17-0)	100
Chloramben methyl ester (7286-84-2)	50	Dinoseb methyl ether (6099-79-2)	100
Dalapon methyl ester (17640-02-7)	100	Pentachloroanisole (1825-21-4)	10
2,4-D methyl ester (1928-38-7)	100	Picloram methyl ester (14143-55-6)	50
2,4-DB methyl ester (18625-12-2)	100	Quinclorac methyl ester	50
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)	100	2,4,5-T methyl ester (1928-37-6)	25
Dicamba methyl ester (6597-78-0)	50	2,4,5-TP (Silvex) methyl ester (4841-20-7)	25

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32444 (ea.)

Method 555 (Chlorinated Acids) LC Mixes

Chlorinated Acids by LC, Mix A (8 components)

Acifluorfen (50594-66-6)	Dicamba (1918-00-9)
Bentazon (25057-89-0)	Dichlorprop (120-36-5)
Chloramben (133-90-4)	Picloram (1918-02-1)
2,4-D (94-75-7)	2,4,5-TP (Silvex) (93-72-1)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32431 (ea.)

Chlorinated Acids by LC, Mix B (8 components)

2,4-DB (94-82-6)	MCPP (Mecoprop) (93-65-2)
3,5-Dichlorobenzoic acid (51-36-5)	4-Nitrophenol (100-02-7)
Dinoseb (88-85-7)	Pentachlorophenol (87-86-5)
MCPA (94-74-6)	2,4,5-T (93-76-5)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32430 (ea.)

Quantity Discounts Available

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— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Method 615 (Chlorinated Acid Herbicides)

Herbicide Surrogate

Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)

200 µg/mL in methanol, 1 mL/ampul

cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32439 (ea.)

Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)

200 µg/mL in hexane, 1 mL/ampul

cat.# 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D (94-75-7)	Dicamba (1918-00-9)
2,4-DB (94-82-6)	Dichlorprop (120-36-5)
2,4,5-T (93-76-5)	Dinoseb (88-85-7)
2,4,5-TP (Silvex) (93-72-1)	

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester (1928-38-7)	Dicamba methyl ester (6597-78-0)
2,4-DB methyl ester (18625-12-2)	Dichlorprop methyl ester (57153-17-0)
2,4,5-T methyl ester (1928-37-6)	Dinoseb methyl ether (6099-79-2)
2,4,5-TP methyl ester (Silvex) (4841-20-7)	

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

Derivatized Form

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 32057 (ea.)

Herbicide Mix #3 (2 components)

Free Acid Form

MCPA (94-74-6)
MCPP (Mecoprop) (93-65-2)

20,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32058 (ea.)

Derivatized Form

MCPA methyl ester (2436-73-9)
MCPP (Mecoprop) methyl ester (2786-19-8)

20,000 µg/mL each in hexane, 1 mL/ampul

cat.# 32059 (ea.)

Herbicides, Chlorinated Acids, *cont.*

Method 8150, 8151, 8151A (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-Dibromooctafluorobiphenyl (10386-84-2)

250 µg/mL in hexane, 1 mL/ampul
cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31856 (ea.)

Herbicide Surrogate

Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)

200 µg/mL in methanol, 1 mL/ampul
cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32439 (ea.)

Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)

200 µg/mL in hexane, 1 mL/ampul
cat.# 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D (94-75-7)
2,4-DB (94-82-6)
2,4,5-T (93-76-5)
2,4,5-TP (Silvex) (93-72-1)
Dicamba (1918-00-9)
Dichlorprop (120-36-5)
Dinoseb (88-85-7)

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester (1928-38-7)
2,4-DB methyl ester (18625-12-2)
2,4,5-T methyl ester (1928-37-6)
2,4,5-TP methyl ester (Silvex) (4841-20-7)
Dicamba methyl ester (6597-78-0)
Dichlorprop methyl ester (57153-17-0)
Dinoseb methyl ether (6099-79-2)

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Derivatized Form

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

Herbicide Mix #3 (2 components)

Free Acid Form

MCPA (94-74-6)
MCPP (Mecoprop) (93-65-2)

20,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32058 (ea.)

Derivatized Form

MCPA methyl ester (2436-73-9)
MCPP (Mecoprop) methyl ester (2786-19-8)

20,000 µg/mL each in hexane, 1 mL/ampul
cat.# 32059 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form

Acifluorfen (50594-66-6)
Bentazon (25057-89-0)
Chloramben (133-90-4)
DCPA diacid (tetrachloroterephthalic acid) (2136-79-0)
3,5-Dichlorobenzoic acid (51-36-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Picloram (1918-02-1)

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32061 (ea.)

Derivatized Form

Acifluorfen methyl ester (50594-67-7)
Bentazon methyl ester (61592-45-8)
Chloramben methyl ester (7286-84-2)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
3,5-Dichlorobenzoic acid methyl ester (2905-67-1)
4-Nitroanisole (100-17-4)
Pentachloroanisole (1825-21-4)
Picloram methyl ester (14143-55-6)

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32062 (ea.)

Picloram

Picloram (1918-02-1)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32265 (ea.)

Reference Standards Documentation Search

Locate SDSs, certificates, & data packs by cat. # or lot #

www.restek.com/**documentation**

Herbicides, Chlorinated Acids, *cont.*

Method 8321 (Chlorinated Acids by LC)

Chlorinated Acids by LC, Mix A (8 components)

Acifluorfen (50594-66-6)
Bentazon (25057-89-0)
Chloramben (133-90-4)
2,4-D (94-75-7)
Dicamba (1918-00-9)
Dichlorprop (120-36-5)
Picloram (1918-02-1)
2,4,5-TP (Silvex) (93-72-1)

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 32431 (ea.)

Chlorinated Acids by LC, Mix B (8 components)

2,4-DB (94-82-6)
3,5-Dichlorobenzoic acid (51-36-5)
Dinoseb (88-85-7)
MCPA (94-74-6)
MCPP (Mecoprop) (93-65-2)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
2,4,5-T (93-76-5)

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 32430 (ea.)

Dalapon (2,2-dichloropropionic acid)

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP])

TCLP Herbicide Mix (2 components)

2,4-D (free acid) (94-75-7)
2,4,5-TP (Silvex) (free acid) (93-72-1)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32014 (ea.)

Herbicides, Glyphosate

Method 547 (Glyphosate)

Glyphosate Standard

Glyphosate (N-(phosphonomethyl)glycine) (1071-83-6)

1,000 µg/mL in DI water, 1 mL/ampul
cat.# 32426 (ea.)

1,000 µg/mL in DI water, 5 mL/ampul
cat.# 32427 (ea.)

AMPA (glyphosate metabolite)

Aminomethyl phosphonic acid (AMPA) (1066-51-9)

100 µg/mL in DI water, 1 mL/ampul
cat.# 32428 (ea.)

Herbicides, Paraquat/Diquat

Method 549.2 (Paraquat/Diquat)

Paraquat & Diquat Calibration Mix (2 components)

Diquat dibromide (6385-62-2)
Paraquat dichloride (1910-42-5)

1,000 µg/mL each in water, 1 mL/ampul
cat.# 32437 (ea.)

Herbicides, Triazines

Canadian Drinking Water Triazine Herbicides Mix (7 components)

Alachlor (15972-60-8)
Atrazine (122-34-9)
Cyanazine (Bladex) (21725-46-2)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
Prometryne (7287-19-6)
Simazine (122-34-9)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 31864 (ea.)

Compound Index for Reference Standards

See **pages 586–592.**

Hormones

Method 539 (Hormones in Drinking Water)

EPA 539 Calibration Stock Standard (7 components)

- Contains the seven hormones listed in EPA Method 539 at the appropriate concentrations.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: UCMR3 Method 539 calibration standard with concentrations of 10–400 µg/mL to more conveniently match UCMR3 requirements (cat.# 32461, see below).

4-Androstene-3,17-dione (63-05-8)	100 µg/mL
Equilin (474-86-2)	200
17-beta-Estradiol (50-28-2)	250
Estriol (50-27-1)	200
Estrone (53-16-7)	200
17-alpha-Ethynylestradiol (57-63-6)	350
Testosterone (58-22-0)	100

In acetonitrile, 1 mL/ampul

cat.# 31998 (ea.)

UCMR3 Method 539 Calibration Standard

(7 components)

- Contains the seven hormones listed in EPA Method 539 at concentrations suited for Unregulated Contaminant Monitoring Rule 3 (UCMR3) screening.
- Ideal for the analysis of finished drinking water as outlined in UCMR3, which requires monitoring of all public drinking water systems with 10,000 or more customers.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: EPA 539 calibration stock standard with concentrations of 100–350 µg/mL to more conveniently match EPA requirements (cat.# 31998, see above).

4-Androstene-3,17-dione (63-05-8)	30 µg/mL
Equilin (474-86-2)	400
17-beta-Estradiol (50-28-2)	40
Estriol (50-27-1)	80
Estrone (53-16-7)	200
17-alpha-Ethynylestradiol (57-63-6)	90
Testosterone (58-22-0)	10

In acetonitrile, 1 mL/ampul

cat.# 32461 (ea.)

Hydrocarbons, Aromatic

Method 8020 (Aromatic Volatile Organics)

Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

8020A Calibration Mix (10 components)

Benzene (71-43-2)	Ethylbenzene (100-41-4)
Chlorobenzene (108-90-7)	Toluene (108-88-3)
1,2-Dichlorobenzene (95-50-1)	*m*-Xylene (108-38-3)
1,3-Dichlorobenzene (541-73-1)	*o*-Xylene (95-47-6)
1,4-Dichlorobenzene (106-46-7)	*p*-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30222 (ea.)

Method 609 (Nitroaromatics & Isophorone)

609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-Dinitrotoluene (121-14-2)	2,6-Dinitrotoluene (606-20-2)
Isophorone (78-59-1)	Nitrobenzene (98-95-3)

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

Hydrocarbons, Halogenated

Method 612 (Chlorinated Hydrocarbons)

612 Chlorinated Hydrocarbons Calibration Mix

(9 components)

2-Chloronaphthalene (91-58-7)	Hexachlorobutadiene (87-68-3)
1,2-Dichlorobenzene (95-50-1)	Hexachlorocyclopentadiene (77-47-4)
1,3-Dichlorobenzene (541-73-1)	Hexachloroethane (67-72-1)
1,4-Dichlorobenzene (106-46-7)	1,2,4-Trichlorobenzene (120-82-1)
Hexachlorobenzene (118-74-1)	

2,000 µg/mL each in isooctane, 1 mL/ampul

cat.# 31035 (ea.)

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See **pages 464–465** or visit www.restek.com/**iso**

Hydrocarbons, Halogenated, *cont.*

Method 624 (Purgeable Halocarbons)

Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

Benzene (71-43-2)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Methylene chloride (dichloromethane) (75-09-2)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30497 (ea.)

624 Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)
2-Bromo-1-chloropropane (3017-95-6)
1,4-Dichlorobutane (110-56-5)

1,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30023 (ea.)

624 Surrogate Standard Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Fluorobenzene (462-06-6)
Pentafluorobenzene (363-72-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30243 (ea.)

Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
α,α,α-Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

Method 624 (Purgeable Halocarbons), *cont.*

624 Calibration Mix #2 (12 components)

Benzene (71-43-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Dibromochloromethane (124-48-1)
1,1-Dichloroethane (75-34-3)
1,1-Dichloroethene (75-35-4)
1,2-Dichloropropane (78-87-5)
Methylene chloride (dichloromethane) (75-09-2)
Tetrachloroethene (127-18-4)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30021 (ea.)

624 Calibration Mix #3 (14 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Chloroform (67-66-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
trans-1,2-Dichloroethene (156-60-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
1,1,2,2-Tetrachloroethane (79-34-5)
Toluene (108-88-3)
1,1,1-Trichloroethane (71-55-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30022 (ea.)

Method 8010 (Halogenated Volatile Organics)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

Method 8011 (1,2-Dibromoethane & 1,2-Dibromo-3-chloropropane)

8011 Calibration Mix—EDB/DBCP (2 components)

1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30062 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): General

Retention Time Standards

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

Leaking Underground Storage Tank Retention Time Standard (7 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetracosane (C24) (646-31-1)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Tetracontane (C40) (4181-95-7)

25 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31200 (ea.)

Retention Time Marker (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30483 (ea.)

TNRCC 1005 Retention Time Markers Mix

(4 components)

- Easily determine the retention time window for each boiling point range.
- Prepared in *n*-pentane according to EPA requirements.

n-Hexane (C6) (110-54-3)
n-Dodecane (C12) (112-40-3)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

Retention Time Marker - Alaska (4 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Pentacosane (C25) (629-99-2)
n-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

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Fuel Composite Standards

Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Motor Oil Composite Standards

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Used Motor Oil Composite Standard

Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Used motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31465 (ea.)

also available

Other fuels, oils, and lubricant oils available on request as custom products.

Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

Single-Source Fuels

Unleaded Gasoline Standard
Prepared from a single-source (one-refinery) product.

Unleaded gasoline: unweathered (8006-61-9)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30096 (ea.)

Kerosene Standard
Prepared from a single-source (one-refinery) product.

Kerosene: unweathered (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31229 (ea.)

Diesel Fuel #2 Standard
Prepared from a single-source (one-refinery) product.

Diesel fuel #2: unweathered (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31233 (ea.)

Fuel Oil #4 Standard
Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. The fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F), measured using ASTM D-445.

Fuel oil #4 (68476-31-3)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31244 (ea.)

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Fuel Oil #6 Standard
This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

Diesel:Biodiesel (80:20) Blend Standard
The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

Aviation Gas Standard
100-octane, low-lead fuel used in piston-type aircraft.

Aviation gas (8006-69-1)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30207 (ea.)

Jet Fuel A Standard
Jet fuel A (64742-47-8)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31243 (ea.)

Creosote Oil Standard
Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

Creosote oil (8001-58-9)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31838 (ea.)

Hydraulic Oil Standard
Hydraulic oil (64741-89-5)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31839 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

Military Fuels (Jet Propellant)

JP-5 Military Fuel Standard

JP-5 Military fuel (8008-20-6)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31252 (ea.)

JP-8 Military Fuel Standard

JP-8 Military fuel (94114-58-6)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31262 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31254 (ea.)

Fuel Oil Degradation Test

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.[1] To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

Fuel Oil Degradation Mix (4 components)

Heptadecane (C17) (629-78-7)
Octadecane (C18) (593-45-3)
Pristane (2,6,10,14-tetramethylpentadecane) (1921-70-6)
Phytane (2,6,10,14-tetramethylhexadecane) (638-36-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31240 (ea.)

[1]Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31260 (ea.)

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30487 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

PVOC Mix (California) (7 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

GRO Mix (9 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
3-Methylpentane (96-14-0)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
2,2,4-Trimethylpentane (isooctane) (540-84-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30069 (ea.)

GRO Mix (EPA) (9 components)

Benzene (71-43-2)	500 µg/mL	1,2,4-Trimethylbenzene (95-63-6)	1,000
Ethylbenzene (100-41-4)	500	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Heptane (142-82-5)	500	*m*-Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	*o*-Xylene (95-47-6)	1,000
Toluene (108-88-3)	1,500		

In P&T methanol, 1 mL/ampul
cat.# 30065 (ea.)

Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	*m*-Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	*o*-Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	*p*-Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

cylinder design

Spectra (Linde)
104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure: 104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide)
110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure: 110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

High-Purity VOC Regulators

See **page 453.**

Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX), *cont.*

Certified BTEX in Unleaded Gas Composite Standard
(9 components)

Certified for:
Benzene*
Ethylbenzene*
Isopropyl benzene*
Methyl *tert*-butyl ether (MTBE)*
Naphthalene*
Toluene*
m-Xylene*
o-Xylene*
p-Xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30237 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Certified Aromatics in Gasoline (16 components)

Certified for:
Benzene*
Ethylbenzene*
m-Ethyltoluene*
o-Ethyltoluene*
p-Ethyltoluene*
Isopropylbenzene*
Methyl *tert*-butyl ether (MTBE)*
Naphthalene*
n-Propylbenzene*
Toluene*
1,2,3-Trimethylbenzene*
1,2,4-Trimethylbenzene*
1,3,5-Trimethylbenzene*
m-Xylene*
o-Xylene*
p-Xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30485 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Certified PAHs in Diesel (7 components)

Certified for:
Acenaphthene*
Acenaphthylene*
Fluorene*
1-Methylnaphthalene*
2-Methylnaphthalene*
Naphthalene*
Phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Gasoline Surrogate & Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
1-Chlorooctane	111-85-3	PTM	10,000	30084
α,α,α-Trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-Trifluorotoluene	98-08-8	PTM	10,000	30083
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

Diesel Surrogate & Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Chlorooctadecane	3386-33-2	D	10,000	31098
2-Fluorobiphenyl	321-60-8	D	10,000	31096
o-Terphenyl	84-15-1	D	10,000	31097
p-Terphenyl	92-94-4	D	10,000	31095
5-α-Androstane	438-22-2	D	2,000	31065
o-Terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

Diesel/Biodiesel Standard

Diesel:Biodiesel (80:20) Blend Standard
The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

also available

ASTM Method D6584-10 and EN14105 Biodiesel Standards

See **page 577.**

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Alaska

Alaska Department of Environmental Conservation (ADEC) regulations indicate which products and indicator compounds are to be tested for each petroleum range. The analyst must use the following Alaska Series Methods or appropriate SW-846 Method for the indicator compounds. The Alaska UST procedurals manual indicates which products are to be tested for each petroleum range.

AK101

Method for determination of aromatic and aliphatic hydrocarbons in gasoline range organics.

Retention Time Marker - Alaska (4 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Pentacosane (C25) (629-99-2)
n-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

Alaska UST Method AK101AA (14 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
1-Ethyl-2-methylbenzene (611-14-3)
1-Ethyl-3-methylbenzene (620-14-4)
1-Ethyl-4-methylbenzene (622-96-8)
Isopropylbenzene (cumene) (98-82-8)
n-Propylbenzene (103-65-1)
Toluene (108-88-3)
1,2,3-Trimethylbenzene (526-73-8)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30461 (ea.)

Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

1-Chloro-4-fluorobenzene Mix

1-Chloro-4-fluorobenzene (352-33-0)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30066 (ea.)

1-Bromo-4-fluorobenzene (BFB)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30026 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30067 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30082 (ea.)

α,α,α-Trifluorotoluene

α,α,α-Trifluorotoluene (98-08-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30083 (ea.)

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Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Alaska, *cont.*

AK102

Method for determination of aromatic and aliphatic hydrocarbons in diesel range organics.

DRO Mix (Tennessee/Mississippi) (16 components)

n-Decane (C10) (124-18-5)
n-Undecane (C11) (1120-21-4)
n-Dodecane (C12) (112-40-3)
n-Tridecane (C13) (629-50-5)
n-Tetradecane (C14) (629-59-4)
n-Pentadecane (C15) (629-62-9)
n-Hexadecane (C16) (544-76-3)
n-Heptadecane (C17) (629-78-7)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tricosane (C23) (638-67-5)
n-Tetracosane (C24) (646-31-1)
n-Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

o-Terphenyl

o-Terphenyl (84-15-1)

2,000 µg/mL in acetone, 1 mL/ampul
cat.# 31066 (ea.)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31097 (ea.)

5-*α*-Androstane

5-α-Androstane (438-22-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31065 (ea.)

AK103

Method for determination of aromatic and aliphatic hydrocarbons in residual range organics.

Residual Range Calibration Standard (RCS) (2 components)

SAE30 motor oil:SAE40 motor oil (1:1) (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31817 (ea.)

Residual Range Calibration Verification Standard (CVS) (2 components)

SAE30 motor oil:SAE40 motor oil (1:1) (64742-65-0)

25,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31818 (ea.)

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

n-Triacontane-d62

n-Triacontane-d62

500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31816 (ea.)

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See **pages 464–465** or visit www.restek.com/iso

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Arizona

Extraction Retention Time Standard (4 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Docosane (C22) (629-97-0)
n-Dotriacontane (C32) (544-85-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31830 (ea.)

DRO/ORO Calibration Standard (2 components)

10W30 Motor oil (64742-65-0):diesel fuel #2 (68334-30-5) (1:1 blend)

25,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31831 (ea.)

DRO/ORO Range Calibration Standard (12 components)

n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31832 (ea.)

o-Terphenyl

o-Terphenyl (84-15-1)

2,000 µg/mL in acetone, 1 mL/ampul
cat.# 31066 (ea.)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31097 (ea.)

Los Angeles County, CA Well Investigation Program (WIP)*

*For monitoring samples suspected of gasoline contamination, Los Angeles County requires laboratories to calibrate and report these compounds.

CA WIP VOA Standard (11 components)

Benzene (71-43-2)
Chlorobenzene (108-90-7)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30236 (ea.)

Compound Index for Reference Standards

See **pages 586–592.**

California

PVOC Mix (California) (7 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

California Oxygenates Mix (5 components)

tert-Amyl methyl ether (TAME) (994-05-8)	2,000 µg/mL
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30465 (ea.)

Methanol

Methanol (67-56-1)

10,000 µg/mL in DI water, 1 mL/ampul
cat.# 30467 (ea.)

15 mg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36401 (ea.)

Ethanol

Ethanol (64-17-5)

10,000 µg/mL in DI water, 1 mL/ampul
cat.# 30466 (ea.)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30288 (ea.)

Glycols Standard (2 components)

Ethylene glycol (107-21-1)
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

Connecticut

Connecticut ETPH Calibration Mixture (15 components)

n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31614 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Florida

Florida TRPH Standard (17 components)

n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)
n-Octatriacontane (C38) (7194-85-6)
n-Tetracontane (C40) (4181-95-7)

500 µg/mL each in hexane, 1 mL/ampul
cat.# 31266 (ea.)

2,000 µg/mL each in carbon disulfide, 1 mL/ampul
cat.# 31878 (ea.)

Florida TRPH Surrogate Mix

n-Nonatriacontane (C39) (7194-86-7)

3,000 µg/mL in carbon disulfide, 1 mL/ampul
cat.# 31456 (ea.)

3,000 µg/mL in carbon disulfide, 10 mL/ampul
cat.# 31877 (ea.)

Note: Reference standards containing greater than 99% carbon disulfide are classified as UN1131 carbon disulfide 3(6.1), I and are restricted from air transportation. Additional restrictions may apply to lower concentration materials depending on formulations. Contact standards@restek.com with any questions.

Massachusetts

MA VPH Standard With Surrogate Rev. 1.1 (July 2004)

(16 components)

n-Pentane (C5) (109-66-0)
n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
Benzene (71-43-2)
n-Butylcyclohexane (1678-93-9)
2,5-Dibromotoluene (SS) (615-59-8)
Ethylbenzene (100-41-4)
2-Methylpentane (107-83-5)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
2,2,4-Trimethylpentane (isooctane) (540-84-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30604 (ea.)

MA VPH Matrix Spike Mix With Surrogate Rev. 1.1 (July 2004) (16 components)

n-Pentane (C5) (109-66-0)
n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
Benzene (71-43-2)
n-Butylcyclohexane (1678-93-9)
2,5-Dibromotoluene (SS) (615-59-8)
Ethylbenzene (100-41-4)
2-Methylpentane (107-83-5)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
2,2,4-Trimethylpentane (isooctane) (540-84-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

50 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30605 (ea.)

Massachusetts, *cont.*

MA Volatile Petroleum Hydrocarbon (VPH) Standard

(13 components)

n-Pentane (C5) (109-66-0)	1,000 µg/mL	Toluene (108-88-3)	1,500
n-Nonane (C9) (111-84-2)	1,000	1,2,4-Trimethylbenzene (95-63-6)	1,000
Benzene (71-43-2)	500	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	*m*-Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	*o*-Xylene (95-47-6)	1,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	1,500	*p*-Xylene (106-42-3)	1,000
Naphthalene (91-20-3)	1,000		

In P&T methanol, 1 mL/ampul
cat.# 30434 (ea.)

MA VPH Standard With Surrogate (14 components)

n-Pentane (C5) (109-66-0)	1,000 µg/mL	Naphthalene (91-20-3)	1,000
n-Nonane (C9) (111-84-2)	1,000	Toluene (108-88-3)	1,500
Benzene (71-43-2)	500	1,2,4-Trimethylbenzene (95-63-6)	1,000
2,5-Dibromotoluene (SS) (615-59-8)	1,000	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	*m*-Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	*o*-Xylene (95-47-6)	1,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	1,500	*p*-Xylene (106-42-3)	1,000

In P&T methanol, 1 mL/ampul
cat.# 30452 (ea.)

MA VPH Matrix Spike Mix With Surrogate

(14 components)

n-Pentane (C5) (109-66-0)
n-Nonane (C9) (111-84-2)
Benzene (71-43-2)
2,5-Dibromotoluene (SS) (615-59-8)
Ethylbenzene (100-41-4)
2-Methylpentane (107-83-5)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
2,2,4-Trimethylpentane (isooctane) (540-84-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30454 (ea.)

MA VPH Surrogate Standard

2,5-Dibromotoluene (615-59-8)

1,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30435 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30453 (ea.)

Quantity Discounts Available

— Buy 3 Standards, Get 10% Off
— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Massachusetts, *cont.*

Massachusetts APH Mix (26 components)

Benzene
1,3-Butadiene
Butylcyclohexane
Cyclohexane
n-Decane
2,3-Dimethylheptane
2,3-Dimethylpentane
n-Dodecane
Ethylbenzene
n-Heptane
n-Hexane
Isopentane
Isopropylbenzene
p-Isopropyltoluene
Methyl *tert*-butyl ether
1-Methyl-3-ethylbenzene
Naphthalene
n-Nonane
n-Octane
Toluene
1,2,3-Trimethylbenzene
1,3,5-Trimethylbenzene
n-Undecane
o-Xylene
m/*p*-Xylene (combined)

cylinder design

Spectra (Linde)
104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide)
110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34540 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800psi
cat.# 26366 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig (Pi-marked cylinder)
cat.# 34540-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

MA EPH Aromatic Hydrocarbon Standard

(17 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31458 (ea.)

MA EPH Aliphatic Hydrocarbon Standard

(14 components)

n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31459 (ea.)

MA EPH Matrix Spike Mix (10 components)

n-Nonane (C9) (111-84-2)
n-Tetradecane (C14) (629-59-4)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Octacosane (C28) (630-02-4)
Acenaphthene (83-32-9)
Anthracene (120-12-7)
Chrysene (218-01-9)
Naphthalene (91-20-3)
Pyrene (129-00-0)

250 µg/mL each in acetone, 1 mL/ampul
cat.# 31460 (ea.)

5-α-Androstane

5-α-Androstane (438-22-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31065 (ea.)

MA EPH Surrogate Spike Mix (2 components)

1-Chlorooctadecane (3386-33-2)
o-Terphenyl (84-15-1)

4,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31479 (ea.)

1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31098 (ea.)

Naphthalene-d8

Naphthalene-d8 (1146-65-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31043 (ea.)

MA Fractionation Surrogate Spike Mix (2 components)

2-Bromonaphthalene (580-13-2)
2-Fluorobiphenyl (321-60-8)

4,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31480 (ea.)

MA Fractionation Check Mix (31 components)

PAHs:
Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

Hydrocarbons:
n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Hexatriacontane (C36) (630-06-8)

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31481 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Michigan

Michigan GRO Mix (14 components)

Benzene (71-43-2)
1,2-Dibromoethane (106-93-4)
1,2-Dichloroethane (107-06-2)
Ethylbenzene (100-41-4)
Isopropylbenzene (cumene) (98-82-8)
2-Methylnaphthalene (91-57-6)
Methyl *tert*-butyl-ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30468 (ea.)

Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-Decane (C10) (124-18-5)
n-Undecane (C11) (1120-21-4)
n-Dodecane (C12) (112-40-3)
n-Tridecane (C13) (629-50-5)
n-Tetradecane (C14) (629-59-4)
n-Pentadecane (C15) (629-62-9)
n-Hexadecane (C16) (544-76-3)
n-Heptadecane (C17) (629-78-7)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tricosane (C23) (638-67-5)
n-Tetracosane (C24) (646-31-1)
n-Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	*m*-Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	*o*-Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	*p*-Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

Save time with prepacked sample prep cartridges!

EPH Fractionation Tubes

See **page 398.**

New Jersey

NJDEP EPH 10/08 Rev. 2 Aliphatics Calibration Standard (20 components)

n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)
n-Octatriacontane (C38) (7194-85-6)
n-Tetracontane (C40) (4181-95-7)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)

2,000 µg/mL each in hexane:carbon disulfide (80:20), 1 mL/ampul
cat.# 30540 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Calibration Standard (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 30541 (ea.)

NJDEP EPH 10/08 Rev. 2 Aliphatics Matrix Spike Mix (18 components)

n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)
n-Octatriacontane (C38) (7194-85-6)
n-Tetracontane (C40) (4181-95-7)

200 µg/mL each in pentane, 5 mL/ampul
cat.# 30542 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul
cat.# 30543 (ea.)

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

New Jersey, *cont.*

NJDEP EPH 10/08 Rev. 2 Aliphatics Fractionation Check Mix (18 components)

n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)
n-Octatriacontane (C38) (7194-85-6)
n-Tetracontane (C40) (4181-95-7)

400 µg/mL each in hexane, 5 mL/ampul
cat.# 30544 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation Check Mix (16 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul
cat.# 30545 (ea.)

Northwest U.S. Regional Method (Oregon & Washington)

Also see Washington, page 510.

Glycols Standard (2 components)

Ethylene glycol (107-21-1)
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-Fluorobiphenyl	321-60-8	D	10,000	31096
o-Terphenyl	84-15-1	D	10,000	31097
p-Terphenyl	92-94-4	D	10,000	31095
Pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene choride

Pennsylvania

PA DEP UST Standard (11 components)

Benzene (71-43-2)
1,2-Dibromoethane (EDB) (106-93-4)
1,2-Dichloroethane (107-06-2)
Ethylbenzene (100-41-4)
Isopropyl benzene (cumene) (98-82-8)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30433 (ea.)

Tennessee/Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-Decane (C10) (124-18-5)
n-Undecane (C11) (1120-21-4)
n-Dodecane (C12) (112-40-3)
n-Tridecane (C13) (629-50-5)
n-Tetradecane (C14) (629-59-4)
n-Pentadecane (C15) (629-62-9)
n-Hexadecane (C16) (544-76-3)
n-Heptadecane (C17) (629-78-7)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Heneicosane (C21) (629-94-7)
n-Docosane (C22) (629-97-0)
n-Tricosane (C23) (638-67-5)
n-Tetracosane (C24) (646-31-1)
n-Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	*m*-Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	*o*-Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	*p*-Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

Reference Standards Documentation Search

Locate SDSs, certificates, & data packs by cat. # or lot #

www.restek.com/**documentation**

Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Texas

Texas TNRCC Method 1006

TNRCC 1006 Retention Time Marker Mix (9 components)

n-Hexane (C6) (110-54-3)
n-Heptane (C7) (142-82-5)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)

200 µg/mL in pentane, 1 mL/ampul
cat.# 31814 (ea.)

Texas TNRCC Method 1005

TNRCC 1005 Retention Time Markers Mix

(4 components)

n-Hexane (C6) (110-54-3)
n-Dodecane (C12) (112-40-3)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

TX TPH Locator Mix (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Octacosane (C28) (630-02-4)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31482 (ea.)

TX TPH Calibration Mix (2 components)

Diesel fuel #2 composite (68334-30-5)
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in pentane, 1 mL/ampul
cat.# 31483 (ea.)

TX TPH Matrix Spike Mix (2 components)

Diesel fuel #2 composite (68334-30-5)
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 31484 (ea.)

Texas TNRCC Method 1005, *cont.*

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)
n-Hexatriacontane (C36) (630-06-8)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31639 (ea.)

α,α,α-Trifluorotoluene

α,α,α-Trifluorotoluene (98-08-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30083 (ea.)

1-Chlorooctane

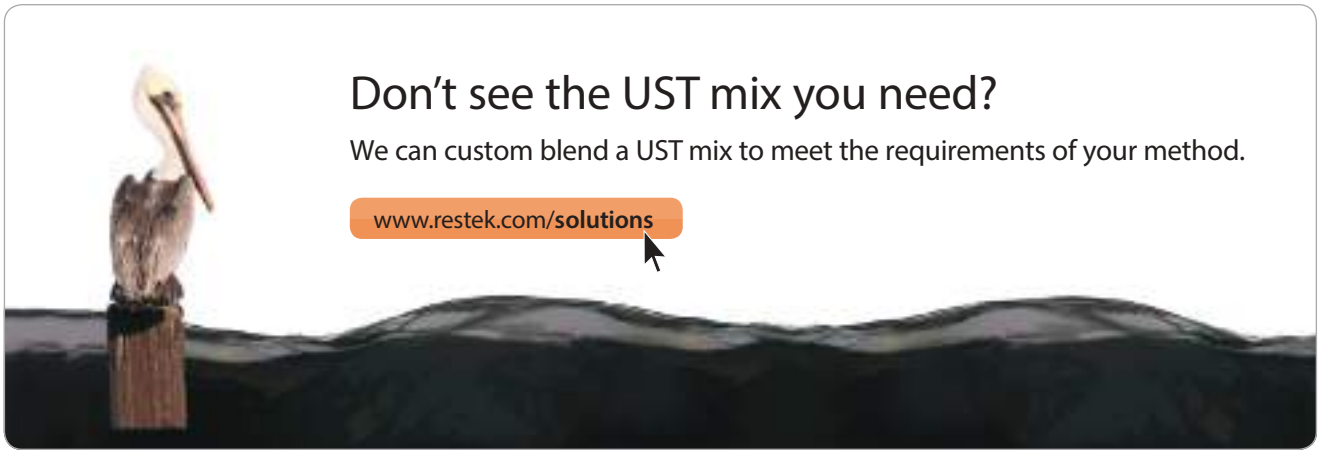
1-Chlorooctane (111-85-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30084 (ea.)

1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31098 (ea.)



Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

Washington

Also see Northwest U.S. Regional Method, page 508.

WA VPH Marker Standard (9 components)

n-Pentane (C5) (109-66-0)
n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
1-Methylnaphthalene (90-12-0)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30450 (ea.)

WA VPH Standard (15 components)

n-Pentane (C5) (109-66-0)
n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
Benzene (71-43-2)
Ethylbenzene (100-41-4)
1-Methylnaphthalene (90-12-0)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,3-Trimethylbenzene (526-73-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30451 (ea.)

WA EPH Aromatic Hydrocarbon Mix (6 components)

Acenaphthene (83-32-9)
Benzo(ghi)perylene (191-24-2)
Naphthalene (91-20-3)
Pyrene (129-00-0)
Toluene (108-88-3)
1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31488 (ea.)

WA EPH Aliphatic Hydrocarbon Mix (6 components)

n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Tetratriacontane (C34) (14167-59-0)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31489 (ea.)

WA EPH Aromatic Hydrocarbon Standard (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31469 (ea.)

Washington, *cont.*

WA EPH Fractionation Check Mix (22 components)

n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Tetratriacontane (C34) (14167-59-0)
Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31491 (ea.)

Wisconsin

PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Naphthalene (91-20-3)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

DRO Mix (EPA/Wisconsin) (10 components)

n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31064 (ea.)

Custom Standards
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Hydrocarbons, Polycyclic Aromatic (PAHs)

Method 610 (Polycyclic Aromatic Hydrocarbons [PAHs])

SV Calibration Mix #5/610 PAH Mix (16 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31011 (ea.)

610 PAH Calibration Mix A (16 components)

For LC-fluorescence detection.

Acenaphthene (83-32-9)	1,000 µg/mL	Chrysene (218-01-9)	500
Acenaphthylene (208-96-8)	1,000	Dibenz(a,h)anthracene (53-70-3)	500
Anthracene (120-12-7)	1,000	Fluoranthene (206-44-0)	500
Benz(a)anthracene (56-55-3)	500	Fluorene (86-73-7)	1,000
Benzo(a)pyrene (50-32-8)	500	Indeno(1,2,3-cd)pyrene (193-39-5)	500
Benzo(b)fluoranthene (205-99-2)	500	Naphthalene (91-20-3)	1,000
Benzo(k)fluoranthene (207-08-9)	500	Phenanthrene (85-01-8)	500
Benzo(ghi)perylene (191-24-2)	500	Pyrene (129-00-0)	500

In methylene chloride, 1 mL/ampul
cat.# 31264 (ea.)

610 PAH Calibration Mix B (16 components)

For LC-UV detection.

Acenaphthene (83-32-9)	1,000 µg/mL	Chrysene (218-01-9)	100
Acenaphthylene (208-96-8)	2,000	Dibenz(a,h)anthracene (53-70-3)	200
Anthracene (120-12-7)	100	Fluoranthene (206-44-0)	200
Benz(a)anthracene (56-55-3)	100	Fluorene (86-73-7)	200
Benzo(a)pyrene (50-32-8)	100	Indeno(1,2,3-cd)pyrene (193-39-5)	100
Benzo(b)fluoranthene (205-99-2)	200	Naphthalene (91-20-3)	1,000
Benzo(k)fluoranthene (207-08-9)	100	Phenanthrene (85-01-8)	100
Benzo(ghi)perylene (191-24-2)	200	Pyrene (129-00-0)	100

In methylene chloride:methanol (1:1), 1 mL/ampul
cat.# 31455 (ea.)

Method 8100 (Polycyclic Aromatic Hydrocarbons [PAHs])

PAH Supplement Mix for Method 8100 (8 components)

Benzo(j)fluoranthene (205-82-3)
Dibenz(a,h)acridine (226-36-8)
Dibenz(a,j)acridine (224-42-0)
7H-Dibenzo(c,g)carbazole (194-59-2)
Dibenzo(a,e)pyrene (192-65-4)
Dibenzo(a,h)pyrene (189-64-0)
Dibenzo(a,i)pyrene (189-55-9)
3-Methylcholanthrene (56-49-5)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31857 (ea.)

SV Calibration Mix #5/610 PAH Mix (16 components)

See cat.# 31011 (above).

Method 8310 (Polycyclic Aromatic Hydrocarbons [PAHs])

EPA Method 8310 PAH Mixture (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
1-Methylnaphthalene (90-12-0)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

500 µg/mL each in acetonitrile:toluene (92:8), 1 mL/ampul
cat.# 31874 (ea.)

EPA Method 8310 Surrogate Standard

Decafluorobiphenyl (434-90-2)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 31842 (ea.)

EPA Method 8310 Quality Control Check (18 components)

Acenaphthene (83-32-9)	100 µg/mL	Dibenz(a,h)anthracene (53-70-3)	10
Acenaphthylene (208-96-8)	100	Fluoranthene (206-44-0)	10
Anthracene (120-12-7)	100	Fluorene (86-73-7)	100
Benz(a)anthracene (56-55-3)	10	Indeno(1,2,3-cd)pyrene (193-39-5)	10
Benzo(a)pyrene (50-32-8)	10	1-Methylnaphthalene (90-12-0)	100
Benzo(b)fluoranthene (205-99-2)	10	2-Methylnaphthalene (91-57-6)	100
Benzo(ghi)perylene (191-24-2)	10	Naphthalene (91-20-3)	100
Benzo(k)fluoranthene (207-08-9)	5	Phenanthrene (85-01-8)	100
Chrysene (218-01-9)	10	Pyrene (129-00-0)	10

In acetonitrile, 1 mL/ampul
cat.# 31843 (ea.)

8270 Calibration Mix #5, Revised (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
1-Methylnaphthalene (90-12-0)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31995 (ea.)

Certified PAHs in Diesel (7 components)

Certified for:
Acenaphthene*
Acenaphthylene*
Fluorene*
1-Methylnaphthalene*
2-Methylnaphthalene*
Naphthalene*
Phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online data pack for certified concentrations.

Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

Miscellaneous

MA EPH Aromatic Hydrocarbon Standard

(17 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31458 (ea.)

MA Fractionation Surrogate Spike Mix (2 components)

2-Bromonaphthalene (580-13-2)
2-Fluorobiphenyl (321-60-8)

4,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31480 (ea.)

MA Fractionation Check Mix (31 components)

PAHs:
Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

Hydrocarbons:
n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Nonadecane (C19) (629-92-5)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Hexatriacontane (C36) (630-06-8)

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31481 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation Check Mix (16 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul
cat.# 30545 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix

(18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul
cat.# 30543 (ea.)

WA EPH Aromatic Hydrocarbon Standard

(18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)
1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31469 (ea.)

WA EPH Aromatic Hydrocarbon Mix (6 components)

Acenaphthene (83-32-9)
Benzo(ghi)perylene (191-24-2)
Naphthalene (91-20-3)
Pyrene (129-00-0)
Toluene (108-88-3)
1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31488 (ea.)

Naphthalene-d8

Naphthalene-d8 (1146-65-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31043 (ea.)

Method 525.2 Fortification Recovery Standard

p-Terphenyl-d14 (1718-51-0)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31828 (ea.)

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465**.

QUALITY ISO 9001 • 17025 • Guide 34

www.restek.com/iso

Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

Miscellaneous, *cont.*

SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Dioxane-d8 (17647-74-4)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	—	—

B/N Surrogate Mix (4/89 SOW) (3 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	—	33028.25

Revised B/N Surrogate Mix (4 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)
Pyrene-d10 (1718-52-1)

Each	15-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul	
31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul	
31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul	
31889	—

Hydrocarbons, Petroleum

Fuels & Products

Aviation Gas

Aviation Gas Standard

100-octane, low-lead fuel used in piston-type aircraft.

Aviation gas (8006-69-1)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30207 (ea.)

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

BTEX

See page 484.

Creosote Oil

Creosote Oil Standard

- For total petroleum hydrocarbon pattern recognition of creosote oil.
- High concentration—50,000 µg/mL in methylene chloride.

Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

Creosote oil (8001-58-9)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31838 (ea.)

Diesel

See pages 484–485.

Fuel Oil

Fuel Oil #4 Standard

Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. The fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F), measured using ASTM D-445.

Fuel oil #4 (68476-31-3)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31244 (ea.)

Reference Standards Documentation Search
Search by cat. # or lot #
- SDSs
- Certificates
- Data packs

www.restek.com/documentation

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

Fuel Oil, *cont.*

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

Fuel Oil Degradation Mix (4 components)

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.[1] To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

Heptadecane (C17) (629-78-7)
Octadecane (C18) (593-45-3)
Pristane (2,6,10,14-tetramethylpentadecane) (1921-70-6)
Phytane (2,6,10,14-tetramethylhexadecane) (638-36-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31240 (ea.)

[1]Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

Gasoline

See page 489.

Hydraulic Oil

Hydraulic Oil Standard

- For total petroleum hydrocarbon pattern recognition of hydraulic oil.
- High concentration—50,000 µg/mL in methylene chloride.

Hydraulic oil (64741-89-5)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31839 (ea.)

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Jet Fuel

JP-5 Military Fuel Standard

JP-5 Military fuel (8008-20-6)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31252 (ea.)

JP-8 Military Fuel Standard

JP-8 Military fuel (94114-58-6)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31262 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31254 (ea.)

Jet Fuel A Standard

Jet fuel A (64742-47-8)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31243 (ea.)

Kerosene

Kerosene Standard

Prepared from a single-source (one-refinery) product.

Kerosene: unweathered (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31229 (ea.)

Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Leaking Underground Storage Tank (LUST)

See pages 497–510.

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31260 (ea.)

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30487 (ea.)

Motor Oil

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Used Motor Oil Composite Standard

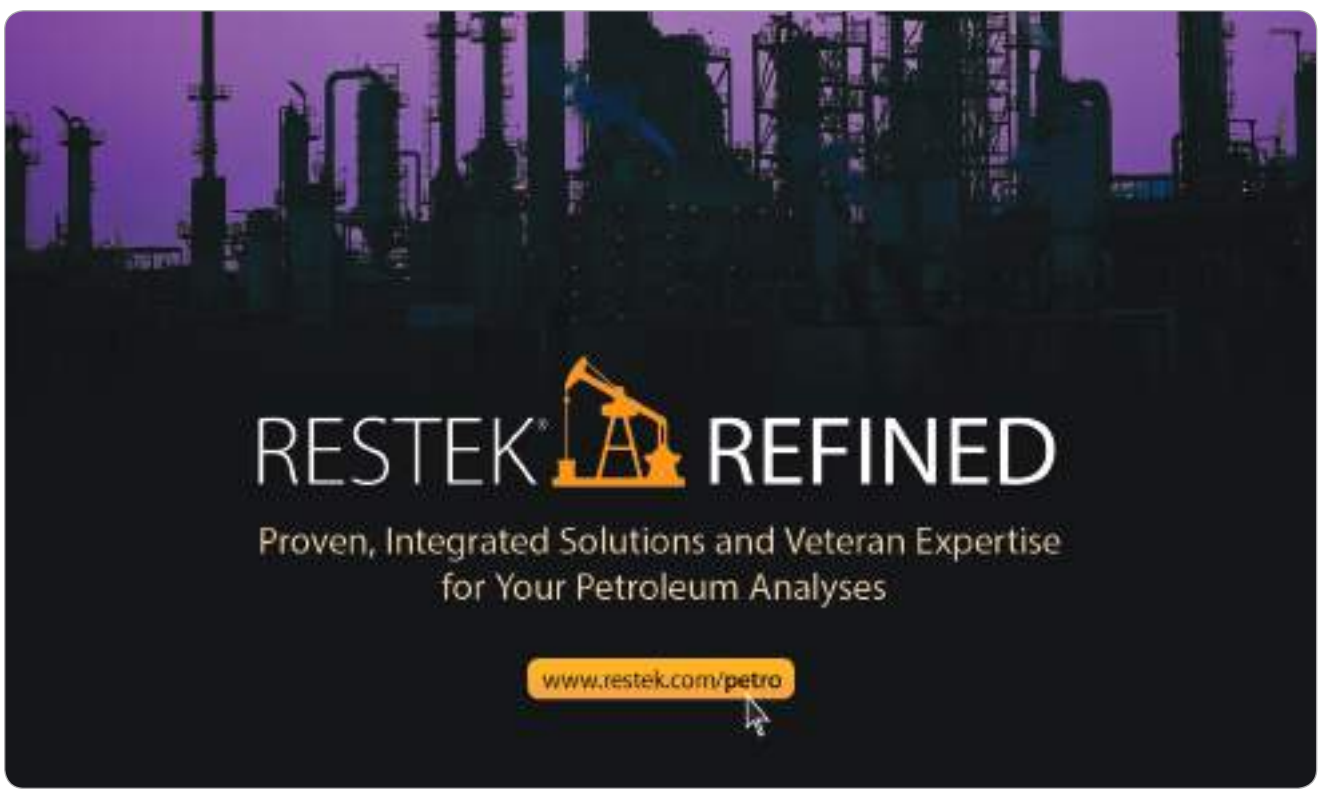
Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Used motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31465 (ea.)

Stoddard Solvent

See cat.# 30487 (left).



Hydrocarbons, Petroleum, *cont.*

Retention Time Markers

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

Leaking Underground Storage Tank Retention Time Standard (7 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetracosane (C24) (646-31-1)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Tetracontane (C40) (4181-95-7)

25 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31200 (ea.)

Retention Time Marker (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30483 (ea.)

TNRCC 1005 Retention Time Markers Mix (4 components)

n-Hexane (C6) (110-54-3)
n-Dodecane (C12) (112-40-3)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

TNRCC 1006 Retention Time Marker Mix (9 components)

n-Hexane (C6) (110-54-3)
n-Heptane (C7) (142-82-5)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)

200 µg/mL in pentane, 1 mL/ampul
cat.# 31814 (ea.)

Retention Time Marker—Alaska (4 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Pentacosane (C25) (629-99-2)
n-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

n-Hexane (C6) (110-54-3)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Octacosane (C28) (630-02-4)
n-Pentatriacontane (C35) (630-07-9)
n-Hexatriacontane (C36) (630-06-8)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31639 (ea.)

CCME F1 Retention Time Marker (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
Toluene (108-88-3)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 30611 (ea.)

Hydrocarbons, Petroleum, *cont.*

Total Petroleum Hydrocarbons (TPH)

Method 418.1 (Total Recoverable Petroleum Hydrocarbons [TRPH])

418.1 Calibration Mix (3 components)

Method 418.1 is an infrared spectrophotometric method for determining Total Recoverable Petroleum Hydrocarbons (TRPH). Dilute this mixture 1:200 to make the stock mixture specified in section 6.5.2 of Method 418.1.

Chlorobenzene (108-90-7)	25.0% (v/v)
n-Hexadecane (C16) (544-76-3)	37.5%
2,2,4-Trimethylpentane (isooctane) (540-84-1)	37.5%

1 mL/ampul

cat.# 30080 (ea.)

Miscellaneous

Glycols Standard (2 components)

Ethylene glycol (107-21-1)
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul

cat.# 30471 (ea.)

NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-Fluorobiphenyl	321-60-8	D	10,000	31096
o-Terphenyl	84-15-1	D	10,000	31097
p-Terphenyl	92-94-4	D	10,000	31095
Pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene choride

TX TPH Locator Mix (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
n-Octacosane (C28) (630-02-4)

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31482 (ea.)

TX TPH Calibration Mix (2 components)

Diesel fuel #2 composite (68334-30-5)
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in pentane, 1 mL/ampul

cat.# 31483 (ea.)

TX TPH Matrix Spike Mix (2 components)

Diesel fuel #2 composite (68334-30-5)
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31484 (ea.)

Miscellaneous, *cont.*

CCME PHC Calibration Mix (3 components)

- Meets CCME 2001 Petroleum Hydrocarbons in Soil Method—Tier 1.
- Primary reference calibration standards for quantification of four fractions.

n-Decane (C10) (124-18-5)
n-Hexadecane (C16) (544-76-3)
n-Tetratriacontane (C34) (14167-59-0)

5,000 µg/mL each in toluene, 1 mL/ampul

cat.# 31684 (ea.)

α,α,α-Trifluorotoluene

α,α,α-Trifluorotoluene (98-08-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30083 (ea.)

1-Chlorooctane

1-Chlorooctane (111-85-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30084 (ea.)

1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31098 (ea.)

Weathered Petrochemical Solutions

See pages 480–481.

Compound Index for Reference Standards

See **pages 586–592.**

Isocyanates

ASTM Method D5836-03/OSHA 42, OSHA 47, NIOSH 5522 (Analysis of Isocyanates in Indoor Air by LC)

ASTM D5836 and OSHA 42 are test methods for determining 2,4-toluene diisocyanate (2,4-TDI) and 2,6-TDI in the workplace atmosphere. OSHA 47 is for 4,4'-methylenediphenyl isocyanate (4,4'-MDI) in indoor air, and NIOSH Method 5522 is for 2,4-TDI; 2,6-TDI; 4,4'-MDI; and 1,6-hexamethylene diisocyanate (1,6-HDI) in air. Restek offers the 1-(2-pyridyl) piperzine (1-2pp) derivative.

Isocyanates Singles

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2,6-TDIP	195625-39-9	DMSO	1,000	33000
2,4-TDIP	72375-21-4	DMSO	1,000	33001
1,6-HDIP	72375-27-0	DMSO	1,000	33002
4,4'-MDIP	72375-24-7	DMSO	1,000	33003

DMSO = dimethyl sulfoxide

Jet Fuel

See page 514.

Kerosene

See page 514.

Ketones

VOA Calibration Mix #1 (ketones) (4 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

Ketones Mix, 524.2 Rev. 4.1 (5 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
1,1-Dichloro-2-propanone (513-88-2)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30602 (ea.)

Quantity Discounts Available

— Buy 3 Standards, Get 10% Off
— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Ketones, *cont.*

Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

Acetaldehyde-DNPH (1019-57-4)
Acetone-DNPH (1567-89-1)
Acrolein-DNPH (888-54-0)
Benzaldehyde-DNPH (1157-84-2)
n-Butyraldehyde-DNPH (1527-98-6)
Crotonaldehyde-DNPH (1527-96-4)
2,5-Dimethylbenzaldehyde-DNPH (152477-96-8)
Formaldehyde-DNPH (1081-15-8)
Hexaldehyde-DNPH (1527-97-5)
Isovaleraldehyde-DNPH (2256-01-1)
Propionaldehyde-DNPH (725-00-8)
m-Tolualdehyde-DNPH (2880-05-9)
o-Tolualdehyde-DNPH (1773-44-0)
p-Tolualdehyde-DNPH (2571-00-8)
Valeraldehyde-DNPH (2057-84-3)

15 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 31808 (ea.)

*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

Leaking Underground Storage Tank (LUST)

See pages 497–510.

Nitriles

8240 Nitriles Mix (7 components)

Acrylonitrile (107-13-1)
Ethyl methacrylate (97-63-2)
Malononitrile (109-77-3)
Methacrylonitrile (126-98-7)
Methyl methacrylate (80-62-6)
Propionitrile (107-12-0)
Styrene (100-42-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30215 (ea.)

Method 603 (Acrolein & Acrylonitrile)

Acrolein/Acrylonitrile (2 components)

Acrolein (107-02-8)
Acrylonitrile (107-13-1)

2,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30600 (ea.)

Must ship overnight on ice.
This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrolein

Acrolein (107-02-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrylonitrile

Acrylonitrile (107-13-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30246 (ea.)

Nitroaromatics & Nitramines

See pages 486–487.

Nitrosamines

Method 521 (Nitrosamines)

Nitrosamine Calibration Mix, Method 521

(7 components)

N-Nitrosodiethylamine (55-18-5)
N-Nitrosodimethylamine (62-75-9)
N-Nitrosodi-*n*-butylamine (924-16-3)
N-Nitrosodi-*n*-propylamine (621-64-7)
N-Nitrosomethylethylamine (10595-95-6)
N-Nitrosopiperidine (100-75-4)
N-Nitrosopyrrolidine (930-55-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31898 (ea.)

N-Nitrosodimethylamine-d6

N-Nitrosodimethylamine-d6 (17829-05-9)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 33910 (ea.)

N-Nitrosodi-*n*-propylamine-d14

N-Nitrosodi-*n*-propylamine-d14 (93951-96-3)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 33911 (ea.)

Method 522 (1,4-Dioxane)

Tetrahydrofuran-d8

Tetrahydrofuran-d8 (1693-74-9)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30112 (ea.)

1,4-Dioxane-d8

1,4-Dioxane-d8 (17647-74-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30614 (ea.)

1,4-Dioxane

1,4-Dioxane (123-91-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30287 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31853 (ea.)

1.9 mg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36294 (ea.)

Method 607 (Nitrosamines)

607 Nitrosamines Calibration Mix (3 components)

N-Nitrosodimethylamine (62-75-9)
N-Nitroso-di-*n*-propylamine (621-64-7)
N-Nitrosodiphenylamine (86-30-6)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31032 (ea.)

Oil & Grease

Method 1664 (Oil & Grease)

Method 1664 Oil & Grease Standard (2 components)

n-Hexadecane (C16) (544-76-3)
Stearic acid (57-11-4)

2,000 µg/mL each in acetone, 10 mL/ampul
cat.# 31954 (ea.)

Method 1664 Oil & Grease Mix (2 components)

n-Hexadecane (C16) (544-76-3)
Stearic acid (57-11-4)

4,000 µg/mL each in acetone, 5 mL/ampul
cat.# 31457 (ea.)

EPA 521 & 522 Cartridge

- Activated charcoal for extraction of nitrosamines and dioxane in drinking water.
- Batch tested to ensure low background and consistent recoveries.
- High-quality polypropylene tubes and frits to minimize interference.
- Specially treated charcoal and frits to minimize fines that result from inconsistent recoveries.

See **page 398.**
Disks are also available on page 402.

Organometallics/Organotin

Complete data pack available for audit compliance.

Butyltin Chloride Calibration Mixture (4 components)

n-Butyltin trichloride (1118-46-3)
Dibutyltin dichloride (683-18-1)
Tetrabutyltin (1461-25-2)
Tributyltin chloride (1461-22-9)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31472 (ea.)

Tributyltin Chloride Calibration Mixture

Tributyltin chloride (1461-22-9)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31478 (ea.)

Phenyltin Chloride Calibration Mixture (4 components)

Diphenyltin dichloride (1135-99-5)
Phenyltin trichloride (1124-19-2)
Tetraphenyltin (595-90-4)
Triphenyltin chloride (639-58-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31473 (ea.)

Tri-*n*-propyltin Chloride Surrogate

Tri-*n*-propyltin chloride

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31476 (ea.)

Tripentyltin Chloride Surrogate

Tripentyltin chloride (3342-67-4)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31477 (ea.)

Tetra-*n*-propyltin Internal Standard

Tetra-*n*-propyltin (2176-98-9)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31474 (ea.)

Oxygenates/Ethers

California Oxygenates Mix (5 components)

tert-Amyl methyl ether (TAME) (994-05-8)	2,000 µg/mL
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30465 (ea.)

Oxygenates (6 components)

tert-Amyl ethyl ether (TAEE) (919-94-8)	2,000 µg/mL
tert-Amyl methyl ether (TAME) (994-05-8)	2,000
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30626 (ea.)

Single-Component Oxygenates

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
tert-Amyl alcohol	75-85-4	PTM	10,000	30631
tert-Amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
tert-Butanol (TBA)	75-65-0	PTM	50,000	30470
tert-Butanol-d9	25725-11-5	PTM	20,000	30618
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
Ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Methanol	67-56-1	W	10,000	30467
Methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water

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Pesticides, Carbamate

Method 531.1, 531.2 (Carbamates)

531.1 Internal Standard

4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (672-99-1)

100 µg/mL in methanol, 1 mL/ampul

cat.# 32274 (ea.)

531.1 Performance Check Mix (4 components)

Aldicarb sulfoxide	100 µg/mL	3-Hydroxycarbofuran	2
BDMC	10	Methiocarb	20

In methanol, 1 mL/ampul

cat.# 32275 (ea.)

531.1 Carbamate Pesticide Calibration Mixture

(10 components)

Aldicarb (116-06-3)
Aldicarb sulfone (1646-88-4)
Aldicarb sulfoxide (1646-87-3)
Carbaryl (Sevin) (63-25-2)
Carbofuran (1563-66-2)
3-Hydroxycarbofuran (16655-82-6)
Methiocarb (2032-65-7)
Methomyl (16752-77-5)
Oxamyl (23135-22-0)
Propoxur (Baygon) (114-26-1)

100 µg/mL each in methanol, 1 mL/ampul

cat.# 32273 (ea.)

531.2 Carbamate Pesticide Calibration Mixture

(11 components)

- Complete set of materials for N-methylcarbamoyloximes and N-methylcarbamates.
- New mix satisfies latest update of EPA Method 531.2.
- Formulated in acetonitrile for stability and convenience for LC analysis.

Aldicarb (116-06-3)
Aldicarb sulfone (1646-88-4)
Aldicarb sulfoxide (1646-87-3)
Carbaryl (Sevin) (63-25-2)
Carbofuran (1563-66-2)
3-Hydroxycarbofuran (16655-82-6)
Methiocarb (2032-65-7)
Methomyl (16752-77-5)
1-Naphthol (90-15-3)
Oxamyl (23135-22-0)
Propoxur (Baygon) (114-26-1)

100 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32435 (ea.)

Pesticides, Chlordane & Toxaphene

Chlordane, Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isooctane; M = methanol

Pesticides, Chlorinated Disinfection By-Products, Pesticides & Herbicides

Method 551 (Chlorinated Disinfection By-Products, Pesticides & Herbicides)

551.1 Surrogate Standard

Decafluorobiphenyl (434-90-2)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 31855 (ea.)

Method 551.1 Pesticide/Herbicide Mix (16 components)

Alachlor (15972-60-8)
Atrazine (1912-24-9)
Bromacil (314-40-9)
Cyanazine (Bladex) (21725-46-2)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
γ-BHC (Lindane) (58-89-9)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Hexachlorobenzene (118-74-1)
Hexachlorocyclopentadiene (77-47-4)
Methoxychlor (72-43-5)
Metolachlor (51218-45-2)
Simazine (122-34-9)
Trifluralin (1582-09-8)

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 32438 (ea.)

Chloral Hydrate

Chloral hydrate (302-17-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 30609 (ea.)

Disinfection By-Product Mix (7 components)

Bromochloroacetonitrile (83463-62-1)
Chloropicrin (76-06-2)
Dibromoacetonitrile (3252-43-5)
Dichloroacetonitrile (3018-12-0)
1,1-Dichloro-2-propanone (513-88-2)
Trichloroacetonitrile (545-06-2)
1,1,1-Trichloro-2-propanone (918-00-3)

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 30616 (ea.)

Reference Standards Documentation Search

Search by cat. # or lot #

- SDSs
- Certificates
- Data packs

www.restek.com/documentation

Pesticides, Chlorinated/Organochlorine/Organohalide

Method 508 (Chlorinated Pesticides)

508.1 Internal Standard

Pentachloronitrobenzene (82-68-8)

100 µg/mL in ethyl acetate, 1 mL/ampul
cat.# 32091 (ea.)

508.1 Surrogate

4,4'-Dibromobiphenyl (92-86-4)

500 µg/mL in ethyl acetate, 1 mL/ampul
cat.# 32092 (ea.)

508.1 GC Degradation Check Mix (2 components)

4,4'-DDT (50-29-3)
Endrin (72-20-8)

100 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32093 (ea.)

508 Performance Check Mix (4 components)

δ-BHC (319-86-8)	0.4 µg/mL	DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)	0.5
Chlorothalonil (1897-45-6)	0.5		
Chlorpyrifos (2921-88-2)	0.02		

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32045 (ea.)

508.1 Calibration Mix #1 (17 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32094 (ea.)

508.1 Calibration Mix #2 (11 components)

Chlorobenzilate (510-15-6)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
Chloroneb (2675-77-6)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
Etridiazole (2593-15-9)
Hexachlorobenzene (118-74-1)
cis-Permethrin* (52645-53-1)
trans-Permethrin* (52645-53-1)
Propachlor (1918-16-7)
Trifluralin (1582-09-8)

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32095 (ea.)

*500 µg/mL total permethrin. Exact content of each isomer is listed on certificate of analysis.

508.1 Calibration Mix #3 (8 components)

Alachlor (15972-60-8)
Atrazine (1912-24-9)
Chlorothalonil (1897-45-6)
Cyanazine (bladex) (21725-46-2)
Hexachlorocyclopentadiene (77-47-4)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
Simazine (122-34-9)

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32096 (ea.)

Toxaphene Solutions

Toxaphene (8001-35-2)

1,000 µg/mL in hexane, 1 mL/ampul
cat.# 32005 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

5,000 µg/mL in isooctane, 1 mL/ampul
cat.# 32071 (ea.)

Organochlorine Pesticide System Evaluation Mix

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT (50-29-3)	200 µg/mL
Endrin (72-20-8)	100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32417 (ea.)

Decachlorobiphenyl, 508A

Decachlorobiphenyl (BZ #209) (2051-24-3)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul
cat.# 32289 (ea.)

508.1 Pesticide Kit

Contains 1 mL each of these mixtures.
32045: 508 Performance Check Mix
32091: 508.1 Internal Standard Mix
32092: 508.1 Surrogate Mix
32093: 508.1 GC Degradation Check Mix
32094: 508.1 Calibration Mix #1
32095: 508.1 Calibration Mix #2
32096: 508.1 Calibration Mix #3

cat.# 32097 (kit) kit

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Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Method 508 (Chlorinated Pesticides), *cont.*

Endrin Standard
Endrin (72-20-8)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32463 (ea.)

Endrin Ketone Standard
Endrin ketone (53494-70-5)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32464 (ea.)

Endosulfan I Standard
Endosulfan I (959-98-8)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32465 (ea.)

Endosulfan II Standard
Endosulfan II (33213-65-9)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32466 (ea.)

Endosulfan Sulfate Standard
Endosulfan sulfate (1031-07-8)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32467 (ea.)

Endrin Aldehyde Standard
Endrin aldehyde (7421-93-4)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32468 (ea.)

Method 505 (Organohalide Pesticides & PCBs)

505 Organohalide Pesticide Mix (16 components)
Aldrin (309-00-2)
Alachlor (15972-60-8)
Atrazine (1912-24-9)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
Dieldrin (60-57-1)
Endrin (72-20-8)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Hexachlorobenzene (118-74-1)
Hexachlorocyclopentadiene (77-47-4)
Methoxychlor (72-43-5)
cis-Nonachlor (5103-73-1)
trans-Nonachlor (39765-80-5)
Simazine (122-34-9)

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32024 (ea.)

Toxaphene Solutions
See cat.#s 32005, 32015, and 32071 on page 521.

Method 608 (Organochlorine Pesticides & PCBs)

608 Calibration Mix (16 components)
Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32022 (ea.)

608 Complete Kit
Contains 1 mL each of these mixtures.
32022: 608 Calibration Mix
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260
32005: toxaphene
32021: chlordane
Contains 1 mL each of these mixtures.
cat.# 32060 (kit) kit

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Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Method 8080, 8081 (Chlorinated Pesticides)

Organochlorine Pesticide Mix AB #1 (20 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32291 (ea.)

Organochlorine Pesticide Mix AB #2 (20 components)

Aldrin (309-00-2)	8 µg/mL	Endosulfan I (959-98-8)	8
α-BHC (319-84-6)	8	Endosulfan II (33213-65-9)	16
β-BHC (319-85-7)	8	Endosulfan sulfate (1031-07-8)	16
δ-BHC (319-86-8)	8	Endrin (72-20-8)	16
γ-BHC (Lindane) (58-89-9)	8	Endrin aldehyde (7421-93-4)	16
cis-Chlordane (5103-71-9)	8	Endrin ketone (53494-70-5)	16
trans-Chlordane (5103-74-2)	8	Heptachlor (76-44-8)	8
4,4'-DDD (72-54-8)	16	Heptachlor epoxide (isomer B) (1024-57-3)	8
4,4'-DDE (72-55-9)	16	Methoxychlor (72-43-5)	80
4,4'-DDT (50-29-3)	16		
Dieldrin (60-57-1)	16		

In hexane:toluene (1:1), 1 mL/ampul
cat.# 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

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Analyze all 20 organochlorine pesticides and their surrogates simultaneously.

See **pages 72–73**.

Pesticide Surrogate Mix (2 components)

Decachlorobiphenyl (2051-24-3)
2,4,5,6-Tetrachloro-*m*-xylene (877-09-8)

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32000 (ea.)

200 µg/mL each in acetone, 5 mL/ampul
cat.# 32457 (ea.)

Pesticide Surrogate Mix (2 components)

Decachlorobiphenyl (2051-24-3)	200 µg/mL
2,4,5,6-Tetrachloro-*m*-xylene (877-09-8)	100

In acetone, 1 mL/ampul
cat.# 32453 (ea.)

TCLP Pesticide Mix (5 components)

γ-BHC (Lindane) (58-89-9)
Endrin (72-20-8)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32013 (ea.)

TCLP Toxaphene Mix

Toxaphene (8001-35-2)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

TCLP Chlordane Mix

Chlordane (57-74-9)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32016 (ea.)

SOM01.1 (Pesticides), QA Mixes

Pesticide Surrogate Mix (2 components)

Decachlorobiphenyl (2051-24-3)	200 µg/mL
2,4,5,6-Tetrachloro-*m*-xylene (877-09-8)	100

In acetone, 1 mL/ampul
cat.# 32453 (ea.)

Organochlorine Pesticide Resolution Check Mix (with surrogates) (22 components)

Aldrin (309-00-2)	10 µg/mL	Endosulfan I (959-98-8)	10
α-BHC (319-84-6)	10	Endosulfan II (33213-65-9)	20
β-BHC (319-85-7)	10	Endosulfan sulfate (1031-07-8)	20
δ-BHC (319-86-8)	10	Endrin (72-20-8)	20
γ-BHC (Lindane) (58-89-9)	10	Endrin aldehyde (7421-93-4)	20
cis-Chlordane (5103-71-9)	10	Endrin ketone (53494-70-5)	20
trans-Chlordane (5103-74-2)	10	Heptachlor (76-44-8)	10
Decachlorobiphenyl (SS) (2051-24-3)	20	Heptachlor epoxide (isomer B) (1024-57-3)	10
Dieldrin (60-57-1)	20	Methoxychlor (72-43-5)	100
4,4'-DDD (72-54-8)	20	2,4,5,6-Tetrachloro-*m*-xylene (SS) (877-09-8)	10
4,4'-DDE (72-55-9)	20		
4,4'-DDT (50-29-3)	20		

In hexane:toluene (90:10), 1 mL/ampul
cat.# 32454 (ea.)

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

04.2, 04.1, 03.2, 3/90, 4/89, and 2/88 SOW (Pesticides), QA Mixes

Pesticide Surrogate Mix (2 components)

See cat.#s 32000 and 32457 on page 524.

2,4,5,6-Tetrachloro-*m*-xylene

2,4,5,6-Tetrachloro-*m*-xylene (877-09-8)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32027 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32028 (ea.)

Decachlorobiphenyl (BZ #209)

Decachlorobiphenyl (BZ #209) (2051-24-3)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul
cat.# 32289 (ea.)

Dibutylchlorendate

Dibutylchlorendate (1770-80-5)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32025 (ea.)

Florisil® Cartridge Check Standard (2,4,5-Trichlorophenol)

2,4,5-Trichlorophenol (95-95-4)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32017 (ea.)

Organochlorine Pesticide System Evaluation Mix

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT (50-29-3)	200 µg/mL
Endrin (72-20-8)	100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32417 (ea.)

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See **pages 568–571**.

Pesticide Performance Evaluation Mix (6 components)

α-BHC (319-84-6)	1 µg/mL	4,4'-DDT (50-29-3)	10
β-BHC (319-85-7)	1	Endrin (72-20-8)	5
γ-BHC (Lindane) (58-89-9)	1	Methoxychlor (72-43-5)	25

In hexane, 1 mL/ampul
cat.# 32002 (ea.)

Pesticide Performance Evaluation Mix w/Surrogates

(8 components)

α-BHC (319-84-6)	1 µg/mL	Endrin (72-20-8)	5
β-BHC (319-85-7)	1	Methoxychlor (72-43-5)	25
γ-BHC (Lindane) (58-89-9)	1	2,4,5,6-Tetrachloro-*m*-xylene (SS) (877-09-8)	2
4,4'-DDT (50-29-3)	10		
Decachlorobiphenyl (SS) (2051-24-3)	2		

In hexane, 1 mL/ampul
cat.# 32074 (ea.)

tech tip

Working with solutions containing decachlorobiphenyl

Decachlorobiphenyl has poor solubility in most organic solvents. The maximum concentration that can be prepared in acetone, hexane, or isooctane is 200 µg/mL. Temperature will affect the solubility as well. Storing solutions at reduced temperatures will cause decachlorobiphenyl to precipitate.

Products containing decachlorobiphenyl must be sonicated for a minimum of 10 minutes prior to opening the ampul. Because each ultrasonic bath operates at a different energy level, 10 minutes is a guideline only. Longer sonication time will not affect product quality.

These precautions apply to working solutions prepared in your laboratory as well. The amount of compound that precipitates depends on concentration AND temperature. If you store your standards at a temperature lower than 4 °C (even dilute solutions), allow extra sonication time.

CLP Pesticides Mixtures, QA Mixes

Pesticide Matrix Spike Mix (6 components)

Aldrin (309-00-2)	25 µg/mL	Dieldrin (60-57-1)	50
γ-BHC (Lindane) (58-89-9)	25	Endrin (72-20-8)	50
4,4'-DDT (50-29-3)	50	Heptachlor (76-44-8)	25

In acetone, 1 mL/ampul
cat.# 32018 (ea.)

For complete listing of PCB reference standards, see pages 530–531.

Low-Concentration Pesticides Mixtures, QA Mixes

L/C Pesticide Lab Control Sample (7 components)

γ-BHC (Lindane) (58-89-9)	10 µg/mL	Endosulfan sulfate (1031-07-8)	20
trans-Chlordane (5103-74-2)	10	Endrin (72-20-8)	20
4,4'-DDE (72-55-9)	20	Heptachlor epoxide (isomer B) (1024-57-3)	10
Dieldrin (60-57-1)	20		

In acetone, 1 mL/ampul
cat.# 32040 (ea.)

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

CLP Pesticides Mixtures, Calibration Mixes

Pesticide Standard Mix A (9 components)

α-BHC (319-84-6)	5 µg/mL	Endosulfan I (959-98-8)	5
γ-BHC (Lindane) (58-89-9)	5	Endrin (72-20-8)	10
4,4'-DDD (72-54-8)	10	Heptachlor (76-44-8)	5
4,4'-DDT (50-29-3)	10	Methoxychlor (72-43-5)	50
Dieldrin (60-57-1)	10		

In hexane:toluene (90:10), 1 mL/ampul

cat.# 32297 (ea.)

Pesticide Standard Mix B (11 components)

Aldrin (309-00-2)	5 µg/mL	Endosulfan II (33213-65-9)	10
β-BHC (319-85-7)	5	Endosulfan sulfate (1031-07-8)	10
δ-BHC (319-86-8)	5	Endrin aldehyde (7421-93-4)	10
cis-Chlordane (5103-71-9)	5	Endrin ketone (53494-70-5)	10
trans-Chlordane (5103-74-2)	5	Heptachlor epoxide (isomer B) (1024-57-3)	5
4,4'-DDE (72-55-9)	10		

In hexane:toluene (90:10), 1 mL/ampul

cat.# 32298 (ea.)

Organochlorine Pesticide Mix AB #1 (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
α-BHC (319-84-6)	Endosulfan II (33213-65-9)
β-BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
δ-BHC (319-86-8)	Endrin (72-20-8)
γ-BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
cis-Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
trans-Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Methoxychlor (72-43-5)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul

cat.# 32291 (ea.)

Organochlorine Pesticide Mix AB #2 (20 components)

Aldrin (309-00-2)	8 µg/mL	Endosulfan I (959-98-8)	8
α-BHC (319-84-6)	8	Endosulfan II (33213-65-9)	16
β-BHC (319-85-7)	8	Endosulfan sulfate (1031-07-8)	16
δ-BHC (319-86-8)	8	Endrin (72-20-8)	16
γ-BHC (Lindane) (58-89-9)	8	Endrin aldehyde (7421-93-4)	16
cis-Chlordane (5103-71-9)	8	Endrin ketone (53494-70-5)	16
trans-Chlordane (5103-74-2)	8	Heptachlor (76-44-8)	8
4,4'-DDD (72-54-8)	16	Heptachlor epoxide (isomer B) (1024-57-3)	8
4,4'-DDE (72-55-9)	16		
4,4'-DDT (50-29-3)	16	Methoxychlor (72-43-5)	80
Dieldrin (60-57-1)	16		

In hexane:toluene (1:1), 1 mL/ampul

cat.# 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
α-BHC (319-84-6)	Endosulfan II (33213-65-9)
β-BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
δ-BHC (319-86-8)	Endrin (72-20-8)
γ-BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
cis-Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
trans-Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Methoxychlor (72-43-5)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul

cat.# 32415 (ea.)

Pesticides Calibration Mixtures

Components of these products are at 16x the contract-required quantitation level (CRQL) and can be used to prepare calibration mixes at 4x CRQL and at 1x CRQL by serial dilution.

Pesticide Standard Mix A w/Surrogates (11 components)

α-BHC (319-84-6)	8 µg/mL	Endosulfan I (959-98-8)	8
γ-BHC (Lindane) (58-89-9)	8	Endrin (72-20-8)	16
4,4'-DDD (72-54-8)	16	Heptachlor (76-44-8)	8
4,4'-DDT (50-29-3)	16	Methoxychlor (72-43-5)	80
Decachlorobiphenyl (SS) (2051-24-3)	16	2,4,5,6-Tetrachloro-*m*-xylene (SS) (877-09-8)	8
Dieldrin (60-57-1)	16		

In hexane, 1 mL/ampul

cat.# 32003 (ea.)

Pesticide Standard Mix B w/Surrogates (13 components)

Aldrin (309-00-2)	8 µg/mL	Endosulfan sulfate (1031-07-8)	16
β-BHC (319-85-7)	8	Endrin aldehyde (7421-93-4)	16
δ-BHC (319-86-8)	8	Endrin ketone (53494-70-5)	16
cis-Chlordane (5103-71-9)	8	Heptachlor epoxide (isomer B) (1024-57-3)	8
trans-Chlordane (5103-74-2)	8	2,4,5,6-Tetrachloro-*m*-xylene (SS) (877-09-8)	8
4,4'-DDE (72-55-9)	16		
Decachlorobiphenyl (SS) (2051-24-3)	16		
Endosulfan II (33213-65-9)	16		

In hexane, 1 mL/ampul

cat.# 32004 (ea.)

Pesticide Kit #3

Calibration mixes only for CLP 04.1. Includes pesticide standard mixes A & B at 16x CRQL with surrogates.

Contains 1 mL each of these mixtures.
32003: Pesticide Standard Mix A w/Surrogates
32004: Pesticide Standard Mix B w/Surrogates
32005: Toxaphene
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

cat.# 32404 (kit) **kit**

Chlordane & Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isooctane; M = methanol

Pesticides, Nitrogen & Phosphorus

Method 507 (Nitrogen & Phosphorus Pesticides)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

Alachlor (15972-60-8)
Ametryn (834-12-8)
Atraton (1610-17-9)
Atrazine (1912-24-9)
Bromacil (314-40-9)
Butachlor (23184-66-9)
Butylate (2008-41-5)
Chlorpropham (101-21-3)
Cyanazine (Bladex) (21725-46-2)
Cycloate (1134-23-2)
Diphenamid (957-51-7)
EPTC (759-94-4)
Etridiazole (2593-15-9)
Fenarimol (60168-88-9)
Fluridone (Sonar) (59756-60-4)
Hexazinone (Velpar) (51235-04-2)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
MGK-264 (113-48-4)
Molinate (2212-67-1)
Napropamide (Devrinol) (15299-99-7)
Norflurazon (27314-13-2)
Pebulate (1114-71-2)
Prometon (1610-18-0)
Prometryne (7287-19-6)
Propachlor (1918-16-7)
Propazine (139-40-2)
Propyzamide (23950-58-5)
Simazine (122-34-9)
Simetryn (1014-70-6)
Tebuthiuron (34014-18-1)
Terbacil (5902-51-2)
Terbutryn (886-50-0)
Triadimefon (43121-43-3)
Tricyclazole (Beam) (41814-78-2)
Trifluralin (1582-09-8)
Vernolate (1929-77-7)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33012 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

Chlorpyrifos (2921-88-2)
Dichlorvos (DDVP) (62-73-7)
Disulfoton sulfone (2497-06-5)
Ethoprop (ethoprophos) (13194-48-4)
Methyl paraoxon (Parathion methyl-O-analog) (950-35-6)
Mevinphos (7786-34-7)
Stirofos (tetrachlorvinphos) (961-11-5)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33013 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

Carboxin (5234-68-4)
Diazinon (333-41-5)
Disulfoton (298-04-4)
Fenamiphos (22224-92-6)
Merphos (150-50-5)
Terbufos (13071-79-9)

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 32423 (ea.)

Compound Index for Reference Standards

See **pages 586–592.**

Pesticides, Organophosphorus

Method 8140, 8141 (Organophosphorus Pesticides)

The preparation of accurate and stable OP standards is complicated by their sensitivity to light, pH, heat, and water. Restek has overcome these issues through our ongoing research into OP pesticide mixtures to save your lab time and effort.

- Solvents are assayed to ensure low water content.
- Reference mixtures are stored in deactivated amber ampuls, under an inert atmosphere.
- Purity is determined by a combination of methods: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

8140/8141 Internal Standards & Surrogates

NPD Detector:

Internal Standard: 1-Bromo-2-nitrobenzene (cat.# 32279)
Surrogate: 4-Chloro-3-nitrobenzotrifluoride (cat.# 32282)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32279 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32282 (ea.)

FPD Detector:

Internal Standard: None recommended
Surrogate: Tributylphosphate (cat.# 32280) and Triphenylphosphate (cat.# 32281)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32280 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32281 (ea.)

8140/8141 OP Pesticide Calibration Mix A

(20 components)

Azinphos methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Coumaphos (56-72-4)
Demeton, O & S (8065-48-3)
Diazinon (333-41-5)
Dichlorvos (DDVP) (62-73-7)
Disulfoton (298-04-4)
Ethoprophos (13194-48-4)
Fenchlorphos (Ronnel) (299-84-3)
Fensulfothion (115-90-2)
Fenthion (55-38-9)
Merphos (150-50-5)
Methyl parathion (298-00-0)
Mevinphos (7786-34-7)
Naled (300-76-5)
Phorate (298-02-2)
Prothiofos (34643-46-4)
Stirofos (tetrachlorvinphos) (961-11-5)
Sulprofos (35400-43-2)
Trichloronate (327-98-0)

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul
cat.# 32277 (ea.)

8141 OP Pesticide Calibration Mix B (7 components)

Dimethoate (60-51-5)
EPN (2104-64-5)
Malathion (121-75-5)
Monocrotophos (6923-22-4)
Parathion (ethyl parathion) (56-38-2)
Sulfotepp (3689-24-5)
TEPP (tetraethylpyrophosphate) (107-49-3)

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul
cat.# 32278 (ea.)

Pesticides, Organophosphorus, *cont.*

International-Specific

Canadian Drinking Water OP Pesticides Mix

(9 components)

Azinphos methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Diazinon (333-41-5)
Dimethoate (60-51-5)
Malathion (121-75-5)
Parathion (ethyl parathion) (56-38-2)
Phorate (298-02-2)
Temephos (Abate) (3383-96-8)
Terbufos (13071-79-9)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31867 (ea.)

Organophosphorus Pesticide Mix, European Formulation (16 components)

Acephate (30560-19-1)	200 µg/mL	Methamidophos (10265-92-6)	500
Azinphos methyl (86-50-0)	400	Methidathion (950-37-8)	200
Chlorpyrifos (2921-88-2)	100	Omethoate (1113-02-6)	1,000
Demeton-S-methyl (919-86-8)	200	Pirimiphos methyl (29232-93-7)	100
Dichlorvos (DDVP) (62-73-7)	500	Profenofos (41198-08-7)	200
Dimethoate (60-51-5)	200	Prothiofos (34643-46-4)	200
Ethion (563-12-2)	200	Pyrazophos (13457-18-6)	500
Malathion (121-75-5)	200	Tolclofos-methyl (57018-04-9)	100

In acetone, 1 mL/ampul

cat.# 32418 (ea.)

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See **page 74** for details.

Pesticides, Pesticides & Flame Retardants

Method 527 (Pesticides & Flame Retardants—GC-MS)

Method 525.2 Internal Standard Mix (3 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
Phenanthrene-d10 (1517-22-2)

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31825 (ea.)

Method 525.2 Surrogate Standard Mix (4 components)

2-Nitro-*m*-xylene (81-20-9)
Perylene-d12 (1520-96-3)
Pyrene-d10 (1718-52-1)
Triphenylphosphate (115-86-6)

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31826 (ea.)

PBDE Mix (5 components)

2,2',4,4',5,5'-Hexabromobiphenyl (59080-40-9)
2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153) (68631-49-2)
2,2',4,4',5-Pentabromodiphenyl ether (BDE-99) (60348-60-9)
2,2',4,4',6-Pentabromodiphenyl ether (BDE-100) (189084-64-8)
2,2',4,4'-Tetrabromodiphenyl ether (BDE-47) (5436-43-1)

50 µg/mL each in isooctane:ethyl acetate (4:1), 1 mL/ampul

cat.# 33098 (ea.)

Pesticides Mix #1, Method 527 (16 components)

Atrazine (1912-24-9)
Bifenthrin (82657-04-3)
Esbiol (Bioallethrin, S-cyclopentyl isomer) (28434-00-6)
Bromacil (314-40-9)
Esfenvalarate (66230-04-4)
Fenvalarate (51630-58-1)
Hexazinone (Velpar) (51235-04-2)
Kepone (143-50-0)
Mirex (2385-85-5)
Nitrofen (1836-75-5)
Norflurazon (27314-13-2)
Oxychlordane (27304-13-8)
Prometryne (7287-19-6)
Propazine (139-40-2)
Thiobencarb (28249-77-6)
Vinclozolin (50471-44-8)

500 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 33007 (ea.)

Pesticides Mix #2, Method 527 (5 components)

Chlorpyrifos (2921-88-2)
Dimethoate (60-51-5)
Malathion (121-75-5)
Parathion (Ethyl parathion) (56-38-2)
Terbufos sulfone (56070-16-7)

500 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 33008 (ea.)

Pesticides, Phenylurea

Method 532 (Phenylurea Pesticides)

Phenylurea Pesticide Mixture (8 components)

Diflubenzuron (35367-38-5)
Diuron (330-54-1)
Fluometuron (2164-17-2)
Linuron (330-55-2)
Propanil (709-98-8)
Siduron (1982-49-6)
Tebuthiuron (34014-18-1)
Thidiazuron (51707-55-2)

200 µg/mL each in acetonitrile:acetone (90:10), 1 mL/ampul

cat.# 32434 (ea.)

Pesticides, State-Specific

Minnesota Department of Agriculture List 1 Pesticides

Minnesota Ag List 1 Pesticides Mix A (16 components)

Acetochlor (34256-82-1)
Alachlor (15972-60-8)
Atrazine (1912-24-9)
Cyanazine (Bladex) (21725-46-2)
Desethylatrazine (6190-65-4)
Desisopropylatrazine (1007-28-9)
Dimethenamid (87674-68-8)*
Ethalfluralin (55283-68-6)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
Pendimethalin (40487-42-1)
Prometon (1610-18-0)
Propachlor (1918-16-7)
Propazine (139-40-2)
Simazine (122-34-9)
Trifluralin (1582-09-8)

200 ppm each in acetone, 1 mL/ampul

cat.# 32406 (ea.)

*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.[1] CAS # 87674-68-8 manufactured by several companies under various trade names.
[1]Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: www.mda.state.mn.us

Minnesota Ag List 1 Pesticides Mix B (6 components)

Chlorpyrifos (2921-88-2)
EPTC (759-94-4)
Fonofos (944-22-9)
Phorate (298-02-2)
Terbufos (13071-79-9)
Triallate (2303-17-5)

200 ppm each in acetone, 1 mL/ampul

cat.# 32407 (ea.)

Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.
32406: Minnesota Ag List Pesticides Mix A
32407: Minnesota Ag List Pesticides Mix B
Contains 1 mL each of these mixtures.

cat.# 32408 (kit) kit

Quantity Discounts Available

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Not available for all standards. Contact your local Restek® representative for more details.

Phenols

Method 528 (Phenols)

- Reference materials for U.S. EPA Method 528.
- Fortification solution formulated based on MS sensitivity to each analyte.

Internal Standard Mix, EPA 528 (2 components)

3-Nitro-*o*-xylene (83-41-0)	1,000 µg/mL
2,3,4,5-Tetrachlorophenol (4901-51-3)	2,000

In methylene chloride, 1 mL/ampul

cat.# 31696 (ea.)

Phenol Calibration Mix, EPA 528 (12 components)

4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
2,4-Dichlorophenol (120-83-2)
2,4-Dimethylphenol (105-67-9)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2-Methylphenol (*o*-cresol) (95-48-7)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31694 (ea.)

Method 604 (Phenols)

604 Phenols Calibration Mix (11 components)

4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
2,4-Dichlorophenol (120-83-2)
2,4-Dimethylphenol (105-67-9)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31029 (ea.)

Method 8040 (Phenols)

8040 Surrogate Mix (2 components)

2-Fluorophenol (367-12-4)
2,4,6-Tribromophenol (118-79-6)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31090 (ea.)

8040 Phenols Mix #1 (9 components)

4-Chloro-3-methylphenol (59-50-7)
2,4-Dichlorophenol (120-83-2)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
3-Methylphenol (*m*-cresol) (108-39-4)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31088 (ea.)

8040 Phenols Mix #2 (9 components)

sec-Butyl-4,6-dinitrophenol (dinoseb) (88-85-7)
2-Chlorophenol (95-57-8)
2,6-Dichlorophenol (87-65-0)
2,4-Dimethylphenol (105-67-9)
2,4-Dinitrophenol (51-28-5)
2-Methylphenol (*o*-cresol) (95-48-7)
4-Methylphenol (*p*-cresol) (106-44-5)
2,3,4,6-Tetrachlorophenol (58-90-2)
2,4,5-Trichlorophenol (95-95-4)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31089 (ea.)

Phthalates (Phthalate Esters)

Method 506 (Phthalate & Adipate Esters)

506 Calibration Mix (7 components)

Benzyl butyl phthalate (85-68-7)
Bis(2-ethylhexyl)adipate (103-23-1)
Bis(2-ethylhexyl)phthalate (117-81-7)
Di-*n*-butylphthalate (84-74-2)
Diethylphthalate (84-66-2)
Dimethylphthalate (131-11-3)
Di-*n*-octyl phthalate (117-84-0)

1,000 µg/mL in isooctane, 1 mL/ampul
cat.# 31845 (ea.)

Method 606 (Phthalate Esters)

606 Phthalate Esters Calibration Mix (6 components)

Bis(2-ethylhexyl)phthalate (117-81-7)
Benzyl butyl phthalate (85-68-7)
Di-*n*-butyl phthalate (84-74-2)
Diethylphthalate (84-66-2)
Dimethylphthalate (131-11-3)
Di-*n*-octyl phthalate (117-84-0)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31031 (ea.)

Method 8061A (Phthalate Esters)

Benzyl Benzoate (Internal Standard)

Benzyl benzoate (120-51-4)

5,000 µg/mL in hexane, 1 mL/ampul
cat.# 31847 (ea.)

EPA Method 8061A Phthalate Esters Mixture

(15 components)

Benzyl butyl phthalate (85-68-7)
Bis(2-*n*-butoxyethyl)phthalate (117-83-9)
Bis(2-ethoxyethyl)phthalate (605-54-9)
Bis(2-ethylhexyl)phthalate (117-81-7)
Bis(2-methoxyethyl)phthalate (117-82-8)
Bis(4-methyl-2-pentyl)phthalate (146-50-9)
Di-*n*-butylphthalate (84-74-2)
Diethylphthalate (84-66-2)
Di-*n*-hexyl phthalate (84-75-3)
Dimethylphthalate (131-11-3)
Di-nonyl phthalate (84-76-4)
Di-*n*-octyl phthalate (117-84-0)
Dipentylphthalate (131-18-0)
Phthalic acid dicyclohexyl ester (84-61-7)
Phthalic acid diisobutyl ester (84-69-5)

1,000 µg/mL each in hexane:acetone (80:20), 1 mL/ampul
cat.# 33227 (ea.)

Polybrominated Diphenyl Ethers (PBDEs)

See page 528.

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See **pages 464–465**.

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Polychlorinated Biphenyls (PCBs)

PCB Aroclors

608 Complete Kit

Contains 1 mL each of these mixtures.
32022: 608 Calibration Mix
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260
32005: toxaphene
32021: chlordane

Contains 1 mL each of these mixtures.
cat.# 32060 (kit) kit

PCB Kit #1

1,000 µg/mL each in hexane, 1 mL/ampul
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260

cat.# 32089 (kit) kit

PCB Kit #2

200 µg/mL each in isooctane, 1 mL/ampul
32064: Aroclor 1016
32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32070: Aroclor 1260

cat.# 32090 (kit) kit

PCB Kit #3

1,000 µg/mL each in hexane, 1 mL/ampul
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

cat.# 32400 (kit) kit

PCB Kit #4

200 µg/mL each in isooctane, 1 mL/ampul
32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32299: Aroclor 1016/1260

cat.# 32401 (kit) kit

Polychlorinated Biphenyls (PCBs), *cont.*

PCB Aroclors, *cont.*

Aroclor Solutions

Volume is 1 mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
Aroclor 1016/1260		H	1,000	32039
Aroclor 1016/1260		I	200	32299
Aroclor 1016/1260		A	400	32456

A = acetone; H = hexane; I = isooctane; TO = transformer oil (PCB-free)

please **note**

We test our transformer oil solvent to ensure that it is PCB-free.

PCB Congeners

Method 525.2 (Semivolatile Organics)

Method 525.2 PCB Congener Mix (8 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)
2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)
2,4,5-Trichlorobiphenyl (BZ #29) (15862-07-4)
2,2',4,4'-Tetrachlorobiphenyl (BZ #47) (2437-79-8)
2,2',3',4,6-Pentachlorobiphenyl (BZ #98) (60233-25-2)
2,2',4,4',5,6'-Hexachlorobiphenyl (BZ #154) (60145-22-4)
2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ #171) (52663-71-5)
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ #200) (40186-71-8)

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32420 (ea.)

PCB Congeners, *cont.*

Method 8082, 8082A (PCBs)

PCB Congener Mix, Method 8082A (19 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)
2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)
2,2',5-Trichlorobiphenyl (BZ #18) (37680-65-2)
2,4',5-Trichlorobiphenyl (BZ #31) (16606-02-3)
2,2',3,5'-Tetrachlorobiphenyl (BZ #44) (41464-39-5)
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)
2,3',4,4'-Tetrachlorobiphenyl (BZ #66) (32598-10-0)
2,2',3,4,5'-Pentachlorobiphenyl (BZ #87) (38380-02-8)
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)
2,3,3',4',6-Pentachlorobiphenyl (BZ #110) (38380-03-9)
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ #141) (52712-04-6)
2,2',3,5,5',6-Hexachlorobiphenyl (BZ #151) (52663-63-5)
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ #170) (35065-30-6)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ #183) (52663-69-1)
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ #187) (52663-68-0)
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ #206) (40186-72-9)

100 µg/mL each in isooctane, 1 mL/ampul
cat.# 32416 (ea.)

Miscellaneous

PCB Congeners

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289

I = isooctane

PCB Congener Standard #1 (6 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul
cat.# 32290 (ea.)

PCB Congener Standard #2 (7 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)
2,3',4,4',5-Pentachlorobiphenyl (BZ #118) (31508-00-6)
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul
cat.# 32294 (ea.)

Polycyclic Aromatic Hydrocarbons (PAHs)

See pages 511–513.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs)

Individual Semivolatile Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Anthracene-d10	1719-06-08	D	2,000	31037
Decafluorobiphenyl	434-90-2	D	2,000	31041
Decafluorobiphenyl	434-90-2	A	1,000	31855
4,4'-Dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
2-Fluorobiphenyl	321-60-8	D	2,000	31091
2-Fluorophenol	367-12-4	D	2,000	31047
Naphthalene-d8	1146-65-2	D	2,000	31043
N-Nitrosodimethylamine-d6	17829-05-9	D	1,000	33910
Pentafluorophenol	771-61-9	D	2,000	31048
Phenanthrene-d10	1517-22-2	D	2,000	31045
Phenol-d6	13127-88-3	D	2,000	31049
p-Terphenyl-d14	1718-51-0	D	1,000	31828
2,4,6-Tribromophenol	118-79-6	M	1,000	31401

A = acetone; D = methylene chloride; M = methanol

SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

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See **pages 464–465** or visit www.restek.com/iso

Method 525, 525.1, 525.2 (Semivolatile Organics)

Method 525.2 Internal Standard Mix (3 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
Phenanthrene-d10 (1517-22-2)

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31825 (ea.)

Method 525.2 Surrogate Standard Mix (4 components)

2-Nitro-*m*-xylene (81-20-9)
Perylene-d12 (1520-96-3)
Pyrene-d10 (1718-52-1)
Triphenylphosphate (115-86-6)

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31826 (ea.)

Method 525.2 Herbicide Mix (3 components)

Acetochlor (34256-82-1)
Alachlor (15972-60-8)
Metolachlor (51218-45-2)

100 µg/mL in methanol, 1 mL/ampul
cat.# 33211 (ea.)

Method 525.2 Semivolatile Mix (revised)

(28 components)

Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl butyl phthalate (85-68-7)
Bis(2-ethylhexyl)adipate (103-23-1)
Bis(2-ethylhexyl)phthalate (117-81-7)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Diethylphthalate (84-66-2)
Dimethylphthalate (131-11-3)
Di-*n*-butylphthalate (84-74-2)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octylphthalate (117-84-0)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachlorocyclopentadiene (77-47-4)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
Naphthalene (91-20-3)
Pentachlorophenol (87-86-5)*
Phenanthrene (85-01-8)
Pyrene (129-00-0)

1,000 µg/mL each in acetone, 1 mL/ampul*
cat.# 31899 (ea.)

*pentachlorophenol at 4,000 µg/mL.

Method 525.2 PCB Congener Mix (8 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)
2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)
2,4,5-Trichlorobiphenyl (BZ #29) (15862-07-4)
2,2',4,4'-Tetrachlorobiphenyl (BZ #47) (2437-79-8)
2,2',3',4,6-Pentachlorobiphenyl (BZ #98) (60233-25-2)
2,2',4,4',5,6'-Hexachlorobiphenyl (BZ #154) (60145-22-4)
2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ #171) (52663-71-5)
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ #200) (40186-71-8)

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32420 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 525, 525.1, 525.2 (Semivolatile Organics), *cont.*

Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

Chlorpyrifos (2921-88-2)
Dichlorvos (DDVP) (62-73-7)
Disulfoton sulfone (2497-06-5)
Ethoprop (ethoprophos) (13194-48-4)
Methyl paraoxon (Parathion methyl-O-analog) (950-35-6)
Mevinphos (7786-34-7)
Stirofos (tetrachlorvinphos) (961-11-5)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33013 (ea.)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2 (37 components)

Alachlor (15972-60-8)
Ametryn (834-12-8)
Atraton (1610-17-9)
Atrazine (1912-24-9)
Bromacil (314-40-9)
Butachlor (23184-66-9)
Butylate (2008-41-5)
Chlorpropham (101-21-3)
Cyanazine (Bladex) (21725-46-2)
Cycloate (1134-23-2)
Diphenamid (957-51-7)
EPTC (759-94-4)
Etridiazole (2593-15-9)
Fenarimol (60168-88-9)
Fluridone (Sonar) (59756-60-4)
Hexazinone (Velpar) (51235-04-2)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
MGK-264 (113-48-4)
Molinate (2212-67-1)
Napropamide (Devrinol) (15299-99-7)
Norflurazon (27314-13-2)
Pebulate (1114-71-2)
Prometon (1610-18-0)
Prometryne (7287-19-6)
Propachlor (1918-16-7)
Propazine (139-40-2)
Propyzamide (23950-58-5)
Simazine (122-34-9)
Simetryn (1014-70-6)
Tebuthiuron (34014-18-1)
Terbacil (5902-51-2)
Terbutryn (886-50-0)
Triadimefon (43121-43-3)
Tricyclazole (Beam) (41814-78-2)
Trifluralin (1582-09-8)
Vernolate (1929-77-7)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33012 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2 (6 components)

Carboxin (5234-68-4)
Diazinon (333-41-5)
Disulfoton (298-04-4)
Fenamiphos (22224-92-6)
Merphos (150-50-5)
Terbufos (13071-79-9)

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 32423 (ea.)

Organochlorine Pesticide Mix #2 (Rev), Method 525.2 (8 components)

Chlorobenzilate (510-15-6)
Chloroneb (2675-77-6)
Chlorothalonil (1897-45-6)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
Heptachlor epoxide (isomer A) (28044-83-9)
trans-Nonachlor (39765-80-5)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33011 (ea.)

Method 525.2 Fortification Recovery Standard

p-Terphenyl-d14 (1718-51-0)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31828 (ea.)

Method 525.2 GC-MS Performance Check Mix (3 components)

4,4'-DDT (50-29-3)
DFTPP (decafluorotriphenylphosphine) (5074-71-5)
Endrin (72-20-8)

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31827 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 625 (Semivolatiles)

Semivolatiles MegaMix® Standard, EPA Method 625 (54 components)

MEGAMIX®

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl butyl phthalate (85-68-7)
Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl phenyl ether (101-55-3)
4-Chloro-3-methylphenol (59-50-7)
2-Chloronaphthalene (91-58-7)
2-Chlorophenol (95-57-8)
4-Chlorophenyl phenyl ether (7005-72-3)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
2,4-Dichlorophenol (120-83-2)
Diethylphthalate (84-66-2)
2,4-Dimethylphenol (105-67-9)
Dimethylphthalate (131-11-3)
Di-*n*-butylphthalate (84-74-2)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octylphthalate (117-84-0)
Diphenylamine (122-39-4)*
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachloro-1,3-butadiene (87-68-3)
Hexachlorocyclopentadiene (77-47-4)*
Hexachloroethane (67-72-1)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
Naphthalene (91-20-3)
Nitrobenzene (98-95-3)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
N-Nitrosodimethylamine (62-75-9)*
N-Nitroso-di-*n*-propylamine (621-64-7)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Pentachlorophenol (87-86-5)
Phenanthrene (85-01-8)
Phenol (108-95-2)
Pyrene (129-00-0)
1,2,4-Trichlorobenzene (120-82-1)
2,4,6-Trichlorophenol (88-06-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31829 (ea.)

*Listed as an "additional compound" in Method 625 (listed compound N-nitrosodiphenylamine decomposes to MegaMix® component diphenylamine). The six other "additional compounds" are components in other Restek® reference mixes used for Method 625: benzidine is included in cat.# 31030 (page 537); β-BHC, δ-BHC, endosulfan I, endosulfan II, endrin are in cat.# 32291 (page 524) and cat.# 32415 (page 537).

Method 625 (Semivolatiles), *cont.*

625 Kit

Because most laboratories do not routinely analyze pesticides, PCBs, toxaphene, and chlordane in their calibration mixtures for Method 625, these mixtures are not included in the 625 kit. They may be purchased separately or in the 608 complete kit. See page 523.

Contains 1 mL each of these mixtures.
31029: 604 Phenols Mix
31030: 605 Benzidines Mix
31031: 606 Phthalate Esters Mix
31032: 607 Nitrosamines Mix
31033: 609 Nitroaromatics/Isophorone Mix
31011: 610 PAH Mix (SV Calibration Mix #5)
31034: 611 Haloethers Mix
31035: 612 Chlorinated Hydrocarbons Mix

cat.# 31036 (kit) kit

TCLP

TCLP B/N Mix (7 components)

1,4-Dichlorobenzene (106-46-7)
2,4-Dinitrotoluene (121-14-2)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachloroethane (67-72-1)
Nitrobenzene (98-95-3)
Pyridine (110-86-1)

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

Method 3500 (Organic Extraction Surrogates)

High-Concentration Surrogates and Matrix Spike Mixtures for SW-846

- Highest concentrations commercially available—reduces cost per sample extract.
- Convenient 1 mL and 5 mL packaging.

See Method 8270, pages 535–538.

also available

Rxi®-5Sil MS Columns for EPA Methods 625 and 8270

Guaranteed for low GC-MS bleed, excellent phenol response, and the resolution needed to quantify critical pairs and structural isomers.

See **page 32–33** for more information.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270C, 8270D (Semivolatile Organic Compounds)

SV Internal Standard Mix (6 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Dioxane-d8 (17647-74-4)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	—	—

B/N Surrogate Mix (4/89 SOW) (3 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes reduce cost per sample extract.

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	—	33028.25

Revised B/N Surrogate Mix (4 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)
Pyrene-d10 (1718-52-1)

Each	15-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul	
31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul	
31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul	
31889	—

Acid Surrogate Mix (4/89 SOW) (3 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

2-Fluorophenol (367-12-4)
Phenol-d6 (13127-88-3)
2,4,6-Tribromophenol (118-79-6)

Each	15-pk.	25-pk.
2,000 µg/mL each in methanol, 1 mL/ampul		
31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31063	31063.15	—
10,000 µg/mL each in methanol, 5 mL/ampul		
31087	—	—
10,000 µg/mL each in methanol, 10 mL/ampul		
33029	—	33029.25

B/N Matrix Spike Mix (6 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

Acenaphthene (83-32-9)
1,4-Dichlorobenzene (106-46-7)
2,4-Dinitrotoluene (121-14-2)
N-Nitroso-di-*n*-propylamine (621-64-7)
Pyrene (129-00-0)
1,2,4-Trichlorobenzene (120-82-1)

Each	15-pk.
1,000 µg/mL each in methanol, 1 mL/ampul	
31004	31004.15
5,000 µg/mL each in methanol, 1 mL/ampul	
31074	—
5,000 µg/mL each in methanol, 5 mL/ampul	
31084	—

Acid Matrix Spike Mix (5 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)

Each	15-pk.
2,000 µg/mL each in methanol, 1 mL/ampul	
31014	31014.15
10,000 µg/mL each in methanol, 1 mL/ampul	
31061	31061.15
10,000 µg/mL each in methanol, 5 mL/ampul	
31071	—

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.*

GC-MS Tuning Mixture (4 components)

Benzidine (92-87-5)
4,4'-DDT (50-29-3)
Decafluorotriphenylphosphine (DFTPP) (5074-71-5)
Pentachlorophenol (87-86-5)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31615 (ea.)

SV Tuning Compound

Decafluorotriphenylphosphine (DFTPP) (5074-71-5)

2,500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

No data pack available.

8270 B/N Calibration Check Mix (7 components)

Acenaphthene (83-32-9)
Benzo(a)pyrene (50-32-8)
1,4-Dichlorobenzene (106-46-7)
Di-*n*-octyl phthalate (117-84-0)
Diphenylamine (122-39-4)
Fluoranthene (206-44-0)
Hexachlorobutadiene (87-68-3)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31616 (ea.)

8270 Acid Calibration Check Mix (6 components)

4-Chloro-3-methylphenol (59-50-7)
2,4-Dichlorophenol (120-83-2)
2-Nitrophenol (88-75-5)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31617 (ea.)

SV System Performance Check Mix (SPCC) (4 components)

2,4-Dinitrophenol (51-28-5)
Hexachlorocyclopentadiene (77-47-4)
4-Nitrophenol (100-02-7)
N-Nitroso-di-*n*-propylamine (621-64-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31689 (ea.)

8270 MegaMix® Standard (76 components)

MEGAMIX®

- Fewest mixtures needed for calibration and matrix spikes.
- Mixtures formulated for maximum stability.
- Contains most routinely analyzed compounds.

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Aniline (62-53-3)
Anthracene (120-12-7)
Azobenzene (103-33-3)[1]
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl alcohol (100-51-6)
Benzyl butyl phthalate (85-68-7)
Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)adipate (103-23-1)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl phenyl ether (101-55-3)
Carbazole (86-74-8)
4-Chloroaniline (106-47-8)
4-Chloro-3-methylphenol (59-50-7)
2-Chloronaphthalene (91-58-7)
2-Chlorophenol (95-57-8)
4-Chlorophenyl phenyl ether (7005-72-3)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Dibenzofuran (132-64-9)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
2,4-Dichlorophenol (120-83-2)
Diethylphthalate (84-66-2)
2,4-Dimethylphenol (105-67-9)
Dimethylphthalate (131-11-3)
Di-*n*-butyl phthalate (84-74-2)
1,2-Dinitrobenzene (528-29-0)
1,3-Dinitrobenzene (99-65-0)
1,4-Dinitrobenzene (100-25-4)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octyl phthalate (117-84-0)
Diphenylamine (122-39-4)[2]
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
1-Methylnaphthalene (90-12-0)
2-Methylnaphthalene (91-57-6)
2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)*
4-Methylphenol (*p*-cresol) (106-44-5)*
Naphthalene (91-20-3)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
Nitrobenzene (98-95-3)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
N-Nitrosodimethylamine (62-75-9)
N-Nitroso-di-*n*-propylamine (621-64-7)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Pentachlorophenol (87-86-5)
Phenanthrene (85-01-8)
Phenol (108-95-2)
Pyrene (129-00-0)
Pyridine (110-86-1)
2,3,4,6-Tetrachlorophenol (58-90-2)
2,3,5,6-Tetrachlorophenol (935-95-5)
1,2,4-Trichlorobenzene (120-82-1)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul*
cat.# 31850 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500 µg/mL.

[1]1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

[2]N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

8270 Matrix Spike Mix (76 components)

MEGAMIX®

Same as 8270 MegaMix® standard list above.

	Each	15-pk.
200 µg/mL each in methanol:methylene chloride (80:20), 5 mL/ampul*	31687	31687.15
200 µg/mL each in methanol:methylene chloride (80:20), 10 mL/ampul*	33073	—

*3-methylphenol and 4-methylphenol concentration is 100 µg/mL.

EASIER calibration

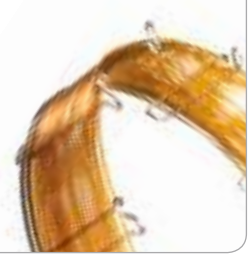
8270 MegaMix® standard and 8270 matrix spike mix include 3-methylphenol and 4-methylphenol at 1/2 x concentration of other components.

also available

Rxi®-5Sil MS Columns

Provide high response for 2,4-dinitrophenol, show excellent peak shape of pyridine, and produce outstanding resolution of PAHs.

See **page 75.**



Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.*

605 Benzidines Calibration Mix (2 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

8270 Benzidines Mix (3 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)
3,3'-Dimethylbenzidine (*o*-tolidine) (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

8270/Appendix IX Kit

Contains 1 mL each of these mixtures.
31850: 8270 MegaMix Standard
31834: 605 Benzidines Calibration Mix
32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)
32460: Methapyrilene Standard
31806: Appendix IX Mix #2

cat.# 31815 (kit) kit

Appendix IX Mix #1, Revised (17 components)

2-Acetylaminofluorene (53-96-3)
4-Aminobiphenyl (92-67-1)
p-Dimethylaminoazobenzene (60-11-7)
3,3'-Dimethylbenzidine (*o*-tolidine) (119-93-7)
α,α-Dimethylphenethylamine (phentermine) (122-09-8)
1-Naphthylamine (1-aminonaphthalene) (134-32-7)
2-Naphthylamine (2-aminonaphthalene) (91-59-8)
N-Nitrosodibutylamine (924-16-3)
N-Nitrosodiethylamine (55-18-5)
N-Nitrosomethylethylamine (10595-95-6)
N-Nitrosomorpholine (59-89-2)
N-Nitrosopiperidine (100-75-4)
N-Nitrosopyrrolidine (930-55-2)
5-Nitro-*o*-toluidine (99-55-8)
1,4-Phenylenediamine (106-50-3)
2-Picoline (109-06-8)
o-Toluidine (95-53-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 32459 (ea.)

Appendix IX Mix #2 (32 components)

Acetophenone (98-86-2)
Aramite (140-57-8)
Atrazine (1912-24-9)
Benzaldehyde (100-52-7)
Biphenyl (92-52-4)
ε-Caprolactam (105-60-2)
Chlorobenzilate (510-15-6)
1-Chloronaphthalene (90-13-1)
Diallate (2303-16-4)
Dibenz(a,j)acridine (224-42-0)
2,6-Dichlorophenol (87-65-0)
7,12-Dimethylbenz(a)anthracene (57-97-6)
1,4-Dioxane (123-91-1)
Diphenyl ether (101-84-8)
Ethyl methacrylate (97-63-2)
Ethyl methanesulfonate (62-50-0)
Hexachloropropene (1888-71-7)
Isodrin (465-73-6)
Isosafrole (*cis* & *trans*) (120-58-1)
Kepone (143-50-0)
3-Methylcholanthrene (56-49-5)
Methyl methanesulfonate (66-27-3)
1,4-Naphthoquinone (130-15-4)
4-Nitroquinoline-N-oxide (56-57-5)
Pentachlorobenzene (608-93-5)
Pentachloroethane (76-01-7)
Pentachloronitrobenzene (quintozene) (82-68-8)
Phenacetin (62-44-2)
Propyzamide (23950-58-5)
Safrole (94-59-7)
1,2,4,5-Tetrachlorobenzene (95-94-3)
1,3,5-Trinitrobenzene (99-35-4)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31806 (ea.)

Methapyrilene Standard

Methapyrilene hydrochloride (135-23-9)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 32460 (ea.)

Organophosphorus Pesticide Mix, 8270/Appendix IX (9 components)

Dimethoate (60-51-5)
Disulfoton (298-04-4)
Famphur (52-85-7)
Methyl parathion (298-00-0)
O,O,O-Triethyl phosphorothioate (126-68-1)
Parathion (ethyl parathion) (56-38-2)
Phorate (298-02-2)
Sulfotepp (3689-24-5)
Zinophos (thionazine) (297-97-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 32419 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

8270 Calibration Mix #1 (19 components)

Benzoic acid (65-85-0)
4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
2,4-Dichlorophenol (120-83-2)
2,6-Dichlorophenol (87-65-0)
2,4-Dimethylphenol (105-67-9)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
Dinoseb (88-85-7)
2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)
4-Methylphenol (*p*-cresol) (106-44-5)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,3,4,6-Tetrachlorophenol (58-90-2)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31618 (ea.)

8270 Calibration Mix #2 (11 components)

Aniline (62-53-3)
Benzidine (92-87-5)
4-Chloroaniline (106-47-8)
3,3'-Dichlorobenzidine (91-94-1)
Diphenylamine (122-39-4)*
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
N-Nitrosodimethylamine (62-75-9)
N-Nitrosodi-*n*-propylamine (621-64-7)
Pyridine (110-86-1)

2,000 µg/mL each in methylene chloride:methanol (85:15), 1 mL/ampul
cat.# 31619 (ea.)

*N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.*

8270 Calibration Mix #3 (23 components)

Aramite (140-57-8)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-chloroethoxy)methane (111-91-1)
4-Bromophenyl phenyl ether (101-55-3)
Chlorobenzilate (510-15-6)
2-Chloronaphthalene (91-58-7)
4-Chlorophenyl phenyl ether (7005-72-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,3-Dinitrobenzene (99-65-0)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Hexachloropropene (1888-71-7)
Isodrin (465-73-6)
Kepone (143-50-0)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Pentachlorobenzene (608-93-5)
Pentachloronitrobenzene (quintozene) (82-68-8)
1,2,4,5-Tetrachlorobenzene (95-94-3)
1,2,4-Trichlorobenzene (120-82-1)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31620 (ea.)

8270 Calibration Mix #4 (22 components)

Acetophenone (98-86-2)
Azobenzene (103-33-3)*
Benzyl alcohol (100-51-6)
Bis(2-ethylhexyl)phthalate (117-81-7)
Benzyl butyl phthalate (85-68-7)
Dibenzofuran (132-64-9)
Diethylphthalate (84-66-2)
Dimethylphthalate (131-11-3)
Di-*n*-butyl phthalate (84-74-2)
Di-*n*-octyl phthalate (117-84-0)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Ethyl methanesulfonate (62-50-0)
Isophorone (78-59-1)
Isosafrole (*cis* & *trans*) (120-58-1)
Methyl methanesulfonate (66-27-3)
1,4-Naphthoquinone (130-15-4)
Nitrobenzene (98-95-3)
4-Nitroquinoline-N-oxide (56-57-5)
Phenacetin (62-44-2)
Safrole (94-59-7)
1,3,5-Trinitrobenzene (99-35-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31621 (ea.)

*1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

3-Methylcholanthrene Standard

3-Methylcholanthrene (56-49-5)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31996 (ea.)

8270 Calibration Mix #5, Revised (18 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
1-Methylnaphthalene (90-12-0)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31995 (ea.)

8270 Calibration Mix #6 (10 components)

Diallate (*cis* & *trans*) (2303-16-4)
Dimethoate (60-51-5)
Disulfoton (298-04-4)
Famphur (52-85-7)
Methyl parathion (298-00-0)
Parathion (ethyl parathion) (56-38-2)
Phorate (298-02-2)
Propyzamide (23950-58-5)
O,O,O-Triethyl phosphorothioate (126-68-1)
Zinophos (Thionazine) (297-97-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31623 (ea.)

Aramite

Aramite (140-57-8)

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 31624 (ea.)

1,2-Diphenylhydrazine

1,2-Diphenylhydrazine (122-66-7)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 31497 (ea.)

No data pack available.

Note that 1,2-diphenylhydrazine is an unstable compound that will oxidize to azobenzene, thereby decreasing the concentration of 1,2-diphenylhydrazine over time. For accurate calibration results, it is recommended that the concentrations of 1,2-diphenylhydrazine and azobenzene be combined. Please contact Restek® Technical Service if you have any questions about this issue.

TCLP Acid Mix (6 components)

2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)
4-Methylphenol (*p*-cresol) (106-44-5)
Pentachlorophenol (87-86-5)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31027 (ea.)

TCLP B/N Mix (7 components)

1,4-Dichlorobenzene (106-46-7)
2,4-Dinitrotoluene (121-14-2)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachloroethane (67-72-1)
Nitrobenzene (98-95-3)
Pyridine (110-86-1)

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

8270/Appendix IX Calibration Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31995: 8270 Calibration Mix #5, Revised
31996: 3-Methylcholanthrene Standard
31623: 8270 Calibration Mix #6
32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)
32460: Methapyrilene Standard

cat.# 31627 (kit) kit

8270 Calibration Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31995: 8270 Calibration Mix #5, Revised
31996: 3-Methylcholanthrene Standard

cat.# 31626 (kit) kit

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

SOM01.1 (Semivolatiles), QA Mixes

SOM01.1 Deuterated Monitoring Compound Mix SIM Compounds (2 components)

Fluoranthene-d10 (93951-69-0)
2-Methylnaphthalene-d10 (7297-45-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 33913 (ea.)

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes

SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

Acenaphthene-d10 (15067-26-2)
Chrysene-d12 (1719-03-5)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Dioxane-d8 (17647-74-4)
Naphthalene-d8 (1146-65-2)
Perylene-d12 (1520-96-3)
Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	—	—

Acid Surrogate Standard Mix (3/90 SOW) (4 components)

2-Chlorophenol-d4 (93951-73-6)
2-Fluorophenol (367-12-4)
Phenol-d6 (13127-88-3)
2,4,6-Tribromophenol (118-79-6)

1,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31003 (ea.)
7,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31073 (ea.)
7,500 µg/mL each in methanol, 5 mL/ampul
cat.# 31083 (ea.)

Acid Surrogate Mix (4/89 SOW) (3 components)

2-Fluorophenol (367-12-4)
Phenol-d6 (13127-88-3)
2,4,6-Tribromophenol (118-79-6)

Each	15-pk.	25-pk.
2,000 µg/mL each in methanol, 1 mL/ampul		
31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31063	31063.15	—
10,000 µg/mL each in methanol, 5 mL/ampul		
31087	—	—
10,000 µg/mL each in methanol, 10 mL/ampul		
33029	—	33029.25

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.*

Revised B/N Surrogate Mix (4 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)
Pyrene-d10 (1718-52-1)

Each	15-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul	
31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul	
31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul	
31889	—

CLP 04.1 BNA Surrogate Mix (8 components)

2-Chlorophenol-d4 (93951-73-6)	1,500 µg/mL	Nitrobenzene-d5 (4165-60-0)	1,000
1,2-Dichlorobenzene-d4 (2199-69-1)	1,000	Phenol-d6 (13127-88-3)	1,500
2-Fluorobiphenyl (321-60-8)	1,000	*p*-Terphenyl-d14 (1718-51-0)	1,000
2-Fluorophenol (367-12-4)	1,500	2,4,6-Tribromophenol (118-79-6)	1,500

In methylene chloride, 1 mL/ampul
cat.# 31493 (ea.)

B/N Surrogate Standard Mix (3/90 SOW) (4 components)

1,2-Dichlorobenzene-d4 (2199-69-1)
2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31002 (ea.)
5,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31072 (ea.)
5,000 µg/mL each in methylene chloride, 5 mL/ampul
cat.# 31082 (ea.)

B/N Surrogate Mix (4/89 SOW) (3 components)

2-Fluorobiphenyl (321-60-8)
Nitrobenzene-d5 (4165-60-0)
p-Terphenyl-d14 (1718-51-0)

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	—	33028.25

Acid Matrix Spike Mix (5 components)

4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)

1,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31005 (ea.)
7,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31075 (ea.)
7,500 µg/mL each in methanol, 5 mL/ampul
cat.# 31085 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.*

CLP 04.1 B/N Matrix Spike Mix (4 components)

Acenaphthene (83-32-9)
2,4-Dinitrotoluene (121-14-2)
N-Nitroso-di-*n*-propylamine (621-64-7)
Pyrene (129-00-0)

1,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31492 (ea.)

B/N Matrix Spike Mix (6 components)

Acenaphthene (83-32-9)
1,4-Dichlorobenzene (106-46-7)
2,4-Dinitrotoluene (121-14-2)
N-Nitroso-di-*n*-propylamine (621-64-7)
Pyrene (129-00-0)
1,2,4-Trichlorobenzene (120-82-1)

Each	15-pk.
1,000 µg/mL each in methanol, 1 mL/ampul	
31004	31004.15
5,000 µg/mL each in methanol, 1 mL/ampul	
31074	—
5,000 µg/mL each in methanol, 5 mL/ampul	
31084	—

Low-Concentration Semivolatiles, QA Mixes

SV Tuning Compound

Decafluorotriphenylphosphine (DFTPP) (5074-71-5)

2,500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

No data pack available.

We maintain an active inventory of more than 1,500 different CRMs. If it's in our catalog, your next standard is likely in stock and waiting for your order.

What separates Restek's line of certified reference materials from ordinary reference standards?

10 Critical Steps...

www.restek.com/10steps

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

SOM01.1 (Semivolatiles), Calibration Mixes

SOM01.1 SVOA MegaMix® Standard, Revised (65 components)

MEGAMIX®

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Acetophenone (98-86-2)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl butyl phthalate (85-68-7)
Biphenyl (92-52-4)
Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl-phenylether (101-55-3)
Carbazole (86-74-8)
4-Chloroaniline (106-47-8)
4-Chloro-3-methylphenol (59-50-7)
2-Chloronaphthalene (91-58-7)
2-Chlorophenol (95-57-8)
4-Chlorophenyl-phenylether (7005-72-3)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Dibenzofuran (132-64-9)
3,3'-Dichlorobenzidine (91-94-1)
2,4-Dichlorophenol (120-83-2)
Diethylphthalate (84-66-2)
2,4-Dimethylphenol (105-67-9)
Dimethylphthalate (131-11-3)
Di-*n*-butylphthalate (84-74-2)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octyl phthalate (117-84-0)
Diphenylamine (122-39-4)[1]
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
2-Methylnaphthalene (91-57-6)
2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)*
4-Methylphenol (*p*-cresol) (106-44-5)*
Naphthalene (91-20-3)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
Nitrobenzene (98-95-3)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
N-Nitroso-di-*n*-propylamine (621-64-7)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Pentachlorophenol (87-86-5)
Phenanthrene (85-01-8)
Phenol (108-95-2)
Pyrene (129-00-0)
1,2,4,5-Tetrachlorobenzene (95-94-3)
2,3,4,6-Tetrachlorophenol (58-90-2)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31900 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500 µg/mL.
[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

CLP/SVOA Additions Mix (3 components)

Atrazine (1912-24-9)
Benzaldehyde (100-52-7)
ε-Caprolactam (105-60-2)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31902 (ea.)

SOM01.1 SVOA MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
31900: SOM01.1 SVOA MegaMix Standard, Revised
31902: CLP/SVOA Additions Mix

cat.# 31904 (kit) kit

also available

Rxi®-5Sil MS Capillary Columns
Ideal for semivolatiles analysis
See **pages 32–33** for details.

04.2 and 04.1 (Semivolatiles), Calibration Mixes

CLP 04.1 B/N MegaMix® Standard, Revision 2 (47 components)

MEGAMIX®

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Acetophenone (98-86-2)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(ghi)perylene (191-24-2)
Benzo(k)fluoranthene (207-08-9)
Benzyl butyl phthalate (85-68-7)
Biphenyl (92-52-4)
Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl phenyl ether (101-55-3)
Carbazole (86-74-8)
4-Chloroaniline (106-47-8)
2-Chloronaphthalene (91-58-7)
4-Chlorophenyl phenyl ether (7005-72-3)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Dibenzofuran (132-64-9)
Diethylphthalate (84-66-2)
Dimethylphthalate (131-11-3)
Di-*n*-butyl phthalate (84-74-2)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Di-*n*-octyl phthalate (117-84-0)
Diphenylamine (122-39-4)[1]
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Hexachlorobenzene (118-74-1)
Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Indeno(1,2,3-cd)pyrene (193-39-5)
Isophorone (78-59-1)
2-Methylnaphthalene (91-57-6)
Naphthalene (91-20-3)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
Nitrobenzene (98-95-3)
N-Nitroso-di-*n*-propylamine (621-64-7)
2,2'-Oxybis(1-chloropropane) (108-60-1)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31903 (ea.)

[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

CLP/SVOA Additions Mix (3 components)

Atrazine (1912-24-9)
Benzaldehyde (100-52-7)
ε-Caprolactam (105-60-2)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31902 (ea.)

CLP 04.1 B/N MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
31903: CLP 04.1 B/N MegaMix Standard, Revision 2
31902: CLP/SVOA Additions Mix

cat.# 31905 (kit) kit

tech tip

CLP Semivolatiles Dilution Tip

Atrazine and benzaldehyde react quickly with the methanol stabilizer used in most brands and grades of methylene chloride. This reaction will prevent you from obtaining stable, working-level calibration standards. We prepare our CLP semivolatiles standards from methylene chloride that is stabilized with amylene and is completely free of methanol. We strongly recommend screening the methylene chloride used to dilute these mixtures and confirming that it is free of methanol.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

04.2 and 04.1 (Semivolatiles), Calibration Mixes, *cont.*

CLP 04.1 Phenols Calibration Mix (14 components)

4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
2,4-Dichlorophenol (120-83-2)
2,4-Dimethylphenol (105-67-9)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2-Methylphenol (*o*-cresol) (95-48-7)
4-Methylphenol (*p*-cresol) (106-44-5)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31494 (ea.)

Benzidine Mix (2 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes

SV Calibration Mix #1 (5 components)

Benzyl alcohol (100-51-6)
4-Chloroaniline (106-47-8)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31007 (ea.)

SV Calibration Mix #2 (15 components)

Benzoic acid (65-85-0)
4-Chloro-3-methylphenol (59-50-7)
2-Chlorophenol (95-57-8)
2,4-Dichlorophenol (120-83-2)
2,4-Dimethylphenol (105-67-9)
4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2-Methylphenol (*o*-cresol) (95-48-7)
4-Methylphenol (*p*-cresol) (106-44-5)
2-Nitrophenol (88-75-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
Phenol (108-95-2)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31008 (ea.)

SV Calibration Mix #3 (14 components)

Bis(2-chloroethoxy)methane (111-91-1)
Bis(2-chloroethyl)ether (111-44-4)
Bis(2-ethylhexyl)phthalate (117-81-7)
4-Bromophenyl phenyl ether (101-55-3)
Benzyl butyl phthalate (85-68-7)
2-Chloronaphthalene (91-58-7)
4-Chlorophenyl phenyl ether (7005-72-3)
Dimethylphthalate (131-11-3)
Di-*n*-butylphthalate (84-74-2)
Di-*n*-octylphthalate (117-84-0)
N-Nitrosodimethylamine (62-75-9)
N-Nitroso-di-*n*-propylamine (621-64-7)
N-Nitrosodiphenylamine (86-30-6)
2,2'-Oxybis(1-chloropropane) (108-60-1)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31009 (ea.)

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes, *cont.*

SV Calibration Mix #4 (13 components)

Carbazole (86-74-8)
Dibenzofuran (132-64-9)
Diethyl phthalate (84-66-2)
2,4-Dinitrotoluene (121-14-2)
2,6-Dinitrotoluene (606-20-2)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachlorocyclopentadiene (77-47-4)
Hexachloroethane (67-72-1)
Isophorone (78-59-1)
2-Methylnaphthalene (91-57-6)
Nitrobenzene (98-95-3)
1,2,4-Trichlorobenzene (120-82-1)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31010 (ea.)

SV Calibration Mix #5 / 610 PAH Mix (16 components)

Acenaphthene (83-32-9)
Acenaphthylene (208-96-8)
Anthracene (120-12-7)
Benz(a)anthracene (56-55-3)
Benzo(a)pyrene (50-32-8)
Benzo(b)fluoranthene (205-99-2)
Benzo(k)fluoranthene (207-08-9)
Benzo(ghi)perylene (191-24-2)
Chrysene (218-01-9)
Dibenz(a,h)anthracene (53-70-3)
Fluoranthene (206-44-0)
Fluorene (86-73-7)
Indeno(1,2,3-cd)pyrene (193-39-5)
Naphthalene (91-20-3)
Phenanthrene (85-01-8)
Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31011 (ea.)

SV Calibration Mix #6 (18 components)

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
δ-BHC (319-86-8)
γ-BHC (Lindane) (58-89-9)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in toluene:hexane (1:1), 1 mL/ampul
cat.# 31012 (ea.)

SV Calibration Mix #7 (3 components)

1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31013 (ea.)

3,3'-Dichlorobenzidine

3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 31026 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

605 Benzidines Calibration Mix (2 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes, *cont.*

8270 Benzidines Mix (3 components)

Benzidine (92-87-5)
3,3'-Dichlorobenzidine (91-94-1)
3,3'-Dimethylbenzidine (*o*-tolidine) (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

CLP Semivolatile Calibration Kit #2 (without pesticides)

Contains 1 mL each of these mixtures.
31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neutrals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31026: 3,3'-dichlorobenzidine

cat.# 31462 (kit) **kit**

Semivolatile Calibration Kit #3 (with benzidine)

Contains 1 mL each of these mixtures.
31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neutrals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31030: 605 Benzidines Calibration Mix (benzidine & 3,3'-dichlorobenzidine)

cat.# 31463 (kit) **kit**

03.2 (Semivolatiles), Calibration Mixes

OLC 03.2 SVOA Deuterated Monitoring Compounds (DMC) (16 components)

Acenaphthylene-d8 (93951-97-4)
Anthracene-d10 (1719-06-8)
Benzo(a)pyrene-d12 (63466-71-7)
Bis-(2-chloroethyl)ether-d8 (93952-02-4)
4-Chloroaniline-d4 (191656-33-4)
2-Chlorophenol-d4 (93951-73-6)
2,4-Dichlorophenol-d3 (93951-74-7)
Dimethylphthalate-d6 (85448-30-2)
4,6-Dinitro-2-methylphenol-d2 (93951-76-9)
Fluorene-d10 (81103-79-9)
4-Methylphenol-d8 (190780-66-6)
Nitrobenzene-d5 (4165-60-0)
2-Nitrophenol-d4 (93951-78-1)
4-Nitrophenol-d4 (93951-79-2)
Phenol-d5 (4165-62-2)
Pyrene-d10 (1718-52-1)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31810 (ea.)

N-Nitrosodimethylamine-d6

N-Nitrosodimethylamine-d6 (17829-05-9)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 33910 (ea.)

03.2 (Semivolatiles), Calibration Mixes, *cont.*

Fortification Mix (7 components)

4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)
4-Nitrophenol (100-02-7)
2,4,5-Trichlorophenol (95-95-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31813 (ea.)

3,3'-Dichlorobenzidine

3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

Hexachlorophene

Hexachlorophene (70-30-4)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31811 (ea.)

Low-Concentration Semivolatiles, Calibration Mixes

L/C Phenol Mix A (6 components)

4,6-Dinitro-2-methylphenol (Dinitro-*o*-cresol) (534-52-1)
2,4-Dinitrophenol (51-28-5)
4-Nitrophenol (100-02-7)
Pentachlorophenol (87-86-5)
2,4,6-Tribromophenol (SS) (118-79-6)
2,4,5-Trichlorophenol (95-95-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31208 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Aniline Mix A (3 components)

2-Nitroaniline (88-74-4)
3-Nitroaniline (99-09-2)
4-Nitroaniline (100-01-6)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31210 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Aniline Mix B

4-Chloroaniline (106-47-8)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31211 (ea.)

Additional Required Low-Concentration Semivolatile Mixes:

31024:	B/N Surrogate Mix (4/89 SOW)	page 535
31009:	SV Calibration Mix #3	page 542
31010:	SV Calibration Mix #4	page 542
31011:	SV Calibration Mix #5	page 542
31026:	3,3'-dichlorobenzidine	page 542
31001:	SV Tuning Compound (DFTPP)	page 536

Note: Pesticides are not included in the EPA CLP semivolatile analytical method.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

GPC Calibration Mix

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

CLP GPC Calibration Mix (5 components)

Bis(2-ethylhexyl) phthalate (117-81-7)	10 mg/mL
Corn oil (8001-30-7)	250
Methoxychlor (72-43-5)	2.0
Perylene (198-55-0)	0.2
Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul
cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul
cat.# 32023 (ea.)

No data pack available.

Revised GPC Calibration Mix (5 components)

Bis(2-ethylhexyl) phthalate (117-81-7)	5 mg/mL
Corn oil (8001-30-7)	250
Methoxychlor (72-43-5)	1.0
Perylene (198-55-0)	0.2
Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul
cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul
cat.# 32042 (ea.)

No data pack available.

did you know?

Our **Pesticide Matrix Spike Mix** (cat.# 32018, **page 525**) can be used as a GPC calibration verification solution.

Compound Index for Reference Standards

See **pages 586–592.**

Toxicity Characteristic Leaching Procedure (TCLP)

Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP])

TCLP VOA Mix (11 components)

Benzene (71-43-2)
2-Butanone (MEK) (78-93-3)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
Tetrachloroethene (127-18-4)
Trichloroethene (79-01-6)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30024 (ea.)

TCLP Acid Mix (6 components)

2-Methylphenol (*o*-cresol) (95-48-7)
3-Methylphenol (*m*-cresol) (108-39-4)
4-Methylphenol (*p*-cresol) (106-44-5)
Pentachlorophenol (87-86-5)
2,4,5-Trichlorophenol (95-95-4)
2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31027 (ea.)

TCLP B/N Mix (7 components)

1,4-Dichlorobenzene (106-46-7)
2,4-Dinitrotoluene (121-14-2)
Hexachlorobenzene (118-74-1)
Hexachlorobutadiene (87-68-3)
Hexachloroethane (67-72-1)
Nitrobenzene (98-95-3)
Pyridine (110-86-1)

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

TCLP Pesticide Mix (5 components)

γ-BHC (Lindane) (58-89-9)
Endrin (72-20-8)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Methoxychlor (72-43-5)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32013 (ea.)

TCLP Herbicide Mix (2 components)

2,4-D (free acid) (94-75-7)
2,4,5-TP (Silvex) (free acid) (93-72-1)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32014 (ea.)

TCLP Toxaphene Mix

Toxaphene (8001-35-2)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

TCLP Chlordane Mix

Chlordane (57-74-9)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32016 (ea.)

Trihalomethanes

Method 501.1, 501.2, 501.3 (Trihalomethanes)

501 Trihalomethane Mix (4 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30036 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30211 (ea.)

DW-VOC Mix #1 (8 components)

Benzene (71-43-2)
Carbon tetrachloride (56-23-5)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
1,1,1-Trichloroethane (71-55-6)
Trichloroethene (79-01-6)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30219 (ea.)

DW-VOC Mix #2 (12 components)

Chlorobenzene (108-90-7)
1,2-Dichlorobenzene (95-50-1)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
Ethylbenzene (100-41-4)
Styrene (100-42-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30220 (ea.)

DW-VOC Mix #3 (3 components)

Methylene chloride (dichloromethane) (75-09-2)
1,2,4-Trichlorobenzene (120-82-1)
1,1,2-Trichloroethane (79-00-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30235 (ea.)

DW-VOC Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30211: 501 Trihalomethane Mix
30219: DW-VOC Mix #1
30220: DW-VOC Mix #2
30235: DW-VOC Mix #3

Contains 1 mL each of these mixtures.
cat.# 30221 (kit) kit

Reference Standards Documentation Search

Locate SDSs, certificates, & data packs by cat. # or lot #

www.restek.com/**documentation**

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Volatile Organics

Individual VOA Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Benzene-d6	1076-43-3	PTM	2,000	30025
2-Bromochlorobenzene	694-80-4	PTM	2,000	30228
4-Bromochlorobenzene	106-39-8	PTM	2,000	30230
Bromochloromethane	74-97-5	PTM	2,000	30225
2-Bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
Chlorobenzene-d5	3114-55-4	PTM	2,000	30223
1-Chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1,2-Dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
1,4-Dichlorobutane	110-56-5	PTM	2,000	30227
1,2-Dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Ethylbenzene-d5	20302-26-5	PTM	2,000	30028
Ethylbenzene-d10	25837-05-2	PTM	2,000	30029
Fluorobenzene	462-06-6	PTM	2,000	30030
Pentafluorobenzene	363-72-4	PTM	2,000	30031
Toluene-d8	2037-26-5	PTM	2,000	30224
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

Method 501.1, 501.2, 501.3 (Trihalomethanes)

See page 545.

Antifoam Agent for Purge-and-Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search "31822" at www.restek.com).

Neat, 1 mL/ampul

cat.# 31822 (ea.)

No data pack available.

Quantity Discounts Available

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— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

Method 502.1, 502.2 (Volatile Halogenated Organics)

502.2 Internal Standard #1

1-Chloro-2-fluorobenzene (348-51-6)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30040 (ea.)

502.2 Internal Standard Mix #2 (2 components)

2-Bromo-1-chloropropane (3017-95-6)
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30041 (ea.)

8021/502.2 Surrogate Mix #1 (3 components)

1-Bromo-2-chloroethane (107-04-0)
1-Chloro-3-fluorobenzene (625-98-9)
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30463 (ea.)

Volatiles MegaMix® Standard With Gases

MEGAMIX®

(60 components)

Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Bromomethane (methyl bromide) (74-83-9)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroethane (ethyl chloride) (75-00-3)
Chloroform (67-66-3)
Chloromethane (methyl chloride) (74-87-3)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
Dichlorodifluoromethane (CFC-12) (75-71-8)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyltoluene (*p*-Cymene) (99-87-6)
Methylene chloride (dichloromethane) (75-09-2)
Naphthalene (91-20-3)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
Trichlorofluoromethane (CFC-11) (75-69-4)
1,2,3-Trichloropropane (96-18-4)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
Vinyl chloride (75-01-4)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30603 (ea.)

Volatile Organics

Method 502.1, 502.2 (Volatile Halogenated Organics), *cont.*

502.2 MegaMix® Standard (54 components)

MEGAMIX®

Includes all target analytes except the six gases, which are available separately as 502.2 Calibration Mix #1.

Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyltoluene (*p*-cymene) (99-87-6)
Methylene chloride (dichloromethane) (75-09-2)
Naphthalene (91-20-3)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,2,3-Trichloropropane (96-18-4)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30432 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30431 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

502.2 Calibration Mix #2 (14 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
Chloroform (67-66-3)
1,1-Dichloroethane (75-34-3)
1,1-Dichloroethene (75-35-4)
trans-1,2-Dichloroethene (156-60-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Methylene chloride (dichloromethane) (75-09-2)
1,1,1-Trichloroethane (71-55-6)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30043 (ea.)

502.2 Calibration Mix #3 (14 components)

Bromochloromethane (74-97-5)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichloroethane (107-06-2)
cis-1,2-Dichloroethene (156-59-2)
1,2-Dichloropropane (78-87-5)
1,1-Dichloropropene (563-58-6)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
1,1,2-Trichloroethane (79-00-5)
1,2,3-Trichloropropane (96-18-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30044 (ea.)

502.2 Calibration Mix #4 (9 components)

Benzene (71-43-2)
tert-Butylbenzene (98-06-6)
Chlorobenzene (108-90-7)
Isopropylbenzene (cumene) (98-82-8)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
Toluene (108-88-3)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30045 (ea.)

502.2 Calibration Mix #5 (10 components)

Bromobenzene (108-86-1)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
2-Chlorotoluene (95-49-8)
1,3-Dichlorobenzene (541-73-1)
Ethylbenzene (100-41-4)
1,2,4-Trichlorobenzene (120-82-1)
1,2,4-Trimethylbenzene (95-63-6)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30046 (ea.)

502.2 Calibration Mix #6 (7 components)

4-Chlorotoluene (106-43-4)
1,2-Dichlorobenzene (95-50-1)
1,4-Dichlorobenzene (106-46-7)
Hexachlorobutadiene (87-68-3)
4-Isopropyltoluene (*p*-Cymene) (99-87-6)
Naphthalene (91-20-3)
1,2,3-Trichlorobenzene (87-61-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30047 (ea.)

502.2 VOA Calibration Kit #1 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6

cat.# 30444 (kit) **kit**

502.2 VOA Calibration Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix Standard

cat.# 30445 (kit) **kit**

502.2 VOA Calibration Kit #3 (200 µg/mL)

Contains 1 mL each of these mixtures.
30439: 502.2 Calibration Mix #1
30432: 502.2 MegaMix Standard

cat.# 30446 (kit) **kit**

Volatile Organics, *cont.*

Method 504.1 (Ethylene Dibromide/ Dibromochloropropane)

504.1 Calibration Mix (3 components)

1,2-Dibromo-3-chloropropane (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
1,2,3-Trichloropropane (96-18-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30239 (ea.)

Method 522 (1,4-Dioxane)

See page 519.

Method 524.1, 524.2 (Volatile Organics)

524 Internal Standard/Surrogate Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
1,2-Dichlorobenzene-d4 (2199-69-1)
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30201 (ea.)

Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
α,α,α-Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

524.2 Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
1,2-Dichlorobenzene-d4 (2199-69-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30607 (ea.)

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

No data pack available.

Antifoam Agent for Purge-and-Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search "31822" at www.restek.com).

Neat, 1 mL/ampul
cat.# 31822 (ea.)

No data pack available.

Method 524.1, 524.2 (Volatile Organics), *cont.*

Volatiles MegaMix® Standard With Gases (60 components)

MEGAMIX®

Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Bromomethane (methyl bromide) (74-83-9)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroethane (ethyl chloride) (75-00-3)
Chloroform (67-66-3)
Chloromethane (methyl chloride) (74-87-3)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
Dichlorodifluoromethane (CFC-12) (75-71-8)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyltoluene (*p*-Cymene) (99-87-6)
Methylene chloride (dichloromethane) (75-09-2)
Naphthalene (91-20-3)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
Trichlorofluoromethane (CFC-11) (75-69-4)
1,2,3-Trichloropropane (96-18-4)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
Vinyl chloride (75-01-4)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30603 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

Ketones Mix, 524.2 Rev. 4.1 (5 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
1,1-Dichloro-2-propanone (513-88-2)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30602 (ea.)

Oxygenates Standard (5 components)

tert-Amyl ethyl ether (TAEE) (919-94-8)	2,000 µg/mL
tert-Amyl methyl ether (TAME) (994-05-8)	2,000
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30619 (ea.)

Volatile Organics, *cont.*

Method 524.1, 524.2 (Volatile Organics), *cont.*

Drinking Water VOA MegaMix® Standard, 524.2 Rev. 4.1 (73 components)

MEGAMIX®

Acrylonitrile (107-13-1)
Allyl chloride (3-chloropropene) (107-05-1)
Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chloroacetonitrile (107-14-2)
Chlorobenzene (108-90-7)
1-Chlorobutane (Butyl chloride) (109-69-3)
Chlorodibromomethane (dibromochloromethane) (124-48-1)
Chloroform (67-66-3)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (ethylene dibromide) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
trans-1,4-Dichloro-2-butene (110-57-6)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Diethyl ether (ethyl ether) (60-29-7)
Ethylbenzene (100-41-4)
Ethyl methacrylate (97-63-2)
Hexachloro-1,3-butadiene (87-68-3)
Hexachloroethane (67-72-1)
Iodomethane (methyl iodide) (74-88-4)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyltoluene (*p*-cymene) (99-87-6)
Methacrylonitrile (126-98-7)
Methyl acrylate (96-33-3)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Methylene chloride (dichloromethane) (75-09-2)
Methyl methacrylate (80-62-6)
Naphthalene (91-20-3)
Nitrobenzene (98-95-3)
2-Nitropropane (79-46-9)
Pentachloroethane (76-01-7)
Propionitrile (ethylcyanide) (107-12-0)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Tetrahydrofuran (109-99-9)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,2,3-Trichloropropane (96-18-4)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30601 (ea.)

524 Calibration Mix #7A (5 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)
Tetrahydrofuran (109-99-9)

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30300 (ea.)

524 Calibration Mix #7B (7 components)

Acrylonitrile (107-13-1)
Allyl chloride (3-chloropropene) (107-05-1)
Ethyl methacrylate (97-63-2)
Methyl acrylate (96-33-3)
Methyl methacrylate (80-62-6)
Nitrobenzene (98-95-3)
Pentachloroethane (76-01-7)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30304 (ea.)

524 Calibration Mix #7 Kit

Contains 1 mL each of these mixtures.
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B

cat.# 30202 (kit) **kit**

524 Calibration Mix #8 (12 components)

Carbon disulfide (75-15-0)
Chloroacetonitrile (107-14-2)
1-Chlorobutane (Butyl chloride) (109-69-3)
trans-1,4-Dichloro-2-butene (110-57-6)
1,1-Dichloro-2-propanone (513-88-2)
Diethyl ether (ethyl ether) (60-29-7)
Hexachloroethane (67-72-1)
Iodomethane (methyl iodide) (74-88-4)
Methacrylonitrile (126-98-7)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
2-Nitropropane (79-46-9)
Propionitrile (107-12-0)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30203 (ea.)

524 Rev. 4.0 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30201: 524 Internal Standard/Surrogate Mix
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B
30203: 524 Calibration Mix #8

cat.# 30204 (kit) **kit**

524 Rev. 4.0 VOA Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix Standard
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B
30203: 524 Calibration Mix #8
30201: 524 Surrogate/Internal Standard Mix

cat.# 30447 (kit) **kit**

Compound Index for Reference Standards

See **pages 586–592.**

Volatile Organics, *cont.*

Method 524.3 (Purgeable Organics in Drinking Water)

UCMR3 Method 524.3 Standard (9 components)

Bromochloromethane (74-97-5)	600 µg/mL	Chlorodifluoromethane (CFC-22) (75-45-6)	800
Bromomethane (methyl bromide) (74-83-9)	2,000	Chloromethane (methyl chloride) (74-87-3)	2,000
1,3-Butadiene (106-99-0)	1,000	1,1-Dichloroethane (75-34-3)	300
sec-Butylbenzene (135-98-8)	400	*n*-Propylbenzene (103-65-1)	300
		1,2,3-Trichloropropane (96-18-4)	300

In P&T methanol, 1 mL/ampul

cat.# 30642 (ea.)

EPA 524.3 Reference Standards

- Full 82-component EPA 524.3 list using as few as three ampuls—reduce prep time and chances for error or contamination.
- EPA 524.3 VOA MegaMix® ampul includes oxygenates group—no need to order separately.
- Volatile gases prepared separately—replace shorter-life components without wasting money on full list.
- Two options for internal and surrogate standards—separate or combined mix.
- Certified reference materials (CRMs) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also ideal for surface water and groundwater testing.

In support of the U.S. Safe Drinking Water Act (SDWA), Restek offers a complete set of EPA 524.3 reference standards for the monitoring of purgeable organic compounds in drinking water—using as few as three ampuls! In addition, this collection of certified reference materials (CRMs) also covers the seven volatile organic compounds (VOCs) included in the Unregulated Contaminant Monitoring Rule 3 (UCMR3), which requires monitoring of all public drinking water systems with 10,000 or more customers.

524.3 VOA MegaMix® Standard

MEGAMIX®

(69 components)

Allyl chloride (3-chloropropene) (107-05-1)
tert-Amyl ethyl ether (TAEE) (919-94-8)
tert-Amyl methyl ether (TAME) (994-05-8)
Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
tert-Butanol (TBA) (75-65-0)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
1-Chlorobutane (butyl chloride) (109-69-3)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (96-12-8)
Dibromomethane (74-95-3)
1,2-Dibromoethane (EDB) (106-93-4)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Diethyl ether (ethyl ether) (60-29-7)
Diisopropyl ether (DIPE) (108-20-3)
Ethylbenzene (100-41-4)
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)
Ethyl methacrylate (97-63-2)
Hexachlorobutadiene (87-68-3)
Hexachloroethane (67-72-1)
Iodomethane (methyl iodide) (74-88-4)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyltoluene (*p*-cymene) (99-87-6)
Methyl acetate (79-20-9)
Methyl-*tert*-butyl ether (MTBE) (1634-04-4)
Methylene chloride (dichloromethane) (75-09-2)
Naphthalene (91-20-3)
Pentachloroethane (76-01-7)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
Tetrachloroethene (127-18-4)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrahydrofuran (109-99-9)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,2,3-Trichloropropane (96-18-4)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30013 (ea.)

524.3 Gas Calibration Mix (7 components)

Bromomethane (methyl bromide) (74-83-9)
1,3-Butadiene (106-99-0)
Chlorodifluoromethane (CFC-22) (75-45-6)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30014 (ea.)

524.3 Internal Standard Mix (3 components)

Chlorobenzene-d5 (3114-55-4)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Difluorobenzene (540-36-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30015 (ea.)

524.3 Surrogate Standard (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Methyl-d3-*tert*-butyl ether (29366-08-3)
1,2-Dichlorobenzene-d4 (2199-69-1)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30016 (ea.)

524.3 Internal Standard/Surrogate Mix (6 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Methyl-d3-*tert*-butyl ether (29366-08-3)
Chlorobenzene-d5 (3114-55-4)
1,2-Dichlorobenzene-d4 (2199-69-1)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Difluorobenzene (540-36-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30017 (ea.)

Volatile Organics, *cont.*

Method 601 (Purgeable Hydrocarbons)

VOA Purgeable Halocarbon Mix #1 (23 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Methylene chloride (dichloromethane) (75-09-2)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30212 (ea.)

Method 603 (Acrolein & Acrylonitrile)

Acrolein/Acrylonitrile (2 components)

Acrolein (107-02-8)
Acrylonitrile (107-13-1)

2,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30600 (ea.)

Must ship overnight on ice.
This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrolein

Acrolein (107-02-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrylonitrile

Acrylonitrile (107-13-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30246 (ea.)

Reference Standards Search

Search by compound name, synonym, or CAS #.

www.restek.com/**reference**

Method 624 (Purgeable Halocarbons)

Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

Benzene (71-43-2)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Methylene chloride (dichloromethane) (75-09-2)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30497 (ea.)

624 Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)
2-Bromo-1-chloropropane (3017-95-6)
1,4-Dichlorobutane (110-56-5)

1,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30023 (ea.)

624 Surrogate Standard Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Fluorobenzene (462-06-6)
Pentafluorobenzene (363-72-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30243 (ea.)

Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
α,α,α-Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

624 Calibration Mix #2 (12 components)

Benzene (71-43-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Dibromochloromethane (124-48-1)
1,1-Dichloroethane (75-34-3)
1,1-Dichloroethene (75-35-4)
1,2-Dichloropropane (78-87-5)
Methylene chloride (dichloromethane) (75-09-2)
Tetrachloroethene (127-18-4)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30021 (ea.)

Volatile Organics, *cont.*

Method 624 (Purgeable Halocarbons), *cont.*

624 Calibration Mix #3 (14 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Chloroform (67-66-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
trans-1,2-Dichloroethene (156-60-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
1,1,2,2-Tetrachloroethane (79-34-5)
Toluene (108-88-3)
1,1,1-Trichloroethane (71-55-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30022 (ea.)

624 Complete Kit

Contains 1 mL each of these mixtures.
30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix
30243: 624 Surrogate Standard Mix

cat.# 30244 (kit) kit

624 Kit

Contains 1 mL each of these mixtures.
30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix

cat.# 30055 (kit) kit

Method 8010 (Halogenated Volatile Organics)

624 Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)
2-Bromo-1-chloropropane (3017-95-6)
1,4-Dichlorobutane (110-56-5)

1,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30023 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

Method 8010 (Halogenated Volatile Organics), *cont.*

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

tech tip

To analyze compounds listed in Methods 8010 and 8020 concurrently, add BTEX standard to the calibration curve mix.

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

High-Purity VOC Regulators

See **page 453.**

Volatile Organics, *cont.*

Method 8011 (1,2-Dibromoethane & 1,2-Dibromo-3-chloropropane)

8011 Calibration Mix—EDB/DBCP (2 components)

1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30062 (ea.)

Method 8020 (Aromatic Volatile Organics)

Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

8020A Calibration Mix (10 components)

Benzene (71-43-2)
Chlorobenzene (108-90-7)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30222 (ea.)

Method 8021 (Volatile Organics)

502.2 Internal Standard Mix #2 (2 components)

2-Bromo-1-chloropropane (3017-95-6)
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30041 (ea.)

8021/502.2 Surrogate Mix #1 (3 components)

1-Bromo-2-chloroethane (107-04-0)
1-Chloro-3-fluorobenzene (625-98-9)
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30463 (ea.)

Restek® innovation!

Xylene-Free, Highly Purified Chloroprene Standard

The R&D chemists at Restek developed a novel procedure that produces a pure, quantitative chloroprene solution specially stabilized in purge-and-trap grade methanol. The entire procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene. The final solution is specially stabilized, allowing analysts to make dilutions for working standards in unmodified purge-and-trap grade methanol.

Note: Because chloroprene is not analyzed by many laboratories, it is not included in our 8240 VOA mixes. Chloroprene is included in our 8260B MegaMix® calibration mix. Refer to **page 555.**

Method 8240 (Volatile Organic Compounds [VOCs])

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

VOA Calibration Mix #1 (ketones) (4 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

VOA Purgeable Halocarbon Mix #1 (23 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethyl vinyl ether (110-75-8)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Methylene chloride (dichloromethane) (75-09-2)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30212 (ea.)

8240 Volatiles Mix #1A (12 components)

Allyl chloride (3-chloropropene) (107-05-1)
Benzyl chloride (100-44-7)
1,2-Dibromo-3-chloropropane (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
cis-1,4-Dichloro-2-butene (1476-11-5)
trans-1,4-Dichloro-2-butene (110-57-6)
1,4-Dioxane (123-91-1)
Iodomethane (methyl iodide) (74-88-4)
Pentachloroethane (76-01-7)
1,1,1,2-Tetrachloroethane (630-20-6)
1,2,3-Trichloropropane (96-18-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30217 (ea.)

8240 Volatiles Mix #2A (3 components)

Carbon disulfide (75-15-0)
2-Picoline (109-06-8)
Pyridine (110-86-1)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30218 (ea.)

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465**.

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Volatile Organics, *cont.*

Method 8240 (Volatile Organic Compounds [VOCs]), *cont.*

8240 Nitriles Mix (7 components)

Acrylonitrile (107-13-1)
Ethyl methacrylate (97-63-2)
Malononitrile (109-77-3)
Methacrylonitrile (126-98-7)
Methyl methacrylate (80-62-6)
Propionitrile (107-12-0)
Styrene (100-42-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30215 (ea.)

8240 Alcohols Mix (5 components)

Allyl alcohol (2-propen-1-ol) (107-18-6)
2-Chloroethanol (107-07-3)
Ethanol (64-17-5)
Isobutyl alcohol (78-83-1)
Propargyl alcohol (107-19-7)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30214 (ea.)

Glycols Standard (2 components)

Ethylene glycol (107-21-1)
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

BTEX Standard (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

Benzene (71-43-2)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

cylinder design

Spectra (Linde) 104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

8260A Internal Standard Mix (3 components)

Chlorobenzene-d5 (3114-55-4)
1,4-Dichlorobenzene-d4 (3855-82-1)
Fluorobenzene (462-06-6)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30241 (ea.)

8260 Internal Standard Mix (4 components)

Chlorobenzene-d5 (3114-55-4)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Difluorobenzene (540-36-3)
Pentafluorobenzene (363-72-4)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30074 (ea.)

8260A Surrogate Mix (4 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Dibromofluoromethane (1868-53-7)
1,2-Dichloroethane-d4 (17060-07-0)
Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30240 (ea.)

8260 Surrogate Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Dibromofluoromethane (1868-53-7)
Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30073 (ea.)

8260B Matrix Spike Mix (5 components)

Benzene (71-43-2)
Chlorobenzene (108-90-7)
1,1-Dichloroethene (75-35-4)
Toluene (108-88-3)
Trichloroethylene (79-01-6)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30479 (ea.)

8240/8260 System Performance Check Mix (5 components)

Bromoform (75-25-2)
Chlorobenzene (108-90-7)
Chloromethane (methyl chloride) (74-87-3)
1,1-Dichloroethane (75-34-3)
1,1,2,2-Tetrachloroethane (79-34-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30075 (ea.)

1-Bromo-4-fluorobenzene (BFB)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30026 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30067 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30082 (ea.)

1,4-Dioxane-d8

1,4-Dioxane-d8 (17647-74-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30614 (ea.)

Volatile Organics, *cont.*

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul

cat.# 30482 (ea.)

No data pack available.

8260B MegaMix® Calibration Mix

MEGAMIX®

(76 components)

Acetonitrile (75-05-8)
Acrylonitrile (107-13-1)
Allyl chloride (3-chloropropene) (107-05-1)
Benzene (71-43-2)
Bromobenzene (108-86-1)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
n-Butylbenzene (104-51-8)
sec-Butylbenzene (135-98-8)
tert-Butylbenzene (98-06-6)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
2-Chloroethanol (107-07-3)
Chloroform (67-66-3)
Chloroprene (2-chloro-1,3-butadiene) (126-99-8)
2-Chlorotoluene (95-49-8)
4-Chlorotoluene (106-43-4)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
Dibromomethane (74-95-3)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
cis-1,4-Dichloro-2-butene (1476-11-5)
trans-1,4-Dichloro-2-butene (110-57-6)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
1,3-Dichloropropane (142-28-9)
2,2-Dichloropropane (594-20-7)
1,1-Dichloropropene (563-58-6)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Diethyl ether (ethyl ether) (60-29-7)
1,4-Dioxane (123-91-1)
Ethylbenzene (100-41-4)
Ethyl methacrylate (97-63-2)
Hexachloro-1,3-butadiene (87-68-3)
Iodomethane (methyl iodide) (74-88-4)
Isobutyl alcohol (2-methyl-1-propanol) (78-83-1)
Isopropylbenzene (cumene) (98-82-8)
4-Isopropyl toluene (*p*-Cymene) (99-87-6)
Methacrylonitrile (126-98-7)
Methyl acrylate (96-33-3)
Methyl methacrylate (80-62-6)
Methylene chloride (dichloromethane) (75-09-2)
Naphthalene (91-20-3)
Nitrobenzene (98-95-3)
2-Nitropropane (79-46-9)
Pentachloroethane (76-01-7)
Propionitrile (107-12-0)
n-Propylbenzene (103-65-1)
Styrene (100-42-5)
1,1,1,2-Tetrachloroethane (630-20-6)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Tetrahydrofuran (109-99-9)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,2,3-Trichloropropane (96-18-4)
1,1,2-Trichlorotrifluorethane (CFC-113) (76-13-1)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30633 (ea.)

8260B MegaMix® Calibration Mix, Revised (75 components)

MEGAMIX®

Same list as above, but without pentachloroethane.

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30152 (ea.)

2-Chloroethyl Vinyl Ether

2-Chloroethyl vinyl ether (110-75-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30265 (ea.)

8260B MegaMix® Calibration Mix Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
30633: 8260B MegaMix Calibration Mix
30265: 2-chlorethyl vinyl ether

cat.# 30475 (kit)

kit

8240/8260 Calibration Check Mix (6 components)

Chloroform (67-66-3)
1,1-Dichloroethene (75-35-4)
1,2-Dichloropropane (78-87-5)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30427 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30042 (ea.)

8260B Acetate Mix (5 components)

n-Butyl acetate (123-86-4)
Ethyl acetate (141-78-6)
Isopropyl acetate (108-21-4)
n-Propyl acetate (109-60-4)
Vinyl acetate (108-05-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30477 (ea.)

8260B Acetate Mix (Revised) (7 components)

n-Amyl acetate (628-63-7)
Butyl acetate (123-86-4)
Ethyl acetate (141-78-6)
Isopropyl acetate (108-21-4)
Methyl acetate (79-20-9)
Propyl acetate (109-60-4)
Vinyl acetate (108-05-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30489 (ea.)

California Oxygenates Mix (5 components)

tert-Amyl methyl ether (TAME) (994-05-8)	2,000 µg/mL
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	2,000

In P&T methanol, 1 mL/ampul

cat.# 30465 (ea.)

Oxygenates (6 components)

tert-Amyl ethyl ether (TAEE) (919-94-8)	2,000 µg/mL
tert-Amyl methyl ether (TAME) (994-05-8)	2,000
tert-Butanol (TBA) (75-65-0)	10,000
Diisopropyl ether (DIPE) (108-20-3)	2,000
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)	2,000
Methyl *tert*-butyl ether (MTBE) (1634-04-4)	2,000

In P&T methanol, 1 mL/ampul

cat.# 30626 (ea.)

Volatile Organics, *cont.*

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

Single-Component Oxygenates Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
tert-Amyl alcohol	75-85-4	PTM	10,000	30631
tert-Amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
tert-Butanol (TBA)	75-65-0	PTM	50,000	30470
tert-Butanol-d9	25725-11-5	PTM	20,000	30618
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
Ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Methanol	67-56-1	W	10,000	30467
Methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water

also available

Rtx®-VMS Column

Your best choice for EPA Method 8260

- Fastest cycle times for VOCs.
- Tuned selectivity for VOCs.
- Excellent separation of gases.

See **page 78** for more information.

Acrolein

Acrolein (107-02-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

1,2-Dichlorotetrafluoroethane (CFC-114)

1,2-Dichlorotetrafluoroethane (CFC-114) (76-14-2)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30476 (ea.)

Chloroprene

A pure, quantitative chloroprene solution, specially stabilized in purge-and-trap grade methanol to allow dilutions for working standards in unmodified purge-and-trap methanol. The entire preparation procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene.

Chloroprene (126-99-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30238 (ea.)

Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

8260A Volatile Organics Kit (2,000 µg/mL)

Changes in this revision of the method include modification of the recommended internal standard and surrogate solutions.

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500 µg/mL)
30240: 8260A Surrogate Mix (2,500 µg/mL)
30241: 8260A Internal Standard Mix (2,500 µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30242 (kit) **kit**

8260 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500 µg/mL)
30073: 8260 Surrogate Mix (2,500 µg/mL)
30074: 8260 Internal Standard Mix (2,500 µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30076 (kit) **kit**

TCLP VOA Mix (11 components)

Benzene (71-43-2)
2-Butanone (MEK) (78-93-3)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
Tetrachloroethene (127-18-4)
Trichloroethene (79-01-6)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30024 (ea.)

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465** or visit www.restek.com/iso

Volatile Organics, *cont.*

SOM01.1 (Volatiles), QA Mixes

SOM01.1 VOA Non-Ketone Deuterated Monitoring Compounds (11 components)

Benzene-d6 (1076-43-3)
Chloroethane-d5 (19199-91-8)
Chloroform-d (865-49-6)
1,2-Dichlorobenzene-d4 (2199-69-1)
1,2-Dichloroethane-d4 (17060-07-0)
1,1-Dichloroethene-d2 (22280-73-5)
1,2-Dichloropropane-d6 (93952-08-0)
1,3-Dichloropropene-d4 (202656-23-3)*
1,1,2,2-Tetrachloroethane-d2 (33685-54-0)
Toluene-d8 (2037-26-5)
Vinyl chloride-d3 (6745-35-3)

500 µg/mL each in deuterated methanol (MeOD), 1 mL/ampul
cat.# 30624 (ea.)

*Mix of *cis* and *trans* isomers. Exact proportions will be reported on the data sheet.

SOM01.1 VOA Ketone Deuterated Monitoring Compounds (2 components)

2-Butanone-d5 (24313-50-6)
2-Hexanone-d5 (4840-82-8)

500 µg/mL each in deuterium oxide (D_2O), 1 mL/ampul
cat.# 30625 (ea.)

SOM01.1 VOA DMC Kit

500 µg/mL. 1 mL each of these mixtures.
30624: Non-Ketones
30625: Ketones

500 µg/mL. 1 mL each of these mixtures.
cat.# 30630 (kit) **kit**

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes

CLP 04.1 VOA Internal Standard/SMC Spike Mix (6 components)

Bromochloromethane (74-97-5)
1-Bromo-4-fluorobenzene (BFB) (460-00-4)
Chlorobenzene-d5 (3114-55-4)
1,2-Dichloroethane-d4 (17060-07-0)
1,4-Difluorobenzene (540-36-3)
Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30457 (ea.)

VOA Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)
1,4-Difluorobenzene (540-36-3)
Chlorobenzene-d5 (3114-55-4)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30011 (ea.)

VOA Surrogate Spike Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)
1,2-Dichloroethane-d4 (17060-07-0)
Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30004 (ea.)

VOA Matrix Spike Mix (5 components)

Benzene (71-43-2)
Chlorobenzene (108-90-7)
1,1-Dichloroethene (75-35-4)
Toluene (108-88-3)
Trichloroethene (79-01-6)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30005 (ea.)

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes, *cont.*

VOA Tuning Compound

1-Bromo-4-fluorobenzene (BFB) (460-00-4)

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30003 (ea.)

PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

No data pack available.

L/C VOA Lab Control Sample

We prepare the L/C VOA lab control sample in two parts. Sample #1 contains all compounds except vinyl chloride because this compound is extremely volatile and must be replaced frequently. Sample #2 contains vinyl chloride.

L/C VOA Lab Control Sample #1 (11 components)

Benzene (71-43-2)
Bromoform (75-25-2)
Carbon tetrachloride (56-23-5)
1,2-Dibromoethane (EDB) (106-93-4)
1,4-Dichlorobenzene (106-46-7)
1,2-Dichloroethane (107-06-2)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
Tetrachloroethene (127-18-4)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30092 (ea.)

L/C VOA Lab Control Sample #2 (Vinyl chloride)

Vinyl chloride (75-01-4)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30093 (ea.)

L/C VOA Internal Standard Mix (3 components)

Chlorobenzene-d5 (3114-55-4)
1,4-Dichlorobenzene-d4 (3855-82-1)
1,4-Difluorobenzene (540-36-3)

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30091 (ea.)

Volatile Organics, *cont.*

04.2 and 04.1 (Volatiles), Calibration Mixes

CLP 04.1 VOA CAL2000 MegaMix® Standard

MEGAMIX®

(40 components)

Benzene (71-43-2)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
Cyclohexane (110-82-7)
Dibromochloromethane (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Isopropylbenzene (cumene) (98-82-8)
Methyl acetate (79-20-9)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Methylcyclohexane (108-87-2)
Methylene chloride (dichloromethane) (75-09-2)
Styrene (100-42-5)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (76-13-1)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30456 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride) (74-87-3)
Dichlorodifluoromethane (CFC-12) (75-71-8)
Trichlorofluoromethane (CFC-11) (75-69-4)
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

VOA Calibration Mix #1 (ketones) (4 components)

Acetone (67-64-1)
2-Butanone (MEK) (78-93-3)
2-Hexanone (591-78-6)
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

CLP 04.1 VOA Kit #3

Contains 1 mL each of these mixtures.
30006: VOA Calibration Mix #1 (ketones)
30042: 502.2 Calibration Mix #1 (gases)
30456: CLP 04.1 VOA CAL2000 MegaMix Standard

cat.# 30460 (kit) kit

3/90 SOW (Volatiles), Calibration Mixes

CLP VOA CAL2000 MegaMix® Standard

MEGAMIX®

(28 components)

Benzene (71-43-2)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
Dibromochloromethane (124-48-1)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Methylene chloride (dichloromethane) (75-09-2)
Styrene (100-42-5)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
m-Xylene (108-38-3)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30632 (ea.)

Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

CLP VOA CAL2000 MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
30632: CLP VOA CAL2000 MegaMix Standard
30216: vinyl acetate

cat.# 30438 (kit) kit

VOA Calibration Mix #2 (7 components)

Benzene (71-43-2)
Carbon disulfide (75-15-0)
Ethylbenzene (100-41-4)
Toluene (108-88-3)
Vinyl acetate (108-05-4)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30007 (ea.)

VOA Calibration Mix #3 (10 components)

Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
1,1-Dichloroethane (75-34-3)
1,1-Dichloroethene (75-35-4)
1,2-Dichloropropane (78-87-5)
Methylene chloride (dichloromethane) (75-09-2)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
m-Xylene (108-38-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30008 (ea.)

VOA Calibration Mix #4 (12 components)

Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Dibromochloromethane (124-48-1)
1,2-Dichloroethane (107-06-2)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Styrene (100-42-5)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
1,1,1-Trichloroethane (71-55-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30009 (ea.)

Volatile Organics, *cont.*

3/90 SOW (Volatiles), Calibration Mixes, *cont.*

VOA Calibration Mix #5 (gases) (4 components)

Bromomethane (methyl bromide) (74-83-9)
Chloroethane (ethyl chloride) (75-00-3)
Chloromethane (methyl chloride (74-87-3)
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30010 (ea.)

CLP VOA Calibration Kit #2

Contains 1 mL each of these mixtures.
30006: VOA Calibration Mix #1 (ketones)
30010: VOA Calibration Mix #5 (gases)
30632: CLP VOA CAL2000 MegaMix Standard
30216: Vinyl acetate

cat.# 30442 (kit) kit

OLC 03.2 (Volatiles), Calibration Mixes

OLC 03.2 VOA MegaMix® Standard

MEGAMIX®

(42 components)

Benzene (71-43-2)
Bromochloromethane (74-97-5)
Bromodichloromethane (75-27-4)
Bromoform (75-25-2)
Carbon disulfide (75-15-0)
Carbon tetrachloride (56-23-5)
Chlorobenzene (108-90-7)
Chloroform (67-66-3)
Cyclohexane (110-82-7)
Dibromochloromethane (chlorodibromomethane) (124-48-1)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
1,2-Dibromoethane (EDB) (106-93-4)
1,2-Dichlorobenzene (95-50-1)
1,3-Dichlorobenzene (541-73-1)
1,4-Dichlorobenzene (106-46-7)
1,1-Dichloroethane (75-34-3)
1,2-Dichloroethane (107-06-2)
1,1-Dichloroethene (75-35-4)
cis-1,2-Dichloroethene (156-59-2)
trans-1,2-Dichloroethene (156-60-5)
1,2-Dichloropropane (78-87-5)
cis-1,3-Dichloropropene (10061-01-5)
trans-1,3-Dichloropropene (10061-02-6)
Ethylbenzene (100-41-4)
Isopropylbenzene (cumene) (98-82-8)
Methyl acetate (79-20-9)
Methylcyclohexane (108-87-2)
Methyl *tert*-butyl ether (MTBE) (1634-04-4)
Methylene chloride (dichloromethane) (75-09-2)
Styrene (100-42-5)
1,1,2,2-Tetrachloroethane (79-34-5)
Tetrachloroethene (127-18-4)
Toluene (108-88-3)
1,2,3-Trichlorobenzene (87-61-6)
1,2,4-Trichlorobenzene (120-82-1)
1,1,1-Trichloroethane (71-55-6)
1,1,2-Trichloroethane (79-00-5)
Trichloroethene (79-01-6)
1,1,2-Trichlorotrifluoroethane (CFC-113) (76-13-1)
m-Xylene (108-38-3)*
o-Xylene (95-47-6)
p-Xylene (106-42-3)*

2,000 µg/mL each in P&T methanol, 1 mL/ampul*
cat.# 30492 (ea.)

*m-xylene and *p*-xylene concentration is 1,000 µg/mL.

Additional VOA Calibration Mixes Required:

30006: VOA Calibration Mix #1 page 558
30007: VOA Calibration Mix #2 page 558
30008: VOA Calibration Mix #3 page 558
30009: VOA Calibration Mix #4 page 558
30010: VOA Calibration Mix #5 see above
30003: VOA Tuning Compound page 557

International-Specific

Canada

C50 in Toluene

n-Pentacontane (C50) (6596-40-3)

10 µg/mL in toluene, 1 mL/ampul
cat.# 31685 (ea.)

CCME F1 Retention Time Marker (3 components)

n-Hexane (C6) (110-54-3)
n-Decane (C10) (124-18-5)
Toluene (108-88-3)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 30611 (ea.)

CCME PHC Calibration Mix (3 components)

n-Decane (C10) (124-18-5)
n-Hexadecane (C16) (544-76-3)
n-Tetratriacontane (C34) (14167-59-0)

5,000 µg/mL each in toluene, 1 mL/ampul
cat.# 31684 (ea.)

Canadian Drinking Water Triazine Herbicides Mix

(7 components)

Alachlor (15972-60-8)
Atrazine (122-34-9)
Cyanazine (Bladex) (21725-46-2)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
Prometryne (7287-19-6)
Simazine (122-34-9)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 31864 (ea.)

Canadian Drinking Water OP Pesticides Mix

(9 components)

Azinphos methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Diazinon (333-41-5)
Dimethoate (60-51-5)
Malathion (121-75-5)
Parathion (ethyl parathion) (56-38-2)
Phorate (298-02-2)
Temephos (Abate) (3383-96-8)
Terbufos (13071-79-9)

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31867 (ea.)

Canada - Atlantic Provinces

Atlantic RBCA EPH Mix (11 components)

n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Hexadecane (C16) (544-76-3)
n-Heneicosane (C21) (629-94-7)
n-Octacosane (C28) (630-02-4)
n-Dotriacontane (C32) (544-85-4)
Acenaphthene (83-32-9)
Anthracene (120-12-7)
Benzo(a)pyrene (50-32-8)
Chrysene (218-01-9)
Naphthalene (91-20-3)

1,000 µg/mL each in hexane:methylene chloride (85:15), 1 mL/ampul
cat.# 31872 (ea.)

Atlantic RBCA VPH Mix (12 components)

n-Hexane (C6) (110-54-3)
n-Heptane (C7) (142-82-5)
n-Octane (C8) (111-65-9)
n-Decane (C10) (124-18-5)
Benzene (71-43-2)
Ethylbenzene (100-41-4)
1-Methyl-3-ethylbenzene (620-14-4)
Toluene (108-88-3)
1,2,4-Trimethylbenzene (95-63-6)
1,3,5-Trimethylbenzene (108-67-8)
o-Xylene (95-47-6)
p-Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 31871 (ea.)

International-Specific, *cont.*

Europe

Organophosphorus Pesticide Mix, European Formulation (16 components)

Acephate (30560-19-1)	200 µg/mL	Methamidophos (10265-92-6)	500
Azinphos methyl (86-50-0)	400	Methidathion (950-37-8)	200
Chlorpyrifos (2921-88-2)	100	Omethoate (1113-02-6)	1,000
Demeton-S-methyl (919-86-8)	200	Pirimiphos methyl (29232-93-7)	100
Dichlorvos (DDVP) (62-73-7)	500	Profenofos (41198-08-7)	200
Dimethoate (60-51-5)	200	Prothiofos (34643-46-4)	200
Ethion (563-12-2)	200	Pyrazophos (13457-18-6)	500
Malathion (121-75-5)	200	Tolclofos-methyl (57018-04-9)	100

In acetone, 1 mL/ampul

cat.# 32418 (ea.)

PCB Congener Standard #1 (6 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32290 (ea.)

PCB Congener Standard #2 (7 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)
2,3',4,4',5-Pentachlorobiphenyl (BZ #118) (31508-00-6)
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32294 (ea.)

Japan

Japan Calibration Mix (9 components)

Acrylonitrile
Benzene
1,3-Butadiene
Chloroform
1,2-Dichloroethane
Dichloromethane
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure: 104 liters of gas @ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure: 110 liters of gas @ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34418-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

High-Purity VOC Regulators

See **page 453.**

Drinking Water Odor Standard (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis: 100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt), and purge-and-trap analyses usually are used to quantify them.

(+/–)-Geosmin (16423-19-1)
2-Methylisoborneol (MIB) (2371-42-8)

100 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30608 (ea.)

International-Specific, *cont.*

ISO/DIS 9377 Water Quality Testing

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as diesel #2/motor oil and diesel #2/mineral oil.

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

Diesel #2/Motor Oil (2 components)

Diesel fuel #2 composite (68334-30-5)
Motor oil (64742-65-0)

5,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31682 (ea.)

Diesel #2/Mineral Oil (2 components)

Diesel fuel #2 composite (68334-30-5)
Mineral oil (8042-47-5)

5,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31676 (ea.)

Standard Mixture Stock Solution (2 components)

Diesel #2 (additive-free) (68334-30-5)
Mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range) (8042-47-5)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point). Total hydrocarbon concentration is 10,000 µg/mL.
cat.# 31630 (ea.)

Quality Control Standard Mixture, Revised (2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

Diesel #2 (additive-free) (68334-30-5)
Motor oil (additive-free bp 325–460 or C18–C32 retention time range) (64742-65-0)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.
cat.# 31641 (ea.)

Quality Control Standard Mixture (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as diesel #2/motor oil and diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)
Mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range) (8042-47-5)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.
cat.# 31631 (ea.)

System Performance Test Standard Mixture of *n*-Alkanes (16 components)

n-Decane (C10) (124-18-5)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Hexadecane (C16) (544-76-3)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Docosane (C22) (629-97-0)
n-Tetracosane (C24) (646-31-1)
n-Hexacosane (C26) (630-01-3)
n-Octacosane (C28) (630-02-4)
n-Triacontane (C30) (638-68-6)
n-Dotriacontane (C32) (544-85-4)
n-Tetratriacontane (C34) (14167-59-0)
n-Hexatriacontane (C36) (630-06-8)
n-Octatriacontane (C38) (7194-85-6)
n-Tetracontane (C40) (4181-95-7)

50 µg/mL each in hexane, 1 mL/ampul
cat.# 31678 (ea.)

Extraction Solvent Stock Solution #1 (2 components)

n-Decane (C10) (124-18-5) 20 µL/L
n-Tetracontane (C40) (4181-95-7) 20 mg/L

In hexane, 5 mL/ampul
cat.# 31679 (ea.)

Extraction Solvent Stock Solution #2 (2 components)

n-Decane (C10) (124-18-5) 20 µL/L
n-Tetracontane (C40) (4181-95-7) 20 mg/L

In hexane, 20 mL/ampul
cat.# 31680 (ea.)

Stearyl Stearate Test Solution

Stearyl stearate (2778-96-3)

2,000 µg/mL in hexane, 10 mL/ampul
cat.# 31681 (ea.)

2,000 µg/mL in cyclohexane, 10 mL/ampul (enough to check one Florisil cartridge)
cat.# 31636 (ea.)

Florisil® Cartridge Quality Control Standard Mixture, Rev. 2 (2 components)

Diesel fuel #2 composite (68334-30-5)
Mineral oil (8042-47-5)

1,000 µg/mL each in hexane, 10 mL/ampul
cat.# 31677 (ea.)

n-Tetracontane (C40)

n-Tetracontane (C40) (4181-95-7)

Neat, 100 mg
cat.# 31859 (ea.)

n-Decane (C10)

n-Decane (C10) (124-18-5)

Neat, 1 mL/ampul
cat.# 31858 (ea.)

Stearyl Stearate

Stearyl stearate (2778-96-3)

Neat, 100 mg
cat.# 31860 (ea.)

Reference Standards

Foods, Flavors & Fragrances

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Derivatization Reagents

See pages 472–473.

Fatty Acid Methyl Esters (FAMEs)

Marine Oil FAME Mix (20 components)

Chain	Description	% by Weight
C14:0	Methyl myristate (124-10-7)	6.0
C14:1	Methyl myristoleate (56219-06-8)	1.0
C16:0	Methyl palmitate (112-39-0)	16.0
C16:1	Methyl palmitoleate (1120-25-8)	5.0
C18:0	Methyl stearate (112-61-8)	8.0
C18:1	Methyl oleate (112-62-9)	13.0
C18:1	Methyl vaccenate (1937-63-9)	4.0
C18:2	Methyl linoleate (112-63-0)	2.0
C18:3	Methyl linolenate (301-00-8)	2.0
C20:0	Methyl arachidate (1120-28-1)	1.0
C20:1	Methyl 11-eicosenoate (2390-09-2)	9.0
C20:2	Methyl 11,14-eicosadienoate (2493-02-7)	1.0
C20:4	Methyl arachidonate (2566-89-4)	3.0
C20:3	Methyl 11,14,17-eicosatrienoate (55682-88-7)	1.0
C20:5	Methyl eicosapentaenoate (2734-47-6)	10.0
C22:0	Methyl behenate (929-77-1)	1.0
C22:1	Methyl erucate (1120-34-9)	3.0
C22:6	Methyl docosahexaenoate (301-01-9)	12.0
C24:0	Methyl lignocerate (2442-49-1)	1.0
C24:1	Methyl nervonate (2733-88-2)	1.0

cat.# 35066 (100 mg)

No data pack available.

cis/trans FAME Mix (8 components)

Description	% by Weight
methyl elaidate (C18:1 *trans*-9)	10.0
methyl linoleate (C18:2 *cis*-9,12)	20.0
methyl oleate (C18:1 *cis*-9)	10.0
methyl petroselinate (C18:1 *cis*-6)	8.0
methyl petroselaidate (C18:1 *trans*-6)	8.0
methyl stearate (C18:0)	20.0
methyl transvaccenate (C18:1 *trans*-11)	12.0
methyl vaccenate (C18:1 *cis*-11)	12.0

10 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35079 (ea.)

No data pack available.

NLEA FAME Mix (28 components)

Chain	% by Weight	Chain	% by Weight
C4:0	1.5	C18:1 (*trans*-9)	2.5
C6:0	1.5	C18:1 (*cis*-9)	15.0
C8:0	2.0	C18:2 (all-*trans*-9,12)	2.5
C10:0	2.5	C18:2 (all-*cis*-9,12)	10.0
C11:0	2.5	C18:3 (all-*cis*-9,12,15)	5.0
C12:0	5.0	C20:0	2.5
C13:0	2.5	C20:1 (*cis*-11)	1.5
C14:0	2.5	C20:5 (all-*cis*-5,8,11,14,17)	2.5
C14:1 (*cis*-9)	1.5	C22:0	2.5
C15:0	1.5	C22:1 (*cis*-13)	1.5
C16:0	10.0	C22:6 (all-*cis*-4,7,10,13,16,19)	2.5
C16:1 (*cis*-9)	5.0	C23:0	1.5
C17:0	2.5	C24:0	2.5
C18:0	5.0	C24:1 (*cis*-15)	2.5

30 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35078 (ea.)

No data pack available.

Fatty Acid Methyl Esters (FAMEs), *cont.*

Food Industry FAME Mix (37 components)

Chain	% by Weight	Chain	% by Weight
C4:0	4.0	C18:2 (all-*cis*-9,12)	2.0
C6:0	4.0	C18:3 (all-*cis*-6,9,12)	2.0
C8:0	4.0	C18:3 (all-*cis*-9,12,15)	2.0
C10:0	4.0	C20:0	4.0
C11:0	2.0	C20:1 (*cis*-11)	2.0
C12:0	4.0	C20:2 (all-*cis*-11,14,)	2.0
C13:0	2.0	C20:3 (all-*cis*-8,11,14)	2.0
C14:0	4.0	C20:3 (all-*cis*-11,14,17)	2.0
C14:1 (*cis*-9)	2.0	C20:4 (all-*cis*-5,8,11,14)	2.0
C15:0	2.0	C20:5 (all-*cis*-5,8,11,14,17)	2.0
C15:1 (*cis*-10)	2.0	C21:0	2.0
C16:0	6.0	C22:0	4.0
C16:1 (*cis*-9)	2.0	C22:1 (*cis*-13)	2.0
C17:0	2.0	C22:2 (all-*cis*-13,16)	2.0
C17:1 (*cis*-10)	2.0	C22:6 (all-*cis*-4,7,10,13,16,19)	2.0
C18:0	4.0	C23:0	2.0
C18:1 (*trans*-9)	2.0	C24:0	4.0
C18:1 (*cis*-9)	4.0	C24:1 (*cis*-15)	2.0
C18:2 (all-*trans*-9,12)	2.0		

30 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35077 (ea.)

No data pack available.

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Fatty Acid Methyl Esters (FAMEs), *cont.*

Neat Fatty Acid Methyl Esters

Use these materials to prepare specific mixtures not commercially available. These products are of the highest purity available, typically 99% by GC-FID analysis. Each compound is packaged under a nitrogen blanket to ensure product stability. A certificate of analysis is provided with each ampul.

Chain	Description	CAS #	qty.	cat.#
C6:0	Methyl caproate	106-70-7	100 mg	35037
C8:0	Methyl caprylate	111-11-5	100 mg	35039
C10:0	Methyl caprate	110-42-9	100 mg	35041
C11:0	Methyl undecanoate	1731-86-8	100 mg	35042
C12:0	Methyl laurate	111-82-0	100 mg	35043
C13:0	Methyl tridecanoate	1731-88-0	100 mg	35044
C14:0	Methyl myristate	124-10-7	100 mg	35045
C16:0	Methyl palmitate	112-39-0	100 mg	35048
C16:1 Δ 9 *cis*	Methyl palmitoleate	1120-25-8	100 mg	35049
C17:0	Methyl heptadecanoate	1731-92-6	100 mg	35050
C18:0	Methyl stearate	112-61-8	100 mg	35051
C18:1 Δ 9 *cis*	Methyl oleate	112-62-9	100 mg	35052
C18:2 Δ 9,12 *cis*	Methyl linoleate	112-63-0	100 mg	35053
C18:3 Δ 9,12,15 *cis*	Methyl linolenate	301-00-8	100 mg	35054
C19:0	Methyl nonadecanoate	1731-94-8	100 mg	35055
C20:0	Methyl arachidate	1120-28-1	100 mg	35056
C20:1 Δ 11 *cis*	Methyl eicosenoate	2390-09-2	100 mg	35057
C20:3 Δ 11,14,17 *cis*	Methyl eicosatrienoate	55682-88-7	100 mg	35059
C21:0	Methyl heneicosanoate	6064-90-0	100 mg	35061
C22:0	Methyl behenate	929-77-1	100 mg	35062
C22:1 Δ 13 *cis*	Methyl erucate	1120-34-9	100 mg	35063
C24:0	Methyl lignocerate	2442-49-1	100 mg	35064

No data pack available.

Quantitative Fatty Acid Methyl Ester (FAME) Mixtures

These mixtures can be used for quantification (AOCS Method CE 1–62) and approximate the compositions of the following types of oils:

AOCS #1: corn, poppy seed, cotton seed, soybean, walnut, safflower, sunflower, rice, bran, and sesame oil
AOCS #2: linseed, perilla, hempseed, and rubberseed oil
AOCS #3: peanut, rapeseed, and mustard seed oil
AOCS #4: olive, teaseed, and neatsfoot oil
AOCS #5: coconut, palm kernel, babassu, and ouricuri oil
AOCS #6: lard, beef or mutton tallow, and palm oil

FAME #1: oils of mid-range chain lengths (C16–C18)
FAME #2: oils of short- to mid-range chain lengths (C6–C14)
FAME #3: oils of short- to mid-range chain lengths (C8–C16)
FAME #4: oils of mid-range to long chain lengths (C16–C24)
FAME #5: oils of mid-range to long chain lengths (C16–C24)
FAME #6: oils of long chain lengths (C20–C21)
FAME #13: mustard seed oil
FAME #14: cocoa butter

Mix	cat.#	Composition of each mixture listed as a weight/weight % basis (minimum 50 mg/ampul)																										
		methyl caproate (6:0)	methyl heptanoate (7:0)	methyl caprylate (8:0)	methyl nonanoate (9:0)	methyl caprate (10:0)	methyl undecanoate (11:0)	methyl laurate (12:0)	methyl tridecanoate (13:0)	methyl myristate (14:0)	methyl pentadecanoate (15:0)	methyl palmitate (16:0)	methyl palmitoleate (16:1)	methyl heptadecanoate (17:0)	methyl stearate (18:0)	methyl oleate (18:1)	methyl linoleate (18:2)	methyl linolenate (18:3)	methyl nonadecanoate (19:0)	methyl arachidate (20:0)	methyl eicosenoate (20:1)	methyl eicosadienoate (20:2)	methyl homo γ linolenate (20:3)	methyl arachidonate (20:4)	methyl heneicosanoate (21:0)	methyl behenate (22:0)	methyl erucate (22:1)	methyl docosadienoate (22:2)	methyl lignocerate (24:0)	methyl nervonate (24:1)
AOCS #1	35022											6.0			3.0	35.0	50.0	3.0		3.0										
AOCS #2	35023											7.0			5.0	18.0	36.0	34.0												
AOCS #3	35024									1.0		4.0			3.0	45.0	15.0	3.0		3.0						3.0	20.0		3.0	
AOCS #4	35025											11.0			3.0	80.0	6.0													
AOCS #5	35026			7.0		5.0		48.0		15.0		7.0			3.0	12.0	3.0													
AOCS #6	35027									2.0		30.0	3.0		14.0	41.0	7.0	3.0												
FAME #1	35010											20.0			20.0	20.0	20.0	20.0												
FAME #2	35011	20.0		20.0		20.0		20.0		20.0																				
FAME #3	35012			20.0		20.0		20.0		20.0		20.0																		
FAME #4	35013											20.0			20.0					20.0						20.0			20.0	
FAME #5	35014												20.0			20.0					20.0						20.0			20.0
FAME #6	35015																			20.0	20.0	20.0	20.0	20.0						
FAME #13	35034											3.0	1.0		2.0	20.0	15.0	10.0		1.0	10.0	2.0				1.0	30.0	2.0	1.0	2.0
FAME #14	35035									0.1		26.3	0.4	0.3	33.7	34.3	3.1	0.2		1.3	0.1					0.2				

Composition of each compound listed as a weight/weight % basis.

Fatty Acids

EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight	Description	% by Weight
Methyl arachidate (C20:0)	40	Methyl oleate (C18:1 [*cis*9])	20
Methyl dodecanoate (C12:0)	5	Methyl palmitate (C16:0)	10
Methyl myristate (C14:0)	5	Methyl stearate (C18:0)	20

100 mg total

cat.# 35100 (ea.)

No data pack available.

EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight	Description	% by Weight
Methyl caproate (C6:0)	10	Methyl dodecanoate (C12:0)	20
Methyl caprylate (C8:0)	10	Methyl myristate (C14:0)	40
Methyl decanoate (C10:0)	20		

100 mg total

cat.# 35101 (ea.)

No data pack available.

Standard Methods for the Examination of Water and Wastewater Method 5560: Organic and Volatile Acids

The measurement of organic acids, either by adsorption and elution from a chromatographic column or by distillation, can be used as a control test for anaerobic digestion. The chromatographic separation method is presented for organic acids (5560B), while a method using distillation (5560C) is presented for volatile acids. A new method using gas chromatography is included for the determination of acetic, propionic, butyric, isobutyric, valeric, and isovaleric acids (5560D).

Free Fatty Acids Test Standard (6 components)

Acetic acid (64-19-7)
Butyric acid (C4:0) (107-92-6)
Isobutyric acid (79-31-2)
Isovaleric acid (503-74-2)
Propionic acid (79-09-4)
Valeric acid (109-52-4)

1,000 µg/mL each in water, 1 mL/ampul

cat.# 35272 (ea.)

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Food Analysis Performance Assessment Scheme (FAPAS®)

FAPAS® Food Testing Program*

FAPAS® Series 5 OC Pesticide Mix 1 (19 components)

Equal concentration of all compounds. Suitable for GC-MS analysis.

Aldrin (309-00-2)
α-BHC (319-84-6)
β-BHC (319-85-7)
γ-BHC (Lindane) (58-89-9)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
4,4'-DDD (72-54-8)
4,4'-DDE (72-55-9)
2,4'-DDT (789-02-6)
4,4'-DDT (50-29-3)
Dieldrin (60-57-1)
α-Endosulfan (I) (959-98-8)
β-Endosulfan (II) (33213-65-9)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Heptachlor (76-44-8)
Heptachlor epoxide (isomer B) (1024-57-3)
Hexachlorobenzene (118-74-1)
Oxychlordane (27304-13-8)

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32412 (ea.)

FAPAS® Series 5 OC Pesticide Mix 2 (19 components)

Varied concentrations. Suitable for GC-ECD analysis.

Aldrin (309-00-2)	10 µg/mL	Dieldrin (60-57-1)	20
α-BHC (319-84-6)	10	α-Endosulfan (I) (959-98-8)	10
β-BHC (319-85-7)	10	β-Endosulfan (II) (33213-65-9)	20
γ-BHC (Lindane) (58-89-9)	10	Endosulfan sulfate (1031-07-8)	20
cis-Chlordane (5103-71-9)	10	Endrin (72-20-8)	20
trans-Chlordane (5103-74-2)	10	Heptachlor (76-44-8)	10
4,4'-DDD (72-54-8)	20	Heptachlor epoxide (isomer B) (1024-57-3)	10
4,4'-DDE (72-55-9)	20	Hexachlorobenzene (118-74-1)	10
2,4'-DDT (789-02-6)	20	Oxychlordane (27304-13-8)	10
4,4'-DDT (50-29-3)	20		

In acetone, 1 mL/ampul

cat.# 32414 (ea.)

FAPAS® Series 9 OP Pesticide Mix 1 (10 components)

Equal concentration of all compounds. Suitable for GC-FPD, GC-NPD, and GC-MS analysis.

Chlorpyriphos (2921-88-2)
Chlorpyriphos-methyl (5598-13-0)
Diazinon (333-41-5)
Dichlorvos (DDVP) (62-73-7)
Etrimphos (38260-54-7)
Fenitrothion (122-14-5)
Malathion (121-75-5)
Methacriphos (62610-77-9)
Phosphamidon (13171-21-6)
Pirimiphos-methyl (29232-93-7)

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32413 (ea.)

*Use of Restek® calibration mixtures by laboratories participating in the FAPAS® program is voluntary; no endorsement of any Restek® product has been made by the Central Science Laboratory. To obtain further information regarding the FAPAS® program, or to participate, contact fapas@csl.gov.uk

Fragrance Allergens

Fragrance Allergen Standards Kit

- Highly stable formulation has a minimum shelf life of 18 months.
- Fully resolves 31 fragrance allergens with one analysis on an Rxi®-17 column.
- Ideal for GC-MS analysis following IFRA methodology.
- Helps you meet EU requirements defined in the European Cosmetics Directive.
- All components included at 400 ppm to allow dilution for calibration curves and use with different solvents.
- Exceeds purity requirements outlined in IFRA method.

MTBE Solvent Blank	
methyl *tert*-butyl ether (MTBE) (1634-04-4)	Neat
1-Fluoronaphthalene (Internal Standard)	
1-fluoronaphthalene (321-38-0)	20 µg/mL
Fragrance Allergen Standard A (Includes Internal Standard)	
α-amylcinnamaldehyde*† (122-40-7)	400 µg/mL
cinnamal* (104-55-2)	400
citral*† (5392-40-5)	400
3,7-dimethyl-7-hydroxyoctanal* (107-75-5)	400
1-fluoronaphthalene (321-38-0)	20
α-hexylcinnamaldehyde*† (101-86-0)	400
lilial* (80-54-6)	400
lyral*† (31906-04-4)	400
phenylacetaldehyde** (122-78-1)	400
Fragrance Allergen Standard B (Includes Internal Standard)	
α-amylcinnamic alcohol*† (101-85-9)	400 µg/mL
benzyl alcohol* (100-51-6)	400
cinnamyl alcohol* (104-54-1)	400
citronellol* (106-22-9)	400
eugenol* (97-53-0)	400
farnesol*† (4602-84-0)	400
1-fluoronaphthalene (321-38-0)	20
geraniol* (106-24-1)	400
isoeugenol* (97-54-1)	400
linalool* (78-70-6)	400
4-methoxybenzyl alcohol* (105-13-5)	400
methyl eugenol** (93-15-2)	400
Fragrance Allergen Standard C (Includes Internal Standard)	
4-allylanisole** (140-67-0)	400 µg/mL
benzyl benzoate* (120-51-4)	400
benzyl cinnamate* (103-41-3)	400
benzyl salicylate* (118-58-1)	400
camphor** (76-22-2)	400
1,8-cineole** (470-82-6)	400
coumarin* (91-64-5)	400
1-fluoronaphthalene (321-38-0)	20
limonene* (138-86-3)	400
iso-α-methylionone* (127-51-5)	400
methyl 2-nonynoate** (111-80-8)	400
methyl 2-octynoate* (111-12-6)	400
safrole** (94-59-7)	400

*Compound listed in 7th Amendment to the European Cosmetics Directive.
**Additional potential allergens included in this formulation.
†Compounds defined as two isomers resulting in two chromatographic peaks.

Contains 1 mL each of these mixtures (in methyl *tert*-butyl ether).
cat.# 33105 (kit) kit

Fragrances

Fragrance Materials Test Mix (12 components)

- Performance evaluation for essential oils and fragrance chemicals.
- System suitability mixture for GC systems and analytical columns.
- Convenient 0.5 mL quantity for easy dilution to recommended working solution.

The Fragrance Materials Association (FMA) has proposed a method for analyzing essential oils on polar and nonpolar capillary GC columns. A performance evaluation mixture should be used to aid in detecting inlet problems, stationary phase degradation, loss of resolution, changes in sensitivity, and the presence of reactive sites in the sample pathway. Our test mix is consistent with the mixture proposed by the FMA. The required 5% test solution is made by diluting the 0.5 mL of neat mixture to 10 mL with acetone. The working solution will be stable for up to one week if transferred to a dark container and stored refrigerated.

Benzoic acid (65-85-0)	1.0%	Geraniol (106-24-1)	0.6%
Benzyl salicylate (118-58-1)	36.2%	Hydroxycitronellal (3,7-Dimethyl-7-hydroxyoctanal) (107-75-5)	5.0%
1,8-Cineole (Eucalyptol) (470-82-6)	0.5%	d-Limonene (5989-27-5)	20.0%
trans Cinnamaldehyde (14371-10-9)	0.5%	Thymol (89-83-8)	0.3%
Cinnamyl acetate (103-54-8)	0.3%	Vanillin (121-33-5)	0.1%
Cinnamyl alcohol (104-54-1)	0.3%		
Ethyl butyrate (105-54-4)	36.2%		

Neat, 0.5 mL in an amber ampul
cat.# 31807 (ea.)

No data pack available.

Medical Cannabis

Cannabinoids Standard (3 components)

Cannabidiol (13956-29-1)
Cannabinol (521-35-7)
delta-9-Tetrahydrocannabinol (Δ⁹-THC) (1972-08-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 34014 (ea.)

Medical Marijuana Singles

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
delta-8-Tetrahydrocannabinol (Δ⁸-THC)	5957-75-5	PTM	1,000	34090
delta-9-Tetrahydrocannabinol (Δ⁹-THC)	1972-08-3	M	1,000	34067
delta-9-Tetrahydrocannabinolic acid A (Δ⁹-THCA-A)	23978-85-0	PTM	1,000	34093
Tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
(±)11-nor-9-carboxy-Δ⁹-THC	104874-50-2	M	100	34068

ACN = acetronitrile; M = methanol; PTM = purge-and-trap grade methanol

Melamine

Melamine Analysis Kit

Kit includes:
Column:
Rxi-5Sil MS w/5-meter Integra-Guard
Standards:

33247: 1 mL Melamine Stock Standard	(1,000 µg/mL)
33248: 1 mL Cyanuric Acid Stock Standard	(1,000 µg/mL)
33249: 1 mL Ammelide Stock Standard	(1,000 µg/mL)
33250: 1 mL Ammeline Stock Standard	(1,000 µg/mL)
33251: 1 mL Benzoguanamine Internal Standard	(1,000 µg/mL)
33253: 1 mL Melamine Mix Standard	(1,000 µg/mL)

Derivatization Reagent:
35607: BSTFA w/1% TMCS, 25 g vial
Accessories:
50 mL empty centrifuge tubes, 10-pk.
13 mm, 0.45 µm nylon syringe filters, 20-pk.
Easy-to-follow instructions with procedural checklists to assist with laboratory documentation.

Contains contents listed above.
cat.# 33254 (kit) kit

*Kit contains a 10-pk. of tubes and 20-pk. of filters. 50-pk. of tubes (cat.# 26239) and 100-pk. of filters (cat.# 26147) sold separately.

Melamine and Related Analogs Stock Standard

(4 components)

Ammelide (645-93-2)
Ammeline (645-92-1)
Cyanuric Acid (108-80-5)
Melamine (108-78-1)

1,000 µg/mL each in diethylamine:water (20:80), 1 mL/ampul
cat.# 33253 (ea.)

Melamine Stock Standard

Melamine (108-78-1)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33247 (ea.)

Cyanuric Acid Stock Standard

Cyanuric acid (108-80-5)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33248 (ea.)

Ammelide Stock Standard

Ammelide (645-93-2)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33249 (ea.)

Ammeline Stock Standard

Ammeline (645-92-1)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33250 (ea.)

Benzoguanamine Internal Standard

Benzoguanamine (91-76-9)

1,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33251 (ea.)

MN Dept. of Agriculture Pesticides

Minnesota Ag List 1 Pesticides Mix A (16 components)

Acetochlor (34256-82-1)
Alachlor (15972-60-8)
Atrazine (1912-24-9)
Cyanazine (Bladex) (21725-46-2)
Desethylatrazine (6190-65-4)
Desisopropylatrazine (1007-28-9)
Dimethenamid (87674-68-8)*
Ethalfluralin (55283-68-6)
Metolachlor (51218-45-2)
Metribuzin (21087-64-9)
Pendimethalin (40487-42-1)
Prometon (1610-18-0)
Propachlor (1918-16-7)
Propazine (139-40-2)
Simazine (122-34-9)
Trifluralin (1582-09-8)

200 ppm each in acetone, 1 mL/ampul
cat.# 32406 (ea.)

*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.[1] CAS # 87674-68-8 manufactured by several companies under various trade names.
[1]Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: www.mda.state.mn.us

Minnesota Ag List 1 Pesticides Mix B (6 components)

Chlorpyrifos (2921-88-2)
EPTC (759-94-4)
Fonofos (944-22-9)
Phorate (298-02-2)
Terbufos (13071-79-9)
Triallate (2303-17-5)

200 ppm each in acetone, 1 mL/ampul
cat.# 32407 (ea.)

Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.
32406: Minnesota Ag List Pesticides Mix A
32407: Minnesota Ag List Pesticides Mix B
Contains 1 mL each of these mixtures.
cat.# 32408 (kit) kit

also available

Rxi®-5Sil MS Column

Ideal for pesticide and melamine analysis.

See **page 32**.

Growing Analytical Solutions for Medical Cannabis Labs

Products and expertise for accurate, reliable results every time

www.restek.com/**cannabis**

Multiresidue Pesticides

GC Multiresidue Pesticide Kit

- Accurately identify and quantify pesticide residues by GC-MS/MS in fruits, vegetables, botanicals, and herbals like tea, ginseng, ginger, Echinacea, and dietary supplements.
- Comprehensive 203-compound kit covers food safety lists by the FDA, USDA, and other global governmental agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Optimized multiresidue pesticide method is offered free of charge; downloadable XLS file includes conditions and transition tables.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class GC-MS/MS multiresidue pesticide analysis: reference and internal standards, Rxi®-5ms GC columns, Q-sep® QuEChERS sample prep, Sky® inlet liners, accessories, and more!

Cat.# 32563: GC Multiresidue Pesticide Standard #1 (16 components)
Organophosphorus Compounds
Azinphos ethyl (2642-71-9)
Azinphos methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Chlorpyrifos methyl (5598-13-0)
Diazinon (333-41-5)
EPN (2104-64-5)
Fenitrothion (122-14-5)
Isazophos (42509-80-8)
Phosalone (2310-17-0)
Phosmet (732-11-6)
Pirimiphos ethyl (23505-41-1)
Pirimiphos methyl (29232-93-7)
Pyraclofos (77458-01-6)
Pyrazophos (13457-18-6)
Pyridaphenthion (119-12-0)
Quinalphos (13593-03-8)

Cat.# 32564: GC Multiresidue Pesticide Standard #2 (40 components)
Organochlorine Compounds
Aldrin (309-00-2)
alpha-BHC (319-84-6)
beta-BHC (319-85-7)
delta-BHC (319-86-8)
gamma-BHC (Lindane) (58-89-9)
Chlorbenside (103-17-3)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
Chlorfenson (Ovex) (80-33-1)
Chloroneb (2675-77-6)
2,4'-DDD (53-19-0)
4,4'-DDD (72-54-8)
2,4'-DDE (3424-82-6)
4,4'-DDE (72-55-9)
2,4'-DDT (789-02-6)
4,4'-DDT (50-29-3)
4,4'-Dichlorobenzophenone (90-98-2)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan ether (3369-52-6)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Ethylan (Perthane) (72-56-0)
Fenson (80-38-6)
Heptachlor (76-44-8)
Heptachlor epoxide (Isomer B) (1024-57-3)
Hexachlorobenzene (118-74-1)
Isodrin (465-73-6)
2,4'-Methoxychlor (30667-99-3)
4,4'-Methoxychlor olefin (2132-70-9)
Mirex (2385-85-5)
cis-Nonachlor (5103-73-1)
trans-Nonachlor (39765-80-5)
Pentachloroanisole (1825-21-4)
Pentachlorobenzene (608-93-5)
Pentachlorothioanisole (1825-19-0)
Tetradifon (116-29-0)

Cat.# 32565: GC Multiresidue Pesticide Standard #3 (25 components)
Organonitrogen Compounds
Benfluralin (1861-40-1)
Biphenyl (92-52-4)
Chlorothalonil (1897-45-6)
Dichlofluanid (1085-98-9)
Dichloran (99-30-9)
3,4-Dichloroaniline (95-76-1)
2,6-Dichlorobenzonitrile (Dichlobenil) (1194-65-6)
Diphenylamine (122-39-4)
Ethalfluralin (55283-68-6)
Fluchloralin (33245-39-5)
Isopropalin (33820-53-0)
Nitralin (4726-14-1)
Nitrofen (1836-75-5)
Oxyfluorfen (42874-03-3)
Pendimethalin (40487-42-1)
Pentachloroaniline (527-20-8)
Pentachlorobenzonitrile (20925-85-3)
Pentachloronitrobenzene (Quintozene) (82-68-8)
Prodiamine (29091-21-2)
Profluralin (26399-36-0)
2,3,5,6-Tetrachloroaniline (3481-20-7)
Tetrachloronitrobenzene (Tecnazene) (117-18-0)
THPI (Tetrahydrophthalimide) (1469-48-3)
Tolylfluanid (731-27-1)
Trifluralin (1582-09-8)

Cat.# 32566: GC Multiresidue Pesticide Standard #4 (28 components)
Organonitrogen Compounds
Acetochlor (34256-82-1)
Alachlor (15972-60-8)
Allidochlor (93-71-0)
Clomazone (Command) (81777-89-1)
Cycloate (1134-23-2)
Diallate (*cis* & *trans*) (2303-16-4)
Dimethachlor (50563-36-5)
Diphenamid (957-51-7)
Fenpropathrin (39515-41-8)
Fluquinconazole (136426-54-5)
Flutolanil (66332-96-5)
Linuron (330-55-2)
Metazachlor (67129-08-2)
Methoxychlor (72-43-5)
Metolachlor (51218-45-2)
N-(2,4-Dimethylphenyl)formamide (60397-77-5)
Norflurazon (27314-13-2)
Oxadiazon (19666-30-9)
Pebulate (1114-71-2)
Pretilachlor (51218-49-6)
Prochloraz (67747-09-5)
Propachlor (1918-16-7)
Propanil (709-98-8)
Propisochlor (86763-47-5)
Propyzamide (23950-58-5)
Pyridaben (96489-71-3)
Tebufenpyrad (119168-77-3)
Triallate (2303-17-5)

Cat.# 32567: GC Multiresidue Pesticide Standard #5 (34 components)
Organonitrogen Compounds
Atrazine (1912-24-9)
Bupirimate (41483-43-6)
Captafol (2425-06-1)
Captan (133-06-2)
Chlorfenapyr (122453-73-0)
Cyprodinil (121552-61-2)
Etofenprox (80844-07-1)
Etridiazole (2593-15-9)
Fenarimol (60168-88-9)
Fipronil (120068-37-3)
Fludioxonil (131341-86-1)
Fluridone (Sonar) (59756-60-4)
Flusilazole (85509-19-9)
Flutriafol (76674-21-0)
Folpet (133-07-3)
Hexazinone (Velpar) (51235-04-2)
Iprodione (36734-19-7)
Lenacil (2164-08-1)
MGK-264 (113-48-4)
Myclobutanil (88671-89-0)
Paclobutrazol (76738-62-0)
Penconazole (66246-88-6)
Procymidone (32809-16-8)
Propargite (2312-35-8)
Pyrimethanil (53112-28-0)
Pyriproxyfen (95737-68-1)
Tebuconazole (107534-96-3)
Terbacil (5902-51-2)
Terbuthylazine (5915-41-3)
Triadimefon (43121-43-3)
Triadimenol (55219-65-3)
Tricyclazole (Beam) (41814-78-2)
Triflumizole (68694-11-1)
Vinclozolin (50471-44-8)

Cat.# 32568: GC Multiresidue Pesticide Standard #6 (18 components)
Synthetic Pyrethroid Compounds
Acrinathrin (101007-06-1)
Anthraquinone (84-65-1)
Bifenthrin (82657-04-3)
Bioallethrin (584-79-2)
Cyfluthrin (68359-37-5)
lambda-Cyhalothrin (91465-08-6)
Cypermethrin (52315-07-8)
Deltamethrin (52918-63-5)
Fenvalerate (51630-58-1)
Flucythrinate (70124-77-5)
tau-Fluvalinate (102851-06-9)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)
Phenothrin (*cis* & *trans*) (26002-80-2)
Resmethrin (10453-86-8)
Tefluthrin (79538-32-2)
Tetramethrin (7696-12-0)
Transfluthrin (118712-89-3)

Cat.# 32569: GC Multiresidue Pesticide Standard #7 (10 components)
Herbicide Methyl Esters
Acequinocyl (57960-19-7)
Bromopropylate (18181-80-1)
Carfentrazone ethyl (128639-02-1)
Chlorobenzilate (510-15-6)
Chlorpropham (101-21-3)
Chlozolinate (84332-86-5)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
Fluazifop-*p*-butyl (79241-46-6)
Metalaxyl (57837-19-1)
2-Phenylphenol (90-43-7)

Cat.# 32570: GC Multiresidue Pesticide Standard #8 (24 components)
Organophosphorus Compounds
Bromfenvinfos-methyl (13104-21-7)
Bromfenvinphos (33399-00-7)
Bromophos ethyl (4824-78-6)
Bromophos methyl (2104-96-3)
Carbophenothion (786-19-6)
Chlorfenvinphos (470-90-6)
Chlorthiophos (60238-56-4)
Coumaphos (56-72-4)
Edifenphos (17109-49-8)
Ethion (563-12-2)
Fenamiphos (22224-92-6)
Fenchlorphos (Ronnel) (299-84-3)
Fenthion (55-38-9)
Iodofenphos (18181-70-9)
Leptophos (21609-90-5)
Malathion (121-75-5)
Methacrifos (62610-77-9)
Profenofos (41198-08-7)
Prothiofos (34643-46-4)
Sulfotepp (3689-24-5)
Sulprofos (35400-43-2)
Terbufos (13071-79-9)
Tetrachlorvinfos (22248-79-9)
Tolclofos-methyl (57018-04-9)

Cat.# 32571: GC Multiresidue Pesticide Standard #9 (8 components)
Organophosphorus Compounds
Disulfoton (298-04-4)
Fonofos (944-22-9)
Methyl parathion (298-00-0)
Mevinphos (7786-34-7)
Parathion (Ethyl parathion) (56-38-2)
Phorate (298-02-2)
Piperonyl butoxide (51-03-6)
Triazophos (24017-47-8)

Contains 1 mL each of these mixtures.

cat.# 32562 (kit)

kit

* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 203 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.

Multiresidue Pesticides, *cont.*

GC Multiresidue Pesticide Standard #1 (16 components)
Organophosphorus Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32563 (ea.)

GC Multiresidue Pesticide Standard #2 (40 components)
Organochlorine Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32564 (ea.)

GC Multiresidue Pesticide Standard #3 (25 components)
Organonitrogen Compounds
100 µg/mL each in toluene:acetonitrile (99:1), 1 mL/ampul
cat.# 32565 (ea.)

GC Multiresidue Pesticide Standard #4 (28 components)
Organonitrogen Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32566 (ea.)

GC Multiresidue Pesticide Standard #5 (34 components)
Organonitrogen Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32567 (ea.)

GC Multiresidue Pesticide Standard #6 (18 components)
Synthetic Pyrethroid Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32568 (ea.)

GC Multiresidue Pesticide Standard #7 (10 components)
Herbicide Methyl Esters
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32569 (ea.)

GC Multiresidue Pesticide Standard #8 (24 components)
Organophosphorus Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32570 (ea.)

GC Multiresidue Pesticide Standard #9 (8 components)
Organophosphorus Compounds
100 µg/mL each in toluene, 1 mL/ampul
cat.# 32571 (ea.)

Labeled Pesticide Residue Internal Standards for Food Analysis

- Isotopically labeled to provide the best approach for pesticide residue quantification.
- Multiple options let you choose internal and surrogate standards that will mitigate matrix effects.
- Economically priced and compatible with both LC-MS and GC-MS applications; even helpful for optimizing LC-MS/MS system performance.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Restek is your complete supplier for world-class food safety analysis: pesticide reference standard mixes and internal/surrogate standards, GC and LC columns, QuEChERS, and more!

Compound	CAS #	Solvent	Conc.	cat.#
Atrazine-d5	163165-75-1	ACN	100	31984
Carbaryl-d7	362049-56-7	ACN	100	31985
Diazinon-d10 (diethyl-d10)	100155-47-3	ACN	100	31986
Dichlorvos-d6	203645-53-8	A	100	31987
Dimethoate-d6	1219794-81-6	ACN	100	31988
Diuron-d6	1007536-67-5	ACN	100	31989
Linuron-d6	330-55-2	ACN	100	31990

A = acetone; ACN = acetonitrile
Volume is 1 mL/ampul. Concentration is µg/mL.

Quantity Discounts Available

— Buy 3 Standards, Get 10% Off
— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

also **available:** LC Multiresidue Pesticide Kit | See **page 570.**

Multiresidue Pesticides, *cont.*

LC Multiresidue Pesticide Kit

- Accurately detect and quantify pesticides of global food safety concern in a wide range of fruits, vegetables, and other commodities by LC-MS/MS.
- Full kit contains 204 compounds of interest, covering many LC-determined pesticides listed by government agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Optimized multiresidue pesticide method is offered free of charge; downloadable XLS file includes conditions and transition tables.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class LC-MS/MS multiresidue pesticide analysis: reference and internal standards, Ultra and Pinnacle® DB LC columns, Q-sep® QuEChERS sample prep products, accessories, and more!

Cat.# 31972: LC Multiresidue Pesticide Standard #1 (13 components)
Organophosphorus Compounds
Acephate (30560-19-1)
Carbaryl (Sevin) (63-25-2)
Dicrotophos (141-66-2)
Dimethoate (60-51-5)
Dimethomorph (110488-70-5)
Isocarbophos (24353-61-5)
Methamidophos (10265-92-6)
Mevinphos (7786-34-7)
Monocrotophos (6923-22-4)
Omethoate (1113-02-6)
Temephos (Abate) (3383-96-8)
Trichlorfon (Dylox) (52-68-6)
Vamidothion (Vamidoate) (2275-23-2)

Cat.# 31973: LC Multiresidue Pesticide Standard #2 (16 components)
Carbamate/Uron Compounds
Alanycarb (83130-01-2)
Aldicarb (116-06-3)
Aldicarb sulfone (1646-88-4)
Aldicarb sulfoxide (1646-87-3)
Benfuracarb (82560-54-1)
Butocarboxim (34681-10-2)
Butoxycarboxim (34681-23-7)
Ethiofencarb (29973-13-5)
Furathiocarb (65907-30-4)
Methabenzthiazuron (18691-97-9)
Methiocarb (2032-65-7)
Methomyl (16752-77-5)
Oxamyl (23135-22-0)
Tebuthiuron (34014-18-1)
Thidiazuron (51707-55-2)
Thiophanate-methyl (23564-05-8)

Cat.# 31974: LC Multiresidue Pesticide Standard #3 (38 components)
Carbamate/Uron Compounds
Bendiocarb (22781-23-3)
Bifenazate (149877-41-8)
Carbofuran (1563-66-2)
Chlorfluazuron (71422-67-8)
Chloroxuron (1982-47-4)
Chlortoluron (15545-48-9)
Cycluron (2163-69-1)
Diethofencarb (87130-20-9)
Diflubenzuron (35367-38-5)
Dioxacarb (6988-21-2)
Diuron (330-54-1)
Fenobucarb (BPMC) (3766-81-2)
Fenoxycarb (79127-80-3)
Fenuron (101-42-8)
Flufenoxuron (101463-69-8)
Fluometuron (2164-17-2)
Forchlorfenuron (68157-60-8)
Hexaflumuron (86479-06-3)
3-Hydroxycarbofuran (16655-82-6)
Indoxacarb (173584-44-6)
Iprovalicarb (140923-17-7)
Isoprocarb (2631-40-5)
Isoproturon (34123-59-6)
Linuron (330-55-2)
Lufenuron (103055-07-8)
Metobromuron (3060-89-7)
Monolinuron (1746-81-2)
Neburon (555-37-3)
Novaluron (116714-46-6)
Pirimicarb (23103-98-2)
Promecarb (2631-37-0)
Propham (122-42-9)
Propoxur (Baygon) (114-26-1)
Pyraclostrobin (175013-18-0)
Siduron (1982-49-6)
Teflubenzuron (83121-18-0)
Thiobencarb (28249-77-6)
Triflumuron (64628-44-0)

Cat.# 31975: LC Multiresidue Pesticide Standard #4 (63 components)
Organonitrogen Compounds
Abamectin (71751-41-2)
Acetamiprid (135410-20-7)
Ametryn (834-12-8)
Amitraz (33089-61-1)
Azoxystrobin (131860-33-8)
Benalaxyl (71626-11-4)
Benzoximate (29104-30-1)
Boscalid (188425-85-6)
Butafenacil (134605-64-4)
Carbetamide (16118-49-3)
Carfentrazone-ethyl (128639-02-1)
Chlorantraniliprole (500008-45-7)
Clofentezine (74115-24-5)
Cymoxanil (57966-95-7)
Cyprodinil (121552-61-2)
Cyromazine (66215-27-8)
Dimoxystrobin (149961-52-4)
Dinotefuran (165252-70-0)
Doramectin (117704-25-3)
Eprinomectin (123997-26-2)
Famoxadon (131807-57-3)
Fenazaquin (120928-09-8)
Fenhexamid (126833-17-8)
Fenpyroximate (111812-58-9)
Flonicamid (158062-67-0)
Fluazinam** (79622-59-6)
Fludioxonil (131341-86-1)
Fluoxastrobin (361377-29-9)
Flutolanil (66332-96-5)
Furalaxyl (57646-30-7)
Halofenozide (112226-61-6)
Imazalil (35554-44-0)
Imidacloprid (138261-41-3)
Ivermectin (70288-86-7)
Kresoxim-methyl (143390-89-0)
Mandipropamid (374726-62-2)
Mepanipyrim (110235-47-7)
Mepronil (55814-41-0)
Metaflumizone (139968-49-3)
Metalaxyl (57837-19-1)
Methoxyfenozide (161050-58-4)
Moxidectin (113507-06-5)
Myclobutanil (88671-89-0)
Nitenpyram (120738-89-8)
Oxadixyl (77732-09-3)
Picoxystrobin (117428-22-5)
Piperonyl butoxide (51-03-6)
Prochloraz (67747-09-5)
Prometon (1610-18-0)
Pymetrozine (123312-89-0)
Pyracarbolid (24691-76-7)
Pyrimethanil (53112-28-0)
Pyriproxyfen (95737-68-1)
Quinoxyfen (124495-18-7)
Rotenone (83-79-4)
Secbumeton (26259-45-0)
Spiroxamine (118134-30-8)
Tebufenozide (112410-23-8)
Tebufenpyrad (119168-77-3)
Terbumeton (33693-04-8)
Triadimefon (43121-43-3)
Trifloxystrobin (141517-21-7)
Zoxamide (156052-68-5)

Cat.# 31976: LC Multiresidue Pesticide Standard #5 (30 components)
Organonitrogen Compounds
Acibenzolar-S-methyl (135158-54-2)
Bupirimate (41483-43-6)
Buprofezin (69327-76-0)
Carboxin (5234-68-4)
Clethodim (99129-21-2)
Clothianidin (210880-92-5)
Cyazofamid (120116-88-3)
Ethiprole (181587-01-9)
Ethofumesate (26225-79-6)
Fenamidone (161326-34-7)
Fipronil (120068-37-3)
Flubendimide (272451-65-7)
Flufenacet (Fluthiamide) (142459-58-3)
Hexythiazox (78587-05-0)
Mefenacet (73250-68-7)
Mesotrione (104206-82-8)
Methoprotryne (841-06-5)
Metribuzin (21087-64-9)
Prometryne (7287-19-6)
Propargite (2312-35-8)
Prothioconazole (178928-70-6)
Pyridaben (96489-71-3)
Simetryn (1014-70-6)
Sulfentrazone (122836-35-5)
Terbutryn (886-50-0)
Thiabendazole (148-79-8)
Thiacloprid (111988-49-9)
Thiamethoxam (153719-23-4)
Thiofanox (39196-18-4)
Tricyclazole (Beam) (41814-78-2)

Cat.# 31977: LC Multiresidue Pesticide Standard #6 (28 components)
Organonitrogen Compounds
Baycor (Bitertanol) (55179-31-2)
Bromuconazole (116255-48-2)
Cyproconazole (113096-99-4)
Diclobutrazol (75736-33-3)
Difenoconazole (119446-68-3)
Diniconazole (83657-24-3)
Epoxiconazole (135319-73-2)
Etaconazole (60207-93-4)
Ethirimol (23947-60-6)
Etoxazole (153233-91-1)
Fenarimol (60168-88-9)
Fenbuconazole (114369-43-6)
Fluquinconazole (136426-54-5)
Flusilazole (85509-19-9)
Flutriafol (76674-21-0)
Fuberidazole (3878-19-1)
Hexaconazole (79983-71-4)
Ipconazole (125225-28-7)
Metconazole (125116-23-6)
Nuarimol (63284-71-9)
Paclobutrazol (76738-62-0)
Penconazole (66246-88-6)
Propiconazole (Tilt) (60207-90-1)
Tebuconazole (107534-96-3)
Tetraconazole (112281-77-3)
Triadimenol (55219-65-3)
Triflumizole (68694-11-1)
Triticonazole (131983-72-7)

Cat.# 31978: LC Multiresidue Pesticide Standard #7 (7 components)
Organonitrogen Compounds
Emamectin-benzoate (155569-91-8)
Fenpropimorph (67564-91-4)
Spirodiclofen (148477-71-8)
Spinosad (168316-95-8)
Spirotetramat (203313-25-1)
Spinetoram (J&L) (187166-40-1)
Spiromesifen (283594-90-1)

Cat.# 31979: LC Multiresidue Pesticide Standard #8
Organonitrogen Compounds
Hydramethylnon (67485-29-4)

Cat.# 31980: LC Multiresidue Pesticide Standard #9 (7 components)
Carbamate/Uron Compounds
Aminocarb (2032-59-9)
Desmedipham (13684-56-5)
Formetanate HCL (23422-53-9)
Mexacarbate (Zectran) (315-18-4)
Monceren (Pencycuron) (66063-05-6)
Phenmedipham (13684-63-4)
Propamocarb free base (24579-73-5)

Cat.# 31981: LC Multiresidue Pesticide Standard #10
Carbamate/Uron Compounds
Carbendazim (10605-21-7)

Contains 1 mL each of these mixtures.

cat.# 31971 (kit)

kit

* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 204 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.
** NOTE: In this standard, fluazinam should only be used for qualitative analysis. A single-component standard (cat.# 31982) is available for quantitative analysis.

Multiresidue Pesticides, *cont.*

LC Multiresidue Pesticide Standard #1 (13 components)
Organophosphorus Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31972 (ea.)

LC Multiresidue Pesticide Standard #2 (16 components)
Carbamate/Uron Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31973 (ea.)

LC Multiresidue Pesticide Standard #3 (38 components)
Carbamate/Uron Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31974 (ea.)

LC Multiresidue Pesticide Standard #4 (63 components)
Organonitrogen Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31975 (ea.)

LC Multiresidue Pesticide Standard #5 (30 components)
Organonitrogen Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31976 (ea.)

LC Multiresidue Pesticide Standard #6 (28 components)
Organonitrogen Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31977 (ea.)

LC Multiresidue Pesticide Standard #7 (7 components)
Organonitrogen Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31978 (ea.)

LC Multiresidue Pesticide Standard #8 (hydramethylnon)
Organonitrogen Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31979 (ea.)

LC Multiresidue Pesticide Standard #9 (7 components)
Carbamate/Uron Compounds
100 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31980 (ea.)

LC Multiresidue Pesticide Standard #10 (carbendazim)
Carbamate/Uron Compounds
100 µg/mL each in methanol, 1 mL/ampul
cat.# 31981 (ea.)

Fluazinam Standard
Fluazinam (79622-59-6)
100 µg/mL in acetonitrile, 1 mL/ampul
cat.# 31982 (ea.)

Searching Online for Reference Standards?

Find a Specific **Compound**

Enter a compound name, synonym, or CAS # in our **Reference Standards Search Tool**.

www.restek.com/**reference**

Find Specific **Documentation**

Locate SDSs, certificates, & data packs by cat. # or lot # with our **Reference Standards Documentation Search**.

www.restek.com/**documentation**

also **available:** GC Multiresidue Pesticide Kit | See **page 568.**

Packaging

MOSH/MOAH Standard (9 components)

- Developed specifically for using LC coupled with GC-FID to accurately determine hydrocarbons found in mineral oils, which can migrate from packaging into food.
- This 9-component mix contains non-interfering internal standards as well as both mineral oil saturated hydrocarbon (MOSH) and mineral oil aromatic hydrocarbon (MOAH) markers to correctly cut fractions.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class MOSH/MOAH analysis: reference standards, Allure® silica LC columns, Rxi®-5Sil MS GC columns, accessories, and more!

Bicyclohexyl (92-51-3)	300 µg/mL
Cholestane (5-alpha-cholestane) (481-21-0)	600
1-Methylnaphthalene (90-12-0)	300
2-Methylnaphthalene (91-57-6)	300
n-Pentylbenzene (538-68-1)	300
Perylene (198-55-0)	600
1,3,5-Tri-*tert*-butylbenzene (1460-02-2)	300
n-Tridecane (C13) (629-50-5)	150
n-Undecane (C11) (1120-21-4)	300

150-600 µg/mL each in toluene, 1 mL/ampul
cat.# 31070 (ea.)

NEW!

Phthalate Esters

See page 530.

Restek® Safe Cracker

Included with every reference standard shipment for added convenience.

Plastic Container Testing

ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a "consensus" or "referee" method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product for their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed-phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

ASTM D6042-96 Calibration Mix (7 components)

BHT (128-37-0)
Erucamide slip (112-84-5)
Vitamin E (59-02-9)
Irgafos 168 (31570-04-4)
Irganox 3114 (27676-62-6)
Irganox 1010 (6683-19-8)
Irganox 1076 (2082-79-3)

50 µg/mL each in isopropanol, 1 mL/ampul
cat.# 31628 (ea.)

Polycyclic Aromatic Hydrocarbons (PAHs)

EFSA PAH4 Standard (4 components)

- European Food Safety Authority (EFSA) PAH4 compounds prepared in toluene solvent.
- High 1,000 µg/mL concentration—dilute as needed to economically prepare custom mixes.
- Low volatility—longer shelf life and more accurate results.
- High miscibility—compatible with QuEChERS solvents.
- Certified reference material (CRM) meets strict ISO quality requirements.
- Pair with Rxi®-PAH GC column for easy separation of EFSA PAH4 compounds from common interferences in food and environmental samples. See page 84 for more details.

Benz[a]anthracene (56-55-3)
Benzo[a]pyrene (50-32-8)
Benzo[b]fluoranthene (205-99-2)
Chrysene (218-01-9)

1,000 µg/mL each in toluene, 1 mL/ampul
cat.# 32469 (ea.)

NEW!

See pages 511–513 for additional PAH standards.

QuEChERS

QuEChERS Performance Standards

- Designed for use in all QuEChERS methods for pesticides in fruits and vegetables, including the original unbuffered method, AOAC 2007.01, and EN15662.
- Ideal for initial method evaluations and ongoing method performance validations.
- Precise formulation improves data quality and operational efficiency; spend more time running samples and less time sourcing and preparing standards.
- Quantitatively analyzed to confirm the composition and stability of each mixture.
- Produced and tested in accordance with ISO Guide 34 and 17025 accreditation.

QuEChERS Performance Standards Kit

- Kit contains organochlorine, organonitrogen, organophosphorus, and carbamate pesticides commonly used on fruits and vegetables.
- Volatile, polar, active, base-sensitive, and nonvolatile compounds are included to allow comprehensive evaluation of QuEChERS extraction and cleanup efficiencies, and optimization of GC and LC instrumental conditions.
- Analytes are divided into three ampuls based on compatibility for maximum stability and shelf life.*

Contains 1 mL each of these mixtures.
31153: QuEChERS Performance Standard A
31154: QuEChERS Performance Standard B
31155: QuEChERS Performance Standard C

NEW!

300 µg/mL each in acetonitrile/acetic acid (99.9:0.1), 1 mL/ampul.
Blend equal volumes of all three ampuls for a 100 µg/mL final solution.
cat.# 31152 (kit)

kit

*When combining compounds with different functionalities, chemical stability can be an issue. The analytes in this kit are separated into three mixes to ensure maximum long-term storage stability. For analysis, a fresh working standard should be prepared by combining the three kit mixes in a 1:1:1 ratio to prepare a 100 µg/mL working standard solution. Once blended, Restek does not recommend storing working standards or subsequent dilutions for future use.

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465**.

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QuEChERS Performance Standard A (16 components)

Acephate (30560-19-1)
Azinphos methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Coumaphos (56-72-4)
Diazinon (333-41-5)
Dichlofluanid (1085-98-9)
Dichlorvos (DDVP) (62-73-7)
Dimethoate (60-51-5)
Fenthion (55-38-9)
Malathion (121-75-5)
Methamidophos (10265-92-6)
Mevinphos (7786-34-7)
Omethoate (1113-02-6)
Phosalone (2310-17-0)
Pirimiphos methyl (29232-93-7)
Propargite (2312-35-8)

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul
cat.# 31153 (ea.)

NEW!

QuEChERS Performance Standard B (7 components)

gamma-BHC (Lindane) (58-89-9)
Chlorothalonil (1897-45-6)
4,4'-DDT (50-29-3)
Dicofol (Kelthane) (115-32-2)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
2-Phenylphenol (90-43-7)

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul
cat.# 31154 (ea.)

NEW!

QuEChERS Performance Standard C (17 components)

Bifenthrin (82657-04-3)
Captan (133-06-2)
Carbaryl (sevin) (63-25-2)
Cyprodinil (121552-61-2)
Deltamethrin (52918-63-5)
Fenhexamid (126833-17-8)
Fenpropathrin (39515-41-8)
Folpet (133-07-3)
Imazalil (35554-44-0)
Iprodione (36734-19-7)
Metalaxyl (57837-19-1)
Methiocarb (2032-65-7)
Myclobutanil (88671-89-0)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)
Thiabendazole (148-79-8)
Vinclozolin (50471-44-8)

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul
cat.# 31155 (ea.)

NEW!

QuEChERS, *cont.*

QuEChERS Standards

- Ready to use for QuEChERS extractions—no dilutions necessary.
- Support for GC and LC with MS, MS/MS, and selective detectors.

Pesticide analysis is fast and simple using QuEChERS methods. Use these cost-effective QuEChERS standards for even greater lab efficiency. Standards are compatible with all major methods, including mini-multiresidue, AOAC, and European procedures. Save time with convenient mixes or make your own blend using our full line of single-component solutions.

QuEChERS Internal Standard Mix for GC-ECD Analysis

(4 components)

PCB 18 (37680-65-2)
PCB 28 (7012-37-5)
PCB 52 (35693-99-3)
Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)

50 µg/mL each in acetonitrile, 5 mL/ampul

cat.# 33265 (ea.)

QuEChERS Internal Standard Mix for GC-NPD and LC-MS/MS Analysis (2 components)

Triphenylphosphate (115-86-6)	20 µg/mL
Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)	50 µg/mL

In acetonitrile, 5 mL/ampul

cat.# 33266 (ea.)

QuEChERS Internal Standard Mix for GC-MS Analysis

(6 components)

PCB 18 (37680-65-2)	50 µg/mL	Triphenylphosphate (115-86-6)	20
PCB 28 (7012-37-5)	50	Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)	50
PCB 52 (35693-99-3)	50		
Triphenylmethane (519-73-3)	10		

In acetonitrile, 5 mL/ampul

cat.# 33267 (ea.)

QuEChERS Internal Standard Mix for LC-MS/MS Analysis

Nicarbazin (bis-nitrophenyl urea) (330-95-0)

10 µg/mL in acetonitrile, 5 mL/ampul

cat.# 33261 (ea.)

QuEChERS Quality Control Standards for GC-MS Analysis

Cat.# 33268:
PCB 138 (35065-28-2)
PCB 153 (35065-27-1)

Cat.# 33264:
Anthracene (120-12-7)

50 µg/mL each in acetonitrile, 5 mL/ampul

cat.# 33268 (ea.)

100 µg/mL in acetonitrile, 5 mL/ampul

cat.# 33264 (ea.)

QuEChERS Single-Component Reference Standards

Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
triphenylmethane (5 mL)	519-73-3	ACN	10	33260
triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259

ACN = acetonitrile

QuEChERS, *cont.*

QuEChERS Standards for AOAC Official Method 2007.01

- Ready to use for generating test mixes, calibration standards, and spiking experiments.
- Reliable standards produced according to specifications defined in AOAC Official Method 2007.01.
- Cost-effective QuEChERS standards can be used without dilutions for greater lab efficiency.

Following QuEChERS methods is even quicker and easier when you use Restek® method-specific chemical standards for AOAC Official Method 2007.01 (Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate). Our suite of AOAC QuEChERS standards includes internal standards mix, triphenylphosphate (TPP) solution, and QC spike mix. Each standard can be used directly without dilutions because they are formulated to the exact concentrations prescribed by AOAC Method 2007.01.

AOAC QuEChERS IS Solution (2 components)

α-BHC-d6 (α-HCH-d6) (86194-41-4)
Parathion-d10 (350820-04-1)

40 µg/mL each in acetonitrile, 5 mL/ampul
cat.# 31963 (ea.)

AOAC QuEChERS Triphenylphosphate Solution

Triphenylphosphate (115-86-6)

2 µg/mL in acetonitrile:acetic acid (99:1), 5 mL/ampul
cat.# 31964 (ea.)

AOAC QuEChERS QC Spike Mix (27 components)

Atrazine (1912-24-9)
Azoxystrobin (131860-33-8)
Bifenthrin (82657-04-3)
Carbaryl (Sevin) (63-25-2)
Chlorothalonil (1897-45-6)
Chlorpyrifos (2921-88-2)
Chlorpyrifos methyl (5598-13-0)
lambda-Cyhalothrin (91465-08-6)
Cyprodinil (121552-61-2)
2,4'-DDD (53-19-0)
Dichlorvos (DDVP) (62-73-7)
Endosulfan sulfate (1031-07-8)
Ethion (563-12-2)
Imazalil (35554-44-0)
Imidacloprid (138261-41-3)
Kresoxim methyl (143390-89-0)
Linuron (330-55-2)
Methamidophos (10265-92-6)
Methomyl (16752-77-5)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)
Procymidone (32809-16-8)
Pymetrozine (123312-89-0)
Tebuconazole (107534-96-3)
Thiabendazole (148-79-8)
Tolylfluanid (731-27-1)
Trifluralin (1582-09-8)

40 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 5 mL/ampul
cat.# 31999 (ea.)

Reference Standards Documentation Search

Search by cat.# or lot #

- SDSs
- Certificates
- Data packs

www.restek.com/**documentation**

Reference Standards

Petroleum & Petrochemical

Biodiesel 577
Finished Motor Oil & Aviation Gasoline 578
Leaking Underground Storage Tank (LUST) .. 497–510
PCBs in Transformer Oil 578
Simulated Distillation 579
Spark Ignition Engine Fuels 580–581

Biodiesel

ASTM Method D6584-10 and EN14105 (Biodiesel)

Determining Free and Total Glycerin in B100 Biodiesel Methyl Esters by GC

In the manufacture of biodiesel fuel, triglycerides are split into their monoalkyl ester components via transesterification. The fatty acid monoalkyl esters can be used as fuel in diesel engines. Amounts of free glycerin and total glycerin indicate the quality of the conversion of the oil or fat to monoalkyl esters. D6584-10 and DIN EN14105 are test methods for quantitative determination of free glycerin, total glycerin, and mono-, di-, and triglycerides in biodiesel fuel methyl esters by GC, after silylation of the sample with N-methyl-N-(trimethylsilyl) trifluoroacetamide (MSTFA).

(s)-(-)-1,2,4-Butanetriol

(s)-(-)-1,2,4-Butanetriol (42890-76-6)

1,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33024 (ea.)

1,000 µg/mL in pyridine, 5 mL/ampul
cat.# 33032 (ea.)

Diolein (1,3-di[*cis*-octadecenoyl]glycerol)

Diolein (1,3-di[*cis*-octadecenoyl]glycerol) (2465-32-9)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33022 (ea.)

Glycerin

Glycerin (56-81-5)

500 µg/mL in pyridine, 1 mL/ampul
cat.# 33020 (ea.)

Monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)

Monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol) (111-03-5)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33021 (ea.)

Monopalmitin

Monopalmitin (524-44-9)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33026 (ea.)

Tricaprin (1,2,3-tricaprinoylglycerol)

Tricaprin (1,2,3-tricaprinoylglycerol) (621-71-6)

8,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33025 (ea.)

8,000 µg/mL in pyridine, 5 mL/ampul
cat.# 33033 (ea.)

Triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol)

Triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol) (122-32-7)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33023 (ea.)

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

MXT® Capillary Columns

Ideal for High-Temperature GC Analysis

- Metal tubing won't become brittle at high temperatures (430 °C).*
- Exclusive Siltek® layer provides an internal surface with excellent inertness.
- Can be tightly coiled well under 4.5" without breaking, even under stress.

*Maximum temperature of finished column may vary by phase.

See **page 104**.

www.restek.com/**mxt**

Finished Motor Oil & Aviation Gasoline

ASTM D3606-10 (Determination of Benzene & Toluene in Finished Motor & Aviation Gasoline by GC)

ASTM D3606 Calibration Kit Without Internal Standard

Contains 25 mL each of these mixtures.
30647: ASTM D3606 Calibration Standard #1 Without Internal Standard
30648: ASTM D3606 Calibration Standard #2 Without Internal Standard
30649: ASTM D3606 Calibration Standard #3 Without Internal Standard
30650: ASTM D3606 Calibration Standard #4 Without Internal Standard
30651: ASTM D3606 Calibration Standard #5 Without Internal Standard
30652: ASTM D3606 Calibration Standard #6 Without Internal Standard
30653: ASTM D3606 Calibration Standard #7 Without Internal Standard

cat.# 30672 (kit) **kit**

Find complete compound lists for our **D3606 reference standards** at

www.restek.com/**D3606standards**

ASTM D3606 Calibration Kit With MEK Internal Standard

Contains 1 mL each of these mixtures.
30654: ASTM D3606 Calibration Standard #1 With MEK Internal Standard
30655: ASTM D3606 Calibration Standard #2 With MEK Internal Standard
30656: ASTM D3606 Calibration Standard #3 With MEK Internal Standard
30657: ASTM D3606 Calibration Standard #4 With MEK Internal Standard
30658: ASTM D3606 Calibration Standard #5 With MEK Internal Standard
30659: ASTM D3606 Calibration Standard #6 With MEK Internal Standard
30660: ASTM D3606 Calibration Standard #7 With MEK Internal Standard

cat.# 30673 (kit) **kit**

ASTM D3606 Calibration Kit With *sec*-Butanol Internal Standard

Contains 1 mL each of these mixtures.
30661: ASTM D3606 Calibration Standard #1 With *sec*-Butanol Internal Standard
30662: ASTM D3606 Calibration Standard #2 With *sec*-Butanol Internal Standard
30663: ASTM D3606 Calibration Standard #3 With *sec*-Butanol Internal Standard
30664: ASTM D3606 Calibration Standard #4 With *sec*-Butanol Internal Standard
30665: ASTM D3606 Calibration Standard #5 With *sec*-Butanol Internal Standard
30666: ASTM D3606 Calibration Standard #6 With *sec*-Butanol Internal Standard
30667: ASTM D3606 Calibration Standard #7 With *sec*-Butanol Internal Standard

cat.# 30674 (kit) **kit**

ASTM D3606 Backflush Standard

2,2,4-Trimethylpentane (isooctane) (540-84-1)

5% vol/vol in nonane, 1 mL/ampul

cat.# 30671 (ea.)

PCBs in Transformer Oil

ASTM Method D4059-00 (PCB Standards in Oil)

ASTM Method D4059-00 is used for determining PCB concentrations in various types of transformer oil using GC-ECD detection. The analyst must dilute transformer oil samples in a solvent prior to injection. The oil in the sample has been shown to quench the ECD. Calibration mixtures of PCBs in transformer oil must be prepared and diluted identically to eliminate the detector quenching bias resulting when samples are analyzed.

We prepare these solutions in a mineral oil–based transformer oil (Exxon® Univolt® N-61), which has been tested to ensure it is PCB-free.

PCB-Free Transformer Oil

Neat, 5 mL

cat.# 32424 (ea.)

Neat, 50 mL

cat.# 32425 (ea.)

No data pack available.

Aroclor Standards

Volume is 1 mL/ampul.

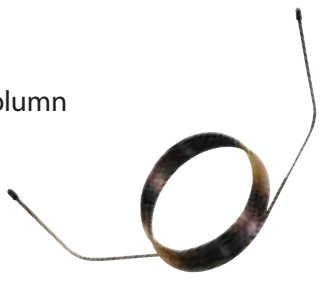
Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088

TO = transformer oil (PCB-free)

also available

D3606 Application Column (2 column set)

See **page 138** for details.



Simulated Distillation

ASTM Simulated Distillation Petroleum Fractions

ASTM D2887-12 Calibration Standard (20 components)

American Society for Testing and Materials (ASTM International) Method D2887-12 is used to determine the boiling range distribution of petroleum products and fractions having a final boiling point of 538 °C (1,000 °F) or lower, a boiling range greater than 55 °C (131 °F), and a vapor pressure sufficiently low to permit sampling at ambient temperature.

n-Pentane (C5) (109-66-0)
n-Hexane (C6) (110-54-3)
n-Heptane (C7) (142-82-5)
n-Octane (C8) (111-65-9)
n-Nonane (C9) (111-84-2)
n-Decane (C10) (124-18-5)
n-Undecane (C11) (1120-21-4)
n-Dodecane (C12) (112-40-3)
n-Tetradecane (C14) (629-59-4)
n-Pentadecane (C15) (629-62-9)
n-Hexadecane (C16) (544-76-3)
n-Heptadecane (C17) (629-78-7)
n-Octadecane (C18) (593-45-3)
n-Eicosane (C20) (112-95-8)
n-Tetracosane (C24) (646-31-1)
n-Octacosane (C28) (630-02-4)
n-Dotriacontane (C32) (544-85-4)
n-Hexatriacontane (C36) (630-06-8)
n-Tetracontane (C40) (4181-95-7)
n-Tetratetracontane (C44) (7098-22-8)

1% w/w in carbon disulfide, 1 g solution/ampul
cat.# 31674 (ea.)

5% w/w, Neat, 1 g /ampul
cat.# 31675 (ea.)

No data pack available.

ASTM Methods D2887 and D3710-95

These calibration mixtures are made with pure, highly characterized neat material and are prepared using NIST-traceable balances and weights. Each ampul is supplied with a data sheet indicating the exact concentration and a sample chromatogram.

D2887 Calibration Mix (17 components)

Compound	Conc. (% w/w)	Compound	Conc. (% w/w)
n-Hexane (C6) (110-54-3)	6	*n*-Octadecane (C18) (593-45-3)	5
n-Heptane (C7) (142-82-5)	6	*n*-Eicosane (C20) (112-95-8)	2
n-Octane (C8) (111-65-9)	8	*n*-Tetracosane (C24) (646-31-1)	2
n-Nonane (C9) (111-84-2)	8	*n*-Octacosane (C28) (630-02-4)	1
n-Decane (C10) (124-18-5)	12	*n*-Dotriacontane (C32) (544-85-4)	1
n-Undecane (C11) (1120-21-4)	12	*n*-Hexatriacontane (C36) (630-06-8)	1
n-Dodecane (C12) (112-40-3)	12	*n*-Tetracontane (C40) (4181-95-7)	1
n-Tetradecane (C14) (629-59-4)	12	*n*-Tetratetracontane (C44) (7098-22-8)	1
n-Hexadecane (C16) (544-76-3)	10		

Packaged 1 mL/ampul
cat.# 31222 (ea.)

No data pack available.

D3710-95 Calibration Mix (16 components)

Compound	Conc. (% vol/vol)	Compound	Conc. (% w/w)
n-Pentane (C5) (109-66-0)	8	*n*-Pentadecane (C15) (629-62-9)	2
n-Hexane (C6) (110-54-3)	6	*n*-Butylbenzene (104-51-8)	4
n-Heptane (C7) (142-82-5)	10	2,4-Dimethylpentane (108-08-7)	6
n-Octane (C8) (111-65-9)	5	2-Methylbutane (Isopentane) (78-78-4)	10
n-Decane (C10) (124-18-5)	4	2-Methylpentane (107-83-5)	6
n-Dodecane (C12) (112-40-3)	4	*n*-Propylbenzene (103-65-1)	5
n-Tridecane (C13) (629-50-5)	2	Toluene (108-88-3)	12
n-Tetradecane (C14) (629-59-4)	2	*p*-Xylene (106-42-3)	14

Packaged 1 mL/ampul
cat.# 31223 (ea.)

No data pack available.

ASTM Method 6352-04 (Polywax® Standards)

Polywax® Standards

These high molecular weight hydrocarbon waxes are useful for simulated distillation and other high-temperature GC work.

Supports ASTM Methods D2887, D6352, D7169, D7398, and D7500.

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1,000	9002-88-4	Neat	1 g	36227

No data pack available.

Petroleum Standards

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and have been verified by one or more analytical methods.

Sulfur Simulated Distillation Standard (SSDS)

30 ppm total sulfur by weight from ethanethiol
60 ppm total sulfur by weight from 1-propanethiol
30 ppm total sulfur by weight from 1-butanethiol
60 ppm total sulfur by weight from 1-pentanethiol
30 ppm total sulfur by weight from 1-hexanethiol
60 ppm total sulfur by weight from 1-heptanethiol
30 ppm total sulfur by weight from 3,5-dimethylbenzenethiol
60 ppm total sulfur by weight from 1-octanethiol
30 ppm total sulfur by weight from 1-nonanethiol
60 ppm total sulfur by weight from 1-decanethiol
30 ppm total sulfur by weight from 1-pentadecanethiolol
60 ppm total sulfur by weight from 1-hexadecanethiol
30 ppm total sulfur by weight from 1-octadecanethiol
Balance: toluene:isooctane (1:15)

1 mL amber ampul.
cat.# 33049 (ea.)

Speciated Sulfur System Suitability Checkout Standard (SSSSCS)

0.50 ppm total sulfur by weight from dimethylsulfide
35.0 ppm total sulfur by weight from tertiary butyl mercaptan
50.0 ppm total sulfur by weight from thiopene
15.0 ppm total sulfur by weight from dimethyl disulfide
25.0 ppm total sulfur by weight from benzothiopene
Balance: isooctane

1 mL amber ampul.
cat.# 33050 (ea.)

Restek Offers a Full Line of Certified Reference Materials
See **pages 464–465**.
QUALITY ISO 9001 • 17025 • Guide 34
www.restek.com/iso

Spark Ignition Engine Fuels

ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels)

ASTM Methods D6729, D6730, and D6733 are designed for the determination of the individual hydrocarbons present in spark engine ignition fuels, as well as fuel blends containing oxygenates such as methyl *tert*-butyl ether, ethyl *tert*-butyl ether, *tert*-butanol, ethanol, etc.

These standards are produced for refineries performing detailed hydrocarbon analysis (DHA) of crude oil feedstocks and fuels. They help with calibrating complex hydrocarbon analyses and provide the greatest number of gravimetrically determined values for quantitative calibration to help our customers optimize production and maximize profitability—while fulfilling requirements such as ASTM Methods D6729, D6730, and D6733.

Oxy Set-Up Blend (30 components)

Gravimetrically prepared and NIST-traceable.

Benzene	1.00%	1-Methylcyclopentene	0.50%
tert-Butanol	0.50%	1-Methyl-2-ethylbenzene	0.50%
Cyclohexane	28.9%	1-Methylnaphthalene	0.25%
n-Decane	1.00%	5-Methylnonane	0.20%
2,3-Dimethylbutane	0.50%	Naphthalene	0.50%
trans-1,2-Dimethylcyclopentane	0.50%	*n*-Nonane	2.00%
2,3-Dimethylheptane	0.20%	*n*-Octane	2.00%
Dodecane	0.25%	*n*-Pentane	2.00%
Ethanol	8.00%	1,2,3,5-Tetramethylbenzene	0.25%
Ethylbenzene	25.0%	Toluene	7.00%
3-Ethylpentane	0.20%	Tridecane	0.25%
n-Heptane	2.00%	2,2,3-Trimethylpentane	0.52%
n-Hexane	2.00%	2,3,3-Trimethylpentane	0.50%
2-Methylbutene-2	2.50%	Undecane	0.50%
Methyl *tert*-butyl ether	10.0%	*p*-Xylene	1.00%

2 mL prescored ampul

cat.# 33034 (ea.)

DHA PONA Standard (188 components)

This standard is a qualitative mixture of various gasoline and refinery materials prepared to provide nearly every component that may be encountered in feedstock and finished gasolines. Some oxygenates have been added to allow this blend to be used by refineries for detailed hydrocarbon analysis (DHA) method setup and to fulfill requirements such as ASTM Methods D6729, D6730, and D6733.

For a full component list, visit www.restek.com and search for "30731".

Neat, 0.15 mL in Autosampler Vial

cat.# 30731 (ea.)

NEW!

No data pack available.

DHA PiONA Standard (133 components)

Compound	Conc (wt/wt%)
Paraffins	
N-Decane	1.736
N-Dodecane	1.727
N-Heptane	1.723
N-Hexane	1.729
N-Nonane	1.727
N-Octane	1.721
N-Pentadecane	1.734
N-Pentane	1.728
N-Tetradecane	1.735
N-Tridecane	1.723
N-Undecane	1.723
Isoparaffins	
3,3-Diethylpentane	0.364
2,3-Dimethylbutane	0.447
2,3-Dimethylheptane	0.22
2,5-Dimethylheptane	0.733
3,3-Dimethylheptane	0.335
3,4-Dimethylheptane	0.159
3,5-Dimethylheptane	0.445
2,2-Dimethylhexane	0.149
2,4-Dimethylhexane	0.276
2,5-Dimethylhexane	1.112
2,2-Dimethyloctane	0.398
3,3-Dimethyloctane	0.153
2,2-Dimethylpentane	0.463
2,3-Dimethylpentane	0.887
2,4-Dimethylpentane	1.127
3,3-Dimethylpentane	0.438
3-Ethylhexane	0.058
3-Ethyloctane	0.203
3-Ethylpentane	0.168
Isopentane	0.304
2-Methylheptane	0.899
3-Methylheptane	1.122
4-Methylheptane	0.286
2-Methylhexane	0.891
3-Methylhexane	0.451
2-Methylnonane	0.3
3-Methylnonane	1.001
2-Methyloctane	0.245
3-Methyloctane	1.329
2-Methylpentane	1.211
3-Methylpentane	1.998
2,2,3-Trimethylbutane	0.125
2,2,3-Trimethylpentane	0.698
Olefins	
1-Decene	0.43
1-Heptene	1.29
cis-2-Heptene	0.649
trans-2-Heptene	0.101
cis-3-Heptene	0.194
trans-3-Heptene	0.712
1-Hexene	2.137
cis-2-Hexene	0.555
trans-2-Hexene	0.31
2-Methyl-1,3-Butadiene	0.699
2-Methyl-1-Butene	0.42
3-Methyl-1-Butene	0.291
2-Methyl-1-Nonene	0.648
2-Methyl-2-Pentene	0.654
4-Methyl-1-Pentene	0.646
1-Nonene	1.313
trans-2-Nonene	0.434
cis-3-Nonene	0.575
trans-3-Nonene	0.44
cis-4-Nonene	0.829
1-Octene	2.155
cis-2-Octene	0.439
trans-2-Octene	0.656
1-Pentene	1.669
cis-2-Pentene	0.21
trans-2-Pentene	0.542
Naphthenes	
Cyclohexane	0.954
Cyclopentane	1.891
cis-1,2-Dimethylcyclohexane	2.055
trans-1,2-Dimethylcyclohexane	0.328
trans-1,4-Dimethylcyclohexane	0.941
trans-1,2-Dimethylcyclopentane	0.73
cis-1,3-Dimethylcyclopentane	0.06
trans-1,3-Dimethylcyclopentane	1.16
Ethylcyclopentane	1.567
1-Ethyl-1-Methylcyclopentane	0.292
Isobutylcyclohexane	0.733
Isobutylcyclopentane	0.267
Isopropylcyclopentane	0.261
Methylcyclohexane	0.735
Methylcyclopentane	1.184
t-1-Methyl-2(4-Methylphenyl) cyclopentane	0.718
t-1-Methyl-2-N-Propylcyclo hexane	0.927
N-Propylcyclopentane	0.874
1,1,2-Trimethylcyclohexane	0.368
1,1,4-Trimethylcyclohexane	1.261
ctc-1,2,3-Trimethylcyclohexane	0.735
ctc-1,2,4-Trimethylcyclohexane	0.212
ctt-1,2,4-Trimethylcyclohexane	0.368
ccc-1,3,5-Trimethylcyclohexane	0.469
ccc-1,2,3-Trimethylcyclopentane	0.159
ctc-1,2,3-Trimethylcyclopentane	0.747
Aromatics	
Benzene	1.899
N-Butylbenzene	0.478
sec-Butylbenzene	0.711
tert-Butylbenzene	0.473
tert-1-Butyl-4-Ethylbenzene	0.478
tert-1-Butyl-2-Methylbenzene	0.478
tert-1-Butyl-3,4,5-Trimethyl benzene	0.772
1,2-Dimethyl-3-Ethylbenzene	0.495
1,2-Dimethyl-4-Ethylbenzene	0.21
1,3-Dimethyl-2-Ethylbenzene	0.184
1,3-Dimethyl-5-Ethylbenzene	0.094
1,4-Dimethyl-2-Ethylbenzene	0.478
Ethylbenzene	1.897
Hexylbenzene	1.186
Isobutylbenzene	0.713
Isopropylbenzene	0.48
2-Methylbutylbenzene	0.027
1-Methyl-2-Ethylbenzene	0.361
1-Methyl-3-Ethylbenzene	0.643
1-Methyl-4-Ethylbenzene	0.476
1-Methyl-2-Isopropylbenzene	0.645
1-Methyl-3-Isopropylbenzene	0.245
1-Methyl-4-Isopropylbenzene	0.949
1-Methyl-2-*n*-Propylbenzene	0.494
1-Methyl-3-*n*-Propylbenzene	0.479
1-Methyl-4-*n*-Propylbenzene	0.477
Pentylbenzene	0.473
N-Propylbenzene	0.711
1,2,4,5-Tetramethylbenzene	0.198
Toluene	2.839
1,2,4-Triethylbenzene	0.233
1,3,5-Triethylbenzene	0.48
1,2,4-Trimethylbenzene	0.475
1,3,5-Trimethylbenzene	0.097
m-Xylene	0.715
o-Xylene	0.719
p-Xylene	0.239

Neat, 0.15 mL in Autosampler Vial

cat.# 30730 (ea.)

NEW!

No data pack available.

Spark Ignition Engine Fuels, *cont.*

ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels), *cont.*

DHA Paraffins Standard (11 components)

Compound	Conc (wt/wt%)		
N-Decane	9.134	N-Octane	9.054
N-Dodecane	9.089	N-Pentadecane	9.123
N-Heptane	9.066	N-Pentane	9.094
N-Hexane	9.097	N-Tetradecane	9.128
N-Nonane	9.086	N-Tridecane	9.064
		N-Undecane	9.064

Neat, 0.15 mL in Autosampler Vial

cat.# 30725 (ea.)

NEW!

No data pack available.

DHA Isoparaffins Standard (33 components)

Compound	Conc (wt/wt%)		
3,3-Diethylpentane	1.914	3-Ethylhexane	0.307
2,3-Dimethylbutane	2.352	3-Ethyloctane	1.068
2,3-Dimethylheptane	1.16	3-Ethylpentane	0.882
2,5-Dimethylheptane	3.86	Isopentane	1.599
3,3-Dimethylheptane	1.765	2-Methylheptane	4.731
3,4-Dimethylheptane	0.839	3-Methylheptane	5.909
3,5-Dimethylheptane	2.344	4-Methylheptane	1.508
2,2-Dimethylhexane	0.786	2-Methylhexane	4.689
2,4-Dimethylhexane	1.454	3-Methylhexane	2.374
2,5-Dimethylhexane	5.854	2-Methylnonane	1.582
2,2-Dimethyloctane	2.095	3-Methylnonane	5.272
3,3-Dimethyloctane	0.804	2-Methyloctane	1.289
2,2-Dimethylpentane	2.438	3-Methyloctane	6.995
2,3-Dimethylpentane	4.668	2-Methylpentane	6.377
2,4-Dimethylpentane	5.931	3-Methylpentane	10.517
3,3-Dimethylpentane	2.305	2,2,3-Trimethylbutane	0.66
		2,2,3-Trimethylpentane	3.673

Neat, 0.15 mL in Autosampler Vial

cat.# 30726 (ea.)

NEW!

No data pack available.

DHA Olefins Standard (26 components)

Compound	Conc (wt/wt%)		
1-Decene	2.265	2-Methyl-2-Pentene	3.444
1-Heptene	6.787	4-Methyl-1-Pentene	3.398
cis-2-Heptene	3.418	1-Nonene	6.912
trans-2-Heptene	0.53	*trans*-2-Nonene	2.282
cis-3-Heptene	1.02	*cis*-3-Nonene	3.027
trans-3-Heptene	3.747	*trans*-3-Nonene	2.315
1-Hexene	11.249	*cis*-4-Nonene	4.365
cis-2-Hexene	2.921	1-Octene	11.339
trans-2-Hexene	1.632	*cis*-2-Octene	2.312
2-Methyl-1,3-Butadiene	3.68	*trans*-2-Octene	3.453
2-Methyl-1-Butene	2.211	1-Pentene	8.786
3-Methyl-1-Butene	1.534	*cis*-2-Pentene	1.107
2-Methyl-1-Nonene	3.412	*trans*-2-Pentene	2.852

Neat, 0.15 mL in Autosampler Vial

cat.# 30727 (ea.)

NEW!

No data pack available.

DHA Naphthenes Standard (26 components)

Compound	Conc (wt/wt%)		
Cyclohexane	4.773	Methylcyclopentane	5.921
Cyclopentane	9.455	t-1-Methyl-2(Methylphenyl) cyclopentane	3.592
cis-1,2-Dimethylcyclohexane	10.276	t-1-Methyl-2-N-Propyl cyclohexane	4.637
trans-1,2-Dimethylcyclohexane	1.642	N-Propylcyclopentane	4.373
trans-1,4-Dimethylcyclohexane	4.705	1,1,2-Trimethylcyclohexane	1.842
trans-1,2-Dimethylcyclopentane	3.653	1,1,4-Trimethylcyclohexane	6.304
cis-1,3-Dimethylcyclopentane	0.3	*ctc*-1,2,3-Trimethylcyclohexane	3.676
trans-1,3-Dimethylcyclopentane	5.799	*ctc*-1,2,4-Trimethylcyclohexane	1.062
Ethylcyclopentane	7.837	*ctt*-1,2,4-Trimethylcyclohexane	1.839
1-Ethyl-1-Methylcyclopentane	1.459	*ccc*-1,3,5-Trimethylcyclohexane	2.343
Isobutylcyclohexane	3.666	*ccc*-1,2,3-Trimethylcyclopentane	0.795
Isobutylcyclopentane	1.334	*ctc*-1,2,3-Trimethylcyclopentane	3.738
Isopropylcyclopentane	1.305		
Methylcyclohexane	3.677		

Neat, 0.15 mL in Autosampler Vial

cat.# 30728 (ea.)

NEW!

No data pack available.

DHA Aromatics Standard (37 components)

Compound	Conc (wt/wt%)		
Benzene	8.255	1-Methyl-3-Ethylbenzene	2.795
N-Butylbenzene	2.077	1-Methyl-4-Ethylbenzene	2.07
sec-Butylbenzene	3.09	1-Methyl-2-Isopropylbenzene	2.806
tert-Butylbenzene	2.058	1-Methyl-3-Isopropylbenzene	1.066
tert-1-Butyl-4-Ethylbenzene	2.076	1-Methyl-4-Isopropylbenzene	4.126
tert-1-Butyl-2-Methylbenzene	2.077	1-Methyl-2-*n*-Propylbenzene	2.148
tert-1-Butyl-3,4,5-Trimethyl benzene	3.355	1-Methyl-3-*n*-Propylbenzene	2.084
1,2-Dimethyl-3-Ethylbenzene	2.152	1-Methyl-4-*n*-Propylbenzene	2.073
1,2-Dimethyl-4-Ethylbenzene	0.915	Pentylbenzene	2.058
1,3-Dimethyl-2-Ethylbenzene	0.799	N-Propylbenzene	3.091
1,3-Dimethyl-5-Ethylbenzene	0.407	1,2,4,5-Tetramethylbenzene	0.86
1,4-Dimethyl-2-Ethylbenzene	2.076	Toluene	12.342
Ethylbenzene	8.248	1,2,4-Triethylbenzene	1.014
Hexylbenzene	5.155	1,3,5-Triethylbenzene	2.087
Isobutylbenzene	3.099	1,2,4-Trimethylbenzene	2.066
Isopropylbenzene	2.085	1,3,5-Trimethylbenzene	0.422
2-Methylbutylbenzene	0.118	*m*-Xylene	3.108
1-Methyl-2-Ethylbenzene	1.571	*o*-Xylene	3.125
		p-Xylene	1.041

Neat, 0.15 mL in Autosampler Vial

cat.# 30729 (ea.)

NEW!

No data pack available.

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See **pages 586–592.**

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Diethylene & Ethylene Glycol

Meet FDA Guidance for Industry: Testing of Glycerin for Diethylene Glycol with our diethylene glycol (DEG) and ethylene glycol limit standards. This guidance emphasizes the importance of screening raw material for the presence of diethylene glycol. Under cGMPs, drug manufacturers—not just glycerin manufacturers—must test glycerin prior to use to prevent DEG contamination in finished products. The FDA has worked extensively with the USP to modify the glycerin monograph, and these standards support the revised USP method.

Glycerin Standard Mix (3 components)

Diethylene glycol (111-46-6)	0.5 mg/mL
Ethylene glycol (107-21-1)	0.5
Glycerin (56-81-5)	20

In P&T methanol, 1 mL/ampul

cat.# 31891 (ea.)

Propylene Glycol Standard Mix (3 components)

Diethylene glycol (111-46-6)	0.5 mg/mL
Ethylene glycol (107-21-1)	0.5
Propylene glycol (57-55-6)	20

In P&T methanol, 1 mL/ampul

cat.# 31892 (ea.)

Sorbitol Standard Mix (2 components)

Diethylene glycol (111-46-6)
Ethylene glycol (107-21-1)

0.8 mg/mL each in acetone:water (96:4), 1 mL/ampul

cat.# 31893 (ea.)

Glycol Internal Standard Mix

2,2,2-Trichloroethanol (115-20-8)

10 mg/mL in P&T methanol, 1 mL/ampul

cat.# 31894 (ea.)

Fatty Acids

Composition of Fatty Acids by GC

EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight	Description	% by Weight
Methyl arachidate (C20:0)	40	Methyl oleate (C18:1 [*cis*9])	20
Methyl dodecanoate (C12:0)	5	Methyl palmitate (C16:0)	10
Methyl myristate (C14:0)	5	Methyl stearate (C18:0)	20

100 mg total

cat.# 35100 (ea.)

No data pack available.

EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight	Description	% by Weight
Methyl caproate (C6:0)	10	Methyl dodecanoate (C12:0)	20
Methyl caprylate (C8:0)	10	Methyl myristate (C14:0)	40
Methyl decanoate (C10:0)	20		

100 mg total

cat.# 35101 (ea.)

No data pack available.

Pharmaceutical Compounds in Drinking Water

Pharmaceuticals Mix #1 (8 components)

Acetaminophen (103-90-2)
Caffeine (58-08-2)
Carbamazepine (298-46-4)
Ciprofloxacin HCL (86393-32-0)
Erythromycin USP (114-07-8)
Fluoxetine HCl (56296-78-7)
Sulfamethoxazole (723-46-6)
Trimethoprim (738-70-5)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31116 (ea.)

Steroids and Mixed Pharmaceuticals Mix

(10 components)

Bisphenol A (80-05-7)
Diclofenac sodium salt (15307-79-6)
17-beta-Estradiol (50-28-2)
Estrone (53-16-7)
17-alpha-Ethynylestradiol (57-63-6)
4-para-Nonylphenol (84852-15-3)
4-*tert*-Octylphenol (140-66-9)
Primidone (125-33-7)
Progestrone (57-83-0)
Testosterone (58-22-0)

200 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31117 (ea.)

Pharmaceuticals Mix #2 (4 components)

Gemfibrozil (25812-30-0)
Ibuprofen (15687-27-1)
Naproxen (22204-53-1)
Triclosan (3380-34-5)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31118 (ea.)

Plastic Container Testing

ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a "consensus" or "referee" method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product for their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed-phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

ASTM D6042-96 Calibration Mix (7 components)

BHT (128-37-0)
Erucamide slip (112-84-5)
Vitamin E (59-02-9)
Irgafos 168 (31570-04-4)
Irganox 3114 (27676-62-6)
Irganox 1010 (6683-19-8)
Irganox 1076 (2082-79-3)

50 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31628 (ea.)

Residual Solvents

USP <467>

The United States Pharmacopeia (USP) General Chapter <467> Residual Solvents is a widely used compendial method intended for identifying and quantifying residual solvents in drug substances, drug products, and excipients. In an attempt to better mirror the International Conference on Harmonization (ICH) guidelines, the USP has adopted a more comprehensive methodology in residual solvent testing—the current USP30/NF25. The ICH publishes a guideline (Q3C) listing the acceptable amounts of solvent residues that can be present. In the ICH guideline, residual solvents are summarized by class according to their toxicity. Class 1 compounds are carcinogenic compounds that pose a risk to both the consumer and the environment. The use of these solvents is to be avoided, but if they are used, they must be tightly controlled. Class 2 compounds are nongenotoxic animal carcinogens, and concentrations of these compounds should be limited. Chromatographic analysis is needed for both the Class 1 and Class 2 residual solvents.

USP <467> Singles

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
benzene	71-43-2	DMSO	10 mg/mL	36282
carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
chloroform	67-66-3	DMSO	0.3 mg/mL	36285
cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
1,1-dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,2-dichloroethane	107-06-2	DMSO	25 mg/mL	36288
cis-1,2-dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
1,2-dimethoxyethane	110-71-4	DMSO	0.5 mg/mL	36291
N,N-dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
N,N-dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
1,4-dioxane	123-91-1	DMSO	1.9 mg/mL	36294
2-ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
formamide	75-12-7	DMSO	1.1 mg/mL	36298
hexane	8031-34-3	DMSO	1.45 mg/mL	36299
methanol	67-56-1	DMSO	15 mg/mL	36401
2-methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
N-methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
pyridine	110-86-1	DMSO	1 mg/mL	36407
sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
tetralin	119-64-2	DMSO	0.5 mg/mL	36409
toluene	108-88-3	DMSO	4.45 mg/mL	36410
1,1,1-trichloroethane	71-55-6	DMSO	50 mg/mL	36411
trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
m-xylene	108-38-3	DMSO	6.51 mg/mL	36414
o-xylene	95-47-6	DMSO	0.97 mg/mL	36415
p-xylene	106-42-3	DMSO	1.52 mg/mL	36416

DMSO = dimethyl sulfoxide

Residual Solvents Class 2 - Mix A (2013 Rev)

(16 components)

NEW!

This mixture reflects the changes made in USP <467> effective August 2013 and replaces Restek® cat.# 36271.

Acetonitrile (75-05-8)	2.05 mg/mL	Methanol (67-56-1)	15
Chlorobenzene (108-90-7)	1.8	Methylcyclohexane (108-87-2)	5.9
Cyclohexane (110-82-7)	19.4	Methylene chloride (dichloromethane) (75-09-2)	3
cis-1,2-Dichloroethene (156-59-2)	4.675	Tetrahydrofuran (109-99-9)	3.6
trans-1,2-Dichloroethene (156-60-5)	4.675	Toluene (108-88-3)	4.45
1,4-Dioxane (123-91-1)	1.9	*m*-Xylene (108-38-3)	6.51
Ethylbenzene (100-41-4)	1.84	*o*-Xylene (95-47-6)	0.98
Isopropylbenzene (cumene) (98-82-8)	0.35	*p*-Xylene (106-42-3)	1.52

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36012 (ea.)

These mixtures reflect the changes made in USP30/NF25 effective July 1, 2008.

Residual Solvents - Class 1 (5 components)

Benzene (71-43-2)	10 mg/mL	1,1-Dichloroethene (75-35-4)	40
Carbon tetrachloride (56-23-5)	20	1,1,1-Trichloroethane (71-55-6)	50
1,2-Dichloroethane (107-06-2)	25		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

Residual Solvents Class 2 - Mix A (15 components)

Note: The USP <467> Class 2 residual solvents list was updated to add cumene in August 2013. See cat.# 36012 (above) for our updated reference standard.

Acetonitrile (75-05-8)	2.05 mg/mL	Methylcyclohexane (108-87-2)	5.90
Chlorobenzene (108-90-7)	1.80	Methylene chloride (dichloromethane) (75-09-2)	3.00
Cyclohexane (110-82-7)	19.40	Tetrahydrofuran (109-99-9)	3.45
cis-1,2-Dichloroethene (156-59-2)	4.70	Toluene (108-88-3)	4.45
trans-1,2-Dichloroethene (156-60-5)	4.70	*m*-Xylene (108-38-3)	6.51
1,4-Dioxane (123-91-1)	1.90	*o*-Xylene (95-47-6)	0.98
Ethylbenzene (100-41-4)	1.84	*p*-Xylene (106-42-3)	1.52
Methanol (67-56-1)	15.00		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36271 (ea.)

Residual Solvents Class 2 - Mix B (8 components)

n-Hexane (C6) (110-54-3)	290 µg/mL	Nitromethane (75-52-5)	50
Chloroform (67-66-3)	60	Pyridine (110-86-1)	200
1,2-Dimethoxyethane (110-71-4)	100	Tetralin (119-64-2)	100
2-Hexanone (591-78-6)	50	Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36280 (ea.)

Residual Solvents Class 2 - Mix C (8 components)

2-Ethoxyethanol (110-80-5)	800 µg/mL	2-Methoxyethanol (Methyl Cellosolve) (109-86-4)	250
Ethylene glycol (107-21-1)	3,100	N-Methylpyrrolidone (872-50-4)	2,650
Formamide (75-12-7)	1,100	Sulfolane (126-33-0)	800
N,N-Dimethylacetamide (127-19-5)	5,450		
N,N-Dimethylformamide (68-12-2)	4,400		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36273 (ea.)

Residual Solvents, *cont.*

USP <467>, *cont.*

The Class 1 mixtures below reflect the requirements of USP23/NF18 effective January 1, 1995 to December 31, 1999. While these mixtures do not meet the current USP guidelines, many still use these mixtures to obtain a detectable benzene peak for the direct injection methods, Method I and Method V.

USP <467> Calibration Mixture #3 (5 components)

Benzene (71-43-2)	100 µg/mL	Methylene chloride (dichloromethane) (75-09-2)	500
Chloroform (67-66-3)	50		
1,4-Dioxane (123-91-1)	100	Trichloroethene (79-01-6)	100

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36004 (ea.)

USP <467> Calibration Mixture #4 (5 components)

Benzene (71-43-2)	2 µg/mL	Methylene chloride (dichloromethane) (75-09-2)	600
Chloroform (67-66-3)	60		
1,4-Dioxane (123-91-1)	380	Trichloroethene (79-01-6)	80

In methanol, 1 mL/ampul

cat.# 36006 (ea.)

USP <467> Calibration Mixture #5 (5 components)

Benzene (71-43-2)	2 µg/mL	Methylene chloride (dichloromethane) (75-09-2)	600
Chloroform (67-66-3)	60		
1,4-Dioxane (123-91-1)	380	Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36007 (ea.)

USP <467> Calibration Mix #6 (4 components)

Chloroform (67-66-3)	60 µg/mL	Methylene chloride (dichloromethane) (75-09-2)	600
1,4-Dioxane (123-91-1)	380		
		Trichloroethene (79-01-6)	80

In methanol, 1 mL/ampul

cat.# 36008 (ea.)

USP <467> Calibration Mix #7 (4 components)

Chloroform (67-66-3)	60 µg/mL	Methylene chloride (dichloromethane) (75-09-2)	600
1,4-Dioxane (123-91-1)	380		
		Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36009 (ea.)

Ethylene Oxide

The test for ethylene oxide is specified in many individual drug monographs of USP24/NF19. The limit test concentration is currently 10 ppm. While the specific test solution and method will vary depending on the particular drug monograph, the solution below is suitable for most tests.

Ethylene oxide (75-21-8)

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul

cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul

cat.# 30620 (ea.)

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at **www.restek.com/solutions**

European Pharmacopoeia Method

Residual Solvents - Class 1 (5 components)

Benzene (71-43-2)	10 mg/mL	1,1-Dichloroethene (75-35-4)	40
Carbon tetrachloride (56-23-5)	20	1,1,1-Trichloroethane (71-55-6)	50
1,2-Dichloroethane (107-06-2)	25		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

European Pharmacopoeia/ICH Q3C(M) Class 2 Mix A, Revised (14 components)

n-Hexane (C6) (110-54-3)	290 µg/mL	Tetrahydrofuran (109-99-9)	720
Chlorobenzene (108-90-7)	360	Toluene (108-88-3)	890
Cyclohexane (110-82-7)	3,880	Trichloroethene (79-01-6)	80
cis-1,2-Dichloroethene (156-59-2)	1,870	*m*-Xylene (108-38-3)	1,302
N,N-Dimethylformamide (68-12-2)	880	*o*-Xylene (95-47-6)	195
Ethylbenzene (100-41-4)	369	*p*-Xylene (106-42-3)	304
Methylcyclohexane (108-87-2)	1,180		
Methylene chloride (dichloromethane) (75-09-2)	600		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36274 (ea.)

European Pharmacopoeia/ICH Class 2 Mix B, Revised (10 components)

Acetonitrile (75-05-8)	410 µg/mL	2-Hexanone (591-78-6)	50
Chloroform (67-66-3)	60	Methanol (67-56-1)	3,000
1,2-Dimethoxyethane (110-71-4)	100	Nitromethane (75-52-5)	50
N,N-Dimethylacetamide (127-19-5)	1,090	Pyridine (110-86-1)	200
1,4-Dioxane (123-91-1)	380	Tetralin (119-64-2)	100

Prepared in water:dimethyl sulfoxide (80:20), 1 mL/ampul

cat.# 36270 (ea.)

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