Agilent J&W GC Column Selection Guide

SPEED YOUR SELECTION WITH THIS ONE-STOP RESOURCE

The Measure of Confidence

Agilent Technologies

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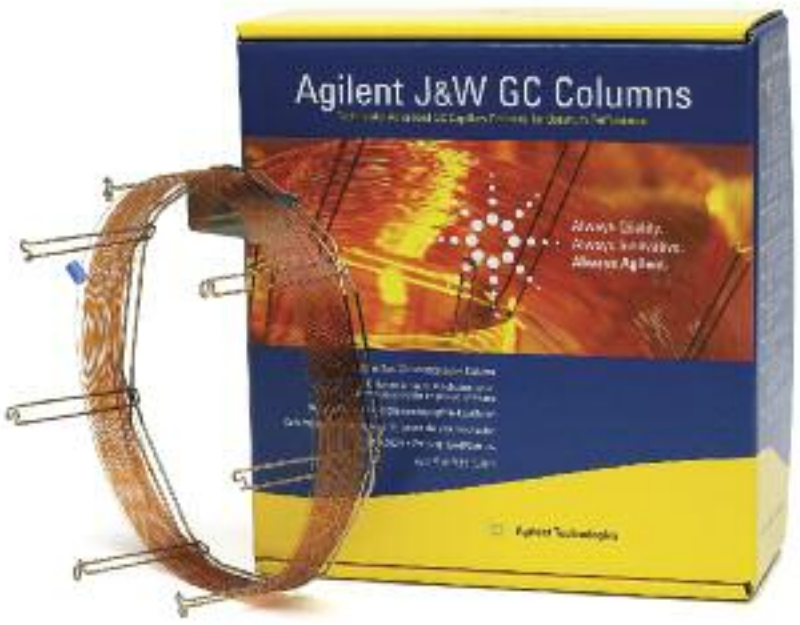
The story behind Agilent J&W Advanced GC Columns

In 2000, Agilent Technologies, the inventor of fused silica GC tubing, merged with J&W Scientific, the creator of the first GC stationary phase made from cross-linked siloxane polymers. In 2010, Agilent acquired Varian, making Agilent J&W GC columns the most extensive and innovative GC column offering in the industry.

Put 40 years of Agilent quality and innovation behind your every separation

The Agilent J&W GC column portfolio, the most extensive in the world, is led by the Agilent J&W Ultra Inert GC column family. This innovative family pushes the industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes.

In our expanded portfolio, due to the Varian acquisition, you will find PLOT, Select, VF, and CP-Sil, in addition to the existing Ultra Inert, High Efficiency, LTM, PAH, Packed, UltiMetal, and Custom GC columns. And, with Agilent's industry-leading instruments, services, global technical support, and quick shipping, Agilent's whole solution provides you with even more confidence in your column, and in your every separation.



The most inert and lowest bleed columns for sensitivity and performance

Agilent J&W columns have the widest range of standard, GC/MS and Ultra Inert stationary phases proven to deliver consistent column inertness and exceptionally low column bleed with high upper temperature limits, ensuring accurate peak identification and quantification. Column bleed can decrease spectral integrity, reduce uptime, and shorten column life. Column activity contributes to severe peak tailing, as well as compound loss or degradation for active compounds (e.g. acids and bases), leading to inaccurate quantification.

Better precision for better results

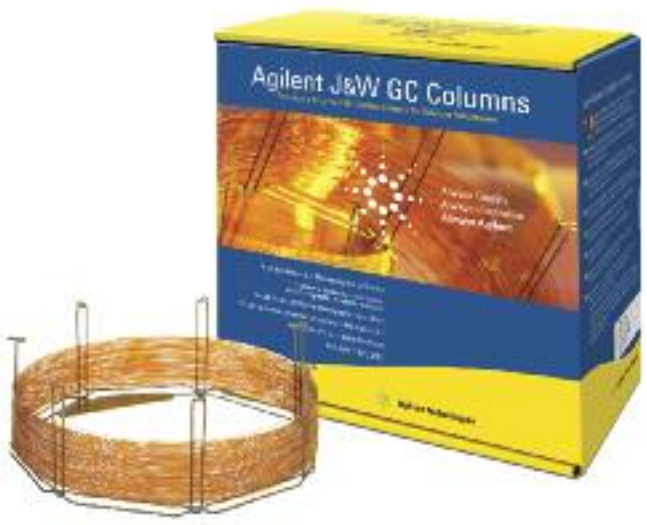
Agilent J&W columns adhere to tight retention factor (k) specifications, promoting consistent retention and separation. They also feature narrow retention indexes and a high number of theoretical plates per meter, ensuring narrow peaks and improving the resolution of closely eluting peaks.

The industry's tightest quality control specifications

Agilent's stringent testing ensures reliable qualitative and quantitative results – even for your most challenging compounds. For example, we measure peak height ratios for both acids and bases to ensure top performance for the widest range of compounds. We also monitor peak symmetry and tailing for a broad scope of chemically active compounds.

As the world's leading provider of GC capillary columns, Agilent is uniquely positioned to offer you superior quality and unmatched service and support.

For additional column recommendations, chromatograms, and method parameters, go to **www.agilent.com/chem/myGCcolumns**



COLUMN SELECTION PRINCIPLES

Narrow your choices, save time, and reduce trial and error

Selecting the right capillary column for your application can be an uncertain (and sometimes difficult) task. If possible, you should begin by consulting sample applications provided by GC manufacturers and suppliers – or described in published Application Notes.

In addition, the following pages will help you:

- Choose a stationary phase – your most critical decision – based on factors such as selectivity, polarity, and phenyl content.
- Understand how column diameter influences factors like efficiency, solute retention, head pressure, and carrier gas flow rates.
- Determine which column length will affect solute retention, column head pressure, column bleed – and cost.
- Appreciate the difference between thin-film and thick-film columns with regard to capacity, inertness, bleed, and upper temperature limit.

While there are no foolproof techniques, shortcuts, tricks or secrets to column selection, there are some guidelines and concepts that simplify the process. There are four major column parameters to consider: stationary phase, diameter, length, and film thickness.

Selecting Stationary Phases

Choosing the best stationary phase is the most important decision when selecting a capillary column. Unfortunately, it is also the most difficult and ambiguous decision. The most reliable method is to consult the large collection of example applications provided by column manufacturers, GC manufacturers and in published literature. While an exact example application may not be available, enough information can usually be obtained to simplify the decision or reduce the number of potential columns. The most difficult situation is when no previous information is available. Stationary phase selection is much easier even if only one chromatogram is available for all or most of the sample compounds. The most reliable method is to consult the large collection of example applications provided by GC column & hardware manufacturers and published in literature.

The concepts of stationary phase selectivity and polarity are very useful when selecting stationary phases. For best performance, start with the general purpose Agilent J&W Ultra Inert 1ms and 5ms columns to get the lowest column bleed and column activity for a wide range of analytes, including active compounds and trace level samples.

Synonymous use of the terms polarity and selectivity is not accurate, but it is very common. Selectivity is determined by the physicochemical interactions of the solute molecules with the stationary phase. Polarity is determined by the structure of the stationary phase. Polarity does have an effect on separation; however, it is only one of the many stationary phase properties that influence peak separation (see the next section on polarity).

Selectivity can be thought of as the ability of the stationary phase to differentiate between two solute molecules by differences in their chemical or physical properties. Separation is obtained if the interactions between the stationary phase and solutes are different. For liquid or gum stationary phase (polysiloxanes and polyethylene glycols), there are three major interactions: dispersion, dipole, and hydrogen bonding. The following is a simplified and condensed explanation of the interactions for polysiloxane and polyethylene glycol stationary phases.

Dispersion is the dominant interaction for all polysiloxane and polyethylene glycol stationary phases. Dispersion can be simplified into the concept of volatility. Simply stated, the more volatile a solute, the faster it elutes from the column (i.e., shorter retention time). However, this order can be altered by the effect of solute and stationary phase polarities, and the other interactions. Solute boiling points are sometimes used as a measure of compound volatility. That is, compounds elute in the order of their increasing boiling points. Unfortunately, boiling points cannot be universally applied to the dispersion interactions. Boiling points are fairly valid when dealing with compounds with similar structures, functional groups or homologous series (**Figure 1**). When dealing with compounds with mixed functional groups, the boiling points simplification often fails (**Figure 2**). If compound boiling points differ by more than 30 °C, they usually can be separated by most stationary phases (there are exceptions). If compound boiling points differ by less than 10 °C, the boiling point simplification becomes less certain and more likely to be in error (except for compounds in a homologous series).

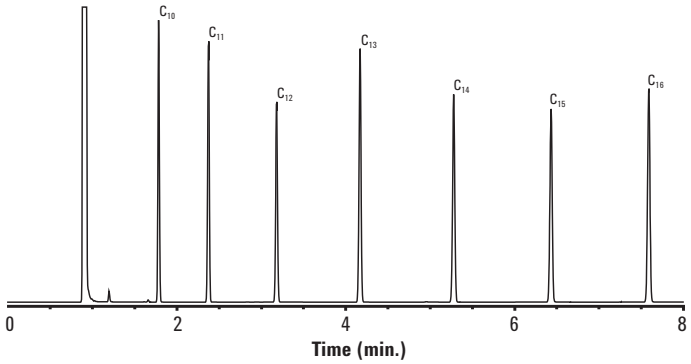
Figure 1: Boiling Point Elution Order for Homologous Series

Column: **DB-1, 15 m x 0.25 mm id, 0.25 µm**

Carrier: Helium at 30 cm/sec

Oven: 60 °C for 1 min, 60-180 °C at 20 °C/min

	Boiling Point (°C)
1. n-Decane (C_{10})	174
2. n-Undecane (C_{11})	196
3. n-Dodecane (C_{12})	216
4. n-Tridecane (C_{13})	234
5. n-Tetradecane (C_{14})	253
6. n-Pentadecane (C_{15})	268
7. n-Hexadecane (C_{16})	287

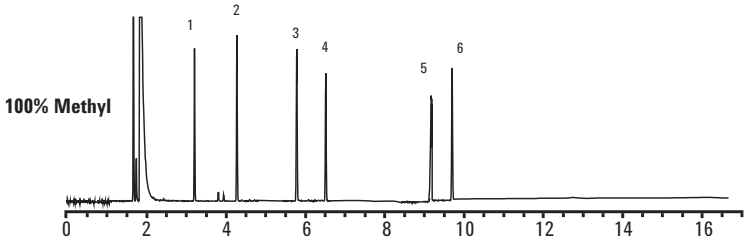


Homologous series of hydrocarbons. The solutes elute in order of their increasing boiling points; however, the peaks are not spaced in proportion to their respective boiling points.

Figure 2: Deviation from Boiling Point Order

Column: **DB-1, 30 m x 0.25 mm id, 0.25 µm**

	Boiling Point (°C)
1. Toluene	111
2. Hexanol	157
3. Phenol	182
4. Decane (C_{10})	174
5. Naphthalene	219
6. Dodecane (C_{12})	216



Solutes outside of the homologous series do not elute in the boiling point order.

If the stationary phase is capable of dipole interaction, it enhances its power to separate solutes whose dipole moments are different. Only some stationary phases are able to exploit this interaction. Polyethylene glycols, and cyanopropyl and trifluoropropyl substituted polysiloxanes readily undergo the dipole interactions; methyl or phenyl substituted groups do not undergo a dipole interaction (**Table 1**). The amount of peak separation for solutes with different dipoles often changes if a stationary phase with a different interaction is used (**Figure 3**). If the dipole difference between compounds is small, a greater amount of the appropriate group is needed (e.g., a 50% cyanopropylphenyl-methyl polysiloxane instead of a 14% cyanopropylphenyl-methyl polysiloxane). It is difficult to accurately predict the magnitude of the separation change for all of the peaks. Empirical results have shown that dipole interaction stationary phases are well suited for samples containing compounds that have base or central structures to which different groups are attached in various positions. Examples include substituted aromatics, halocarbons, pesticides and drugs.

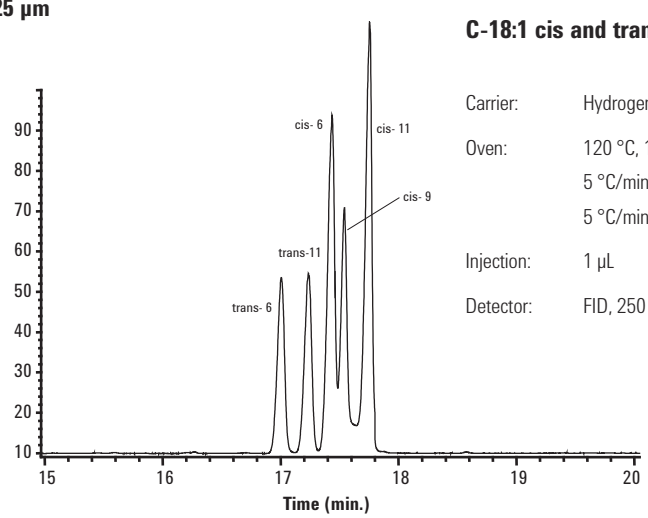
Table 1: Stationary Phase Interactions

Functional Group	Dispersion	Dipole	Hydrogen Bonding
Methyl	Strong	None	None
Phenyl	Strong	None to Weak	Weak
Cyanopropyl	Strong	Very Strong	Moderate
Trifluoropropyl	Strong	Moderate	Weak
PEG	Strong	Strong	Moderate

Figure 3: Dipole Interactions

Column: **HP-88, 30 m x 0.25 mm id, 0.25 µm**

Molecular weight and boiling points are virtually identical for these fatty acid methyl ester (FAME) isomers, with only the dipole interactions due to the hydrogen isomeric positions on the molecules being different. Only strong dipole interactions in the stationary phase can provide chromatographic separation for these types of compounds.



C-18:1 cis and trans isomers on HP-88

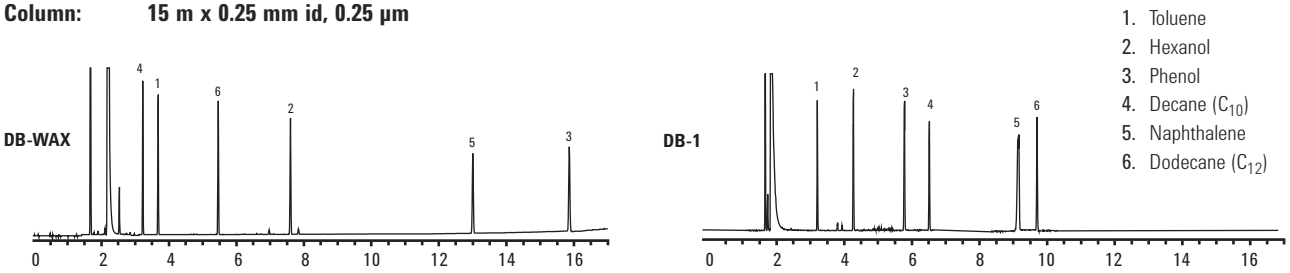
Carrier:	Hydrogen, 2 mL/min constant flow
Oven:	120 °C, 1 min, 10 °C/min to 175 °C, 10 min 5 °C/min to 210 °C, 5 min 5 °C/min to 230 °C, 5 min
Injection:	1 µL
Detector:	FID, 250 °C

The hydrogen bonding interaction occurs if there is hydrogen bonding between the solute molecules and the stationary phase. **Table 2** lists the types of compounds that can form hydrogen bonds along with their relative bonding strengths. It is the difference in the strength of the hydrogen bonding that is critical. The same stationary phases that undergo dipole interactions also undergo hydrogen bonding interactions. The amount of peak separation for solutes whose hydrogen bonding potentials differ often changes if a stationary phase with a different amount of hydrogen bonding interaction is used (**Figure 4**). If the hydrogen bonding difference between compounds is small, a great amount of the appropriate group is needed (e.g., a polyethylene glycol instead of a 14% cyanopropylphenyl-methyl polysiloxane). It is difficult to accurately predict the magnitude of the separation change for all of the peaks. Sometimes the desired separation is obtained, but another set of peaks now co-elute with the new stationary phase.

Table 2: Relative Hydrogen Bonding Strengths

Strength	Compounds
Strong	Alcohols, carboxylic acids, amines
Moderate	Aldehydes, esters, ketones
Weak to None	Hydrocarbons, halocarbons, ethers

Figure 4: Hydrogen Bonding Interactions



DB-1 does not undergo hydrogen bonding interactions. The change in the elution order of hexanol and phenol with DB-WAX is a combination of the dipole and hydrogen bonding interaction.

Another stationary phase characteristic that may effect retention in a predictable manner is the phenyl content. In general, the higher the phenyl content of the stationary phase, the higher the retention of aromatic solutes relative to aliphatic solutes. This does not mean that aromatic solutes are more retained (e.g., higher k) by high phenyl content stationary phases, but that aromatic solutes are more retained relative to aliphatic solutes. **Figure 5** shows an example of this retention behavior.

Polarity

Stationary phase polarity is determined by the polarity of the substituted groups and their relative amounts. **Table 3** lists a variety of stationary phases in order of their increasing polarity. Polarity is often erroneously used to select columns or to determine separation characteristics. Stationary phase polarity is only one of many factors that affect retention and separation.

While polarity is not directly related to selectivity, it has a pronounced affect on compound retention, thus separation. For compounds of similar volatility, greater retention is obtained for solutes with polarities similar to the stationary phase. In other words, polar compounds are more strongly retained by a polar stationary phase than a less polar stationary phase, and vice versa. This effect can be seen in **Figure 6**. The changes in retention and elution order can be largely attributed to the changes in stationary phase polarity. Changes in the amount of phenyl substitution, and dipole and hydrogen bonding interactions also contribute to the changes; however, it is difficult to assess the magnitude of their individual contributions.

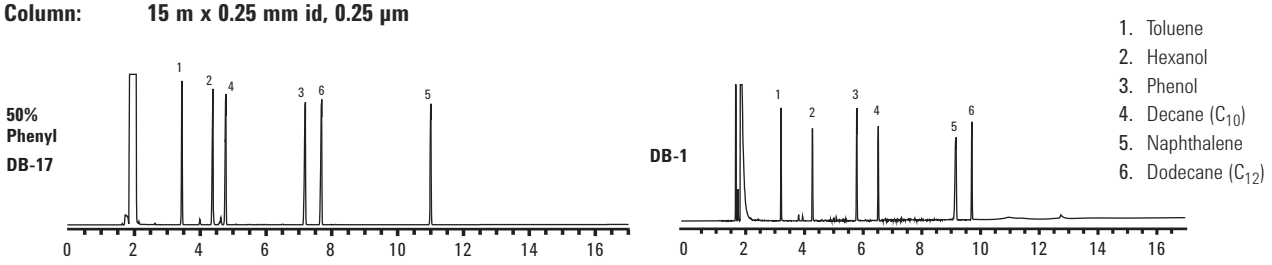
In addition to retention, stationary phase polarity influences other column characteristics. There is a general trend between stationary phase polarity and column lifetime, temperature limits, bleed and efficiency. Column life, temperature limits and efficiency tend to be higher for more non-polar stationary phases. These are general trends and not absolute certainties. Low bleed stationary phases sometimes go against this trend.

Table 3: Stationary Phase Polarity

Low Polarity			Mid Polarity			High Polarity		
CP-Sil 2	DB & HP-1ms UI	DB & HP-5ms UI	DB-XLB	DB-225ms	DB-ALC1	HP-88	DB-WAX	CP-TCEP
DB-MTBE	DB & HP-1ms	DB & HP-5ms	VF-Xms	DB-225	DB-Dioxin	CP-Sil 88	DB-WAXetr	
CP-Select CB MTBE	VF-1 ms	VF-5ms	DB-35ms UI	CP-Sil 43 CB	DB-200	DB-23	HP-INNOWax	
	DB & HP-1	DB & HP-5	DB & VF-35ms	VF-1701 ms	VF-200ms	VF-23 ms	VF-WAXms	
	CP-Sil 5 CB	CP-Sil 8 CB	DB & HP-35	DB-1701	DB-210		CP-Wax 57 CB	
	Ultra 1	Ultra 2	DB & VF-17ms	CP-Sil 19 CB	DX-4		DB & HP-FFAP	
	DB-1ht	VF-DA	DB-17	HP-Blood Alcohol			DB-WAX FF	
	DB-2887	DB-5.625	HP-50+	DB-ALC2			CP-FFAP CB	
	DB-Petro/ PONA	DB & VF-5ht	DB-17ht	DX-1			CP-WAX 58 FFAP CB	
	CP-Sil PONA CB	CP-Sil PAH CB	DB-608				CP-WAX 52 CB	
	DB-HT SimDis	Select Biodiesel	DB-TPH				CP-WAX 51	
	CP-SimDis	SE-54	DB-502.2				CP-Carbowax 400	
	CP-Volamine		HP-VOC				Carbowax 20M	
	Select Mineral Oil		DB-VRX				HP-20M	
	HP-101		DB-624				CAM	
	SE-30		VF-624ms					
			CP-Select 624 CB					
			DB-1301					
			VF-1301ms					
			CP-Sil 13 CB					

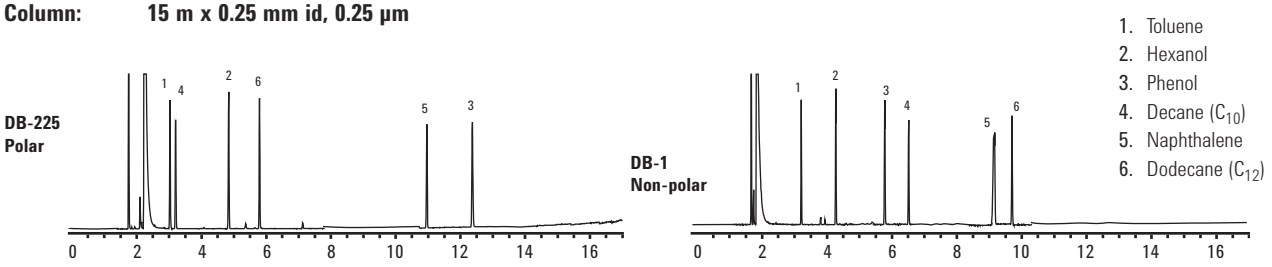
Separation and efficiency have to be considered together and not as separate column attributes, as each contributes to peak resolution. When the stationary phase provides adequate resolution between peaks, higher efficiency is not needed. Shorter or larger diameter columns and less than optimal GC conditions can be used in these situations. When resolution is not adequate, there is a need for higher column efficiency.

Figure 5: Phenyl Content Retention



The aromatics increase in retention relative to the hydrocarbons for the DB-17 columns. DB-17 contains 50% phenyl substitution. DB-1 contains no phenyl substitution.

Figure 6: Polarity – Retention Relationship



The alcohols (polar) increase in retention relative to hydrocarbon (non-polar) for the DB-225 column. DB-225 is more polar than DB-1.

Gas-Solid or PLOT Columns

PLOT (Porous Layer Open Tubular) columns are intended for the separation of very volatile solutes (primarily gases) without the need for cryogenic or sub-ambient cooling of the oven. Separations that would require column temperatures below 35 °C, even with thick film liquid stationary phase can be obtained at temperatures above 35 °C with PLOT columns.

Gas-solid or PLOT column stationary phases are physically different than polysiloxanes and polyethylene glycols. Gas-solid stationary phase are small, porous particles. The particles are stuck to the inner wall of the capillary tubing using a binder or similar means. Solutes are separated based on differences in their adsorption properties. Since the particles are porous, size and shape differentiation also occurs.

Alumina PLOT columns are well suited for the separation of C_1-C_{10} hydrocarbons and small aromatics. The KCl version of the Alumina PLOT column changes the retention order for some of the hydrocarbons. The PLOT Q column provides slightly better separation for C_1-C_3 hydrocarbons, but C_4 and higher hydrocarbons are better separated with an Alumina PLOT column. PLOT Q exhibits extremely long retention times and very broad peaks for C_6 and higher hydrocarbons and aromatics. PLOT Q separates sulfur gases from each other and from most light hydrocarbons. Molesieve PLOT columns are used to separate many noble and permanent gases. GS-GasPro columns combine many of the features of the various other PLOT columns. Light hydrocarbons, inorganic gases and solvents are some of the samples suitable for GS-GasPro.

Primary Selectivity Interactions in PLOT Phases

Dispersive		
Shape/Size Zeolites	⟷	**Ionic Surface** Alumina/Al_2O_3 GS-OxyPLOT

Dispersive		
Shape/Size Bonded Graphitized Carbon Molecular Sieves	⟷ **Porous Polymers**	**Ionic Surface** Bonded Silica

PLOT Column Examples

Zeolite/Molesieve:	HP-PLOT Molesieve
Graphitized Bonded Carbon:	GS-CarbonPLOT, CarboBOND
Porous Polymers:	HP-PLOT Q, HP-PLOT U
Bonded Silica:	GS-GasPro, CP-SilicaPLOT
Alumina/Al_2O_3:	GS-Alumina, GS-Alumina KCl, HP-PLOT Al_2O_3 KCl, HP-PLOT Al_2O_3 "S", HP-PLOT Al_2O_3 "M"
Proprietary Phase:	Lowox, GS-OxyPLOT

Stationary Phase Selection Summary

1. If no information or ideas about which stationary phase to use is available, start with a DB-1 or DB-5.
2. Low-bleed ("ms") columns are usually more inert and have higher temperature limits. Ultra Inert 1ms, 5ms and 35ms columns provide the lowest column bleed and highest column inertness for a wide range of analytes, including active compounds and trace level samples.
3. Use the least polar stationary phase that provides satisfactory resolution and analysis times. Non-polar stationary phases have superior lifetimes compared to polar phases.
4. Use a stationary phase with a polarity similar to that of the solutes. This approach works more times than not; however, the best stationary phase is not always found using this technique.
5. If poorly separated solutes possess different dipoles or hydrogen bonding strengths, change to a stationary phase with a different amount (not necessarily more) of the dipole or hydrogen bonding interaction. Other co-elutions may occur upon changing the stationary phase, thus the new stationary phase may not provide better overall resolution.
6. If possible, avoid using a stationary phase that contains a functionality that generates a large response with a selective detector. For example, cyanopropyl containing stationary phases exhibit a disproportionately large baseline rise (due to column bleed) with NPDs.
7. A DB-1 or DB-5, DB-1701, DB-17, and DB-WAX cover the widest range of selectivities with the smallest number of columns.
8. PLOT columns are used for the analysis of gaseous samples at above ambient column temperatures.

Tips & Tools

Ensure a lifetime of peak performance and maximum productivity with Agilent's comprehensive GC supplies portfolio, learn more at **www.agilent.com/chem/GCsupplies**

Table 4:
Column Efficiency vs. Diameter

Column ID Diameter (mm)	Theoretical Plates/Meter
0.10	12,500
0.18	6,600
0.20	5,940
0.25	4,750
0.32	3,710
0.45	2,640
0.53	2,240

Maximum efficiency for a solute with k=5

Column Diameter

Column diameter has an influence over five parameters of primary concern. They are efficiency, retention, pressure, carrier gas flow rate, and capacity.

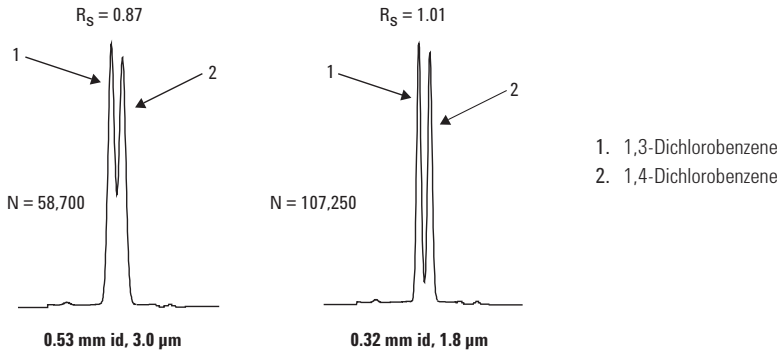
Column efficiency (N/m) is inversely proportional to column diameter. The efficiencies listed in **Table 4** show that smaller diameter columns have higher theoretical plates per meter. Resolution is a square root function of the theoretical plate number. Therefore, doubling column efficiency theoretically increases resolution only by 1.41 times (the square root of 2), but closer to 1.2-1.3 times in real practice. Smaller diameter columns are used when peak separation is small and high column efficiency (i.e., narrow peaks) is needed. **Figure 7** shows the difference in resolution for two different diameter columns.

Solute retention is inversely proportional to column diameter, for isothermal temperature conditions. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. Column diameters are rarely selected based on retention. **Figure 7** shows the difference in retention for two different diameter columns.

Column head pressure is approximately an inverse squared function of the column radius. For example, a 0.25 mm id column requires about 1.7 times the head pressure of a 0.32 mm id column of the same length (also, carrier gas and temperature). Column head pressures increase or decrease dramatically with changes in column diameter. Column diameters of 0.18 mm id or larger are used for standard GC analysis due to the very high pressures needed for smaller diameter columns. Wider diameter columns, especially shorter ones (e.g., 15 m x 0.32 mm id), are impractical for use in GC/MS systems. The vacuum at the exit of the column greatly reduces the required head pressure, and it is difficult to maintain or control very low head pressures.

Figure 7: Column Diameter – Comparison of Resolution and Retention

Column: DB-624, 30 m



1. 1,3-Dichlorobenzene
2. 1,4-Dichlorobenzene

At constant pressure, **carrier gas flow rates** increase as column diameters increase. For applications or hardware requiring high flow rates, larger diameter columns are normally used. Headspace and purge & trap systems require higher carrier gas flow rates for proper operation. 0.45 or 0.53 mm id columns are used with these systems so that the higher flow rates can be used. Special considerations must be taken if small diameter columns are used in these types of systems. This includes the use of cryogenic interfaces or ovens, or interfacing through split injectors. Added complexity and/or cost, or sample loss, are involved with these techniques. For applications or hardware requiring low carrier gas flow rates, smaller diameter columns are normally used. GC/MS is the typical system requiring low carrier gas flow rates, and therefore, 0.25 mm id and smaller id columns are used in these applications.

Column capacity increases as the column diameter increases. The actual column capacity also depends on the stationary phase, solute and film thickness. **Table 5** lists typical capacity ranges for a variety of column diameters.

Table 5: Column Capacity in ng

Film Thickness (µm)	Column Inside Diameter (mm)			
	0.18-0.20	**0.25**	**0.32**	**0.53**
0.10	20-35	25-50	35-75	50-100
0.25	35-75	50-100	75-125	100-250
0.50	75-150	100-200	125-250	250-500
1.00	150-250	200-300	250-500	500-1000
3.00		400-600	500-800	1000-2000
5.00		1000-1500	1200-2000	2000-3000

Column Diameter Selection Summary

1. Use **0.15, 0.18 or 0.25 mm id columns** when higher column efficiencies are needed. 0.15 and 0.18 mm id columns are especially well suited for GC/MS systems with low pumping capacities. Smaller diameter columns have the lowest capacities and require the highest head pressures.
2. Use **0.32 mm id columns** when higher sample capacity is needed. They often provide better resolution of earlier eluting solutes for splitless injections or large injection volumes (> 2 µL) than 0.25 mm id columns.
3. Use **0.45 mm id columns** when only a Megabore direct injector is available and higher column efficiency is desired. Well suited for high carrier gas flow rate situations, such as with purge & trap, headspace samplers, and valve injection applications.
4. Use **0.53 mm id columns** when only a Megabore direct injector is available. Well suited for high carrier gas flow rate situations, such as with purge & trap and headspace samplers. 0.53 mm id columns have the highest sample capacities at constant d_f.

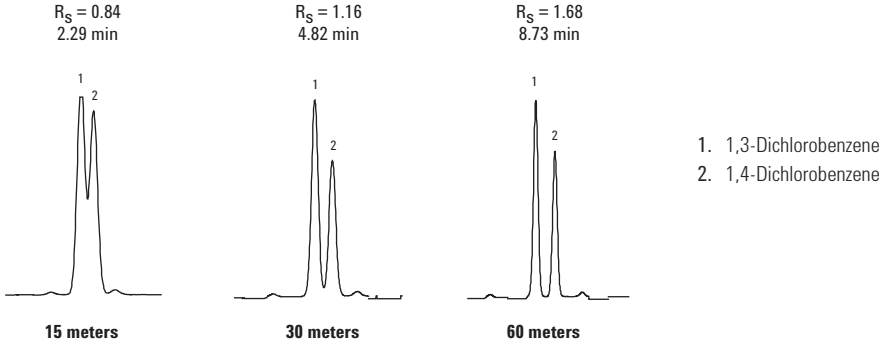
Column Length

Column length influences three parameters of major concern. They are efficiency, retention (analysis time) and carrier gas pressure.

Column efficiency (N) is proportional to column length. Resolution is a square root function of the theoretical plate number. For example, doubling column length (thus efficiency) theoretically increases resolution by only 1.41 times (closer to 1.2-1.3 times in practice). Longer columns are used when peak separation is small and high column efficiency (i.e., narrow peaks) is needed. **Figure 8** shows the difference in resolution for three different lengths.

Figure 8: Column Length – Comparison of Resolution and Retention

Column: **DB-624**
15 m x 0.53 mm id, 0.3 µm
30 m x 0.53 mm id, 0.3 µm
60 m x 0.53 mm id, 0.3 µm



1. 1,3-Dichlorobenzene
2. 1,4-Dichlorobenzene

Solute retention is proportional to column length for isothermal temperature conditions. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. When efficiency is increased by lengthening the column, there is a significant increase in analysis time. **Figure 8** shows the difference in retention for three different lengths.

Column head pressure is nearly proportional to column length. Pressure is usually not an issue unless the column has a very small or large diameter. Long, small diameter columns require extremely high head pressures, and short, wide diameter columns require very low head pressures. Neither situation is very practical and may be a limiting factor. Choice of carrier gas will also have an impact on column pressure.

Column bleed increases as column length increases. Longer columns have more stationary phase, thus more degradation products are produced. The increase in bleed with longer columns is not large and should not be a deterrent to using a longer column when one is necessary.

Column cost is directly related to column length. Doubling column length nearly doubles the price of the column. When efficiency is increased by lengthening the column, there is a significant increase in column cost. When considered in conjunction with the increase in analysis time, lengthening the column should be the last reasonable option for increasing efficiency.

Shorter columns cost more per meter than longer columns. Cutting longer columns into shorter lengths seems like a good method to save money, but it is not recommended. The quality of the smaller pieces cannot be guaranteed and may not be the same as the original, intact column. Theoretically, each piece should provide satisfactory and consistent results. In practice, this does not always occur. The probability of individual piece variation is higher when shorter pieces are cut from the original column. Greater variability between individual pieces is observed as column length, film thickness and stationary phase polarity increases, and column diameter decreases. Finally, there is the increased chance of tubing breakage when rewinding the shorter columns on other cages. Technically, cutting a column into shorter pieces voids the performance warranty.

Column Length Selection Summary

1. Start with **25-30 meter columns** when the best length is unknown.
2. **10-15 meter columns** are well suited for samples containing very well separated solutes or very few solutes. Shorter lengths are used for very small diameter columns to reduce head pressures.
3. **50-60 meter columns** should be used when resolution is not possible by other means (smaller diameter, different stationary phase, change in column temperature). Best suited for complex samples containing a large number of solutes. Long columns have long analysis times and higher cost.

Column Film Thickness

Column film thickness influences five major parameters: retention, resolution, bleed, inertness and capacity.

For isothermal conditions, solution retention is directly proportional to film thickness. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. Thicker film columns are used to obtain higher retention for very volatile solutes. Volatile solutes normally requiring cryogenic (subambient) cooling with standard film thickness columns can be sufficiently retained at temperatures above 30 °C. Changing to a thicker film column has a net effect of providing equal or greater retention at a higher column temperature. Thicker film columns are typically used for volatile compounds like solvents and select gases. Thinner film columns are used to reduce the retention of highly retained solutes. Highly retained solutes can be eluted faster or at a lower temperature. Changing to a thinner film column has the net effect of providing equal or less retention at a lower column temperature. Thinner film columns are typically used for high boiling or molecular weight compounds. **Figure 9** shows the difference in retention for two different film thicknesses.

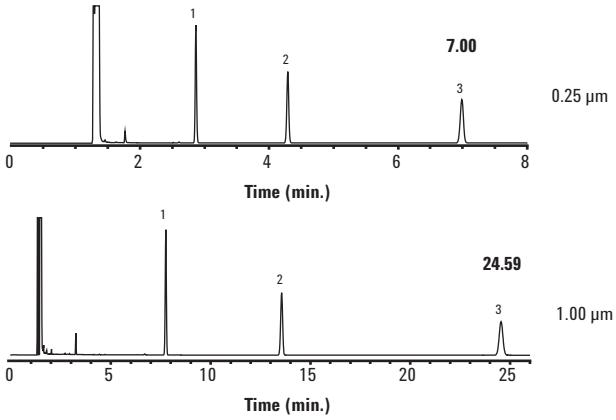
Solutes with **k** values less than 2 are very difficult to resolve due to insufficient retention by the column. Changing to a thicker film column results in better resolution since solute retention is increased. The resolution improvement depends on the solute **k** value for the original column. For solutes with **k** values of about 5 or less, increasing their retention results in improved resolution. For solute peaks with values of 5-10, increasing their retention provides a small to moderate increase in resolution. For peaks with **k** values above 10, increasing their retention often results in no resolution improvement and sometimes a loss of resolution. Increasing film thickness to improve the resolution of early eluting peaks may result in a resolution loss for later eluting peaks.

Figure 9: Column Film Thickness – Comparison of Resolution and Retention

Column: **DB-1, 30 m x 0.32 mm id**

Carrier: Helium at 38 cm/sec

Oven: 100 °C isothermal



1. n-Decane
2. n-Undecane
3. n-Dodecane

For a given stationary phase, column bleed increases as film thickness increases. Since thicker film columns are more retentive, later eluting peaks may shift into a region of much higher column bleed when increasing film thickness. The upper temperature limits of thick film columns may be lower due to their higher bleed levels.

Thicker film columns are more inert. There is more stationary phase to shield the solutes from the tubing surface. Peak tailing for active compounds can often be reduced or eliminated with a thicker film column.

Thicker film columns have higher solute capacities. When one solute is present in significantly higher amounts, the resulting broad peak may interfere or co-elute with an adjacent peak. Changing to a thicker film column may reduce peak broadening, thus co-eluting. **Table 5** lists typical capacity ranges for a variety of film thickness.

Column Film Thickness Selection Summary

1. For **0.18-0.32 mm id columns**, a film thickness of 0.18-0.25 µm is average or standard (i.e., not thin or thick) and used for most analyses.
2. For **0.45-0.53 mm id columns**, a film thickness of 0.8-1.5 µm is average or standard (i.e., not thin or thick) and used for most analyses.
3. **Thick film columns** are used to retain and resolve volatile solutes (e.g., light solvents, gases). Thick columns are more inert and have higher capacities. Thick film columns exhibit higher column bleed and decreased upper temperature limits.
4. **Thin film columns** are used to minimize the retention of high boiling, high molecular weight solutes (e.g., steroids, triglycerides). Thin film columns are less inert, have lower capacities and exhibit lower column bleed.

GC Column Application and Method Guides

Application	Specific Application	Agilent Phase
Biodiesel	EN14105 Free/Total Glycerin	Biodiesel, Select Biodiesel
	ASTM D6584 Free/Total Glycerin	Biodiesel, Select Biodiesel
	EN14103 FAME Analysis	Biodiesel, Select Biodiesel
	EN14110 Residual Methanol	Biodiesel, Select Biodiesel
	EN14106 Free Glycerol	Select Biodiesel
Chiral	Chiral γ-lactones and terpenes	CycloSil-B
	Optical isomers of acids, alcohols, amino acids, aromatic hydrocarbons, diols, flavors, aromas, ketones, organic acids and phenols	Cyclodex-B
	Chiral compounds using a nitrogen selective detector	HP-Chiral β
	Optical isomers of acids, alcohols, amino acids, aromatic, diols, flavor, aromas, ketones, organic acids and phenols	CP-Chirasil-Dex CB, CP-Cyclodextrin-β-2,3,6-M-19
	Amino acids, optical isomers	CP-Chirasil-Dex CB, CP-Cyclodextrin-β-2,3,6-M-19
Foods, Flavors and Fragrances	FAME up to C_{26}, cis, trans, fast resolution FAME	Select FAME
	Best separation for cis, trans FAME analyses up to 260 °C	HP-88, CP-Sil 88 for FAME
	Volatiles	CP-Carbowax 400 for Volatiles in Alcohol
	Unsaturated triglycerides	CP-TAP CB for Triglycerides
	Flavors, aromas, free fatty acids C_1-C_{26}	DB-WAX, HP-WAX, CP-FFAP CB
	Glycols, diols, alcohols	CP-Wax 57 CB for Glycols and Alcohols, DB-WAX
Life Sciences	Blood alcohol analysis	DB-ALC1 and DB-ALC2
	Drugs of abuse confirmation	DB-5ms EVDX
	USP solvents, common solvents	DB-624, VF-624ms
	Drugs of abuse confirmation	DB-35ms Ultra Inert, VF-DA
Pesticides	Organochlorine pesticides and PCBs	DB-35ms Ultra Inert, DB-17ms, DB-XLB
	Chlorinated pesticides and PCBs	DB-608
	Trace levels of pesticides in food and environmental samples	DB-35ms Ultra Inert, DB-XLB, VF-1701 Pesticides, DB-1701P
	Chlorinated, nitrogen, phosphorus pesticides	CP-Sil 8 CB for Pesticides, DB-35ms Ultra Inert, DB-5ms Ultra Inert
	Chlorinated, nitrogen, phosphorus pesticides, trace level DDT and Endrin	CP-Sil 19 CB for Pesticides, DB-35ms, DB-XLB

(Continued)

Application	Specific Application	Agilent Phase
Polycyclic Aromatic Hydrocarbons	EU regulated PAHs	DB-EUPAH
	PAHs in environmental and food samples	Select PAH
	C_5-C_{80}, PAH and polar compounds	CP-Sil PAH CB UltiMetal
	EU and EPA regulated PAHs	VF-17ms for PAH
Petroleum	Simulated distillation using ASTM Method D2887	DB-2887
	C_5-C_{120} simulated distillation	DB-HT SimDis, CP-SimDist UltiMetal
	PONA and PIANO analysis	HP-PONA, DB-Petro, CP-Sil PONA CB
	ASTM D5134	CP-Sil PONA for ASTM D5134
	C_1-C_{10} hydrocarbons	Select Al_2O_3 MAPD, Alumina PLOT family
	C_1-C_6 alcohols, aromatic C_6-C_{10}	CP-TCEP for Alcohols in Gasoline
	Sulfur impurities in propylene streams	Select Low Sulfur
	Polar and non-polar volatile compounds, especially chlorosilanes with different substituents such as alkyl groups, or groups with ether, hydroxy and nitrile bonds	Select Silanes
	C_1-C_6 amines, alcohols, NH_3, water, solvents, ethanol amines	CP-Volamine
	C_3-C_{20} amines, alkanol amines	CP-Sil 8 CB for Amines
	C_3-C_8 amines and diamines	CP-Wax for Volatile Amines and Diamines
	C_4-C_{10} amines, diamines and aromatic amines	CP-Wax 51 for Amines
	Oxygenates in C_1-C_{10} hydrocarbons	CP-Lowox, GS-OxyPLOT
	C_1-C_{10} hydrocarbons	GS-OxyPLOT
	Methanol, formaldehyde and formic acid in water	CP-Sil 5 CB for Formaldehyde
	C_1-C_{12} hydrocarbons	CP-Squalane
	Volatile oxygenates and halogenated hydrocarbons	CP-Propox
Semivolatiles	Polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs)	DB-Dioxin
	Dioxins and dibenzo furan	CP-Sil 88 for Dioxins, DB-Dioxin
	EPA Semivolatiles Methods 625, 1625, 8270 and CLP protocols	DB-5ms Ultra Inert, DB-5.625, HP-5ms Semivolatile
	PCB, detailed analysis	CP-Sil 5/C18 CB for PCB
	PCB	CP-Sil 8 CB for PCB, DB-XLB

(Continued)

Application	Specific Application	Agilent Phase
Volatiles	EPA Methods 502.2, 524.2 and 8260	DB-VRX
	Volatile priority pollutants and residual solvents	DB-624, VF-624ms
	Halogenated hydrocarbons and solvents	CP-Select 624 CB
	EPA Methods 502.2, 524.2 and 8260	HP-VOC
	EPA Method 502.2	DB-502.2
	MTBE in soil and water	DB-MTBE
	Oxygenates and solvents	CP-Select CB for MTBE
	Total petroleum hydrocarbons (TPHs), soil analysis, and LUFT	DB-TPH
	C_5-C_{40} hydrocarbons	Select Mineral Oil
Metal	High temperature analysis and process applications	UltiMetal and DB-ProSteel
Non-Bonded	Amino acid derivatives, essential oils	HP-101
	Drugs, glycols, pesticides, steroids	HP-17
	Amines, basic compounds	CAM
	Alcohols, free acids, essential oils, ethers, glycols, solvents	Carbowax 20M and HP-20M
	Generic	SE-30 and SE-54

Tips & Tools

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EPA Method

Drinking Water			
EPA Method	**Application**	**Recommended Column**	**Part No.**
501, 501.3	Measurement of trihalomethanes in drinking water by GC/MS and selected ion monitoring	DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
502.2	Volatile organic compounds in water by purge and trap capillary column GC with photoionization and electrolytic conductivity detectors in series	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
503.1	Volatile aromatic and unsaturated organic compounds in water by purge and trap gas chromatography	DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
504.1	1,2-Dibromoethane (EDB) and 1,2-dibromo-3-chloropropane (DB CP), GC, microextraction	DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		VF-1ms, 30 m x 0.32 mm, 1.00 µm	CP8926
		VF-1701ms, 30 m x 0.32 mm, 1.00 µm	CP9163
505	Analysis of organohalide pesticides and commercial polychlorinated biphenyl (PCB) products in water by microextraction and GC	DB-XLB, 30 m x 0.25 mm, 0.50 µm	122-1236
		VF-1ms, 30 m x 0.32 mm, 1.00 µm	CP8926
		VF-17ms, 30 m x 0.32 mm, 0.50 µm	CP8991
506	Determination of phthalate and adipate esters in drinking water by liquid-liquid extraction or liquid-solid extraction and GC with photoionization detection	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5ms, 30 m x 0.32 mm, 0.25 µm	CP8955
		VF-1ms, 30 m x 0.32 mm, 0.25 µm	CP8924
507	Determination of nitrogen and phosphorus-containing pesticides in water by GC with a nitrogen-phosphorus detector	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
508	Determination of chlorinated pesticides in water by GC with an electron capture detector	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-608, 30 m x 0.32 mm, 0.50 µm	123-1730
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
508.1	Determination of chlorinated pesticides, herbicides, and organohalides by liquid-solid extraction and electron capture GC	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074

(Continued)

Drinking Water

EPA Method	Application	Recommended Column	Part No.
515	Determination of chlorinated herbicides in drinking water	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
515.3	Determination of chlorinated acids in drinking water by liquid-liquid extraction, derivatization and GC with electron capture detection	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
515.4	Determination of chlorinated acids in drinking water by liquid-liquid microextraction, derivatization, and fast GC with electron capture detection	DB-5ms Ultra Inert, 20 m x 0.18 mm, 0.18 µm	121-5522UI
		HP-5ms Ultra Inert, 20 m x 0.18 mm, 0.18 µm	19091S-577UI
		DB-1701, 20 m x 0.18 mm, 0.18 µm	121-0722
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
521	Determination of nitrosamines in drinking water by solid phase extraction and capillary column gas chromatography with large volume injection and chemical ionization tandem mass spectrometry (MS/MS)	DB-5ms Ultra Inert, 30 m x 0.25 mm, 1.00 µm	122-5533UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 1.00 µm	19091S-233UI
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
524.2	Measurement of purgeable organic compounds in water by capillary GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		HP-VOC, 60 m x 0.20 mm, 1.10 µm	19091R-306
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
		VF-5ms, 30 m x 0.32 mm, 1.00 µm	CP8957
525, 525.2	Determination of organic compounds in drinking water by liquid-solid extraction and capillary column GC/MS	HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
526	Determination of selected semivolatile organic compounds in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
527	Determination of selected pesticides and flame retardants in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944

(Continued)

Drinking Water

EPA Method	Application	Recommended Column	Part No.
528	Determination of phenols in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
529	Determination of explosives and related compounds in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms Ultra Inert, 15 m x 0.25 mm, 0.25 µm	122-5512UI
		HP-5ms Ultra Inert, 15 m x 0.25 mm, 0.25 µm	19091S-431UI
		VF-5ms, 15 m x 0.25 mm, 0.25 µm	CP8939
551	Determination of chlorination disinfection byproducts and chlorinated solvents in drinking water by liquid-liquid extraction and gas chromatography with electron-capture detection	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-1, 30 m x 0.25 mm, 1.00 µm	122-1033
		DB-210, 30 m x 0.25 mm, 0.50 µm	122-0233
		VF-1301ms, 30 m x 0.25 mm, 1.00 µm	CP9054
551.1	Determination of chlorination disinfection byproducts, chlorinated solvents, and halogenated pesticides/herbicides in drinking water by liquid-liquid extraction and GC with electron-capture detection	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-1, 30 m x 0.25 mm, 1.00 µm	122-1033
		DB-1301, 30 m x 0.25 mm, 1.00 µm	122-1333
		VF-1ms, 30 m x 0.25 mm, 1.00 µm	CP8913
		VF-1301ms, 30 m x 0.25 mm, 1.00 µm	CP9054
552	Determination of haloacetic acids in drinking water by liquid-liquid extraction, derivatization, and gas chromatography with electron-capture detection	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
552.1	Determination of haloacetic acids and dalapon in drinking water by ion-exchange liquid-solid extraction and gas chromatography with an electron-capture detector	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236

(Continued)

Drinking Water

EPA Method	Application	Recommended Column	Part No.
552.2	Determination of haloacetic acids and dalapon in drinking water by liquid-liquid extraction, derivatization GC with electron capture detection	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
552.3	Determination of haloacetic acids and dalapon in drinking water by liquid-liquid microextraction, derivatization, and GC with electron capture detection	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
556	Determination of carbonyl compounds in drinking water by pentafluorobenzylhydroxylamine derivatization and capillary GC with electron capture detection	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944

Waste Water

EPA Method	Application	Column	Part No.
601	Purgeable halocarbons	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 75 m x 0.45 mm, 2.55 µm	124-1374
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
602	Purgeable aromatics	DB-624, 75 m x 0.53 mm, 3.00 µm	125-1374
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
603	Acrolein and acrylonitrile	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-WAXms, 30 m x 0.25 mm, 1.00 µm	CP9206
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
604	Phenols	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
605	Benzidines	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
606	Phthalate esters	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
607	Nitrosamines	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		CP-Sil 8 CB for Amines, 30 m x 0.32 mm, 1.00 µm	CP7596
608	Organochlorine pesticides and PCBs	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-17ms, 30 m x 0.32 mm, 0.25 µm	123-4732
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-17ms, 30 m x 0.25 mm, 0.25 µm	CP8982

(Continued)

Waste Water

EPA Method	Application	Column	Part No.
609	Nitroaromatics and isophorone	HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		DB-5ms, 30 m x 0.25 mm, 0.50 µm	122-5536
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
610	Polynuclear aromatic hydrocarbons	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-5ms, 30 m x 0.32 mm, 0.25 µm	123-5532
		DB-17ms, 30 m x 0.25 mm, 0.25 µm	122-4732
		VF-17ms, 30 m x 0.25 mm, 0.25 µm	CP8982
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
611	Haloethers	VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
612	Chlorinated hydrocarbons	DB-5ms, 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms, 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1, 30 m x 0.32 mm, 0.50 µm	123-103E
		VF-5ms, 30 m x 0.25 mm, 0.10 µm	CP8943
		VF-35ms, 30 m x 0.25 mm, 0.25 µm	CP8877
		VF-200ms, 30 m x 0.25 mm, 1.00 µm	CP8860
613	2,3,7,8-Tetrachlorodibenzo-p-dioxin	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 88 for Dioxins, 50 m x 0.25 mm, 0.20 µm	CP7588
		VF-5ms, 60 m x 0.25 mm, 0.10 µm	CP8948
614	The determination of organophosphorus pesticides in municipal and industrial wastewater	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
615	Chlorinated herbicides	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
619	Triazine pesticides	DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		VF-17ms, 30 m x 0.25 mm, 0.50 µm	CP8983
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
622	The determination of organophosphorus pesticides in municipal and industrial wastewater	DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI

(Continued)

Waste Water

EPA Method	Application	Column	Part No.
624	Purgeables	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		HP-VOC, 60 m x 0.20 mm, 1.10 µm	19091R-306
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
625	Base/neutrals and acids	HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.50 µm	19091S-133UI
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-200ms, 30 m x 0.25 mm, 0.25 µm	CP8858
1613	Tetra- through octa-chlorinated dioxins and furans by isotope dilution HRGC/HRMS	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 88 for Dioxins, 50 m x 0.25 mm, 0.20 µm	CP7588
		VF-5ms, 60 m x 0.25 mm, 0.25 µm	CP8960
1624	Volatile organic compounds by isotope dilution GC/MS	DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
1625	Semivolatile organic compounds by isotope dilution GC/MS	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
8021	Volatile halogenated & aromatic organic compounds	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364

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EPA Method	Application	Column	Part No.
8010	Volatile halogenated organic compounds list by EPA method 8021	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
8011	1,2-Dibromoethane and 1,2-dibromo-3-chloropropane by microextraction and GC	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-1ms, 30 m x 0.32 mm, 0.25 µm	CP8924
8015	Nonhalogenated organics by GC	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
8015c	Nonhalogenated organics by GC	DB-WAX, 30 m x 0.25 mm, 0.50 µm	122-7033
		DB-5, 30 m x 0.25 mm, 1.00 µm	122-5033
		HP-5, 30 m x 0.25 mm, 1.00 µm	19091J-233
		VF-WAXms, 30 m x 0.53 mm, 1.00 µm	CP9215
		CP-Sil 8 CB, 30 m x 0.53 mm, 1.50 µm	CP8736
8020	Volatile aromatic organic compounds list by EPA method 8021	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
8021, CLP Volamines	Volatile halogenated & aromatic organic compounds	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
8021b	Aromatic and halogenated volatiles by GC	VF-624ms, 60 m x 0.53 mm, 3.00 µm	CP9107
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
8031	Acrylonitrile by GC	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
8032	Acrylamide by GC	CP-Wax 58 FFAP CB, 25 m x 0.53 mm, 2.00 µm	CP7654
8033	Acetonitrile by GC with nitrogen-phosphorus detection	DB-WAX, 15 m x 0.25 mm, 0.50 µm	122-7013
		HP-INNOWax, 15 m x 0.25 mm, 0.50 µm	19091N-231
		VF-WAXms, 15 m x 0.53 mm, 1.00 µm	CP9226
8040, 8041, 8041a	Phenols by gas chromatography	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
		VF-17ms, 30 m x 0.53 mm, 1.00 µm	CP9001
8060	Phthalate esters	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
8061	Phthalate esters by GC with electron capture detection (GC/ECD)	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
8070, 8070a	Nitrosamines by gas chromatography	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		CP-Sil 8 CB for Amines, 30 m x 0.53 mm, 1.00 µm	CP7597
		VF-17ms, 30 m x 0.53 mm, 1.50 µm	CP9002

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EPA Method	Application	Column	Part No.
8081, 8081a	Organochlorine pesticides by gas chromatography	DB-35ms, 30 m x 0.32 mm, 0.25 µm	123-3832
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-35ms, 30 m x 0.25 mm, 1.00 µm	CP8879
		VF-35ms, 30 m x 0.53 mm, 0.50 µm	CP8887
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
8082, CLP Pesticides, 8082a	Polychlorinated biphenyls (PCBs) by gas chromatography	DB-35ms, 30 m x 0.32 mm, 0.25 µm	123-3832
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-35ms, 30 m x 0.25 mm, 1.00 µm	CP8879
		VF-35ms, 30 m x 0.53 mm, 0.50 µm	CP8887
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
8090	Nitroaromatics and isophorone	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
8091	Nitroaromatics and cyclic ketones by GC	VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
8095	Explosives by GC	DB-225, 15 m x 0.53 mm, 1.00 µm	125-2212
		HP-5, 15 m x 0.53 mm, 1.50 µm	19095J-321
		DB-5, 15 m x 0.53 mm, 1.50 µm	125-5012
		VF-5ms, 15 m x 0.53 mm, 1.50 µm	CP8973
		VF-1ms, 15 m x 0.53 mm, 1.50 µm	CP8967
		VF-200ms, 15 m x 0.53 mm, 1.00 µm	CP8866
8100	Polynuclear aromatic hydrocarbons	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-5ms, 30 m x 0.32 mm, 0.25 µm	123-5532
		DB-1ms, 30 m x 0.25 mm, 0.25 µm	122-0132
		DB-17ms, 30 m x 0.25 mm, 0.25 µm	122-4732
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
8111	Haloethers by GC	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		DB-1701, 30 m x 0.25 mm, 1.00 µm	122-0733
		VF-5ms, 15 m x 0.53 mm, 1.50 µm	CP8973
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171

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EPA Method	Application	Column	Part No.
8120	Chlorinated hydrocarbons by gas chromatography	DB-5ms, 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms, 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1, 30 m x 0.32 mm, 0.50 µm	123-103E
8121	Chlorinated hydrocarbons by GC: capillary column technique	DB-5ms, 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms, 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1, 30 m x 0.32 mm, 0.50 µm	123-103E
		VF-200ms, 30 m x 0.53 mm, 1.00 µm	CP8868
		VF-WAXms, 30 m x 0.53 mm, 1.00 µm	CP9215
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
8131	Aniline and selected derivatives by GC	DB-5ms Ultra Inert, 30 m x 0.25 mm, 1.00 µm	122-5533UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.50 µm	19091S-133UI
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
		CP-Sil 8 CB for Amines, 30 m x 0.25 mm, 0.25 µm	CP7598
8140	Organophosphorus pesticides by GC-NPD	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
8141a, 8141b	Organophosphorus compounds by gas chromatography: capillary column technique	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-200ms, 30 m x 0.53 mm, 1.00 µm	CP8868
		VF-35ms, 30 m x 0.53 mm, 1.00 µm	CP8888
		VF-5ms, 30 m x 0.53 mm, 1.00 µm	CP8975
		VF-1ms, 30 m x 0.53 mm, 1.00 µm	CP8969
8150	Chlorinated herbicides	DB-35ms, 30 m x 0.32 mm, 0.25 µm	123-3832
8151, 8151b	Chlorinated herbicides by GC using methylation or pentafluorobenzylation derivatization: capillary column technique	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-5ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-5532UI
		HP-5ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	19091S-413UI
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-5ms, 30 m x 0.32 mm, 1.00 µm	CP8957
		VF-35ms, 30 m x 0.25 mm, 0.25 µm	CP8877
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-35ms, 30 m x 0.53 mm, 1.00 µm	CP8888
		VF-1701ms, 30 m x 0.53 mm, 1.00 µm	CP9171
8240	Volatile chlorinated and aromatic hydrocarbons	DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		HP-VOC, 60 m x 0.20 mm, 1.10 µm	19091R-306
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103

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EPA Method	Application	Column	Part No.
8260/CLP-VOCs	Volatile organic compounds by gas chromatography/mass mpectroscopy (GC/MS): capillary column technique method	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
8260b	Volatile organic compounds by GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
8261	Volatile organic compounds by vacuum distillation in combination with GC/MS spectrometry (VD/GC/MS)	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
8270, 8270d	Semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS)	DB-8270D, 30 m x 0.25 mm, 0.25 µm	122-9732
		DB-8270D, 20 m x 0.18 mm, 0.36 µm	121-9723
		HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
8275a	Semivolatile organic compounds (PAHs and PCBs) in soils/sludges and solid wastes using thermal extraction/gas chromatography/mass spectrometry (TE/GC/MS)	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946
8280b	Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDfs) by high resolution gas chromatography/low resolution mass spectrometry (HRGC/LRMS)	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 8 CB, 30 m x 0.25 mm, 0.25 µm	CP8751
8290b	Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDfs) by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS)	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 8 CB, 30 m x 0.25 mm, 0.25 µm	CP8751
		CP-Sil 88 for Dioxins, 50 m x 0.25 mm, 0.20 µm	CP7588
8410	Gas chromatography/Fourier transform infrared (GC/FT-IR) spectrometry for semivolatile organics: capillary column	HP-5ms, 30 m x 0.32 mm, 1.00 µm	19091S-213
		DB-5ms, 30 m x 0.32 mm, 1.00 µm	123-5533
		VF-5ms, 30 m x 0.32 mm, 0.25 µm	CP8955
8430	Analysis of bis(2-chloroethyl) ether and hydrolysis products by direct aqueous injection (GC/FT-IR)	DB-WAX, 30 m x 0.25 mm, 0.50 µm	122-7033
		HP-INNOWax, 30 m x 0.25 mm, 0.50 µm	19091N-233
		VF-WAXms, 30 m x 0.53 mm, 1.00 µm	CP9215

United States Pharmacopoeia (USP) GC Phases

USP	Phase Composition	Agilent Phase Recommendation
G1	Dimethylpolysiloxane oil	HP-1*, DB-1*, HP-1ms*, DB-1ms*, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS
G2	Dimethylpolysiloxane gum	HP-1*, DB-1*, HP-1ms*, DB-1ms*, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS, CP-SimDist
G3	50% Phenyl 50% methylpolysiloxane	DB-17*, HP-50+*, VF-17ms, CP-Sil 24 CB, CP-Sil 24 CB Low Bleed/MS
G5	3-cyanopropyl polysiloxane	DB-23, VF-23ms, Select for FAME, CP-Sil 88
G6	Trifluoropropylmethylpolysilicone	DB-200, DB-210, VF-200ms
G7	50% 3-cyanopropyl 50% phenylmethylsilicone	DB-225, DB-225ms, CP-Sil 43 CB
G8	80% Bis(3-cyanopropyl) 20% 3-cyanopropylphenylpolysiloxane or 90% 3-cyanopropyl 10% phenylmethylsiloxane	HP-88, VF-23ms
G14	Polyethylene glycol (average molecular weight of 950-1,050)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G15	Polyethylene glycol (average molecular weight of 3,000-3,700)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G16	Polyethylene glycol (average molecular weight of 15,000)	DB-WAX*, VF-WAXms, CP-Wax 52 CB
G17	75% Phenyl 25% methylpolysiloxane	DB-17, HP-50+, VF-17ms, CP-Sil 24 CB, CP-Sil 24 CB Low Bleed/MS
G19	25% Phenyl 25% cyanopropylmethylsilicone	DB-225*, DB-225ms, CP-Sil 43 CB
G20	Polyethylene glycol (average molecular weight of 380-420)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G25	Polyethylene glycol TPA (Carbowax 20M terephthalic acid)	DB-FFAP*, HP-FFAP*, CP-Wax 58 (FFAP) CB, CP-FFAP CB
G27	5% Phenyl 95% methylpolysiloxane	DB-5*, HP-5*, HP-5ms*, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G28	25% Phenyl 75% methylpolysiloxane	DB-35, HP-35, DB-35ms, VF-35ms
G32	20% Phenylmethyl 80% dimethylpolysiloxane	DB-35, HP-35, DB-35ms, VF-35ms
G35	Polyethylene glycol & diepoxide esterified with nitroterepthalic acid	DB-FFAP*, HP-FFAP*, CP-Wax 58 (FFAP) CB, CP-FFAP CB
G36	1% Vinyl 5% phenylmethylpolysiloxane	DB-5, HP-5, HP-5ms, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G38	Phase G1 plus a tailing inhibitor	DB-1, HP-1, HP-1ms, DB-1ms, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS
G39	Polyethylene glycol (average molecular weight of 1,500)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G41	Phenylmethyldimethylsilicone (10% phenyl substituted)	DB-5, HP-5, HP-5ms, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G42	35% Phenyl 65% dimethylvinylsiloxane	DB-35*, HP-35*, DB-35ms, VF-35ms
G43	6% Cyanopropylphenyl 94% dimethylpolysiloxane	DB-624*, DB-1301, VF-624ms, VF-1301ms, CP-1301, CP-Select 624 CB
G45	Divinylbenzene-ethylene glycol-dimethacrylate	HP-PLOT U*, CP-PoraBOND U, CP-PoraPLOT U
G46	14% Cyanopropylphenyl 86% methylpolysiloxane	DB-1701*, VF-1701ms, CP-Sil 19 CB, CP-Sil 19 CB Low Bleed/MS

*Indicates an exact equivalent

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 1945	Standard Test Method for the Analysis of Natural Gas by GC	HP PLOT, 15 m x 0.53 mm, 50.00 µm	19095P-MS9
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		CP-Molsieve 5Å, 10 m x 0.53 mm, 50.00 µm	CP7537
		PoraPLOT Q-HT, 10 m x 0.53 mm, 20.00 µm	CP7558
D 1946	Standard Test Method for the Analysis of Reformed Gas by GC	HP PLOT, 15 m x 0.53 mm, 50.00 µm	19095P-MS9
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		CP-Molsieve 5Å, 10 m x 0.53 mm, 50.00 µm	CP7537
		CP-Molsieve 5Å, 25 m x 0.25 mm, 30.00 µm	CP7533
D 1983	Standard Test Method for Fatty Acid Composition by Gas-Liquid Chromatography of Methyl Esters	DB-WAX, 30 m x 0.25 mm, 0.25 µm	122-7032
D 2163	Standard Test Method for the Analysis of Liquified Petroleum (LP) Gases and Propene Concentrates by GC	HP PLOT Al2O3 "KCl", 30 m x 0.53 mm, 15.00 µm	19095P-K23
		HP PLOT Al2O3 "S", 30 m x 0.53 mm, 15.00 µm	19095P-S23
D 2195	Standard Test Methods for Pentaerythritol	CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 2268	Standard Test Method for Analysis of High-Purity n-Heptane and Isooctane by Capillary GC	DB-1, 60 m x 0.25 mm, 0.50 µm	122-106E
D 2306	Standard Test Method for C8 Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.25 mm, 0.25 µm	19091N-136
D 2360	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.32 mm, 0.25 µm	19091N-116
D 2426	Standard Test Method for Butadiene Dimer and Styrene in Butadiene Concentrates by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 2427	Standard Test Method for Determination of C_2 through C_5 Hydrocarbons in Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		GS-Alumina, 30 m x 0.53 mm	115-3532
		CP-Al2O3/KCl, 50 m x 0.53 mm, 10.00 µm	CP7518
D 2245	Standard Test Method for Identification of Oils and Oil Acids in Solvent-Reducible Paints	CP-Sil 88 for FAME, 50 m x 0.25 mm, 0.20 µm	CP7488
D 2504	Standard Test Method for Noncondensable Gases in C_2 and Lighter Hydrocarbon Products by GC	HP PLOT, 30 m x 0.53 mm, 50.00 µm	19095P-MS0
		CarboBOND, 25 m x 0.53 mm, 10.00 µm	CP7374
D 2505	Standard Test Method for Ethylene, Other Hydrocarbons, and Carbon Dioxide in High-Purity Ethylene by GC	GS-GasPro, 60 m x 0.32 mm	113-4362

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 2580	Standard Test Method for Phenols in Water by Gas-Liquid Chromatography	CP-Sil 8 CB, 25 m x 0.32 mm, 0.40 µm	CP5850
		CP-FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7486
D 2593	Standard Test Method for Butadiene Purity and Hydrocarbon Impurities by GC	GS-Alumina, 30 m x 0.53 mm	115-3532
		CP-Al2O3/KCl, 50 m x 0.32 mm, 5.00 µm	CP7515
		CP-Al2O3/KCl, 50 m x 0.53 mm, 10.00 µm	CP7518
D 2712	Standard Test Method for for Hydrocarbon Traces in Propylene Concentrates by GC	GS-Alumina, 50 m x 0.53 mm	115-3552
D 2743	Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography	CP-Sil 88 for FAME, 50 m x 0.25 mm, 0.20 µm	CP7488
D 2804	Standard Test Method for Purity of Methyl Ethyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-210, 15 m x 0.53 mm, 1.00 µm	125-0212
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
		CP-SimDist UltiMetal, 5 m x 0.53 mm, 0.88 µm	CP7570
		CP-SimDist UltiMetal, 10 m x 0.53 mm, 2.65 µm	CP7582
		CP-SimDist UltiMetal, 5 m x 0.53 mm, 0.17 µm	CP7532
Extended D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC, to C_{60}	HP-1, 10 m x 0.53 mm, 0.88 µm	19095Z-021
		HP-1, 5 m x 0.53 mm, 0.88 µm	19095Z-020
D 2908	Standard Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection GC	CP-Select 624 CB, 30 m x 0.32 mm, 1.80 µm	CP7414
		CP-Select 624 CB, 75 m x 0.53 mm, 3.00 µm	CP7417
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 3054	Standard Test Method for Analysis of Cyclohexane by GC	DB-1, 60 m x 0.32 mm, 0.50 µm	123-106E
D 3168	Standard Practice for Qualitative Identification of Polymers in Emulsion Paints	CP-Sil 5 CB, 30 m x 0.32 mm, 1.00 µm	CP8760
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3257	Standard Test Method for Aromatics in Mineral Spirits by GC	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3271	Standard Practice for Direct Injection of Solvent-Reducible Paints into a Gas Chromatograph for Solvent Analysis	PoraPLOT Q, 25 m x 0.53 mm, 20.00 µm	CP7554
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 3328	Standard Test Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 3.00 µm	CP8687
		CP-Sil 5 CB, 30 m x 0.53 mm, 3.00 µm	CP8677
D 3329	Standard Test Method for Purity of Methyl Isobutyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-624, 30 m x 0.45 mm, 2.55 µm	124-1334
		CP-WAX 52 CB, 60 m x 0.53 mm, 1.00 µm	CP8798
D 3432	Standard Test Method for Unreacted Toluene Diisocyanates in Urethane Prepolymers and Coating Solutions by GC	HP-1ms, 30 m x 0.32 mm, 1.00 µm	19091S-713
D 3447	Standard Test Method for Purity of Halogentated Organic Solvents	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3452	Standard Practice for Rubber – Identification by Pyrolysis-Gas Chromatography	CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3465	Standard Test Method for Purity of Monomeric Plasticizers by Gas Chromatography	CP-Sil 5 CB, 25 m x 0.32 mm, 0.52 µm	CP8430
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3524	Standard Test Method for Diesel Fuel Diluent in Used Diesel Engine Oils by Gas Chromatography	CP-SimDist UltiMetal, 10 m x 0.53 mm, 0.53 µm	CP7592
D 3545	Standard Test Method for Alcohol Content and Purity of Acetate Esters by GC	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3606	Standard Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography	VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 3687	Standard Test Method for Analysis of Organic Vapors Collected by the Activated Charcoal Tube Adsorption Method	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-WAX, 30 m x 0.45 mm, 0.85 µm	124-7032
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 3695	Standard Test Method for Volatile Alcohols in Water by Direct Aqueous-Injection GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		CP-SimDist UltiMetal, 10 m x 0.53 mm, 0.53 µm	CP7592
D 3710	Standard Test Method for Boiling Range Distribution of Gasoline and Gasoline Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
D 3749	Standard Test Method for Residual Vinyl Chloride Monomer in Poly(Vinyl Chloride) Resins by Gas Chromatographic Headspace Technique	PoraBOND Q, 10 m x 0.32 mm, 5.00 µm	CP7350
		PoraBOND Q, 10 m x 0.53 mm, 10.00 µm	CP7353

(Continued)

ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 3760	Standard Test Method for Analysis of Isopropylbenzene (Cumene) by GC	DB-WAX, 60 m x 0.32 mm, 0.25 µm	123-7062
		HP-1, 50 m x 0.32 mm, 0.52 µm	19091Z-115
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3792	Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph	PoraBOND Q, 25 m x 0.32 mm, 5.00 µm	CP7351
		PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 3797	Standard Test Method for Analysis of o-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3798	Standard Test Method for Analysis of p-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3871	Standard Test Method for Purgeable Organic Compounds in Water Using Headspace Sampling	DB-VRX, 75 m x 0.45 mm, 2.55 µm	124-1574
D 3876	Standard Test Method for Methoxyl and Hydroxypropyl Substitution in Cellulose Ether Products by Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 1.00 µm	CP8760
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3893	Standard Test Method for Purity of Methyl Amyl Ketone and Methyl Isoamyl Ketone by GC	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534
D 3973	Standard Test Method for Low-Molecular Weight Halogenated Hydrocarbons in Water	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534
D 4059	Standard Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography	CP-Sil 8 CB for PCB, 50 m x 0.25 mm, 0.25 µm	CP7482
D 4275	Standard Test Method for Determination of Butylated Hydroxy Toluene (BHT) in Polymers of Ethylene and Ethylene – Vinyl Acetate (EVA) Copolymers By Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 3.00 µm	CP8687
		CP-Sil 5 CB, 30 m x 0.53 mm, 3.00 µm	CP8677
D 4322	Standard Test Method for Residual Acrylonitrile Monomer Styrene-Acrylonitrile Copolymers and Nitrile Rubber by Headspace Gas Chromatography	PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 4367	Standard Test Method for Benzene in Hydrocarbon Solvents by Gas Chromatography	VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4415	Standard Test Method for Determination of Dimer in Acrylic Acid	DB-FFAP, 30 m x 0.32 mm, 0.25 µm	123-3232
D 4424	Standard Test Method for Butylene Analysis by GC	HP PLOT Al_2O_3 S, 50 m x 0.53 mm, 15.00 µm	19095P-S25
		CP-Al2O3/Na2SO4, 25 m x 0.53 mm, 10.00 µm	CP7567
D 4443	Standard Test Method for Residual Vinyl Chloride Monomer Content in PPB Range in Vinyl Chloride Homo- and Co-Polymers by Headspace GC	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 4492	Standard Test Method for Analysis of Benzene by Gas Chromatography	CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4509	Standard Test Methods for Determining the 24-Hour Gas (AIR) Space Acetaldehyde Content of Freshly Blown PET Bottles	PoraBOND Q, 25 m x 0.32 mm, 5.00 µm	CP7351
		PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 4534	Test Method for Benzene Content of Cyclic Products by Gas Chromatography	CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4735	Standard Test Method for Determination of Trace Thiophene in Refined Benzene by GC	DB-FFAP, 30 m x 0.45 mm, 0.85 µm	124-3232
		CP-Wax 58 FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7614
D 4768	Standard Test Method for Analysis of 2,6-Ditertiary-Butyl Para-Cresol and 2,6-Ditertiary- Butyl Phenol in Insulating Liquids by Gas Chromatography	CP-Wax 58 FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7614
D 4864	Standard Test Method for Determination of Traces of Methanol in Propylene Concentrates by GC	DB-WAX, 30 m x 0.45 mm, 0.85 µm	124-7032
D 4947	Standard Test Method for Chlordane and Heptachlor Residues in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 µm	125-5032
		DB-608, 30 m x 0.53 mm, 0.83 µm	125-1730
D 4961	Standard Test Method for GC Analysis of Major Organic Impurities in Phenol Produced by the Cumene Process	DB-FFAP, 30 m x 0.45 mm, 0.85 µm	124-3232
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
D 4983	Standard Test Method for Cyclohexylamine Morpholine and Diethylaminoethanol in Water and Condensed Steam by Direct Aqueous Injection GC	HP-5ms, 30 m x 0.32 mm, 1.00 µm	19091S-213
		CAM, 30 m x 0.53 mm, 1.00 µm	115-2132
D 5008	Standard Test Method for Ethyl Methyl Pentonal Content and Purity Value of 2-Ethylhexanol by GC	HP-1, 15 m x 0.53 mm, 5.00 µm	19095Z-621
		HP-INNOWax, 30 m x 0.32 mm, 0.25 µm	19091N-113
D 5060	Standard Test Method for Determining Impurities in High-Purity Ethylbenzene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-WAX 52 CB, 60 m x 0.32 mm, 0.50 µm	CP8773
D 5075	Standard Test Method for Nicotine in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 µm	125-5032
		DB-5, 30 m x 0.32 mm, 1.00 µm	123-5033
D 5134	Standard Test Method for Detailed Analysis of Petroleum Naphthas Through n-Nonane by Capillary GC	HP-PONA, 50 m x 0.20 mm, 0.50 µm	19091S-001
		CP-Sil PONA para ASTM D 5134, 50 m x 0.21 mm, 0.50 µm	CP7531
D 5135	Standard Test Method for Analysis of Styrene by Capillary GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-WAX 52 CB, 60 m x 0.32 mm, 0.50 µm	CP8773
D 5175	Standard Test Method for Organohalide Pesticides and Polychlorinated Biphenyls in Water by Microextraction and GC	DB-1, 30 m x 0.32 mm, 1.00 µm	123-1033
		DB-608, 30 m x 0.32 mm, 0.50 µm	123-1730
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5303	Standard Test Method for Trace Carbonyl Sulfide Propylene by GC	GS-GasPro, 30 m x 0.32 mm	113-4332
		HP PLOT Q, 30 m x 0.53 mm, 40.00 µm	19095P-QO4
D 5307	Standard Test Method for Determination of Boiling Range Distribution of Crude Petroleum by GC	HP-1, 7.5 m x 0.53 mm, 5.00 µm	19095Z-627
D 5310	Standard Test Method for Tar Acid Composition by Capillary GC	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-225ms, 30 m x 0.25 mm, 0.25 µm	122-2932
D 5316	Standard Test Method for 1, 2-Dibromoethane and 1, 2-Dibromo-3-Chloropropane in Water by Microextraction and GC	HP-1ms, 30 m x 0.32 mm, 1.00 µm	19091S-713
		DB-624, 30 m x 0.45 mm, 2.55 µm	124-1334
D 5317	Standard Test Method for Determination of Chlorinated Organic Acid Compounds in Water by GC with Electron Capture Detector	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
D 5320	Standard Test Method for Determination of 1, 1-Trichloroethane and Methylene Chloride in Stabilized Trichloroethylene and Tetrachloroethylene	DB-1, 30 m x 0.53 mm, 3.00 µm	125-1034
		DB-VRX, 30 m x 0.32 mm, 1.80 µm	123-1534
D 5399	Standard Test Method for Boiling Point Distribution of Hydrocarbon Solvents by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
D 5441	Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBD) by GC	HP-PONA, 50 m x 0.20 mm, 0.50 µm	19091S-001
		DB-Petro, 100 m x 0.25 mm, 0.50 µm	122-10A6E
D 5442	Standard Test Method for Analysis of Petroleum Waxes by GC	DB-1, 25 m x 0.32 mm, 0.25 µm	123-1022
		DB-5, 15 m x 0.25 mm, 0.25 µm	122-5012
D 5475	Standard Test Method for Nitrogen- and Phosphorus-Containing Pesticides in Water by GC with a Nitrogen Phosphorus Detector	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
D 5480	Standard Test Method for Engine Oil Volatility by GC	DB-PS1, 15 m x 0.53 mm, 0.15 µm	145-1011
D 5501	Standard Test Method for Determination of Ethanol Content of Denatured Fuel Ethanol by GC	HP-1, 100 m x 0.25 mm, 0.50 µm	19091Z-530
D 5504	Standard Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence	CP-Sil 5 CB for Sulfur, 30 m x 0.32 mm, 4.00 µm	CP7529

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5507	Standard Test Method for Determination of Trace Organic Impurities in Monomer Grade Vinyl Chloride by Capillary Column/Multi-dimensional GC	HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		HP PLOT U, 30 m x 0.53 mm, 20.00 µm	19095P-UO4
D 5508	Standard Test Method for Determination of Residual Acrylonitrile Monomer in Styrene-Acyrlonitrile Co-polymer Resins and Nitrile-Butadiene Rubber by Headspace Capillary GC	HP PLOT Q, 30 m x 0.53 mm, 40.00 µm	19095P-QO4
D 5580	Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, C_9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
		CP-Sil 5 CB, 30 m x 0.53 mm, 5.00 µm	CP8775
		VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
D 5599	Standard Test Method for Determination of Oxygenates in Gasoline by GC and Oxygen Selective Flame Ionization Detection	DB-5, 30 m x 0.25 mm, 0.25 µm	122-5032
D 5623	Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by GC and Sulfur Selective Detection	HP-1, 30 m x 0.32 mm, 4.00 µm	19091Z-613
D 5713	Standard Test Method for Analysis of High Purity Benzene for Cyclohexane Feedstock by Capillary GC	DB-Petro, 50 m x 0.20 mm, 0.50 µm	128-1056
D 5739	Standard Practice for Oil Spill Source Identification by GC and Positive Ion Electron Impact Low Resolution Mass Spectrometry	DB-5, 30 m x 0.25 mm, 0.25 µm	122-5032
		DB-TPH, 30 m x 0.32 mm, 0.25 µm	123-1632
D 5769	Standard Test Method for Determination of Benzene, Toluene, and Total Aromatics in Finished Gasoline by GC/MS	HP-1, 60 m x 0.25 mm, 1.00 µm	19091Z-236
D 5790	Standard Test Method for Measurement of Purgeable Organic Compounds in Water by Capillary Column GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
D 5812	Standard Test Method for Determination of Organochlorine Pesticides in Water by Capillary Column GC	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5917	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC and External Calibration	HP-INNOWax, 60 m x 0.32 mm, 0.25 µm	19091N-116
D 5974	Standard Test Method for Fatty and Rosin Acids in Tall Oil Fraction Products by Capillary GC	DB-23, 60 m x 0.25 mm, 0.25 µm	122-2362
D 5986	Standard Test Method for Determination of Oxygenates, Benzene, Toluene, C_8-C_{12} Aromatics and Total Aromatics in Finished Gasoline by GC/FTIR	HP-1, 60 m x 0.53 mm, 5.00 µm	19095Z-626
D 6144	Standard Test Method for Trace Impurities in Alpha-Methylstyrene by Capillary GC	HP-1, 60 m x 0.25 mm, 1.00 µm	19091Z-236
D 6159	Standard Test Method for Determination of Hydrocarbon Impurities in Ethylene by GC	HP PLOT Al2O3 "KCl", 50 m x 0.53 mm, 15.00 µm	19095P-K25
		GS-Alumina, 50 m x 0.53 mm	115-3552
		DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
D 6160	Standard Test Method for Determination of PCBs in Waste Materials by GC	HP-5ms, 30 m x 0.32 mm, 0.25 µm	19091S-413
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
D 6352	Standard Test Method for Boiling Range Distribution of Petroleum Distillates in Boiling Range from 174 to 700 °C by GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 µm	145-1001
D 6387	Standard Test Methods for Composition of Turpentine and Related Terpene Products by Capillary Gas Chromatography	CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 6417	Standard Test Method for Estimation of Engine Oil Volatility by Capillary GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 µm	145-1001
D 6584	Standard Test Method for Determination of Total Monoglyceride, Total Diglyceride, Total Triglyceride, and Free and Total Glycerin in B-100 Biodiesel Methyl Esters by Gas Chromatography	Select Biodiesel, 15 m x 0.32 mm, 0.10 µm	CP9078
D 6806	Standard Practice for Analysis of Halogenated Organic Solvents and Their Admixtures by Gas Chromatography	CP-Sil 5 CB, 50 m x 0.53 mm, 5.00 µm	CP7685
E 1616	Standard Test Method for Analysis of Acetic Anhydride Using GC	HP-1, 50 m x 0.32 mm, 0.52 µm	19091Z-115
E 1863	Standard Test Method for Analysis of Acrylonitrile by GC	DB-WAXetr, 60 m x 0.32 mm, 1.00 µm	123-7364
E 0202	Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
		CP-Wax 57 CB for Gycols and Alcohols, 25 m x 0.25 mm, 0.25 µm	CP7615
E 0475	Standard Test Method for Assay of Di-tert-Butyl Peroxide Using GC	HP-5, 30 m x 0.53 mm, 5.00 µm	19095J-623

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Tips & Tools

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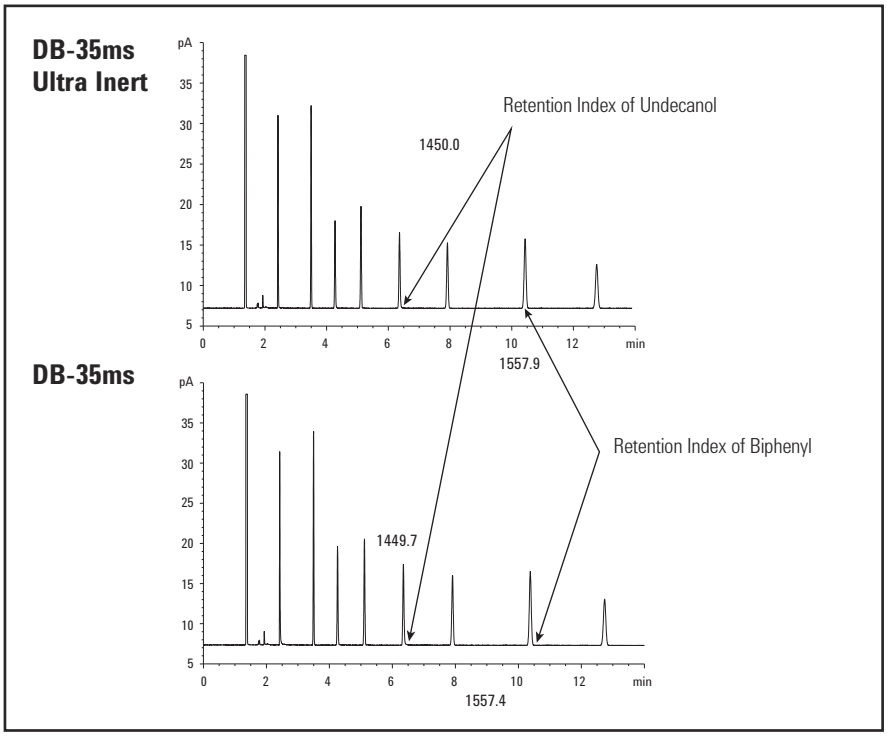

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A strong test probe mixture can highlight deficiencies in column activity, while a weak mixture can actually mask such deficiencies.

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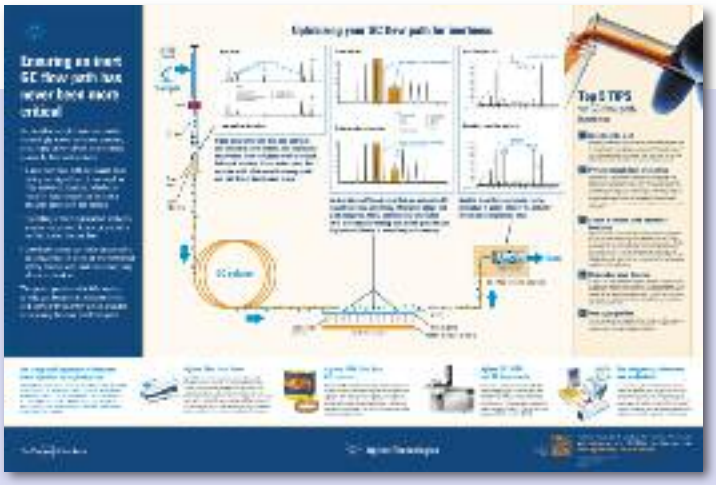
Commonly used, less demanding test probes		
1. 1-Octanol	4. 2,6-Dimethylaniline	7. 1-Decanol
2. n-Undecane	5. n-Dodecane	8. n-Tridecane
3. 2,6-Dimethylphenol	6. Napthalene	9. Methyldecanoate



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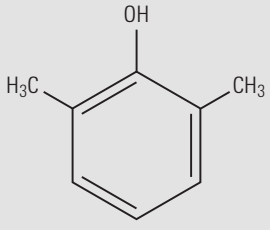
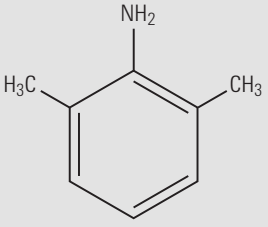
Ultra Inert 5ms Columns			Ultra Inert 1ms Columns			Ultra Inert 35ms Columns		
Elution Order	**Test Probe**	**Functional Test**	**Elution Order**	**Test Probe**	**Functional Test**	**Elution Order**	**Test Probe**	**Functional Test**
1.	1-Propionic acid	Basicity	1.	1-Propionic acid	Basicity	1.	1-Octene	Polarity
2.	1-Octene	Polarity	2.	1-Octene	Polarity	2.	1-Butyric acid	Basicity
3.	n-Octane	Hydrocarbon marker	3.	n-Octane	Hydrocarbon marker	3.	n-Nonane	Hydrocarbon marker
4.	4-Picoline	Acidity	4.	1,2-Butanediol	Silanol	4.	4-Picoline	Acidity
5.	n-Nonane	Hydrocarbon marker	5.	4-Picoline	Acidity	5.	n-Propylbenzene	Polarity
6.	Trimethyl phosphate	Acidity	6.	Trimethyl phosphate	Acidity	6.	1-Heptanol	Silanol, Polarity
7.	1,2-Pentanediol	Silanol	7.	n-Propylbenzene	Hydrocarbon marker	7.	1,2-Pentanediol	Silanol
8.	n-Propylbenzene	Hydrocarbon marker	8.	1-Heptanol	Silanol	8.	3-Octanone	Polarity
9.	1-Heptanol	Silanol	9.	3-Octanone	Polarity	9.	Trimethyl phosphate	Acidity
10.	3-Octanone	Polarity	10.	tert-Butylbenzene	Hydrocarbon marker	10.	tert-Butylbenzene	Hydrocarbon marker
11.	n-Decane	Efficiency	11.	n-Decane	Efficiency	11.	n-Undecane	Efficiency

Chemical Structures

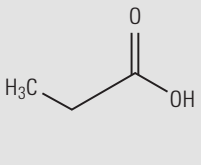


2,6-Dimethylphenol

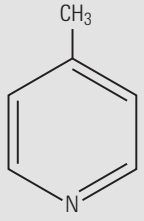


2,6-Dimethylaniline

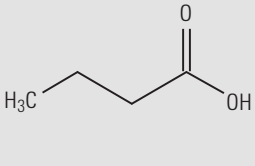
Weak probe molecules: The acidic and basic portions of these molecules are shielded by the two methyl groups on their phenyl rings, making them less probative.



1-Propionic acid



4-Picoline



1-Butyric acid

Strong probe molecules: The probes in Agilent's Ultra Inert test probe mixture are highly probative of the stationary phase and surface. Note, too, that the active end of each compound is available to interact with any active sites on the column.

DB-1ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.18	*20*	*0.18*	*-60 to 325/350*	*121-0122UI*	
0.25	15	0.25	-60 to 325/350	122-0112UI	122-0112UIE
	30	0.25	-60 to 325/350	122-0132UI	122-0132UIE
	60	0.25	-60 to 325/350	122-0162UI	
0.32	15	0.25	-60 to 325/350	123-0112UI	
	30	0.25	-60 to 325/350	123-0132UI	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1, ZB-1ms

HP-1ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-677UI*	*19091S-677UIE*
0.25	15	0.25	-60 to 325/350	19091S-931UI	19091S-931UIE
	30	0.25	-60 to 325/350	19091S-933UI	19091S-933UIE
		0.50	-60 to 325/350	19091S-633UI	
		1.00	-60 to 325/350	19091S-733UI	19091S-733UIE
0.32	15	0.25	-60 to 325/350	19091S-911UI	
	25	0.52	-60 to 325/350	19091S-612UI	
	30	0.25	-60 to 325/350	19091S-913UI	19091S-913UIE
		1.00	-60 to 325/350	19091S-713UI	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, VF-5ms, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5

DB-5ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5522UI*		*121-5522UILTM*
		0.36	*-60 to 325/350*	*121-5523UI*		*121-5523UILTM*
0.25	15	0.25	-60 to 325/350	122-5512UI		122-5512UILTM
		1.00	-60 to 325/350	122-5513UI		122-5513UILTM
	25	0.25	-60 to 325/350	122-5522UI		122-5522UILTM
	30	0.25	-60 to 325/350	122-5532UI	122-5532UIE	122-5532UILTM
		0.50	-60 to 325/350	122-5536UI		122-5536UILTM
		1.00	-60 to 325/350	122-5533UI	122-5533UIE	122-5533UILTM
	50	0.25	-60 to 325/350	122-5552UI		
	60	0.25	-60 to 325/350	122-5562UI		
		1.00	-60 to 325/350	122-5563UI		
0.32	30	0.25	-60 to 325/350	123-5532UI	123-5532UIE	123-5532UILTM
		0.50	-60 to 325/350	123-5536UI		123-5536UILTM
		1.00	-60 to 325/350	123-5533UI		123-5533UILTM
	60	1.00	-60 to 325/350	123-5563UI		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-7

HP-5ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
HP-5ms Ultra Inert						
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-577UI*		*19091S-577UILTM*
0.25	15	0.25	-60 to 325/350	19091S-431UI		19091S-431UILTM
	30	0.25	-60 to 325/350	19091S-433UI	19091S-433UIE	19091S-433UILTM
		0.50	-60 to 325/350	19091S-133UI		19091S-133UILTM
		1.00	-60 to 325/350	19091S-233UI	19091S-233UIE	19091S-233UILTM
	60	0.25	-60 to 325/350	19091S-436UI		
0.32	30	0.25	-60 to 325/350	19091S-413UI		19091S-413UILTM
		1.00	-60 to 325/350	19091S-213UI		19091S-213UILTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

DB-35ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.18*	*50 to 340/360*	*121-3822UI*
0.25	15	0.25	50 to 340/360	122-3812UI
	30	0.25	50 to 340/360	122-3832UI
0.32	15	0.25	50 to 340/360	123-3812UI
	30	0.25	50 to 340/360	123-3832UI

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Tips & Tools

Complete your ultra inert flow path with the industry leading Agilent Ultra Inert Inlet Liner, **www.agilent.com/chem/uiliner**

Agilent J&W High Efficiency GC Capillary Columns

High efficiency, high throughput, and high resolution without the high costs

This leading-edge column technology is ideal for applications that require faster run times, such as high-throughput screening, fast process monitoring, and fast method development. In fact, Agilent High Efficiency GC columns can reduce your sample run time by 50% or more without compromising resolution.

Unlike other manufacturers' 0.1 mm id columns, Agilent's 0.15 and 0.18 mm id High Efficiency Capillary GC columns are compatible with all standard-pressure capillary GC and GC/MS instruments – without expensive high-pressure modifications. They also give you:

- The flexibility to choose between helium and hydrogen carrier gases. You can stay with a helium carrier if you wish to simplify method development, or switch to a hydrogen carrier to further reduce your analysis time.
- The ability to separate samples using less carrier gas, which can lead to longer intervals between cylinder changes, increased uptime, and a lower cost per sample.

In addition, these flexible columns easily adapt to a wide variety of environmental, petrochemical, flavor/fragrance, clinical toxicology, and pharmaceutical sample matrices.

The Agilent J&W High Efficiency GC columns throughout this section are displayed using italicized descriptions and part numbers in the ordering tables.

Low-bleed GC/MS Columns

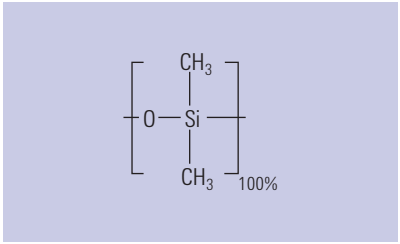
There is a rapidly increasing population of benchtop GC/MS instruments in analytical laboratories that analyze a widening range of trace level, higher temperature samples. These samples require increasingly inert, lower bleed, higher temperature columns. In response to this growing need, Agilent Technologies designed several "ms" columns to chromatograph a broader range of low level samples and generate lower bleed even at higher temperatures.

What makes an Agilent J&W low-bleed column exceptional? Unique polymer chemistry and proprietary surface deactivation, both of which have contributed to columns that adhere to the tightest quality control specifications in the industry for bleed, inertness, selectivity and efficiency. Agilent J&W "ms" columns utilize special surface deactivation and siloxane chemistries which enhance the chromatographic performance of siloxane polymers.

The mass spectrum of septum bleed can look very much like GC column bleed, so the two are often confused. An easy way to tell the two apart: column bleed will be indicated by a rise in the baseline, not peaks. If you see bleed peaks, these generally come from lower quality septa or septa being used beyond their operating limits. To minimize septa contributions to background bleed, use quality Agilent BTO, Long Life, or Advanced Green septa.

Tips & Tools

Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at **www.agilent.com/chem/sampleprep**



Structure of DB-1ms

DB-1ms

- 100% Dimethylpolysiloxane
- Identical selectivity to DB-1
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Improved acid performance compared to standard 100% Dimethylpolysiloxane columns
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- 340/360 °C upper temperature limit
- Excellent general purpose column
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1, ZB-1ms

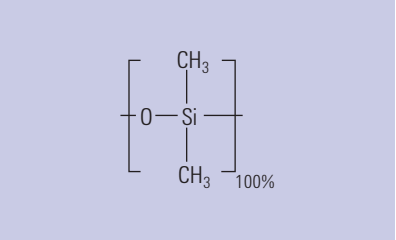
DB-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.10	10	0.10	-60 to 340/360	127-0112		127-0112LTM	
		0.40	-60 to 340/360	127-0113			
	20	0.10	-60 to 340/360	127-0122			
		0.40	-60 to 340/360	127-0123		127-0123LTM	
0.18	*20*	*0.18*	*-60 to 340/360*	*121-0122*	*121-0122E*	*121-0122LTM*	*221-0122LTM*
0.20	12	0.33	-60 to 340/350	128-0112		128-0112LTM	
	25	0.33	-60 to 340/350	128-0122	128-0122E	128-0122LTM	
0.25	15	0.25	-60 to 340/360	122-0112	122-0112E	122-0112LTM	222-0112LTM
	30	0.10	-60 to 340/360	122-0131			
		0.25	-60 to 340/360	122-0132	122-0132E		222-0132LTM
	60	0.25	-60 to 340/360	122-0162			
0.32	15	0.25	-60 to 340/360	123-0112			
	30	0.10	-60 to 340/360	123-0131			
		0.25	-60 to 340/360	123-0132		123-0132LTM	
	60	0.25	-60 to 340/360	123-0162			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Tips & Tools

Learn how the Agilent 5975T LTM GC/MSD can deliver the rapid, reliable results you need in the field or in the lab, **www.agilent.com/chem/5975T**



Structure of HP-1ms

HP-1ms

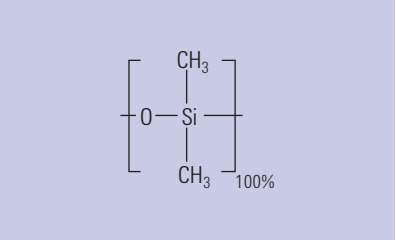
- 100% Dimethylpolysiloxane
- Identical selectivity to HP-1
- Non-polar
- Low bleed characteristics
- Excellent general purpose column
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-1ms, Rxi-1ms, MDN-1, AT-1, ZB-1ms, Equity-1

HP-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-677*	*19091S-677E*	*19091S-677LTM*	*29091S-677LTM*
0.20	25	0.33	-60 to 325/350	19091S-602	19091S-602E	19091S-602LTM	
0.25	15	0.25	-60 to 325/350	19091S-931	19091S-931E	19091S-931LTM	29091S-931LTM
	30	0.10	-60 to 325/350	19091S-833		19091S-833LTM	29091S-833LTM
		0.25	-60 to 325/350	19091S-933	19091S-933E	19091S-933LTM	29091S-433LTM
		0.50	-60 to 325/350	19091S-633		19091S-633LTM	
		1.00	-60 to 325/350	19091S-733	19091S-733E	19091S-733LTM	
	60	0.25	-60 to 325/350	19091S-936	19091S-936E		
0.32	15	0.25	-60 to 325/350	19091S-911		19091S-911LTM	
	25	0.52	-60 to 325/350	19091S-612		19091S-612LTM	
	30	0.25	-60 to 325/350	19091S-913	19091S-913E	19091S-913LTM	
		1.00	-60 to 325/350	19091S-713		19091S-713LTM	
	60	0.25	-60 to 325/350	19091S-916			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-1ms

VF-1ms

- Highly inert, non-polar 100% dimethylpolysiloxane phase, low-bleed GC column providing increased sensitivity over a broad array of applications
- Ultra low bleed specification of 1 pA @ 325 °C (30 m, 0.25 mm, 0.25 µm) for trace analysis with MS
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-1ms, Rxi-1ms, MDN-1, AT-1, ZB-1ms, Equity-1

Column shown with EZ-GRIP

VF-1ms

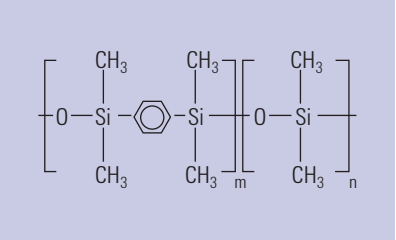
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	-60 to 325/350	CP8900	
		0.40	-60 to 325/350	CP8901	
	20	0.10	-60 to 325/350	CP8902	
		0.40	-60 to 325/350	CP8903	
0.15	*10*	*0.15*	*-60 to 325/350*	*CP9030*	
	15	*0.15*	*-60 to 325/350*	*CP5881*	
	20	*0.15*	*-60 to 325/350*	*CP9031*	
		0.60	*-60 to 325/350*	*CP9032*	*CP9032I5*
0.20	12	0.33	-60 to 325/350	CP8904	
	25	0.33	-60 to 325/350	CP8905	
0.25	15	0.10	-60 to 325/350	CP8906	CP8906I5
		0.25	-60 to 325/350	CP8907	CP8907I5
		1.00	-60 to 325/350	CP8908	CP8908I5
	25	0.25	-60 to 325/350	CP8909	
		0.40	-60 to 325/350	CP8910	
	30	0.10	-60 to 325/350	CP8911	CP8911I5
		0.25	-60 to 325/350	CP8912	CP8912I5
		1.00	-60 to 325/350	CP8913	CP8913I5
	50	0.25	-60 to 325/350	CP8914	
		0.40	-60 to 325/350	CP8915	
	60	0.25	-60 to 325/350	CP8916	CP8916I5
		1.00	-60 to 325/350	CP8917	CP8917I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

VF-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.10	-60 to 325/350	CP8918	CP8918I5
		0.25	-60 to 325/350	CP8919	
		1.00	-60 to 325/350	CP8920	CP8920I5
	25	0.25	-60 to 325/350	CP8921	
		0.40	-60 to 325/350	CP8922	
	30	0.10	-60 to 325/350	CP8923	
		0.25	-60 to 325/350	CP8924	
		0.50	-60 to 325/350	CP8925	
		1.00	-60 to 325/350	CP8926	
	50	0.25	-60 to 325/350	CP8927	
		0.40	-60 to 325/350	CP8928	
	60	0.25	-60 to 325/350	CP8929	
		1.00	-60 to 325/350	CP8930	
0.53	15	0.50	-60 to 325/350	CP8965	
		1.50	-60 to 325/350	CP8967	
	30	0.50	-60 to 325/350	CP8968	
		1.00	-60 to 325/350	CP8969	
		1.50	-60 to 310/335	CP8970	



Structure of DB-5ms

DB-5ms

- Phenyl Arylene polymer virtually equivalent to a (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Excellent inertness for active compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-5TA
- Close equivalent to USP Phase G27
- Test mix available

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5

DB-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5522*	*121-5522E*	*121-5522LTM*	*221-5522LTM*
		0.36	*-60 to 325/350*	*121-5523*		*121-5523LTM*	
	40	*0.18*	*-60 to 325/350*	*121-5542*			
0.20	12	0.33	-60 to 325/350	128-5512		128-5512LTM	
	25	0.33	-60 to 325/350	128-5522		128-5522LTM	
	50	0.33	-60 to 325/350	128-5552			
0.25	15	0.10	-60 to 325/350	122-5511		122-5511LTM	
		0.25	-60 to 325/350	122-5512		122-5512LTM	222-5512LTM
		0.50	-60 to 325/350	122-5516		122-5516LTM	
		1.00	-60 to 325/350	122-5513		122-5513LTM	
	25	0.25	-60 to 325/350	122-5522		122-5522LTM	
		0.40	-60 to 325/350	122-552A		122-552ALTM	
	30	0.10	-60 to 325/350	122-5531		122-5531LTM	
		0.25	-60 to 325/350	122-5532	122-5532E	122-5532LTM	222-5532LTM
		0.50	-60 to 325/350	122-5536	122-5536E	122-5536LTM	
		1.00	-60 to 325/350	122-5533	122-5533E	122-5533LTM	
	50	0.25	-60 to 325/350	122-5552			
	60	0.10	-60 to 325/350	122-5561			
		0.25	-60 to 325/350	122-5562	122-5562E		
		1.00	-60 to 325/350	122-5563			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

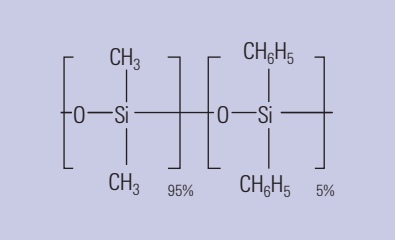
(Continued)

DB-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.32	15	0.10	-60 to 325/350	123-5511		123-5511LTM	
		0.25	-60 to 325/350	123-5512		123-5512LTM	
		1.00	-60 to 325/350	123-5513	123-5513E	123-5513LTM	
	25	0.52	-60 to 325/350	123-5526		123-5526LTM	
	30	0.10	-60 to 325/350	123-5531		123-5531LTM	
		0.25	-60 to 325/350	123-5532	123-5532E	123-5532LTM	
		0.50	-60 to 325/350	123-5536		123-5536LTM	
		1.00	-60 to 325/350	123-5533		123-5533LTM	
	60	0.10	-60 to 325/350	123-5561			
		0.25	-60 to 325/350	123-5562			
		0.50	-60 to 325/350	123-5566			
		1.00	-60 to 325/350	123-5563			
0.53	15	1.50	-60 to 300/320	125-5512		125-5512LTM	
	30	0.50	-60 to 300/320	125-5537		125-5537LTM	
		1.00	-60 to 300/320	125-553J		125-553JLTM	
		1.50	-60 to 300/320	125-5532		125-5532LTM	

Tips & Tools

Learn more about the Agilent 7890A System at
www.agilent.com/chem/7890A



Structure of HP-5ms

HP-5ms

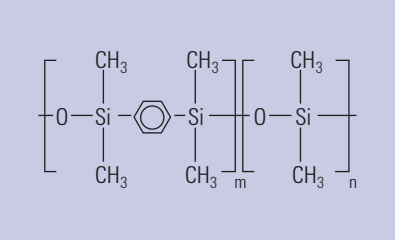
- (5%-Phenyl)-methylpolysiloxane
- Identical selectivity to HP-5
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Excellent inertness for active compounds including acidic and basic compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G27

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-5

HP-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-577*		*19091S-577LTM*	
0.20	12	0.33	-60 to 325/350	19091S-101		19091S-101LTM	
	25	0.33	-60 to 325/350	19091S-102	19091S-102E	19091S-102LTM	
	50	0.33	-60 to 325/350	19091S-105			
0.25	15	0.10	-60 to 325/350	19091S-331		19091S-331LTM	
		0.25	-60 to 325/350	19091S-431		19091S-431LTM	
		1.00	-60 to 325/350	19091S-231		19091S-231LTM	
	30	0.10	-60 to 325/350	19091S-333		19091S-333LTM	
		0.25	-60 to 325/350	19091S-433	19091S-433E	19091S-433LTM	29091S-433LTM
		0.50	-60 to 325/350	19091S-133		19091S-133LTM	
		1.00	-60 to 325/350	19091S-233	19091S-233E	19091S-233LTM	
	60	0.10	-60 to 325/350	19091S-336			
		0.25	-60 to 325/350	19091S-436	19091S-436E		
0.32	25	0.52	-60 to 325/350	19091S-112	19091S-112E	19091S-112LTM	
	30	0.10	-60 to 325/350	19091S-313		19091S-313LTM	
		0.25	-60 to 325/350	19091S-413	19091S-413E	19091S-413LTM	
		0.50	-60 to 325/350	19091S-113		19091S-113LTM	
		1.00	-60 to 325/350	19091S-213		19091S-213LTM	
	60	0.25	-60 to 325/350	19091S-416			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-5ms

VF-5ms

- Highly inert 5% phenylmethyl column for increased sensitivity, accuracy and instrument uptime
- Minimal column bleed improves sensitivity – ultra low bleed specification of 1 pA @ 325 °C (30 m x 0.25 mm, 0.25 µm)
- Slightly higher polarity than VF-1ms, results in improved selectivity for aromatic compounds; selectivity and excellent inertness make these columns applicable for a wide range of semi-polar and even polar compounds
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- Supplied with EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5

VF-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.40	-60 to 325/350	CP8934	
	20	0.40	-60 to 325/350	CP8933	
0.15	*10*	*0.15*	*-60 to 325/350*	*CP9034*	*CP9034I5*
	15	*0.15*	*-60 to 325/350*	*CP9035*	
	20	*0.15*	*-60 to 325/350*	*CP9036*	*CP9036I5*
		0.30	*-60 to 325/350*	*CP9037*	
		0.60	*-60 to 325/350*	*CP9038*	
	40	*0.15*	*-60 to 325/350*	*CP9039*	*CP9039I5*
		0.60	*-60 to 325/350*	*CP9040*	
0.20	12	0.33	-60 to 325/350	CP8935	CP8935I5
	25	0.33	-60 to 325/350	CP8936	CP8936I5
	50	0.33	-60 to 325/350	CP8937	
0.25	15	0.10	-60 to 325/350	CP8938	
		0.25	-60 to 325/350	CP8939	
		0.50	-60 to 325/350	CP8963	
		1.00	-60 to 325/350	CP8940	
	25	0.25	-60 to 325/350	CP8941	CP8941I5
		0.40	-60 to 325/350	CP8942	
	30	0.10	-60 to 325/350	CP8943	CP8943I5
		0.25	-60 to 325/350	CP8944	CP8944I5
		0.50	-60 to 325/350	CP8945	
		1.00	-60 to 325/350	CP8946	
	50	0.25	-60 to 325/350	CP8947	
	60	0.10	-60 to 325/350	CP8948	CP8948I5
		0.25	-60 to 325/350	CP8960	CP8960I5
		1.00	-60 to 325/350	CP8949	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

VF-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.10	-60 to 325/350	CP8950	
		0.25	-60 to 325/350	CP8951	
		1.00	-60 to 325/350	CP8952	
	25	0.52	-60 to 325/350	CP8953	
	30	0.10	-60 to 325/350	CP8954	CP8954I5
		0.25	-60 to 325/350	CP8955	CP8955I5
		0.50	-60 to 325/350	CP8956	
		1.00	-60 to 325/350	CP8957	CP8957I5
	50	0.25	-60 to 325/350	CP8958	
		0.40	-60 to 325/350	CP8959	
	60	0.25	-60 to 325/350	CP8961	CP8961I5
		1.00	-60 to 325/350	CP8962	
0.53	15	0.50	-60 to 325/350	CP8971	
		1.00	-60 to 325/350	CP8972	
		1.50	-60 to 325/350	CP8973	
	30	0.50	-60 to 325/350	CP8974	
		1.00	-60 to 325/350	CP8975	
		1.50	-60 to 310/335	CP8976	

Tips & Tools

As part of Agilent's ongoing commitment to be your partner in chromatography, we have created a series of GC Troubleshooting videos, featuring Daron Decker, GC Applications Specialist, and Herb Brooks, Agilent Service Engineer. To view the videos, visit **www.agilent.com/chem/gctroubleshooting**

DB-XLB

- Exceptionally low bleed
- Low polarity
- Extended temperature limit of 340/360 °C
- Unique selectivity
- Excellent inertness for active compounds
- Ideal for confirmational analyses
- Excellent for pesticides, herbicides, PCBs and PAHs
- Ideal for GC/MS
- Bonded and cross-linked
- Solvent rinsable

Note: "DB-XLB is designed for inhibiting column bleed at high temperatures. It also appears to have inadvertently inherited an exceptional ability for separating many PCB congeners when used with MS detection. This stellar performance was maximized after careful optimization of the column dimensions, temperature programs, and carrier gas flow conditions."

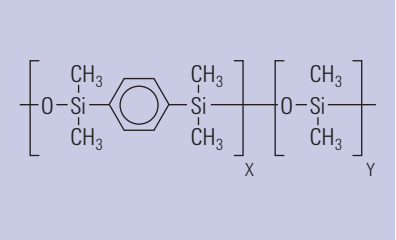
(Frame, G. Analytical Chemistry News & Features, Aug. 1, 1997, 468A-475A)

Similar Phases: Rtx-XLB, MDN-12, ZB-XLB, ZB-XLB HT

DB-XLB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*30 to 340/360*	*121-1222*	*121-1222E*	*121-1222LTM*
	30	*0.18*	*30 to 340/360*	*121-1232*		
0.20	12	0.33	30 to 340/360	128-1212	128-1212E	
	25	0.33	30 to 340/360	128-1222		
0.25	15	0.10	30 to 340/360	122-1211		122-1211LTM
		0.25	30 to 340/360	122-1212		
	30	0.10	30 to 340/360	122-1231		
		0.25	30 to 340/360	122-1232		122-1232LTM
		0.50	30 to 340/360	122-1236		
		1.00	30 to 340/360	122-1233		
	60	0.25	30 to 340/360	122-1262	122-1262E	
0.32	30	0.25	30 to 340/360	123-1232		
		0.50	30 to 340/360	123-1236		
	60	0.25	30 to 340/360	123-1262		
0.53	15	1.50	30 to 320/340	125-1212		125-1212LTM
	30	1.50	30 to 320/340	125-1232		125-1232LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-Xms

Column shown with EZ-GRIP

VF-Xms

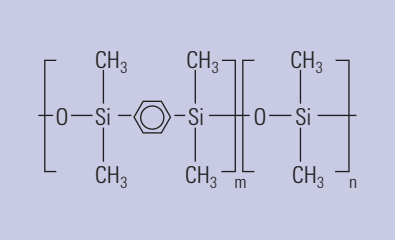
- High arylene modified phase for accurate results
- Isothermal applications up to 340 °C for a broad application range
- Ideal for confirmational analyses – more polar alternative to 5% phenyl columns
- Ultra low bleed delivers ultimate sensitivity and signal-to-noise ratio
- Provides exceptionally high selectivity for semivolatile compounds such as pesticides and delivers high resolution with short analysis time
- Very unique selectivity for chlorinated compounds
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-XLB, MDN-12, ZB-XLB, ZB-XLB HT

VF-Xms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*20*	*0.15*	*30 to 340/360*	*CP9041*	
0.20	12	0.33	30 to 340/360	CP8800	
	25	0.33	30 to 340/360	CP8801	
0.25	15	0.10	30 to 340/360	CP8802	
		0.25	30 to 340/360	CP8803	
	30	0.10	30 to 340/360	CP8805	
		0.25	30 to 340/360	CP8806	CP8806I5
		0.50	30 to 340/360	CP8807	
		1.00	30 to 340/360	CP8808	
	60	0.25	30 to 340/360	CP8809	
0.32	15	0.25	30 to 340/360	CP8810	
		1.00	30 to 340/360	CP8811	
	30	0.10	30 to 340/360	CP8812	
		0.25	30 to 340/360	CP8813	
		0.50	30 to 340/360	CP8814	
		1.00	30 to 340/360	CP8815	
	60	0.25	30 to 340/360	CP8816	
0.53	15	1.50	30 to 325/340	CP8817	
	30	1.50	30 to 325/340	CP8818	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of DB-35ms

DB-35ms

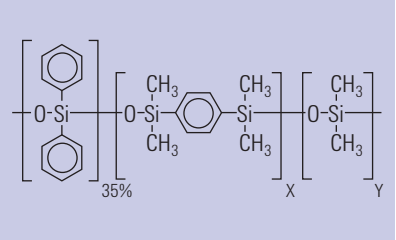
- Virtually equivalent to a (35%-Phenyl)-methylpolysiloxane
- Mid-polarity
- Very low bleed characteristics, ideal for GC/MS
- Extended temperature limit of 340/360 °C
- Excellent inertness for active compounds
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Replaces HP-35ms
- Close equivalent to USP Phase G42

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

DB-35ms

ID (mm)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*0.18*	*50 to 340/360*	*121-3822*	*121-3822E*	*121-3822LTM*	*221-3822LTM*
0.20	0.33	50 to 340/360	128-3812			
	0.33	50 to 340/360	128-3822			
0.25	0.25	50 to 340/360	122-3812			222-3812LTM
	0.15	50 to 340/360	122-3831			
	0.25	50 to 340/360	122-3832	122-3832E	122-3832LTM	222-3832LTM
	0.25	50 to 340/360	122-3862			
0.32	0.25	50 to 340/360	123-3812			
	0.25	50 to 340/360	123-3832	123-3832E		
0.53	0.50	50 to 320/340	125-3837		125-3837LTM	
	1.00	50 to 320/340	125-3832		125-3832LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-35ms

VF-35ms

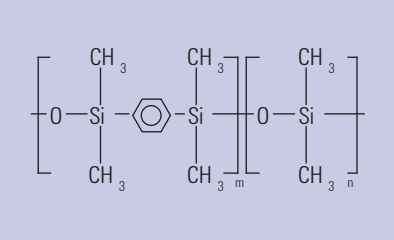
- Stabilized arylene-modified equivalent of a 35% phenylmethyl phase
- Ideal for dual column confirmational analyses
- Ultra low bleed, highly stable column with a programmable maximum temperature of 360 °C
- Medium polarity column ideal for trace environmental and chemical analyses
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

VF-35ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*10*	*0.15*	*40 to 340/360*	*CP5887*	
	15	*0.15*	*40 to 340/360*	*CP5888*	
	20	*0.15*	*40 to 340/360*	*CP5889*	
0.20	15	0.33	40 to 340/360	CP8872	
	25	0.33	40 to 340/360	CP8873	
0.25	15	0.25	40 to 340/360	CP8874	
	30	0.10	40 to 340/360	CP8875	
		0.15	40 to 340/360	CP8876	
		0.25	40 to 340/360	CP8877	CP8877I5
		0.50	40 to 340/360	CP8878	CP8878I5
		1.00	40 to 340/360	CP8879	
	60	0.25	40 to 340/360	CP8880	
0.32	15	0.25	40 to 340/360	CP8881	
	30	0.25	40 to 340/360	CP8882	
		0.50	40 to 340/360	CP8883	CP8883I5
		1.00	40 to 340/360	CP8884	
	60	0.25	40 to 340/360	CP8885	
0.53	15	1.00	40 to 325/350	CP8886	
	30	0.50	40 to 325/350	CP8887	
		1.00	40 to 325/350	CP8888	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of DB-17ms

DB-17ms

- Virtually equivalent to (50%-Phenyl)-methylpolysiloxane
- 320/340 °C upper temperature limit
- Very low bleed mid-polarity column, ideal for GC/MS
- Excellent inertness for active compounds
- Enhanced mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Excellent choice for CLP pesticides

Similar Phases: Rxi-17Sil MS, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50

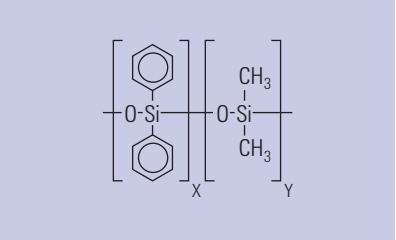
DB-17ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 320/340*	*121-4722*	*121-4722E*	*121-4722LTM*	*221-4722LTM*
0.25	15	0.15	40 to 320/340	122-4711		122-4711LTM	
		0.25	40 to 320/340	122-4712		122-4712LTM	222-4712LTM
	30	0.15	40 to 320/340	122-4731		122-4731LTM	
		0.25	40 to 320/340	122-4732	122-4732E	122-4732LTM	222-4732LTM
	60	0.25	40 to 320/340	122-4762			
0.32	15	0.25	40 to 320/340	123-4712		123-4712LTM	
	30	0.25	40 to 320/340	123-4732		123-4732LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Tips & Tools

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**



Structure of VF-17ms

VF-17ms

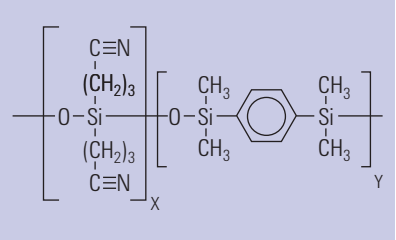
- 50% phenyl/50% dimethylpolysiloxane, medium polarity phase
- Ultra low bleed
- Proprietary deactivation technology and manufacturing process improves column stability, resulting in improved column-to-column repeatability and column lifetimes
- Ideal for environmental and clinical methods
- Ultra low bleed specification at 2 pA @ 325 °C (0.25 mm x 30 m, 0.25 µm)
- Ideal EPA confirmation column for ultimate confidence
- Bonded and cross-linked
- Solvent rinsable
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rxi-17Sil MS, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50

VF-17ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	40 to 330/360	CP8977	
0.15	*10*	*0.15*	*40 to 330/360*	*CP5882*	
	15	*0.15*	*40 to 330/360*	*CP5883*	
	20	*0.15*	*40 to 330/360*	*CP5884*	
0.25	15	0.25	40 to 330/360	CP8979	
	15	0.50	40 to 330/360	CP8980	
	30	0.15	40 to 330/360	CP8981	
		0.25	40 to 330/360	CP8982	CP8982I5
		0.50	40 to 330/360	CP8983	
	60	0.25	40 to 330/360	CP8984	
0.32	15	0.15	40 to 330/360	CP8986	
		0.25	40 to 330/360	CP8987	
	30	0.25	40 to 330/360	CP8990	CP8990I5
		0.50	40 to 330/360	CP8991	
0.53	15	0.25	40 to 330/360	CP8994	
		1.00	40 to 330/360	CP8996	
		1.50	40 to 310/340	CP8998	
	30	0.50	40 to 330/360	CP9000	
		1.00	40 to 310/340	CP9001	
		1.50	40 to 310/340	CP9002	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-23ms

VF-23ms

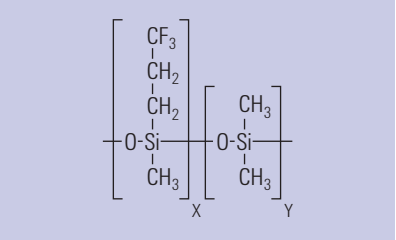
- High polarity and highly substituted cyanopropyl low bleed phase
- Engineered for accurate analysis of very polar analytes
- 100% bonded phase permits column rinsing to enhance column lifetime
- Operating temperature up to 260 °C
- Expands application ranges to higher molecular weight compounds
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SP-2330, Rtx-2330, 007-23, AT-Silar, BPX-70, SP-2340

VF-23ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	40 to 260/260	CP8819	
0.15	*15*	*0.15*	*40 to 260/260*	*CP5886*	
	20	*0.15*	*40 to 260/260*	*CP9042*	
	40	*0.15*	*40 to 260/260*	*CP5885*	
0.25	15	0.25	40 to 260/260	CP8820	CP8820I5
	30	0.15	40 to 260/260	CP8821	CP8821I5
		0.25	40 to 260/260	CP8822	CP8822I5
	60	0.15	40 to 260/260	CP8823	
		0.25	40 to 260/260	CP8824	CP8824I5
0.32	15	0.25	40 to 260/260	CP8825	
	30	0.15	40 to 260/260	CP8826	
		0.25	40 to 260/260	CP8827	
	60	0.15	40 to 260/260	CP8828	
		0.25	40 to 260/260	CP8829	
0.53	15	0.50	40 to 245/245	CP8830	
	30	0.50	40 to 245/245	CP8831	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-200ms

VF-200ms

- Trifluoropropyl phase has very high temperature stability and can be used routinely up to 350 °C
- Ideally suited for analyses of ketones, aldehydes, nitro- or chloro-containing compounds, PAHs, unsaturated compounds, silanes, and CFCs
- Optimized deactivation for symmetrical peak shape
- Ultra-low bleed for trace analysis
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-200

VF-200ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*10*	*0.15*	*0 to 325/350*	*CP5893*	
	20	*0.15*	*0 to 325/350*	*CP5891*	
		0.60	*0 to 325/350*	*CP5892*	
0.25	15	0.25	0 to 325/350	CP8855	CP8855I5
		0.50	0 to 325/350	CP8856	
	30	0.10	0 to 325/350	CP8857	
		0.25	0 to 325/350	CP8858	
		0.50	0 to 325/350	CP8859	CP8859I5
		1.00	0 to 325/350	CP8860	CP8860I5
	60	0.25	0 to 325/350	CP8861	
0.32	15	0.25	0 to 325/350	CP8862	
	30	0.25	0 to 325/350	CP8863	
		0.50	0 to 325/350	CP8864	
		1.00	0 to 325/350	CP8865	CP8865I5
0.53	15	1.00	0 to 300/325	CP8866	
	30	0.50	0 to 300/325	CP8867	
		1.00	0 to 300/325	CP8868	CP8868I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-225ms

- Virtually equivalent to (50%-Cyanopropylphenyl)-methylpolysiloxane
- Mid/high polarity
- Excellent for separations of cis- and trans-fatty acid methyl esters (FAMEs)
- Low bleed
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G7

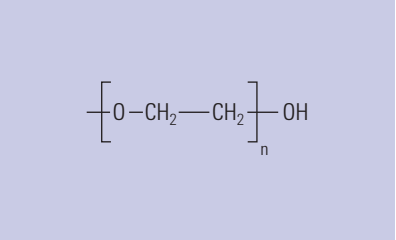
Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225

DB-225ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.25	40 to 240	122-2912		122-2912LTM	222-2912LTM
	30	0.25	40 to 240	122-2932	122-2932E	122-2932LTM	222-2932LTM
	60	0.25	40 to 240	122-2962			
0.32	30	0.25	40 to 240	123-2932		123-2932LTM	

Tips & Tools

Get fast and easy GC pressure and flow calculations at your fingertips with Agilent's GC Calculator Application – **www.agilent.com/chem/gcapp**



Structure of VF-WAXms

VF-WAXms

- Specially designed WAX phase designed for accurate MS results with polar compounds
- Operating temperature range of 20 °C to 250 °C
- Improves signal-to-noise ratio for trace analyses
- Ideal for GC/MS food, flavor and fragrance applications, especially where trace analyses are required
- Ultra low bleed provides increased sensitivity and extended column lifetime at higher temperatures
- Improved performance with no change in the typical selectivity of PEG
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

VF-WAXms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	20 to 250/260	CP9219	
		0.20	20 to 250/260	CP9218	
	20	0.10	20 to 250/260	CP9229	CP9229I5
0.15	*10*	*0.15*	*20 to 250/260*	*CP9200*	
	15	*0.15*	*20 to 250/260*	*CP9201*	
	20	*0.15*	*20 to 250/260*	*CP9220*	
	30	*0.15*	*20 to 250/260*	*CP9202*	
0.25	15	0.25	20 to 250/260	CP9203	
		0.50	20 to 250/260	CP9221	
	25	0.20	20 to 250/260	CP9204	
	30	0.25	20 to 250/260	CP9205	CP9205I5
		0.50	20 to 250/260	CP9222	
		1.00	20 to 240	CP9206	
	60	0.25	20 to 250/260	CP9207	
		0.50	20 to 240	CP9223	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

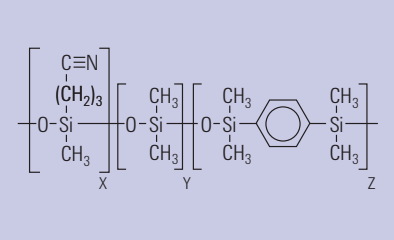
(Continued)

VF-WAXms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.25	20 to 250/260	CP9209	
		0.50	20 to 250/260	CP9224	
		1.00	20 to 250/260	CP9208	
	30	0.25	20 to 250/260	CP9212	CP9212I5
		0.50	20 to 250/260	CP9210	
		1.00	20 to 240	CP9211	
	60	0.25	20 to 250/260	CP9214	
		0.50	20 to 240	CP9225	CP9225I5
		1.00	20 to 230	CP9213	
0.53	15	1.00	20 to 250/260	CP9226	CP9226I5
		2.00	20 to 240	CP9227	
	30	1.00	20 to 240	CP9215	
		2.00	20 to 230	CP9216	
	60	1.00	20 to 230	CP9228	
		2.00	20 to 220	CP9217	

Tips & Tools

As a special MS-type phase, the VF-WAXms column generates less bleed, and therefore less noise and higher signal-to-noise ratios for critical components.



Structure of VF-624ms and VF-1301ms

VF-624ms and VF-1301ms

- VF-624ms is designed for analyzing solvents according to EPA Methods 524, 624 and 8260, as well as USP 467
- VF-1301ms ultra-low-bleed thin-film has a similar selectivity to 624 and is suitable for semivolatile organic solvents, as well as PCBs and pesticides
- Enhanced selectivity for USP 467 eliminates coelution of benzene and 1,2-dichloroethane
- Mid polarity
- Low bleed
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: AT-624, Rxi-624 Sil MS, Rtx-624, PE-624, 007-624, 007-502, ZB-624

VF-624ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*15*	*0.84*	*-40 to 280/300*	*CP9101*	*CP9101I5*
	20	*0.84*	*-40 to 280/300*	*CP9100*	
	30	*0.84*	*-40 to 280/300*	*CP9109*	
	40	*0.84*	*-40 to 280/300*	*CP9110*	
0.25	30	1.40	-40 to 280/300	CP9102	CP9102I5
	60	1.40	-40 to 280/300	CP9103	CP9103I5
0.32	30	1.80	-40 to 280/300	CP9104	CP9104I5
	60	1.80	-40 to 280/300	CP9105	CP9105I5
0.53	30	3.00	-40 to 280/300	CP9106	CP9106I5
	60	3.00	-40 to 265/280	CP9107	
	75	3.00	-40 to 265/280	CP9108	

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Similar Phases: Rtx-1301, PE-1301

VF-1301ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	1.00	-40 to 280/300	CP9066	
0.15	*15*	*0.15*	*-40 to 280/300*	*CP9050*	
	20	*0.15*	*-40 to 280/300*	*CP9051*	
0.25	15	1.00	-40 to 280/300	CP9052	
	30	0.25	-40 to 280/300	CP9053	
		1.00	-40 to 280/300	CP9054	
	60	0.25	-40 to 280/300	CP9055	
		1.00	-40 to 280/300	CP9056	
0.32	15	0.25	-40 to 280/300	CP9057	
		1.00	-40 to 280/300	CP9058	
	30	0.25	-40 to 280/300	CP9059	
		1.00	-40 to 280/300	CP9060	CP9060I5
	60	1.00	-40 to 280/300	CP9061	
0.53	15	1.00	-40 to 280/300	CP9062	
	30	1.00	-40 to 280/300	CP9063	
		1.50	-40 to 280/300	CP9064	

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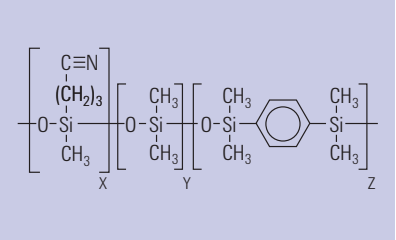
Tips & Tools

Ensure a lifetime of peak performance and maximum productivity with Agilent's comprehensive GC supplies portfolio, learn more at **www.agilent.com/chem/GCsupplies**



Structure of VF-1701ms

VF-1701ms

- Ultra-low bleed 14% cyanopropyl/phenyl/86% polydimethylsiloxane phase
- Mid polarity
- Ideal for pesticides, PCBs and semi-volatile organic compounds
- Highly inert for difficult analytes such as p,p'-DDT
- Deactivated for accurate trace analysis
- Engineered for reduced bleed, (bleed specification is 2 pA @ 280 °C for a 0.25 mm x 60 m, 0.25 µm id column)
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701

VF-1701ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	-20 to 280/300	CP9140	
		0.40	-20 to 280/300	CP9141	
	20	0.10	-20 to 280/300	CP9142	
0.15	*15*	*0.10*	*-20 to 280/300*	*CP9175*	
		0.15	*-20 to 280/300*	*CP9143*	
		0.60	*-20 to 280/300*	*CP9144*	
	20	*0.15*	*-20 to 280/300*	*CP9145*	
		0.60	*-20 to 280/300*	*CP9146*	
0.25	15	0.15	-20 to 280/300	CP9147	
		0.25	-20 to 280/300	CP9148	
		1.00	-20 to 280/300	CP9149	CP9149I5
	30	0.15	-20 to 280/300	CP9150	
		0.25	-20 to 280/300	CP9151	CP9151I5
		1.00	-20 to 280/300	CP9152	CP9152I5
	60	0.15	-20 to 280/300	CP9153	
		0.25	-20 to 280/300	CP9154	CP9154I5
		0.50	-20 to 280/300	CP9155	CP9155I5
		1.00	-20 to 280/300	CP9156	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

VF-1701ms

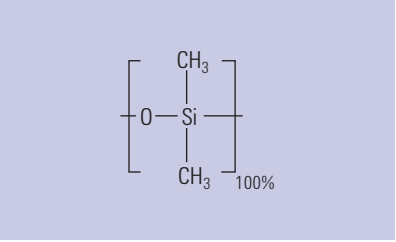
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.15	-20 to 280/300	CP9157	
		0.25	-20 to 280/300	CP9158	
		1.00	-20 to 280/300	CP9159	
	30	0.10	-20 to 280/300	CP9160	
		0.15	-20 to 280/300	CP9161	
		0.25	-20 to 280/300	CP9162	
		1.00	-20 to 280/300	CP9163	
	60	0.15	-20 to 280/300	CP9164	
		0.25	-20 to 280/300	CP9165	
		1.00	-20 to 280/300	CP9166	CP9166I5
0.53	15	1.00	-20 to 280/300	CP9167	
	30	0.10	-20 to 280/300	CP9168	
		0.25	-20 to 280/300	CP9169	
		0.50	-20 to 280/300	CP9170	
		1.00	-20 to 280/300	CP9171	
		1.50	-20 to 280/300	CP9172	
	60	1.00	-20 to 280/300	CP9173	
		1.50	-20 to 265/280	CP9174	

Tips & Tools

Search the ScanView database to find almost 2000 GC applications and standard methods of all types, old and new. Get your free copy of ScanView at **www.agilent.com/chem/scanview**

Premium Polysiloxane Columns

Polysiloxanes are the most common stationary phases. They are available in the greatest variety and are stable, robust and versatile. Standard polysiloxanes are characterized by the repeating siloxane backbone. Each silicon atom contains two functional groups. The type and percent level of substitution of the groups distinguish each stationary phase and its properties.



Structure of DB-1

DB-1

- 100% Dimethylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- Low bleed
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G2

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.05	10	0.05	-60 to 325/350	126-1012		126-1012LTM
		0.05	-60 to 325/350	126-10SP		
		0.20	-60 to 325/350	126-1013		126-1013LTM
0.10	5	0.12	-60 to 325/350	127-100A		127-100ALTM
	10	0.10	-60 to 325/350	127-1012	127-1012E	127-1012LTM
		0.40	-60 to 325/350	127-1013	127-1013E	127-1013LTM
	20	0.10	-60 to 325/350	127-1022	127-1022E	127-1022LTM
		0.40	-60 to 325/350	127-1023	127-1023E	127-1023LTM
	40	0.20	-60 to 325/350	127-1046	127-1046E	
		0.40	-60 to 325/350	127-1043		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.15	*10*	*1.20*	*-60 to 325/350*	*12A-1015*		*12A-1015LTM*
0.18	*10*	*0.18*	*-60 to 325/350*	*121-1012*	*121-1012E*	*121-1012LTM*
		0.20	*-60 to 325/350*	*121-101A*		*121-101ALTM*
		0.40	*-60 to 325/350*	*121-1013*	*121-1013E*	*121-1013LTM*
	20	*0.18*	*-60 to 325/350*	*121-1022*	*121-1022E*	*121-1022LTM*
		0.40	*-60 to 325/350*	*121-1023*		*121-1023LTM*
	40	*0.40*	*-60 to 325/350*	*121-1043*	*121-1043E*	
0.20	12	0.33	-60 to 325/350	128-1012		128-1012LTM
	25	0.33	-60 to 325/350	128-1022		128-1022LTM
	30	0.80	-60 to 325/350	128-1034		128-1034LTM
	50	0.33	-60 to 325/350	128-1052		
0.25	15	0.10	-60 to 325/350	122-1011		122-1011LTM
		0.25	-60 to 325/350	122-1012		122-1012LTM
		1.00	-60 to 325/350	122-1013		122-1013LTM
	25	0.25	-60 to 325/350	122-1022		122-1022LTM
	30	0.10	-60 to 325/350	122-1031		122-1031LTM
		0.25	-60 to 325/350	122-1032	122-1032E	122-1032LTM*
		0.50	-60 to 325/350	122-103E		122-103ELTM
		1.00	-60 to 325/350	122-1033	122-1033E	122-1033LTM
	50	0.25	-60 to 325/350	122-1052		
	60	0.10	-60 to 325/350	122-1061		
		0.25	-60 to 325/350	122-1062		
		0.50	-60 to 325/350	122-106E		
		1.00	-60 to 325/350	122-1063		
	100	0.50	-60 to 325/350	122-10AE		
	150	1.00	-60 to 325/350	122-10G3		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	10	0.50	-60 to 325/350	123-100E		123-100ELTM
	15	0.10	-60 to 325/350	123-1011		123-1011LTM
		0.25	-60 to 325/350	123-1012		123-1012LTM
		1.00	-60 to 325/350	123-1013		123-1013LTM
		3.00	-60 to 280/300	123-1014		123-1014LTM
		5.00	-60 to 280/300	123-1015		123-1015LTM
	25	0.12	-60 to 325/350	123-1027		123-1027LTM
		0.25	-60 to 325/350	123-1022		123-1022LTM
		0.52	-60 to 325/350	123-1026		123-1026LTM
		1.05	-60 to 325/350	123-102F		123-102FLTM
	30	0.10	-60 to 325/350	123-1031		123-1031LTM
		0.25	-60 to 325/350	123-1032		123-1032LTM
		0.50	-60 to 325/350	123-103E		123-103ELTM
		1.00	-60 to 325/350	123-1033	123-1033E	123-1033LTM
		1.50	-60 to 300/320	123-103B		123-103BLTM
		3.00	-60 to 280/300	123-1034		123-1034LTM
		5.00	-60 to 280/300	123-1035		123-1035LTM
	50	0.25	-60 to 325/350	123-1052		
		0.52	-60 to 325/350	123-1056		
		1.05	-60 to 325/350	123-105F		
		1.20	-60 to 325/350	123-105C		
		5.00	-60 to 280/300	123-1055		
	60	0.10	-60 to 325/350	123-1061		
		0.25	-60 to 325/350	123-1062	123-1062E	
		0.50	-60 to 325/350	123-106E		
		1.00	-60 to 325/350	123-1063	123-1063E	
		1.50	-60 to 300/320	123-106B	123-106BE	
		2.00	-60 to 280/300	123-106G		
		3.00	-60 to 280/300	123-1064	123-1064E	
		5.00	-60 to 280/300	123-1065	123-1065E	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.45	30	1.27	-60 to 325/350	124-1032		124-1032LTM
		2.55	-60 to 260/280	124-1034		124-1034LTM
0.53	5	0.88	-60 to 325/350	125-100A		125-100ALTM
		2.65	-60 to 325/350	125-100B		125-100BLTM
		5.00	-60 to 325/350	125-1005		125-1005LTM
	7.5	1.50	-60 to 325/350	125-1002		125-1002LTM
	10	2.65	-60 to 260/280	125-10HB	125-10HBE	125-10HBLTM
		5.00	-60 to 260/280	125-10H5		125-10H5LTM
	15	0.15	-60 to 340/360	125-1011	125-1011E	125-1011LTM
		0.25	-60 to 320/340	125-101K		125-101KLTM
		0.50	-60 to 300/320	125-1017		125-1017LTM
		1.00	-60 to 300/320	125-101J		125-101JLTM
		1.50	-60 to 300/320	125-1012	125-1012E	125-1012LTM
		3.00	-60 to 260/280	125-1014		125-1014LTM
		5.00	-60 to 260/280	125-1015		125-1015LTM
	25	1.00	-60 to 300/320	125-102J		125-102JLTM
		5.00	-60 to 260/280	125-1025		125-1025LTM
	30	0.10	-60 to 340/360	125-1039		
		0.25	-60 to 320/340	125-103K	125-103KE	125-103KLTM
		0.50	-60 to 300/320	125-1037		125-1037LTM
		1.00	-60 to 300/320	125-103J		125-103JLTM
		1.50	-60 to 300/320	125-1032		125-1032LTM
		2.65	-60 to 260/280	125-103B		125-103BLTM
		3.00	-60 to 260/280	125-1034	125-1034E	125-1034LTM
		5.00	-60 to 260/280	125-1035	125-1035E	125-1035LTM
	50	5.00	-60 to 260/280	125-1055		
	60	1.00	-60 to 300/320	125-106J	125-106JE	
		1.50	-60 to 300/320	125-1062	125-1062E	
		3.00	-60 to 260/280	125-1064		
		5.00	-60 to 260/280	125-1065	125-1065E	
	105	5.00	-60 to 260/280	125-10B5		

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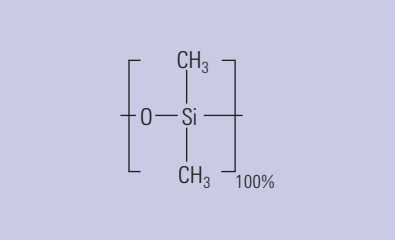


Structure of HP-1

HP-1

- 100% Dimethylpolysiloxane
- Non-polar
- Excellent general purpose column – "Industry Standard"
- Wide range of applications
- Superior performance for low molecular weight alcohols (< C_5)
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G2

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1

HP-1

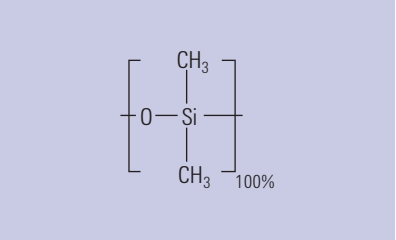
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*19091Z-577*	*19091Z-577E*	*19091Z-577LTM*
0.20	12	0.33	-60 to 325/350	19091-60312		
	17	0.11	-60 to 325/350	19091Z-008		19091Z-008LTM
	25	0.11	-60 to 325/350	19091Z-002		19091Z-002LTM
		0.33	-60 to 325/350	19091Z-102	19091Z-102E	19091Z-102LTM
		0.50	-60 to 325/350	19091Z-202		19091Z-202LTM
	50	0.11	-60 to 325/350	19091Z-005		
		0.33	-60 to 325/350	19091Z-105		
		0.50	-60 to 325/350	19091Z-205		
0.25	15	0.10	-60 to 325/350	19091Z-331		19091Z-331LTM
		0.25	-60 to 325/350	19091Z-431		19091Z-431LTM
		1.00	-60 to 325/350	19091Z-231		19091Z-231LTM
	30	0.10	-60 to 325/350	19091Z-333		19091Z-333LTM
		0.25	-60 to 325/350	19091Z-433	19091Z-433E	19091Z-433LTM
		1.00	-60 to 325/350	19091Z-233	19091Z-233E	19091Z-233LTM
	60	0.25	-60 to 325/350	19091Z-436		
		1.00	-60 to 325/350	19091Z-236	19091Z-236E	
	100	0.50	-60 to 325/350	19091Z-530	19091Z-530E	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

HP-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	0.25	-60 to 325/350	19091Z-411	19091Z-411E	19091Z-411LTM
		1.00	-60 to 325/350	19091Z-211		19091Z-211LTM
	25	0.17	-60 to 325/350	19091Z-012	19091Z-012E	19091Z-012LTM
		0.52	-60 to 325/350	19091Z-112	19091Z-112E	19091Z-112LTM
		1.05	-60 to 325/350	19091Z-212		19091Z-212LTM
	30	0.10	-60 to 325/350	19091Z-313	19091Z-313E	19091Z-313LTM
		0.25	-60 to 325/350	19091Z-413	19091Z-413E	19091Z-413LTM
		1.00	-60 to 325/350	19091Z-213	19091Z-213E	19091Z-213LTM
		3.00	-60 to 260/280	19091Z-513	19091Z-513E	19091Z-513LTM
		4.00	-60 to 260/280	19091Z-613		19091Z-613LTM
		5.00	-60 to 260/280	19091Z-713	19091Z-713E	19091Z-713LTM
	50	0.17	-60 to 325/350	19091Z-015		
		0.52	-60 to 325/350	19091Z-115	19091Z-115E	
		1.05	-60 to 325/350	19091Z-215		
	60	0.25	-60 to 325/350	19091Z-416		
		1.00	-60 to 325/350	19091Z-216	19091Z-216E	
		5.00	-60 to 260/280	19091Z-716		
0.53	5	0.15	-60 to 320/400	19095Z-220		
		0.88	-60 to 320/400	19095Z-020		
			-60 to 325/350	125-100A		
		2.65	-60 to 260/280	19095S-100	19095S-100E	19095S-100LTM
	7.5	5.00	-60 to 260/280	19095Z-627	19095Z-627E	19095Z-627LTM
	10	0.88	-60 to 300/320	19095Z-021	19095Z-021E	19095Z-021LTM
		2.65	-60 to 260/280	19095Z-121	19095Z-121E	19095Z-121LTM
	15	0.15	-60 to 320/400	19095Z-221	19095Z-221E	
		1.50	-60 to 300/320	19095Z-321		19095Z-321LTM
		3.00	-60 to 260/280	19095Z-421	19095Z-421LTM	19095Z-421LTM
		5.00	-60 to 260/280	19095Z-621		19095Z-621LTM
	30	0.88	-60 to 300/320	19095Z-023	19095Z-023E	19095Z-023LTM
		1.50	-60 to 300/320	19095Z-323	19095Z-323E	19095Z-323LTM
		2.65	-60 to 260/280	19095Z-123	19095Z-123E	19095Z-123LTM
		3.00	-60 to 260/280	19095Z-423	19095Z-423E	19095Z-423LTM
		5.00	-60 to 260/280	19095Z-623	19095Z-623E	19095Z-623LTM
	60	5.00	-60 to 260/280	19095Z-626		



Structure of CP-Sil 5 CB

CP-Sil 5 CB

- 100% dimethylpolysiloxane
- Non-polar
- General purpose phase
- Bonded and cross-linked
- Solvent rinsable
- Available in Fused Silica or UltiMetal
- Separation almost entirely based on boiling points, making this column suitable for a wide range of applications with a broad temperature range
- High temperature limit
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	5	0.12	-60 to 330/350	CP7300	
	10	0.10	-60 to 330/350	CP7311	
		0.12	-60 to 330/350	CP7310	CP7310I5
		0.40	-60 to 325/350	CP7312	
	20	0.10	-60 to 330/350	CP7313	
0.15	*10*	*0.12*	*-60 to 330/350*	*CP7684*	*CP7684I5*
		2.00	*-60 to 325/350*	*CP7682*	*CP7682I5*
	25	*0.12*	*-60 to 330/350*	*CP7694*	
		1.20	*-60 to 325/350*	*CP7693*	
		2.00	*-60 to 325/350*	*CP7692*	*CP7692I5*
0.20	12	0.33	-60 to 325/350	CP7602	
	15	0.20	-60 to 330/350	CP7604	
	25	0.33	-60 to 325/350	CP7622	
	30	0.80	-60 to 325/350	CP7633	
	50	0.11	-60 to 330/350	CP7642	
		0.33	-60 to 325/350	CP7643	CP7643I5
		0.50	-60 to 325/350	CP7644	CP7644I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	0.12	-60 to 330/350	CP7700	
	15	0.25	-60 to 330/350	CP8510	
	25	0.12	-60 to 330/350	CP7710	CP7710I5
		0.25	-60 to 330/350	CP7441	
		0.40	-60 to 325/350	CP7709	
		1.20	-60 to 325/350	CP7670	CP7670I5
	30	0.10	-60 to 330/350	CP8710	
		0.25	-60 to 330/350	CP8741	CP8741I5
		1.00	-60 to 325/350	CP8770	
	50	0.12	-60 to 330/350	CP7720	
		0.25	-60 to 330/350	CP7443	CP7443I5
		0.40	-60 to 325/350	CP7719	CP7719I5
	60	0.25	-60 to 330/350	CP8743	CP8743I5
		1.00	-60 to 325/350	CP8780	CP8780I5
0.32	10	0.12	-60 to 330/350	CP7730	
		1.20	-60 to 325/350	CP7758	CP7758I5
	15	0.10	-60 to 330/350	CP8529	
		0.25	-60 to 325/350	CP8530	
		3.00	-60 to 325/350	CP8550	CP8550I5
		1.00	-60 to 325/350	CP8540	
		5.00	-60 to 300/325	CP8560	CP8560I5
	25	0.12	-60 to 330/350	CP7740	
		0.25	-60 to 325/350	CP7442	
		0.40	-60 to 325/350	CP7739	
		0.52	-60 to 325/350	CP8430	CP8430I5
		1.20	-60 to 325/350	CP7760	CP7760I5
		5.00	-60 to 300/325	CP7680	CP7680I5
	30	0.25	-60 to 325/350	CP8742	CP8742I5
		1.00	-60 to 325/350	CP8760	CP8760I5
		3.00	-60 to 310/335	CP8687	CP8687I5
		5.00	-60 to 300/325	CP8688	CP8688I5
	50	0.12	-60 to 330/335	CP7750	CP7750I5
		0.25	-60 to 325/350	CP7444	CP7444I5
		0.40	-60 to 325/350	CP7749	CP7749I5
		1.20	-60 to 325/350	CP7770	CP7770I5
		5.00	-60 to 300/325	CP7690	CP7690I5
	60	0.25	-60 to 325/350	CP8744	CP8744I5
		1.00	-60 to 325/350	CP8870	
		3.00	-60 to 310/335	CP8689	
		5.00	-60 to 300/325	CP8690	CP8690I5

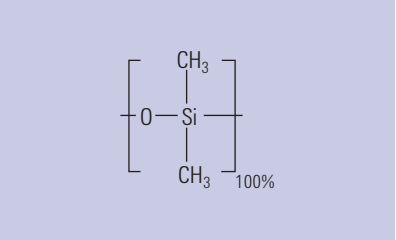
(Continued)

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	1.00	-60 to 315/340	CP7625	
		2.00	-60 to 305/330	CP7620	CP7620I5
		5.00	-60 to 290/325	CP7645	
	15	0.15	-60 to 330/350	CP8673	CP8673I5
		1.50	-60 to 305/330	CP8674	CP8674I5
		3.00	-60 to 300/325	CP8675	
		5.00	-60 to 290/325	CP8676	
	20	5.00	-60 to 290/325	CP8774	
	25	1.00	-60 to 315/340	CP7635	CP7635I5
		2.00	-60 to 305/330	CP7630	
		5.00	-60 to 290/325	CP7675	CP7675I5
	30	1.50	-60 to 305/330	CP8735	CP8735I5
		2.00	-60 to 305/330	CP8730	CP8730I5
		3.00	-60 to 300/325	CP8677	CP8677I5
		5.00	-60 to 290/325	CP8775	CP8775I5
	50	1.00	-60 to 315/340	CP7695	
		2.00	-60 to 305/330	CP7640	
		5.00	-60 to 290/325	CP7685	CP7685I5
	60	1.50	-60 to 305/330	CP8799	
		5.00	-60 to 290/325	CP8685	
	100	0.50	-60 to 325/350	CP7608	
		2.00	-60 to 305/330	CP7650	
		5.00	-60 to 290/325	CP7688	

CP-Sil 5 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	1.00	-60 to 325/350	CP7120	
		2.00	-60 to 325/350	CP7150	
		5.00	-60 to 325/350	CP6666	CP6666I5
	25	0.50	-60 to 325/350	CP7135	CP7135I5
		2.00	-60 to 325/350	CP7160	
		5.00	-60 to 325/350	CP6670	
	50	0.50	-60 to 325/350	CP7195	
		1.00	-60 to 325/350	CP7140	
		2.00	-60 to 325/350	CP7170	
		5.00	-60 to 325/350	CP6671	



Structure of Ultra 1

Ultra 1

- 100% Dimethylpolysiloxane
- Non-polar
- Equivalent to HP-1 with tighter specifications for retention index and capacity factors
- Bonded and cross-linked
- Solvent rinsable

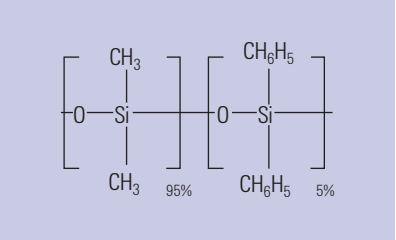
Similar Phases: SPB-1, Rtx-1, BP-1, 007-1(MS)

Ultra 1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	12	0.33	-60 to 325/350	19091A-101		19091A-101LTM
	17	0.11	-60 to 325/350	19091A-008		19091A-008LTM
		0.33	-60 to 325/350	19091A-108		19091A-108LTM
	25	0.11	-60 to 325/350	19091A-002		19091A-002LTM
		0.33	-60 to 325/350	19091A-102	19091A-102E	19091A-102LTM
	50	0.11	-60 to 325/350	19091A-005		
		0.33	-60 to 325/350	19091A-105		
0.32	25	0.17	-60 to 325/350	19091A-012		19091A-012LTM
		0.52	-60 to 325/350	19091A-112		19091A-112LTM
	50	0.17	-60 to 325/350	19091A-015		
		0.52	-60 to 325/350	19091A-115		

Tips & Tools

Agilent CrossLab GC supplies, including CrossLab Ultra Inert liners, perform seamlessly with a variety of instruments regardless of make or model, including Varian (now Bruker), PerkinElmer, Shimadzu, and Thermo Scientific GC systems. Learn more at **www.agilent.com/chem/CrossLab**



Structure of Ultra 2

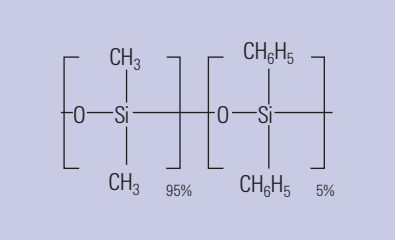
Ultra 2

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Equivalent to HP-5 with tighter specifications for retention index and capacity factors
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-5, Rtx-5, BP-5, CB-5, 007-5, 2B-5

Ultra 2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	12	0.33	-60 to 325/350	19091B-101		19091B-101LTM
	25	0.11	-60 to 325/350	19091B-002		19091B-002LTM
		0.33	-60 to 325/350	19091B-102	19091B-102E	19091B-102LTM
	50	0.11	-60 to 325/350	19091B-005		
		0.33	-60 to 325/350	19091B-105	19091B-105E	
0.32	25	0.17	-60 to 325/350	19091B-012	19091B-012E	19091B-012LTM
		0.52	-60 to 325/350	19091B-112		19091B-112LTM
	50	0.17	-60 to 325/350	19091B-015		
		0.52	-60 to 325/350	19091B-115	19091B-115E	



Structure of DB-5

DB-5

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- Low bleed
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G27

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5

DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	10	0.10	-60 to 325/350	127-5012	127-5012E	127-5012LTM
		0.17	-60 to 325/350	127-501E	127-501EE	127-501ELTM
		0.33	-60 to 325/350	127-501N		127-501NLTM
		0.40	-60 to 325/350	127-5013		127-5013LTM
	20	0.10	-60 to 325/350	127-5022	127-5022E	127-5022LTM
		0.40	-60 to 325/350	127-5023		127-5023LTM
0.15	*10*	*1.20*	*-60 to 300/320*	*12A-5015*		*12A-5015LTM*
0.18	*10*	*0.18*	*-60 to 325/350*	*121-5012*	*121-5012E*	*121-5012LTM*
		0.40	*-60 to 325/350*	*121-5013*		*121-5013LTM*
	20	*0.18*	*-60 to 325/350*	*121-5022*	*121-5022E*	*121-5022LTM*
		0.40	*-60 to 325/350*	*121-5023*	*121-5023E*	*121-5023LTM*
	40	*0.18*	*-60 to 325/350*	*121-5042*		
0.20	12	0.33	-60 to 325/350	128-5012		128-5012LTM
	15	0.20	-60 to 325/350	128-50H7		128-50H7LTM
	25	0.33	-60 to 325/350	128-5022		128-5022LTM
	50	0.33	-60 to 325/350	128-5052		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

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DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.10	-60 to 325/350	122-5011		122-5011LTM
		0.25	-60 to 325/350	122-5012		122-5012LTM
		0.50	-60 to 325/350	122-501E		122-501ELTM
		1.00	-60 to 325/350	122-5013		122-5013LTM
	25	0.25	-60 to 325/350	122-5022		122-5022LTM
	30	0.10	-60 to 325/350	122-5031		122-5031LTM
		0.25	-60 to 325/350	122-5032	122-5032E	122-5032LTM
		0.50	-60 to 325/350	122-503E		122-503ELTM
		1.00	-60 to 325/350	122-5033	122-5033E	122-5033LTM
	50	0.25	-60 to 325/350	122-5052		
	60	0.10	-60 to 325/350	122-5061		
		0.25	-60 to 325/350	122-5062		
		0.50	-60 to 325/350	122-506E		
		1.00	-60 to 325/350	122-5063		
0.32	10	0.50	-60 to 325/350	123-500E		123-500ELTM
	15	0.10	-60 to 325/350	123-5011		123-5011LTM
		0.25	-60 to 325/350	123-5012	123-5012E	123-5012LTM
		1.00	-60 to 325/350	123-5013	123-5013E	123-5013LTM
	25	0.17	-60 to 325/350	123-502D		123-502DLTM
		0.25	-60 to 325/350	123-5022		123-5022LTM
		0.52	-60 to 325/350	123-5026		123-5026LTM
		1.05	-60 to 325/350	123-502F		123-502FLTM
	30	0.10	-60 to 325/350	123-5031		123-5031LTM
		0.25	-60 to 325/350	123-5032	123-5032E	123-5032LTM
		0.50	-60 to 325/350	123-503E		123-503ELTM
		1.00	-60 to 325/350	123-5033	123-5033E	123-5033LTM
		1.50	-60 to 325/350	123-503B		123-503BLTM
	50	0.25	-60 to 325/350	123-5052		
		0.52	-60 to 325/350	123-5056		
		1.00	-60 to 325/350	123-5053		
	60	0.25	-60 to 325/350	123-5062		
		1.00	-60 to 325/350	123-5063	123-5063E	
0.45	15	1.27	-60 to 300/320	124-5012		124-5012LTM
	30	0.42	-60 to 300/320	124-5037		124-5037LTM
		1.27	-60 to 300/320	124-5032		124-5032LTM

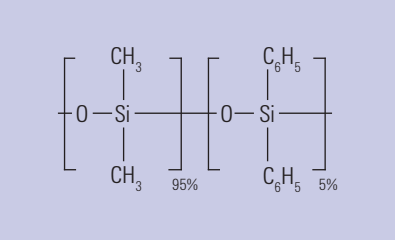
(Continued)

DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	10	2.65	-60 to 260/280	125-50HB		125-50HBLTM
	15	0.25	-60 to 300/320	125-501K		125-501KLTM
		0.50	-60 to 300/320	125-5017		125-5017LTM
		1.00	-60 to 300/320	125-501J		125-501JLTM
		1.50	-60 to 300/320	125-5012	125-5012E	125-5012LTM
	25	5.00	-60 to 260/280	125-5025		125-5025LTM
	30	0.25	-60 to 300/320	125-503K		125-503KLTM
		0.50	-60 to 300/320	125-5037		125-5037LTM
		0.88	-60 to 300/320	125-503D		125-503DLTM
		1.00	-60 to 300/320	125-503J		125-503JLTM
		1.50	-60 to 300/320	125-5032	125-5032E	125-5032LTM
		2.65	-60 to 260/280	125-503B		125-503BLTM
		3.00	-60 to 260/280	125-5034	125-5034E	125-5034LTM
		5.00	-60 to 260/280	125-5035	125-5035E	125-5035LTM
	60	1.50	-60 to 300/320	125-5062	125-5062E	
		5.00	-60 to 260/280	125-5065	125-5065E	

Tips & Tools

Complete your ultra inert flow path with the industry leading Agilent Ultra Inert Inlet Liner, **www.agilent.com/chem/uiliner**



Structure of HP-5

HP-5

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G27

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5

HP-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*19091J-577*	*19091J-577E*	*19091J-577LTM*
0.20	12	0.33	-60 to 325/350	19091J-101		19091J-101LTM
	17	0.33	-60 to 325/350	19091J-108		
	25	0.11	-60 to 325/350	19091J-002		19091J-002LTM
		0.33	-60 to 325/350	19091J-102	19091J-102E	19091J-102LTM
		0.50	-60 to 325/350	19091J-202		19091J-202LTM
	50	0.11	-60 to 325/350	19091J-005		
		0.33	-60 to 325/350	19091J-105	19091J-105E	
		0.50	-60 to 325/350	19091J-205		
0.25	5	0.10	-60 to 325/350	19091J-330		19091J-330LTM
	15	0.25	-60 to 325/350	19091J-431	19091J-431E	19091J-431LTM
		1.00	-60 to 325/350	19091J-231		19091J-231LTM
	30	0.10	-60 to 325/350	19091J-333		19091J-333LTM
		0.25	-60 to 325/350	19091J-433	19091J-433E	19091J-433LTM
		1.00	-60 to 325/350	19091J-233		19091J-233LTM
	60	0.25	-60 to 325/350	19091J-436	19091J-436E	
		1.00	-60 to 325/350	19091J-236	19091J-236E	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

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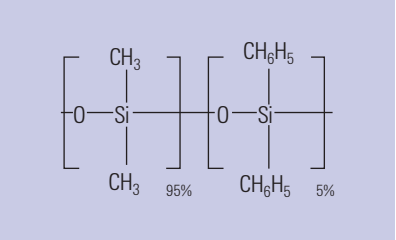
HP-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	0.25	-60 to 325/350	19091J-411		19091J-411LTM
	25	0.17	-60 to 325/350	19091J-012	19091J-012E	19091J-012LTM
		0.52	-60 to 325/350	19091J-112	19091J-112E	19091J-112LTM
		1.05	-60 to 325/350	19091J-212		19091J-212LTM
	30	0.10	-60 to 325/350	19091J-313		19091J-313LTM
		0.25	-60 to 325/350	19091J-413	19091J-413E	19091J-413LTM
		0.50	-60 to 325/350	19091J-113	19091J-113E	19091J-113LTM
		1.00	-60 to 325/350	19091J-213	19091J-213E	19091J-213LTM
	50	0.17	-60 to 325/350	19091J-015	19091J-015E	
		0.52	-60 to 325/350	19091J-115	19091J-115E	
		1.05	-60 to 325/350	19091J-215	19091J-215E	
	60	0.25	-60 to 325/350	19091J-416		
		1.00	-60 to 325/350	19091J-216	19091J-216E	
0.53	10	2.65	-60 to 260/280	19095J-121	19095J-121E	19095J-121LTM
	15	1.50	-60 to 300/320	19095J-321		19095J-321LTM
		5.00	-60 to 260/280	19095J-621		19095J-621LTM
	30	0.88	-60 to 300/320	19095J-023	19095J-023E	19095J-023LTM
		1.50	-60 to 300/320	19095J-323	19095J-323E	19095J-323LTM
		2.65	-60 to 260/280	19095J-123	19095J-123E	19095J-123LTM
		5.00	-60 to 260/280	19095J-623	19095J-623E	19095J-623LTM



Structure of CP-Sil 8 CB

CP-Sil 8 CB

- (5% phenyl) methylpolysiloxane
- Non-polar
- General purpose phase
- Cross-linked and bonded
- Solvent rinsable
- Low bleed
- High column-to-column reproducibility
- Wide choice of dimensions available
- Available in fused silica and UltiMetal
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5

CP-Sil 8 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	20	0.10	-60 to 330/350	CP7319	CP7319I5
0.15	*10*	*0.12*	*-60 to 330/350*	*CP7884*	
		1.20	*-60 to 325/350*	*CP7885*	
	25	*0.12*	*-60 to 330/350*	*CP7894*	
0.20	12	0.33	-60 to 325/350	CP7900	
	25	0.33	-60 to 325/350	CP7921	
	50	0.33	-60 to 325/350	CP7941	
	60	0.20	-60 to 330/350	CP7950	
0.25	15	0.25	-60 to 330/350	CP8511	
		1.00	-60 to 325/350	CP8521	
	25	0.12	-60 to 330/350	CP7711	
		0.25	-60 to 330/350	CP7451	CP7451I5
		0.40	-60 to 325/350	CP7759	
		1.20	-60 to 325/350	CP7671	
	30	0.25	-60 to 330/350	CP8751	CP8751I5
		1.00	-60 to 325/350	CP8771	CP8771I5
	50	0.12	-60 to 330/350	CP7721	
		0.25	-60 to 330/350	CP7453	CP7453I5
		0.40	-60 to 325/350	CP7769	
	60	0.10	-60 to 325/350	CP8750	
		0.25	-60 to 330/350	CP8753	
		1.00	-60 to 325/350	CP8781	

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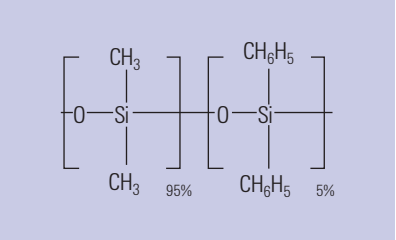
(Continued)

CP-Sil 8 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.12	-60 to 330/350	CP7731	
		5.00	-60 to 300/325	CP8014	CP8014I5
	15	0.25	-60 to 325/350	CP8531	
		1.00	-60 to 325/350	CP8541	
	25	0.12	-60 to 330/350	CP7741	CP7741I5
		0.25	-60 to 325/350	CP7452	
		0.40	-60 to 325/350	CP7779	
		0.52	-60 to 325/350	CP8431	
		1.20	-60 to 325/350	CP7761	
		5.00	-60 to 300/325	CP7681	CP7681I5
	30	0.10	-60 to 330/350	CP8791	
		0.25	-60 to 325/350	CP8752	CP8752I5
		1.00	-60 to 325/350	CP8761	CP8761I5
	50	0.12	-60 to 330/350	CP7751	CP7751I5
		0.25	-60 to 325/350	CP7454	
		0.40	-60 to 325/350	CP7789	
		1.20	-60 to 325/350	CP7771	
		5.00	-60 to 300/325	CP7691	CP7691I5
	60	0.25	-60 to 325/350	CP8754	
		1.00	-60 to 325/350	CP8871	CP8871I5
0.53	10	2.00	-60 to 305/330	CP7621	
		5.00	-60 to 290/325	CP7646	
	15	1.50	-60 to 305/330	CP8678	
	25	0.15	-60 to 325/350	CP7634	
		2.00	-60 to 305/330	CP7631	
		1.00	-60 to 315/340	CP7636	
		5.00	-60 to 290/325	CP7656	
	30	0.50	-60 to 325/350	CP8716	
		1.50	-60 to 305/330	CP8736	CP8736I5
		5.00	-60 to 290/325	CP8756	CP8756I5
	50	1.00	-60 to 315/340	CP7696	
		2.00	-60 to 305/330	CP7641	
		5.00	-60 to 290/325	CP7666	
	60	1.50	-60 to 305/330	CP8796	
	100	5.00	-60 to 290/325	CP7676	

CP-Sil 8 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	25	5.00	-60 to 325/350	CP6680
	50	5.00	-60 to 325/350	CP7196



Structure of CP-Sil 13 CB
(with 14% phenyl substitution)

CP-Sil 13 CB

- 14% phenyl/86% dimethylpolysiloxane
- Mid polarity phase
- Specially developed for the analysis of medium polarity compounds
- Ideal for confirmational analyses using ECD
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-20

CP-Sil 13 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.40*	*-25 to 300/330*	*CP7813*	
0.25	25	0.20	-25 to 300/330	CP7906	
		0.40	-25 to 300/330	CP7916	
		1.20	-25 to 300/330	CP7977	CP7977I5
	50	0.20	-25 to 300/330	CP7907	
		0.40	-25 to 300/330	CP7917	
0.32	25	0.20	-25 to 300/330	CP7926	CP7926I5
		0.40	-25 to 300/330	CP7936	
		1.20	-25 to 300/330	CP7946	
	50	0.20	-25 to 300/330	CP7927	
		0.40	-25 to 300/330	CP7937	
		1.20	-25 to 300/330	CP7947	
0.53	10	1.00	-25 to 300/330	CP7609	
	25	1.00	-25 to 300/330	CP7619	
		2.00	-25 to 300/330	CP7649	
	50	1.00	-25 to 300/330	CP7629	
		2.00	-25 to 300/330	CP7659	
	100	2.00	-25 to 300/330	CP7669	

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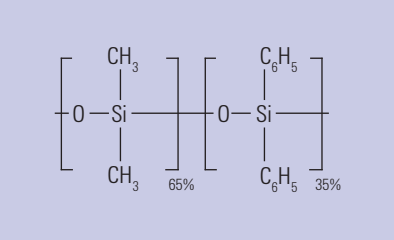


Structure of DB-35

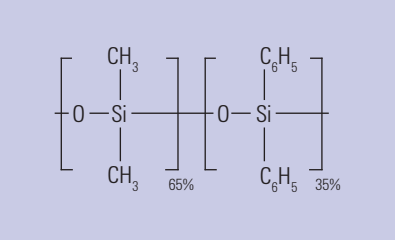
DB-35

- (35%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly more polar than HP-35
- Low bleed
- Inert to active solutes
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G42

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

DB-35

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	40 to 300/320	122-1932		122-1932LTM
	60	0.25	40 to 300/320	122-1962		
0.32	30	0.25	40 to 300/320	123-1932		123-1932LTM
		0.50	40 to 300/320	123-1933	123-1933E	123-1933LTM
0.53	15	1.00	40 to 280/300	125-1912		125-1912LTM
	30	0.50	40 to 280/300	125-1937		125-1937LTM
		1.00	40 to 280/300	125-1932		125-1932LTM



Structure of HP-35

HP-35

- (35%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly less polar than DB-35
- Inert to active solutes
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G42

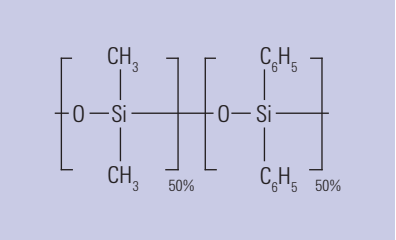
Similar Phases: Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

HP-35

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	40 to 300/320	19091G-131	19091G-131E	19091G-131LTM
	30	0.25	40 to 300/320	19091G-133		19091G-133LTM
0.32	30	0.25	40 to 300/320	19091G-113		19091G-113LTM
		0.50	40 to 300/320	19091G-213		19091G-213LTM

Tips & Tools

Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**



Structure of DB-17

DB-17

- (50%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly more polar than HP-50+
- Excellent for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G3

Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

DB-17

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.05	10	0.10	40 to 280/300	126-1713		126-1713LTM
0.10	10	0.10	40 to 280/300	127-1712		127-1712LTM
		0.20	40 to 280/300	127-1713		127-1713LTM
	20	0.10	40 to 280/300	127-1722		127-1722LTM
0.18	*20*	*0.18*	*40 to 280/300*	*121-1722*		*121-1722LTM*
		0.30	*40 to 280/300*	*121-1723*		*121-1723LTM*
0.25	15	0.15	40 to 280/300	122-1711		122-1711LTM
		0.25	40 to 280/300	122-1712		122-1712LTM
		0.50	40 to 280/300	122-1713	122-1713E	122-1713LTM
	30	0.15	40 to 280/300	122-1731	122-1731E	122-1731LTM
		0.25	40 to 280/300	122-1732	122-1732E	122-1732LTM
		0.50	40 to 280/300	122-1733		122-1733LTM
	60	0.25	40 to 280/300	122-1762		
0.32	15	0.15	40 to 280/300	123-1711		123-1711LTM
		0.25	40 to 280/300	123-1712		123-1712LTM
		0.50	40 to 280/300	123-1713		123-1713LTM
	30	0.15	40 to 280/300	123-1731		123-1731LTM
		0.25	40 to 280/300	123-1732	123-1732E	123-1732LTM
		0.50	40 to 280/300	123-1733	123-1733E	123-1733LTM
	60	0.25	40 to 280/300	123-1762		
0.53	5	2.00	40 to 280/300	125-1704		125-1704LTM
	15	0.25	40 to 260/280	125-1711		125-1711LTM
		0.50	40 to 260/280	125-1717		125-1717LTM
		1.00	40 to 260/280	125-1712		125-1712LTM
		1.50	40 to 260/280	125-1713		125-1713LTM
	30	0.25	40 to 260/280	125-1731		125-1731LTM
		0.50	40 to 260/280	125-1737		125-1737LTM
		1.00	40 to 260/280	125-1732	125-1732E	125-1732LTM
		1.50	40 to 260/280	125-1733		125-1733LTM
	60	1.00	40 to 260/280	125-1762		

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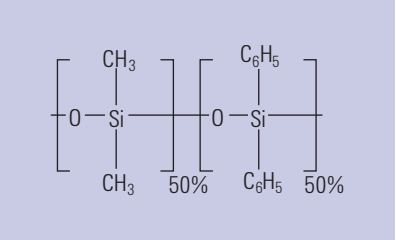


Structure of HP-50+

HP-50+

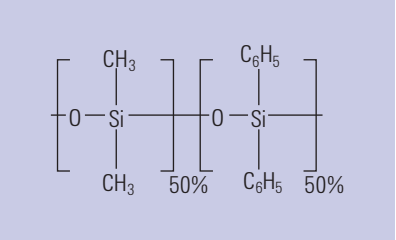
- (50%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly less polar than DB-17
- Excellent for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G3

Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

HP-50+

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*40 to 280/300*	*19091L-577*		*19091L-577LTM*
0.20	12	0.31	40 to 280/300	19091L-101		19091L-101LTM
0.25	5	0.15	40 to 280/300	19091L-330		19091L-330LTM
	15	0.25	40 to 280/300	19091L-431		19091L-431LTM
	30	0.15	40 to 280/300	19091L-333		19091L-333LTM
		0.25	40 to 280/300	19091L-433		19091L-433LTM
		0.50	40 to 280/300	19091L-133		19091L-133LTM
0.32	15	0.50	40 to 280/300	19091L-111		19091L-111LTM
	30	0.25	40 to 280/300	19091L-413	19091L-413E	19091L-413LTM
		0.50	40 to 280/300	19091L-113	19091L-113E	19091L-113LTM
	60	0.25	40 to 280/300	19091L-416		
0.53	15	1.00	40 to 260/280	19095L-021		19095L-021LTM
	30	0.50	40 to 260/280	19095L-523	19095L-523E	19095L-523LTM
		1.00	40 to 260/280	19095L-023	19095L-023E	19095L-023LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CP-Sil 24 CB

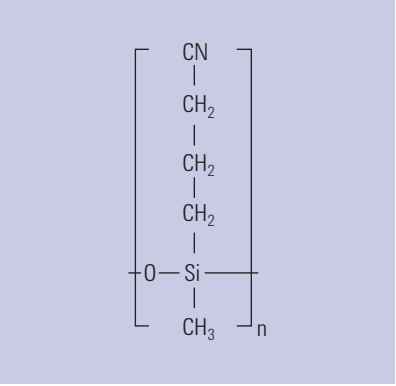
CP-Sil 24 CB

- 50% phenyl/50% dimethylpolysiloxane
- Mid polarity phase
- Specially suitable for analysis of amines, drugs and pesticides
- Ideal for analysis using ECD
- Excellent confirmation column in combination with CP-Sil 5 CB or CP-Sil 8 CB
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

CP-Sil 24 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.25	40 to 280/300	CP7820	
	30	0.25	40 to 280/300	CP7821	
		0.50	40 to 280/300	CP7824	
	60	0.25	40 to 280/300	CP7822	CP7822I5
		0.50	40 to 280/300		CP7825I5
0.32	15	0.25	40 to 280/300	CP7830	CP7830I5
	30	0.25	40 to 280/300	CP7831	CP7831I5
	60	0.25	40 to 280/300	CP7832	
0.53	15	1.00	40 to 265/290	CP7870	
	30	0.50	40 to 280/300	CP7834	CP7834I5
		1.00	40 to 265/290	CP7871	CP7871I5
	60	1.00	40 to 265/290	CP7872	



Structure of DB-23

DB-23

- (50%-Cyanopropyl)-methylpolysiloxane
- High polarity
- Designed for separation of fatty acid methyl esters (FAMEs)
- Excellent resolution for cis- and trans-isomers
- Bonded and cross-linked
- Solvent rinsable
- Replaces HP-23
- Close equivalent to USP Phase G5

Similar Phases: SP-2330, Rtx-2330, 007-23, AT-Silar, BPX-70, SP-2340

DB-23

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.20*	*40 to 250/260*	*121-2323*		*121-2323LTM*
0.25	15	0.25	40 to 250/260	122-2312		122-2312LTM
	30	0.15	40 to 250/260	122-2331		122-2331LTM
		0.25	40 to 250/260	122-2332	122-2332E	122-2332LTM
	60	0.15	40 to 250/260	122-2361	122-2361E	
		0.25	40 to 250/260	122-2362	122-2362E	
0.32	30	0.25	40 to 250/260	123-2332	123-2332E	123-2332LTM
	60	0.25	40 to 250/260	123-2362		
0.53	15	0.50	40 to 230/240	125-2312		125-2312LTM
	30	0.50	40 to 230/240	125-2332		125-2332LTM

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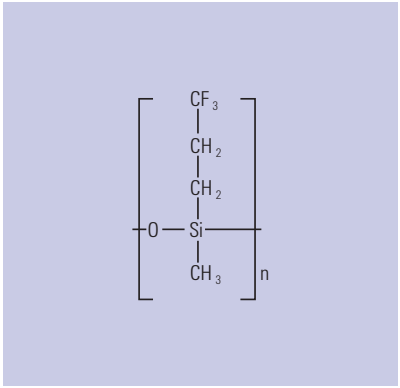


Structure of DB-200

DB-200

- (35% Trifluoropropyl)-methylpolysiloxane
- 300/320 °C temperature limit
- Mid polarity – more polar than DB-1701 or DB-17
- Ideal for difficult-to-separate positional isomers
- Unique interactions with compounds containing nitro, halogen and carbonyl groups
- Low ECD bleed
- Unique selectivity
- Close equivalent to USP Phase G6

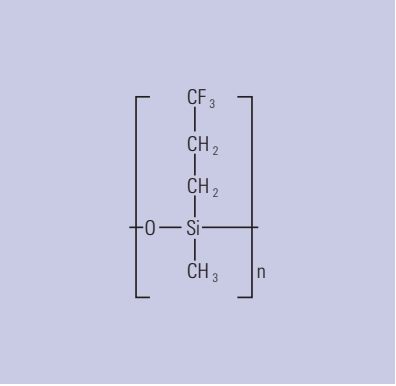
Similar Phases: Rtx-200

DB-200

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	30 to 300/320	122-2032	122-2032LTM
		0.50	30 to 300/320	122-2033	122-2033LTM
0.32	30	0.25	30 to 300/320	123-2032	123-2032LTM
		0.50	30 to 300/320	123-2033	123-2033LTM
0.53	30	1.00	30 to 280/300	125-2032	125-2032LTM

Tips & Tools

Get fast and easy GC pressure and flow calculations at your fingertips with Agilent's GC Calculator Application – **www.agilent.com/chem/gcapp**



Structure of DB-210

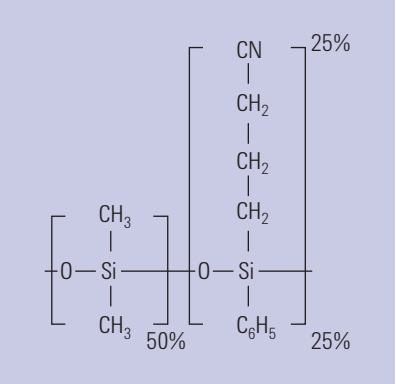
DB-210

- (50%-Trifluoropropyl)-methylpolysiloxane
- High polarity
- Excellent for U.S. EPA Methods 8140 and 609
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-210
- Close equivalent to USP Phase G6

Similar Phases: SP-2401

DB-210

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	45 to 240/260	122-0212		122-0212LTM
	30	0.25	45 to 240/260	122-0232	122-0232E	122-0232LTM
		0.50	45 to 240/260	122-0233		122-0233LTM
0.32	15	0.50	45 to 240/260	123-0213		123-0213LTM
	30	0.25	45 to 240/260	123-0232		123-0232LTM
		0.50	45 to 240/260	123-0233		123-0233LTM
0.53	15	1.00	45 to 220/240	125-0212		125-0212LTM
	30	1.00	45 to 220/240	125-0232		125-0232LTM



Structure of DB-225

DB-225

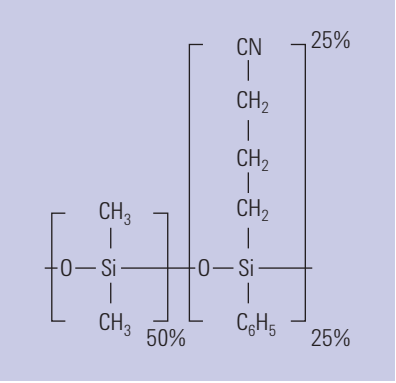
- (50%-Cyanopropylphenyl)-dimethylpolysiloxane
- Mid/high polarity
- Excellent for separations of cis- and trans-fatty acid methyl esters (FAMEs)
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-225
- Close equivalent to USP Phase G7

Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225

DB-225

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	20	0.10	40 to 220/240	127-2222		127-2222LTM
0.18	*20*	*0.20*	*40 to 220/240*	*121-2223*		*121-2223LTM*
0.25	15	0.25	40 to 220/240	122-2212		122-2212LTM
	30	0.15	40 to 220/240	122-2231		122-2231LTM
		0.25	40 to 220/240	122-2232		122-2232LTM
0.32	30	0.25	40 to 220/240	123-2232	123-2232E	123-2232LTM
0.53	15	1.00	40 to 200/220	125-2212		125-2212LTM
	30	0.50	40 to 200/220	125-2237		125-2237LTM
		1.00	40 to 200/220	125-2232		125-2232LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CP-Sil 43 CB

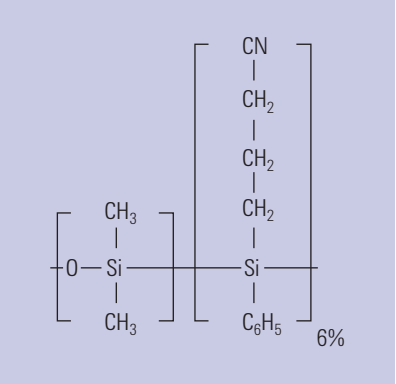
CP-Sil 43 CB

- 25% cyanopropyl/25% phenyl/50% dimethylpolysiloxane phase
- Mid polarity
- Separates aromatic from aliphatic hydrocarbons with selectivity equivalent to OV-255
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225

CP-Sil 43 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.20	45 to 200/225	CP7715	CP7715I5
	50	0.20	45 to 200/225	CP7725	CP7725I5
0.32	10	0.20	45 to 200/225	CP7735	
	25	0.20	45 to 200/225	CP7745	



Structure of DB-1301

DB-1301

- (6%-Cyanopropyl-phenyl) methylpolysiloxane
- Equivalent to USP Phase G43
- Low/mid polarity
- Bonded and cross-linked
- Exact replacement of HP-1301 and HP-1701
- Solvent rinsable

Similar Phases: Rtx-1301, PE-1301

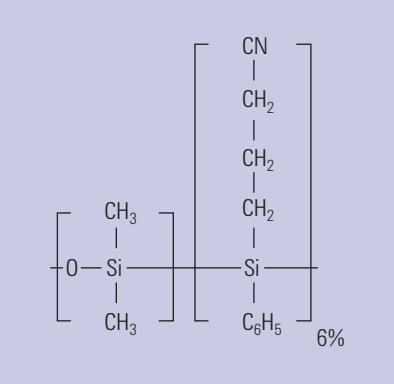
DB-1301

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*10*	*0.40*	*-20 to 280/300*	*121-1313*		*121-1313LTM*
0.25	30	0.25	-20 to 280/300	122-1332	122-1332E	122-1332LTM
		1.00	-20 to 280/300	122-1333		122-1333LTM
	60	0.25	-20 to 280/300	122-1362		
		1.00	-20 to 280/300	122-1363	122-1363E	
0.32	30	0.25	-20 to 280/300	123-1332		123-1332LTM
		1.00	-20 to 280/300	123-1333		123-1333LTM
	60	1.00	-20 to 280/300	123-1363	123-1363E	
0.53	15	1.00	-20 to 260/280	125-1312		125-1312LTM
	30	1.00	-20 to 260/280	125-1332		125-1332LTM
		1.50	-20 to 260/280	125-1333		125-1333LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Tips & Tools

Need assistance selecting a column for your method?
Contact our chromatography technical specialists at
www.agilent.com/chem/TechRep



Structure of CP-1301

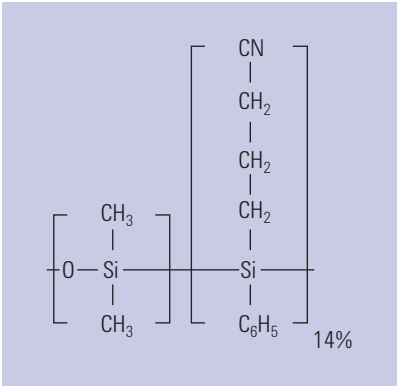
CP-1301

- 6% cyanopropyl-phenyl/94% dimethylpolysiloxane
- Mid polarity
- Ideal for analysis of herbicides, pesticides and many pharmaceutical products
- High column-to-column reproducibility
- Good inertness for better quality of data, even with thick films
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-1301, PE-1301

CP-1301

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	1.00	-25 to 265/280	CP8604
	60	0.25	-25 to 280/280	CP8602
		1.00	-25 to 265/280	CP8605
0.32	30	0.25	-25 to 280/280	CP8607
		1.00	-25 to 265/280	CP8610
	60	0.25	-25 to 280/280	CP8608
		1.00	-25 to 265/280	CP8611
0.53	30	1.00	-25 to 265/280	CP8613



Structure of DB-1701

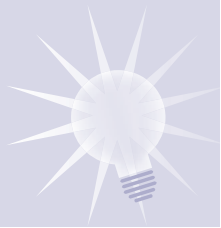
DB-1701

- (14% Cyanopropyl-phenyl)-methylpolysiloxane
- Low/mid polarity
- Bonded and cross-linked
- Exact replacement of HP-1301 and HP-1701
- Solvent rinsable

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701

Tips & Tools

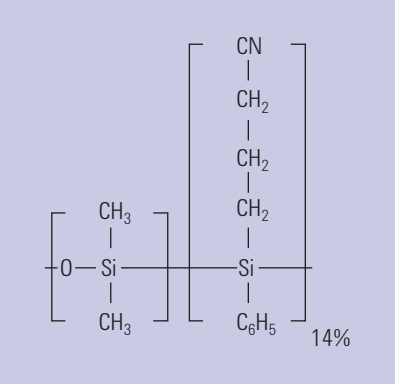
Agilent also offers DB-624 columns for the analysis of volatile priority pollutants and residual solvents.



DB-1701

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	20	0.10	-20 to 280/300	127-0722		127-0722LTM
		0.40	-20 to 280/300	127-0723		127-0723LTM
0.18	*10*	*0.40*	*-20 to 280/300*	*121-0713*		*121-0713LTM*
	20	*0.18*	*-20 to 280/300*	*121-0722*		*121-0722LTM*
0.25	15	0.25	-20 to 280/300	122-0712		122-0712LTM
		1.00	-20 to 280/300	122-0713		122-0713LTM
	30	0.15	-20 to 280/300	122-0731		122-0731LTM
		0.25	-20 to 280/300	122-0732	122-0732E	122-0732LTM
		1.00	-20 to 280/300	122-0733	122-0733E	122-0733LTM
	60	0.15	-20 to 280/300	122-0761		
		0.25	-20 to 280/300	122-0762		
		0.50	-20 to 280/300	122-0766		
		1.00	-20 to 280/300	122-0763	122-0763E	
0.32	15	0.25	-20 to 280/300	123-0712		123-0712LTM
		1.00	-20 to 280/300	123-0713		123-0713LTM
	30	0.15	-20 to 280/300	123-0731		123-0731LTM
		0.25	-20 to 280/300	123-0732	123-0732E	123-0732LTM
		1.00	-20 to 280/300	123-0733	123-0733E	123-0733LTM
	50	1.00	-20 to 280/300	123-0753		
	60	0.25	-20 to 280/300	123-0762		
		1.00	-20 to 280/300	123-0763	123-0763E	
0.53	15	1.00	-20 to 260/280	125-0712	125-0712E	125-0712LTM
	30	0.25	-20 to 260/280	125-0731		125-0731LTM
		0.50	-20 to 260/280	125-0737		125-0737LTM
		1.00	-20 to 260/280	125-0732	125-0732E	125-0732LTM
		1.50	-20 to 260/280	125-0733		125-0733LTM
	60	1.00	-20 to 260/280	125-0762	125-0762E	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CP-Sil 19 CB

CP-Sil 19 CB

- 14% cyanopropyl-phenyl/86% dimethylpolysiloxane
- Mid polarity
- Ideal for many environmental, food and beverage, and pharmaceutical applications
- Useful as confirmation column
- Bonded and cross-linked
- Solvent rinsable
- Broad range of configurations available
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701

CP-Sil 19 CB

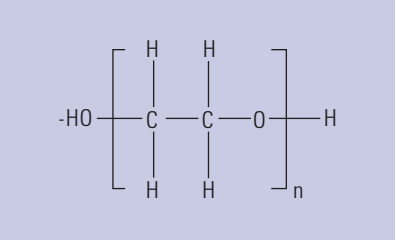
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	-25 to 275/300	CP7331	
0.15	*25*	*0.50*	*-25 to 275/300*	*CP7340*	
0.20	25	0.20	-25 to 275/300	CP7360	
0.25	10	0.20	-25 to 275/300	CP7702	
	15	0.15	-25 to 275/300	CP8502	
		0.25	-25 to 275/300	CP8512	CP8512I5
	25	0.20	-25 to 275/300	CP7712	
		0.40	-25 to 275/300	CP7809	
		1.20	-25 to 275/300	CP7672	
	30	0.25	-25 to 275/300	CP8712	CP8712I5
		1.00	-25 to 275/300	CP8562	CP8562I5
	50	0.20	-25 to 275/300	CP7722	
		0.40	-25 to 275/300	CP7819	CP7819I5
	60	0.15	-25 to 275/300	CP8592	CP8592I5
		0.25	-25 to 275/300	CP8722	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

CP-Sil 19 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.20	-25 to 275/300	CP7732	
	15	0.25	-25 to 275/300	CP8542	CP8542I5
	25	0.20	-25 to 275/300	CP7742	
		0.40	-25 to 275/300	CP7829	
		1.20	-25 to 275/300	CP7762	
	30	0.25	-25 to 275/300	CP8842	
		1.00	-25 to 275/300	CP8762	
	50	0.20	-25 to 275/300	CP7752	
		0.40	-25 to 275/300	CP7839	
		1.20	-25 to 275/300	CP7772	
	60	0.15	-25 to 275/300	CP8662	
		0.25	-25 to 275/300	CP8852	
		1.00	-25 to 275/300	CP8772	CP8772I5
0.53	10	2.00	-25 to 275/300	CP7647	
	15	0.50	-25 to 275/300	CP8663	
	25	1.00	-25 to 275/300	CP7637	
		2.00	-25 to 275/300	CP7657	
	30	1.00	-25 to 275/300	CP8737	
	50	2.00	-25 to 275/300	CP7667	
		1.00	-25 to 275/300	CP7697	



Structure of Polyethylene Glycol (PEG)
This structure is applicable for all WAX and FFAP phases.

Polyethylene Glycol (PEG) Columns

Agilent offers a full range of PEG columns. Even though each phase is based on the polyethylene glycol polymer, strict control of the cross-linking and deactivation processes result in a variety of unique phase characteristics to meet your varying analysis needs.

DB-WAX and DB-WaxFF

- Polyethylene glycol (PEG)
- Equivalent to USP Phase G16
- High polarity
- Lower temperature limit of 20 °C is the lowest of any bonded PEG phase; improves resolution of low boiling point analytes
- Column-to-column reproducibility
- Bonded and cross-linked
- Exact replacement of HP-WAX
- Solvent rinsable
- DB-WaxFF is a highly reproducible, specially tested microbore DB-Wax for fragrance analysis

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

DB-WAX and DB-WaxFF

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
DB-WAX							
0.05	10	0.05	20 to 250/260	126-7012		126-7012LTM	
		0.10	20 to 240/250	126-7013		126-7013LTM	222-7013LTM
0.10	10	0.10	20 to 250/260	127-7012	127-7012E	127-7012LTM	
		0.20	20 to 240/250	127-7013		127-7013LTM	
	20	0.10	20 to 250/260	127-7022		127-7022LTM	
		0.20	20 to 240/250	127-7023	127-7023E	127-7023LTM	
0.18	*10*	*0.18*	*20 to 250/260*	*121-7012*		*121-7012LTM*	
	20	*0.18*	*20 to 250/260*	*121-7022*	*121-7022E*	*121-7022LTM*	
		0.30	*20 to 240/250*	*121-7023*	*121-7023E*	*121-7023LTM*	
	40	*0.18*	*20 to 250/260*	*121-7042*	*121-7042E*		
		0.30	*20 to 240/250*	*121-7043*			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

DB-WAX and DB-WaxFF

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
DB-WAX							
0.20	25	0.20	20 to 250/260	128-7022		128-7022LTM	
	30	0.20	20 to 250/260	128-7032		128-7032LTM	
	50	0.20	20 to 250/260	128-7052			
0.25	15	0.25	20 to 250/260	122-7012	122-7012E	122-7012LTM	
		0.50	20 to 240/250	122-7013		122-7013LTM	
	30	0.15	20 to 250/260	122-7031		122-7031LTM	
		0.25	20 to 250/260	122-7032	122-7032E	122-7032LTM	
		0.50	20 to 240/250	122-7033	122-7033E	122-7033LTM	222-7033LTM
	60	0.15	20 to 250/260	122-7061			
		0.25	20 to 250/260	122-7062	122-7062E		
		0.50	20 to 240/250	122-7063	122-7063E		
0.32	15	0.25	20 to 250/260	123-7012		123-7012LTM	
		0.50	20 to 240/250	123-7013		123-7013LTM	
	30	0.15	20 to 250/260	123-7031		123-7031LTM	
		0.25	20 to 250/260	123-7032	123-7032E	123-7032LTM	
		0.50	20 to 240/250	123-7033	123-7033E	123-7033LTM	
	60	0.25	20 to 250/260	123-7062			
		0.50	20 to 240/250	123-7063	123-7063E		
0.45	30	0.85	20 to 230/240	124-7032		124-7032LTM	
0.53	15	0.50	20 to 230/240	125-7017		125-7017LTM	
		1.00	20 to 230/240	125-7012	125-7012E	125-7012LTM	
	30	0.25	20 to 230/240	125-7031		125-7031LTM	
		0.50	20 to 230/240	125-7037		125-7037LTM	
		1.00	20 to 230/240	125-7032	125-7032E	125-7032LTM	
	60	1.00	20 to 230/240	125-7062	125-7062E		
DB-WaxFF							
0.10	20	0.20	20 to 240/250	127-7023FF			

DB-WAXetr

- Polyethylene glycol (PEG)
- Extended Temperature Range (etr)
- High polarity
- Excellent column-to-column repeatability
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G16

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

DB-WAXetr

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.40	30 to 250/260	128-7323		128-7323LTM
0.25	30	0.25	30 to 260/280	122-7332	122-7332E	122-7332LTM
		0.50	30 to 250/260	122-7333		122-7333LTM
	60	0.25	30 to 260/280	122-7362		
		0.50	30 to 250/260	122-7363		
0.32	15	0.25	30 to 260/280	123-7312		123-7312LTM
		1.00	30 to 250/260	123-7314		123-7314LTM
	30	0.25	30 to 260/280	123-7332		123-7332LTM
		0.50	30 to 250/260	123-7333		123-7333LTM
		1.00	30 to 250/260	123-7334		123-7334LTM
	50	1.00	30 to 250/260	123-7354	123-7354E	
	60	0.25	30 to 260/280	123-7362		
		0.50	30 to 250/260	123-7363		
		1.00	30 to 250/260	123-7364		
0.53	15	1.00	30 to 240/260	125-7312		125-7312LTM
		2.00	50 to 230/250	125-7314		125-7314LTM
	30	1.00	30 to 240/260	125-7332	125-7332E	125-7332LTM
		1.50	30 to 230/240	125-7333		125-7333LTM
		2.00	50 to 230/250	125-7334	125-7334E	125-7334LTM
	60	1.00	30 to 240/260	125-7362		

HP-INNOWax

- Polyethylene glycol (PEG)
- High polarity
- Highest upper temperature limits of the bonded PEG phases
- Column-to-column repeatability
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G16

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, ZB-WAX, ZB-WAX+

HP-INNOWax

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 260/270*	*19091N-577*	*19091N-577E*	*19091N-577LTM*	*29091N-577LTM*
0.20	25	0.20	40 to 260/270	19091N-102		19091N-102LTM	
		0.40	40 to 260/270	19091N-202		19091N-202LTM	
	50	0.20	40 to 260/270	19091N-105	19091N-105E		
		0.40	40 to 260/270	19091N-205	19091N-205E		
0.25	4	0.25	40 to 260/270	19091N-130		19091N-130LTM	
	5	0.10	40 to 260/270	19091N-330			
		0.15	40 to 260/270	19091N-030		19091N-030LTM	
	15	0.10	40 to 260/270	19091N-331			
		0.25	40 to 260/270	19091N-131	19091N-131E	19091N-131LTM	
		0.50	40 to 260/270	19091N-231		19091N-231LTM	
	30	0.15	40 to 260/270	19091N-033		19091N-033LTM	
		0.25	40 to 260/270	19091N-133	19091N-133E	19091N-133LTM	29091N-133LTM
		0.50	40 to 260/270	19091N-233	19091N-233E	19091N-233LTM	
	60	0.15	40 to 260/270	19091N-036			
		0.25	40 to 260/270	19091N-136	19091N-136E		
		0.50	40 to 260/270	19091N-236			
0.32	15	0.25	40 to 260/270	19091N-111		19091N-111LTM	
	30	0.15	40 to 260/270	19091N-013		19091N-013LTM	
		0.25	40 to 260/270	19091N-113	19091N-113E	19091N-113LTM	
		0.50	40 to 260/270	19091N-213	19091N-213E	19091N-213LTM	
	60	0.25	40 to 260/270	19091N-116			
		0.50	40 to 260/270	19091N-216	19091N-216E		
0.53	15	1.00	40 to 240/250	19095N-121	19095N-121E	19095N-121LTM	
	30	1.00	40 to 240/250	19095N-123	19095N-123E	19095N-123LTM	
	60	1.00	40 to 240/250	19095N-126			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Wax 52 CB

- Polyethylene glycol phase
- High polarity
- Wider temperature range than non-bonded polyethylene glycols
- Bonded and cross-linked
- Solvent rinsable
- High resolution of low boiling point analytes
- High polarity provides separations for a broad range of applications
- Excellent reproducibility and temperature stability for a variety of EPA and ASTM methods
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Note: We recommend the UltiMetal column when working in rugged environments with process or portable instruments.

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, Rtx-WAX, ZB-WAX, ZB-WAX+

CP-Wax 52 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	20 to 250/265	CP7334	CP7334I5
		0.20	20 to 250/265	CP7335	
0.15	*15*	*0.15*	*20 to 250/265*	*CP7791*	*CP7791I5*
	25	*0.25*	*20 to 250/265*	*CP7792*	*CP7792I5*
0.20	25	0.20	20 to 250/265	CP7765	
	30	0.20	20 to 250/265	CP7775	
	50	0.20	20 to 250/265	CP7785	
0.25	10	0.20	20 to 250/265	CP7703	
	15	0.25	20 to 250/265	CP8513	
	25	0.20	20 to 250/265	CP7713	CP7713I5
		1.20	20 to 250/265	CP7673	CP7673I5
	30	0.15	20 to 250/265	CP8745	
		0.25	20 to 250/265	CP8713	CP8713I5
		0.50	20 to 250/265	CP8746	CP8746I5
	50	0.20	20 to 250/265	CP7723	CP7723I5
	60	0.25	20 to 250/265	CP8723	CP8723I5
		0.50	20 to 250/265	CP8748	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

CP-Wax 52 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.20	20 to 250/265	CP7733	CP7733I5
		1.00	20 to 250/265	CP7628	
	15	0.15	20 to 250/265	CP8533	
		0.25	20 to 250/265	CP8543	
		0.50	20 to 250/265	CP8553	
	25	0.20	20 to 250/265	CP7743	
		0.40	20 to 250/265	CP7879	
		1.20	20 to 250/265	CP7763	CP7763I5
	30	0.25	20 to 250/265	CP8843	CP8843I5
		0.50	20 to 250/265	CP8763	CP8763I5
	50	0.20	20 to 250/265	CP7753	CP7753I5
		0.40	20 to 250/265	CP7889	
		1.20	20 to 250/265	CP7773	CP7773I5
	60	0.25	20 to 250/265	CP8853	
		0.50	20 to 250/265	CP8773	
		1.20	20 to 250/265	CP8073	CP8073I5
0.53	10	2.00	20 to 250/265	CP7648	
	15	1.00	20 to 250/265	CP8718	
	25	1.00	20 to 250/265	CP7638	
		2.00	20 to 250/265	CP7658	CP7658I5
	30	1.00	20 to 250/265	CP8738	CP8738I5
	50	1.00	20 to 250/265	CP7698	CP7698I5
		2.00	20 to 250/265	CP7668	
	60	1.00	20 to 250/265	CP8798	
	100	2.00	20 to 250/265	CP7678	

CP-Wax 52 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.53	10	0.50	20 to 250/275	CP7128
		1.00	20 to 250/275	CP7148
		2.00	20 to 250/275	CP7177
	25	0.50	20 to 250/275	CP7138
		1.00	20 to 250/275	CP7158
		2.00	20 to 250/275	CP7178
	50	0.50	20 to 250/275	CP7198
		1.00	20 to 250/275	CP7168
		2.00	20 to 250/275	CP7179

DB-FFAP

- Nitroterephthalic acid modified polyethylene glycol
- High polarity
- Temperature range from 40 °C to 250 °C
- Designed for the analysis of volatile fatty acids and phenols
- Replaces OV-351
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G35

Note: We do not recommend the use of water or methanol to rinse DB-FFAP GC columns.

Similar Phases: Stabilwax-DA, Nukol, 007-FFAP, BP21, AT-1000, OV-351

DB-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.10	10	0.10	40 to 250	127-3212		127-3212LTM	
	15	0.10	40 to 250	127-32H2		127-32H2LTM	
0.25	15	0.25	40 to 250	122-3212		122-3212LTM	222-3212LTM
	30	0.25	40 to 250	122-3232	122-3232E	122-3232LTM	222-3232LTM
		0.50	40 to 250	122-3233		122-3233LTM	
	60	0.25	40 to 250	122-3262	122-3262E		
		0.50	40 to 250	122-3263			
0.32	15	0.25	40 to 250	123-3212		123-3212LTM	
	25	0.50	40 to 250	123-3223		123-3223LTM	
	30	0.25	40 to 250	123-3232	123-3232E	123-3232LTM	
		0.50	40 to 250	123-3233		123-3233LTM	
		1.00	40 to 250	123-3234		123-3234LTM	
	50	0.50	40 to 250	123-3253			
	60	0.25	40 to 250	123-3262			
		0.50	40 to 250	123-3263			
		1.00	40 to 250	123-3264			
0.45	30	0.85	40 to 250	124-3232		124-3232LTM	
0.53	10	1.00	40 to 250	125-32H2		125-32H2LTM	
	15	0.50	40 to 250	125-3217		125-3217LTM	
		1.00	40 to 250	125-3212		125-3212LTM	
	30	0.25	40 to 250	125-3231		125-3231LTM	
		0.50	40 to 250	125-3237		125-3237LTM	
		1.00	40 to 250	125-3232	125-3232E	125-3232LTM	
		1.50	40 to 250	125-3233		125-3233LTM	
	60	1.00	40 to 250	125-3262			

Tips & Tools

Agilent also offers CAM columns for amine analysis.

HP-FFAP

- Nitroterephthalic acid modified polyethylene glycol
- High polarity
- Temperature range from 60 °C to 240/250 °C (230/240 °C for 0.53 mm)
- Designed for the analysis of volatile fatty acids and phenols
- Replaces OV-351
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G35

Note: We do not recommend the use of water or methanol to rinse HP-FFAP GC columns.

Similar Phases: Stabilwax-DA, Nukol, 007-FFAP, BP21, AT-1000, OV-351

HP-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.30	60 to 240/250	19091F-102	19091F-102E	19091F-102LTM
	50	0.30	60 to 240/250	19091F-105	19091F-105E	
0.25	30	0.25	60 to 240/250	19091F-433	19091F-433E	19091F-433LTM
0.32	25	0.50	60 to 240/250	19091F-112	19091F-112E	19091F-112LTM
	30	0.25	60 to 240/250	19091F-413		19091F-413LTM
	50	0.50	60 to 240/250	19091F-115	19091F-115E	
0.53	10	1.00	60 to 240	19095F-121		19095F-121LTM
	15	1.00	60 to 240	19095F-120	19095F-120E	19095F-120LTM
	30	1.00	60 to 240	19095F-123	19095F-123E	19095F-123LTM

CP-Wax 58 FFAP CB

- Nitroterephthalic acid-modified polyethylene glycol phase
- High polarity
- Ideal for analysis of acidic compounds, such as phenols, underivatized and derivatized free fatty acids
- Highest polarity bonded wax column for analyzing polar compounds
- Chemically-bonded
- Solvent rinsable
- High inertness provides excellent peak shape
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX

CP-Wax 58 FFAP CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.20	25	0.30	20 to 250/275	CP7787	CP7787I5
	50	0.30	20 to 250/275	CP7797	
0.25	25	0.20	20 to 250/275	CP7717	CP7717I5
	50	0.20	20 to 250/275	CP7727	
0.32	25	0.20	20 to 250/275	CP7747	CP7747I5
		1.20	20 to 250/275	CP7767	
	50	0.20	20 to 250/275	CP7757	
		0.50	20 to 250/275	CP7778	
		1.20	20 to 250/275	CP7777	
0.53	15	0.50	20 to 250/275	CP7665	
	25	1.00	20 to 250/275	CP7614	CP7614I5
		2.00	20 to 250/275	CP7654	
	50	1.00	20 to 250/275	CP7624	
		2.00	20 to 250/275	CP7664	

Tips & Tools

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

Carbowax 20M and HP-20M

- Polyethylene glycol, MW 20,000
- Equivalent to USP Phase G16

Similar Phases: Rt-CW20M F&F

Because the Carbowax 20M and the HP-20M are not bonded or cross-linked, we do not recommend solvent rinsing. DB-WAX is the recommended bonded alternate for the HP-20M.

Carbowax 20M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	60 to 220/240	112-2032	112-2032LTM
0.32	30	0.25	60 to 220/240	113-2032	113-2032LTM
	60	0.25	60 to 220/240	113-2062	

HP-20M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.10	60 to 220	19091W-102		19091W-102LTM
	50	0.10	60 to 220	19091W-105		
0.32	25	0.30	60 to 220	19091W-012	19091W-012E	19091W-012LTM
	50	0.30	60 to 220	19091W-015	19091W-015E	
0.53	10	1.33	60 to 220	19095W-121		19095W-121LTM
	30	1.33	60 to 220	19095W-123		19095W-123LTM

Specialty Columns

Agilent chemists have developed many columns with unique characteristics designed to solve the most difficult separation problems of a given method. As a result, we offer a comprehensive line of specialty or "select" columns for a variety of applications to enhance the standard phase portfolio. With columns for volatiles, pesticides, petrochemicals and more – Agilent exceeds standard QA/QC procedures for the manufacturing and testing of all of our specialty columns to ensure they meet the stringent demands for their application. These columns offer reliable, accurate results with the shortest run times possible on complex sample lists and matrices.

High Temperature Columns

DB-1ht

- 100% Dimethylpolysiloxane
- Non-polar
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rxi-1HT, Stx-1ht, ZB-1ht

DB-1ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.10	-60 to 400	122-1111	122-1111E		222-1111LTM
	30	0.10	-60 to 400	122-1131			222-1131LTM
0.32	15	0.10	-60 to 400	123-1111		123-1111LTM	
	30	0.10	-60 to 400	123-1131	123-1131E	123-1131LTM	
0.53	30	0.17	-60 to 400	125-1131			

DB-5ht

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: HT5, Stx-5ht, ZB-5ht

DB-5ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.10	-60 to 400	122-5711	122-5711E	122-5711LTM	222-5711LTM
	30	0.10	-60 to 400	122-5731		122-5731LTM	222-5731LTM
0.32	10	0.10	-60 to 400	123-5701		123-5701LTM	
	15	0.10	-60 to 400	123-5711	123-5711E		
	30	0.10	-60 to 400	123-5731	123-5731E	123-5731LTM	

DB-17ht

- (50%-Phenyl)-methylpolysiloxane
- Mid-polarity
- Extended upper temperature limit of 365 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Improved resolution for triglycerides
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-65TG, BPX50

DB-17ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	5	0.15	40 to 340/365	122-1801		122-1801LTM
	15	0.15	40 to 340/365	122-1811		
	30	0.15	40 to 340/365	122-1831		122-1831LTM
0.32	15	0.15	40 to 340/365	123-1811		
	30	0.15	40 to 340/365	123-1831	123-1831E	
	60	0.15	40 to 340/365	123-1861		

Tips & Tools

Learn more about the Agilent 7890A System at **www.agilent.com/chem/7890A**

VF-5ht and VF-5ht UltiMetal

- Enhanced selectivity improves column longevity and reduces downtime
- Superior detector performance provides improved detection limits
- For analyses of high boiling compounds by exhibiting ultra low bleed at high temperatures
- Optimized sensitivity and accuracy for analysis of high molecular weight compounds
- Identical selectivity as VF-5ms (bleed spec of 30 m x 0.25 mm column is < 5 pA at 400 °C)
- UltiMetal technology renders the stainless steel inert and enhances bonding of the stationary phase for improved column lifetime and excellent peak shape

Similar Phases: ZB-5ht, Rxi-5ht

VF-5ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	15	0.10	-60 to 400/400	CP9045
	30	0.10	-60 to 400/400	CP9046
0.32	10	0.10	-60 to 400/400	CP9044
	15	0.10	-60 to 400/400	CP9047
	30	0.10	-60 to 400/400	CP9048

Similar Phases: ZB-5ht, Rxi-5ht

VF-5ht UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.10	-60 to 430/450	CP9090	
		0.10	-60 to 430/450	CP9091*	
	30	0.10	-60 to 430/450	CP9092	CP9092I5
		0.10	-60 to 430/450	CP9093*	
0.32	15	0.10	-60 to 430/450	CP9094	CP9094I5
		0.10	-60 to 430/450	CP9095*	
	30	0.10	-60 to 430/450	CP9096	
		0.10	-60 to 430/450	CP9097*	

*These configurations include a 2 m x 0.53 mm id UltiMetal retention gap which are pre-connected to the VF-5ht UltiMetal column with a high-temperature column connector.

Petroleum Columns

Petroleum applications vary greatly in character. From noble gases to simulated distillation, Agilent offers a broad range of columns designed to meet the needs of the petroleum/petrochemical chromatographer. Refer to the PLOT column section for columns for the analysis of light gases.

Lowox

- Unique selectivity for a wide range of oxygenates
- Minimal particle loss preserves detector performance
- Industry proven for process and portable GC applications (ASTM D 7059)
- Analyze trace level oxygenate impurities in gas and liquid hydrocarbon streams
- High polarity
- Ideal for monitoring catalyst contamination by oxygenates

Lowox

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	10.00	0 to 350/350	CP8587	CP8587I5

GS-OxyPLOT

- Accurate analysis of ppm/ppb level oxygenates in C_1 to C_{10} hydrocarbons
- Strong selectivity for a wide range of oxygenates (ethers, alcohols, aldehydes, and ketones) in complex matrices such as gaseous hydrocarbons, motor fuels, and crude oil
- Suitable for ASTM methods for oxygenates
- Very high column stability (upper temperature limit of 350 °C) with no column bleed
- Stable phase coating virtually eliminates particle generation and detector spiking
- Excellent for low concentration, quantitative GC analysis
- Ideal for selective heart-cutting applications

GS-OxyPLOT

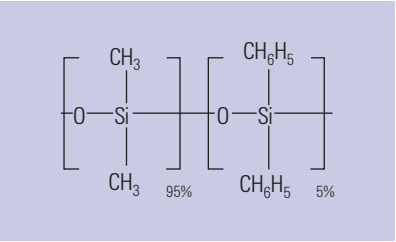
ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	350	115-4912	115-4912E

CP-Sil 5 CB for Formaldehyde

- Optimized for analysis of formaldehyde, water and methanol
- Trace analysis of sulfur compounds possible
- Partial permanent gas analysis possible (especially in switching systems)
- Non-polar phase provides accurate separations based on volatility
- High inertness, elutes sulfur components without absorption for high quality data and low detection limits
- Highest efficiency for this apolar column with the thickest film

CP-Sil 5 CB for Formaldehyde

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	60	8.00	-60 to 300/325	CP7475	CP7475I5



Structure of HP-PONA

HP-PONA

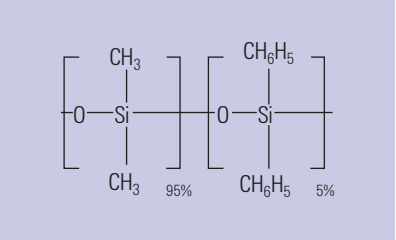
- 100% Dimethylpolysiloxane
- Configured for the analysis of petroleum process products
- Tested to ensure the resolution of m-xylene from p-xylene and of cyclopentane from 2,3-dimethylbutane
- PONA, PIANO
- High resolution
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1, Rtx-1PONA, Rtx-DHA

HP-PONA

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
HP-PONA	0.20	50	0.50	-60 to 325/350	19091S-001	19091S-001E
HP-1	0.20	50	0.50	-60 to 325/350	19091Z-205	19091Z-205E
HP-1	0.25	100	0.50	-60 to 325/350	19091Z-530	19091Z-530E



Structure of CP-Sil PONA CB

CP-Sil PONA CB

- High resolution analysis of paraffins, olefins, napthalenes and aromatics in complex hydrocarbon mixtures
- Engineered for hydrocarbon analysis according to ASTM (DHA method)
- Inert to polar compounds for highly accurate data
- Excellent column-to-column reproducibility

Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1

CP-Sil PONA CB

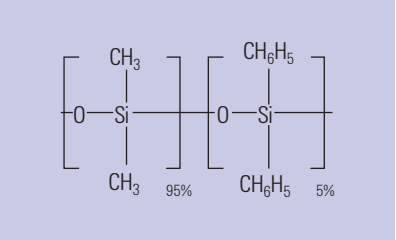
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.21	50	0.50	250/275	CP7531	CP7531I5
0.25	100	0.50	250/275	CP7530	CP7530I5
0.25	150	1.00	250/275	CP7945	

CP-Sil PONA for ASTM D 5134

- Optimized PONA analysis for ASTM D 5134
- Exact dimensions as specified in the ASTM method for full compliance
- Inert to polar additives

CP-Sil PONA for ASTM D 5134

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.21	50	0.50	250/275	CP7531



Structure of DB-Petro

DB-Petro

- 100% Dimethylpolysiloxane
- Configured for the analysis of petroleum process products
- PONA, PIANO
- High resolution
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1

DB-Petro

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.20	50	0.50	-60 to 325/350	128-1056	
0.25	100	0.50	-60 to 325/350	122-10A6	122-10A6E

Tips & Tools

For optimum performance, ferrules should be replaced every time the column is replaced and during column maintenance.

HP-1 Aluminum Clad

- 100% Dimethylpolysiloxane
- Aluminum clad fused silica tubing
- For high temperature simulated distillation
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: MXT-1

HP-1 Aluminum Clad

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	5	0.09	0 to 350/450	19095S-205
	10	0.09	0 to 350/450	19095S-200

DB-2887

- 100% Dimethylpolysiloxane
- Specifically designed for simulated distillation using ASTM Method D 2887
- Rapid conditioning, fast run time and low bleed when compared to packed columns
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Petrocol EX2887, MXT-2887, MXT-1, Rtx-2887

DB-2887

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	10	3.00	-60 to 350	125-2814	125-2814E	125-2814LTM

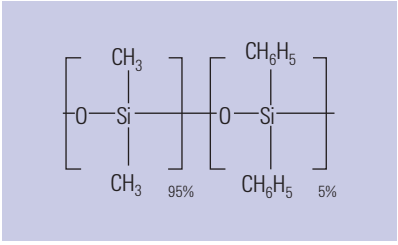
DB-HT SimDis

- 100% Dimethylpolysiloxane
- "Boiling point" phase for high temperature simulated distillation
- Durable stainless steel tubing
- 430 ºC upper temperature limit
- Distillation range of C_6 to C_{110+}
- Low bleed, even at 430 ºC
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist

DB-HT SimDis

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	5	0.10	-60 to 400/430	145-1009
		0.15	-60 to 400/430	145-1001



Structure of CP-SimDist

CP-SimDist

- For simulated distillation analysis up to C_{100}
- High temperature non-polar stationary phase
- Low bleed improves quantitation
- High temperature polyimide coating extends lifetime

CP-SimDist Fused Silica columns are guaranteed for simulated distillation up to C_{100}. These columns are low bleed, typically only 4-5 pA at 400 °C. The high temperature stationary phase and polyimide coating extend column lifetime.

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist

CP-SimDist

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.10	375/400	CP7521	
0.53	5	0.17	375/400	CP7522	CP7522I5
	10	0.10	375/400	CP7541	

CP-SimDist UltiMetal

- Designed for ASTM D2887 and the extended D2887 method compliance
- Low bleed
- Extended analysis to C_{120} with maximum temperature of 450 °C
- UltiMetal tubing for excellent durability (same id as 0.53 mm id fused silica)
- Excellent retention time repeatability and column lifetime due to special deactivation of UltiMetal surface

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist

CP-SimDist UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	5	0.09	450/450	CP7569	CP7569I5
		0.17	450/450	CP7532	CP7532I5
		0.88	450/450	CP7570	
		2.65	400/400	CP7571	
	10	0.17	450/450	CP7542	CP7542I5
		0.06	450/450	CP6540	
		0.53	450/450	CP7592	
		0.88	450/450	CP7512	CP7512I5
		1.20	450/450	CP7562	
		2.65	400/400	CP7582	CP7582I5
		5.00	400/400	CP7572	
	20	0.11	450/450	CP7593	
	25	0.06	450/450	CP6550	
	50	0.06	450/450	CP6560	

CP-Sil 2 CB

- Lowest polarity bonded stationary phase available
- Superior replacement to squalane
- Unique selectivity toward cyclic hydrocarbons
- Separation almost entirely based on boiling point
- Stable at temperatures up to 200 °C

CP-Sil 2 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	25 to 200/200	CP7714	CP7714I5
	50	0.25	25 to 200/200	CP7724	
0.32	50	0.25	25 to 200/200	CP7754	CP7754I5
	25	1.20	25 to 200/200	CP7764	
	50	1.20	25 to 200/200	CP7774	
0.53	25	2.00	25 to 200/200	CP7653	

CP-TCEP for Alcohols in Gasoline

- Engineered for analysis of alcohols in gasoline
- Excellent peak shape for accurate separations of alcohols
- Temperature stability to 135 °C for high productivity
- Unique selectivity separates benzene after n-dodecane

Similar Phases: Rt-TCEP

CP-TCEP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	50	0.40	135/140	CP7525	CP7525I5

Select Low Sulfur

- Highest degree of column inertness provides excellent peak shape for active compounds
- Low detection limits for sulfur compounds
- Unique selectivity prevent co-elution and matrix interferences in propylene streams
- Highly permeable PLOT stationary phase provides high retention of volatile compounds
- Unique QC testing results in consistent column inertness performance
- Mechanical stability results in no particle loss

Select Low Sulfur

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	60	185	CP8575

CP-Sil 5 CB for Sulfur

- Optimized for analysis of Volatile Sulfur Compounds
- Trace analysis of sulfur compounds to C_7 mercaptan for high productivity
- Non-polar phase provides accurate separations based on volatility
- High inertness, elutes SO_2 for high quality data and low detection limits

CP-Sil 5 CB for Sulfur

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	30	4.00	-60 to 300/325	CP7529	CP7529I5

Select for Permanent Gases – Dual Column

- Set of two parallel columns: CP-Molsieve 5Å for permanent gases and CP-PoraBOND Q for CO_2 analysis
- Isothermal separation at temperatures > 40 ºC eliminates the need for cryogenics
- Temperature stability up to 300 °C allows short regeneration times and improves efficiency
- One injector, one detector simplifies operation
- Engineered for fast separation, low level analysis and quantification of argon/oxygen
- Separates permanent gases and CO_2 in a single run
- Coupled, tested and securely mounted on EZ-GRIP column mount
- For resolution of the difficult-to-separate argon/oxygen and helium/neon pairs, use CP7530 Select Permanent Gases/HR (High Resolution) column

Select for Permanent Gases – Dual Column

ID (mm)	Temp Limits (°C)	7 in Cage
Select Permanent Gases/CO_2	300/325	CP7429
Select Permanent Gases/HR	300/325	CP7430

Select Al_2O_3 MAPD

- Aluminum oxide PLOT column for the analysis of reactive hydrocarbons such as methyl acetylene and propadiene (MAPD)
- Optimized to improve sensitivity and response
- Faster run improves operating efficiency
- Two-fold higher response for MAPD, especially important when running impurity analyses

Similar Phases: Rt-Alumina BOND/MAPD, MXT-Alumina BOND/MAPD

Select Al_2O_3 MAPD

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	50	-100 to 200/200	CP7431
0.53	25	-100 to 200/200	CP7433
	50	-100 to 200/200	CP7432

Agilent J&W Biodiesel Capillary GC Columns

Biofuels are becoming more attractive as a viable supplement or alternative to petroleum-based fuels. Agilent J&W Biodiesel Capillary GC columns are purposely designed and application-optimized for the analysis of biodiesel to meet ASTM and CEN testing standards.

Biodiesel EN14105 Free/Total Glycerin and Biodiesel ASTM D6584 Free/Total Glycerin

- Designed for the analysis of free and total glycerin in B100 according to EN14105 or ASTM D6584
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated fused silica tubing
- Excellent peak shape and extended column life
- Bonded and cross-linked
- Solvent rinsable
- Retention gaps please order P/N 160-BD65-5 (5 m x 0.53 mm)

Biodiesel EN14103 FAME Analysis

- Specially designed for the analysis of esters and linoleic acid methyl esters in B100 using EN14103
- Bonded and cross-linked
- Solvent rinsable

Biodiesel EN14110 Residual Methanol

- Specially designed for the determination of trace methanol in B100 using EN14110
- Bonded and cross-linked
- Solvent rinsable

Biodiesel Capillary GC Columns

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
Biodiesel ASTM D6584 Free/Total Glycerin	0.32	15	0.10	-60 to 400	123-BD11
Biodiesel EN14105 Free/Total Glycerin	0.32	10	0.10	-60 to 400	123-BD01
Biodiesel EN14103 FAME Analysis	0.32	30	0.25	40 to 260/270	1909BD-113
Biodiesel EN14110 Residual Methanol	0.32	30	1.80	20 to 260/280	123-BD34

Biodiesel Test Samples

Description	Part No.
Biodiesel MSTFA kit, 10 x 1 mL ampoules, N-Methyl-N-(trimethylsilyl)trifluoro-acetamide for ASTM method D6584	5190-1407
Biodiesel D6584 kit 2 internal standard solutions, 1 mL, 5/pk and 2 internal standard solutions, 5 mL	5190-1408
Biodiesel E14105 kit, 4 x 1 mL ampoules 4 standard solutions	5190-1409
Biodiesel Monoglyceride kit, 3 x 1 mL ampoules	5190-1410

Select Biodiesel

- Complete set of biodiesel columns for full compliance and ease-of-use
- UltiMetal technology provides high accuracy and longevity
- Pre-tested for complete confidence in results
- Good column lifetime when operating at temperatures up to 400 °C
- UltiMetal column with ultra stable stationary phase
- Convenient pre-coupled retention gap that is leak tested

Technical Specifications

Method	Analytes	Column	Injector Type	Analysis Time (min)
ASTM D 6584	Free and total glycerine	Select Biodiesel for Glycerides	On-column	32
EN14103	Ester and linoleic acid methyl esters	Select Biodiesel for FAME	Split/splitless	30
EN14105	Free and total glycerine; mono, di- and tri-glycerides	Select Biodiesel for Glycerides	On-column	35
EN14106	Free glycerol	Select Biodiesel for Glycerides	Split/splitless	10
EN14110	Methanol	Select Biodiesel for Methanol	Headspace with split/splitless	10

Select Biodiesel

Description	ID (mm)	Length (m)	Film (µm)	7 in Cage
For gylcerides, UltiMetal, with retention gap	0.32	15	0.10	CP9078
For gylcerides, UltiMetal	0.32	15	0.10	CP9079
For gylcerides, UltiMetal, with retention gap	0.32	10	0.10	CP9076
For gylcerides, UltiMetal	0.32	10	0.10	CP9077
For FAME, fused silica	0.32	30	0.25	CP9080
For Methanol, fused silica	0.32	30	3.00	CP9083
UltiMetal retention gap, methyl deactivated	0.53	2		CP6530

Select Silanes

- Stabilized trifluoropropyl-methyl polysiloxane phase for optimized ppm level analysis of silanes
- High capacity and retention
- Low bleed
- Reduced surface activity provides excellent peak shape
- Thick film offers high sample loading capacity and retention
- Typical applications include alkylated chlorosilanes at % levels as well as impurity analysis
- Valved, direct and split/splitless injections are possible

Select Silanes

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.32	30	1.80	0 to 270/300	CP7434
	60	1.80	0 to 270/300	CP7435
0.53	60	3.00	0 to 270/300	CP7437

CP-Volamine

- Non polar stationary phase
- Excellent stability for samples containing water expands the application range
- Maximum temperature of 265 °C for enhanced productivity
- Highly inert providing sharp amine peaks for accurate results
- Produces symmetrical peaks due to MPD (Multi-Purpose Deactivation) technology
- Excellent performance even when the sample contains high percentages of water
- Ideal for analyzing volatile amines like MMA, DMA and TMA (monomethyl, dimethyl and trimethyl amine)

Similar Phases: Rtx-Volatile Amines

CP-Volamine

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	265/300	CP7446	
	30	265/300	CP7447	CP7447I5
	60	265/275	CP7448	CP7448I5

CP-Sil 8 CB for Amines

- Base deactivated 5% phenyl polydimethylpolysiloxane
- Optimized inertness performance for a broad range of Amine compounds
- Thermal stability up to 350 °C enable separations of Amines up to C_{20} as well as alkanolamines
- Base deactivated columns also available as CP-Wax for Amines

Similar Phases: Rtx-5 Amine

CP-Sil 8 CB for Amines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*2.00*	*325/350*	*CP7599*	
0.25	30	0.25	325/350	CP7598	CP7598I5
	30	0.50	325/350	CP7595	CP7595I5
0.32	30	1.00	325/350	CP7596	CP7596I5
0.53	30	1.00	325/350	CP7597	CP7597I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Wax for Volatile Amines and Diamines

Similar Phases: Stabilwax DB

CP-Wax for Volatile Amines and Diamines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	25	1.20	220/220	CP7422	CP7422I5
0.53	25	2.00	220/220	CP7424	

PoraPLOT Amines

- Unique PLOT columns specially designed for high retention of very volatile amines
- High efficiency at temperatures above ambient eliminates the need for cryogenics
- High sensitivity for amines and ammonia

PoraPLOT Amines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	25	10.00	-100 to 220/220	CP7591	CP7591I5
0.53	25	20.00	-100 to 220/220	CP7594	

Pesticides Columns

Agilent J&W low-bleed columns are ideal for the analysis of pesticides. Not only do they possess less bleed than a standard polymer, which improves the signal-to-noise ratio and minimum detectable quantities, but they also have higher upper temperature limits which allow for faster run times. Agilent also offers several common phases with additional pesticide-specific testing to ensure performance for your application.

Note: For CLP pesticides and other methods using electron capture detectors, see DB-35ms, DB-17ms and DB-XLB.

VF-5 Pesticides

- Specially designed for the determination of trace levels of pesticide residue
- Highly inert for enhanced ECD and MS detection
- Tested with key pesticides including endrin and aldrin for optimal performance and consistency of results
- Low bleed

VF-5 Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.25	-60 to 325/350	CP9074
	50	0.25	-60 to 325/350	CP9073
0.32	30	0.25	-60 to 325/350	CP9075

Tips & Tools

Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at **www.agilent.com/chem/sampleprep**

DB-1701P

- Low/mid-polarity
- Exact replacement of HP-PAS1701
- Specifically designed and processed for the analysis of organochlorine pesticides
- ECD tested to ensure minimal pesticide breakdown and low ECD bleed
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-1701, Rtx-1701, BP-10, CB-1701, OV-1701, 007-1701, ZB-1701P

DB-1701P

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	-20 to 280/300	122-7732		122-7732LTM
0.32	25	0.25	-20 to 280/300	123-7722		123-7722LTM
	30	0.25	-20 to 280/300	123-7732	123-7732E	123-7732LTM
0.53	30	1.00	-20 to 260/280	125-7732		125-7732LTM

VF-1701 Pesticides

- Specially designed for the determination of trace levels of pesticide residues
- Columns individually tested with key pesticides, including endrin and aldrin
- Highly inert for improved detection limits for trace pesticide determination
- Proven performance with ECD or MS detection
- Ultra low bleed to improve sensitivity

VF-1701 Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.25	-20 to 280/300	CP9070
	50	0.25	-20 to 280/300	CP9072
0.32	30	0.25	-20 to 280/300	CP9071

CP-Sil 8 CB for Pesticides

- Linear column response down to femtogram level for improved productivity
- Excellent inertness – tested with DDTs to provide very reliable data
- Can be used with on-column injection techniques
- Integrated retention gap helps avoid problems with solvent condensation allowing repeated splitless injections without phase deterioration

CP-Sil 8 CB for Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.12	300/325	CP7481
0.53	50	0.25	300/325	CP7504

CP-Sil 19 CB for Pesticides

- Ideal as a confirmation column for reliable results
- Specified for EPA and CLP analytes for ultimate compliance
- Supplied with a coupled retention gap for on-column injection for best detection limits

CP-Sil 19 CB for Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	30	0.25	275/300	CP7406	
	50	0.20	275/300	CP7407	CP7407I5
0.32	30	0.25	275/300	CP7408	
0.53	30	1.00	260/275	CP7409	

DB-608

- Specifically designed for the analysis of chlorinated pesticides and PCBs
- U.S. EPA Methods: 608, 508, 8080
- Excellent inertness and recoveries without pesticide breakdown
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-608

Similar Phases: SPB-608, NON-PAKD Pesticide, 007-608

DB-608

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 280/300*	*121-6822*	*121-6822LTM*	*221-6822LTM*
0.25	30	0.25	40 to 280/300	122-6832	122-6832LTM	
0.32	30	0.50	40 to 280/300	123-1730	123-1730LTM	
0.45	30	0.70	40 to 260/280	124-1730	124-1730LTM	
0.53	15	0.83	40 to 260/280	125-1710	125-1710LTM	
	30	0.50	40 to 260/280	125-6837	125-6837LTM	
		0.83	40 to 260/280	125-1730	125-1730LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-PAS5

- Non-polar
- Specifically designed and processed for the analysis of organochlorine pesticides
- ECD tested to ensure minimal pesticide breakdown and low ECD bleed
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-5, RSL-200, Rtx-5, BP-5, CB-5, OV-5, 007-2 (MPS-5), SE-52, SE-54, XTI-5, PTE-5, CC-5, ZB-5

HP-PAS5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	25	0.52	-60 to 325/350	19091S-010	19091S-010LTM

Rapid-MS

- Equivalent to 5% phenyl, 95% dimethylpolysiloxane
- Fast analysis time improves productivity
- Reduce analysis time by 3-5x for temperature programmed, and up to a 10x for isothermal runs
- The film thickness from 0.1 to 1 µm ensures high loadability and higher sensitivity
- Low bleed

Note: Rapid-MS columns utilize the high optimal carrier gas velocity obtained when a separation is performed under reduced pressure for fast analysis times

Rapid-MS

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	10	0.12	-60 to 325/325	CP8131
		0.25	-60 to 325/325	CP8132
		0.50	-60 to 325/325	CP8133
		1.00	-60 to 325/325	CP8134

Restriction for Rapid-MS

Description	Part No.
Restriction for Rapid-MS, fused silica, 0.1 mm id, 0.6 m, 5/pk	CP8121

PAH Columns

Select PAH

- Full separation for all PAH isomers avoids false positives and inaccurate results
- Full separation of EPA PAHs in less than 7 minutes and EU PAHs in less than 30 minutes including separation of chrysene, triphenylene and benzofluoranthene (type b,j and k)
- Fast results with no need for further analysis
- Low bleed enhances sensitivity

Select PAH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.15	*15*	*0.10*	*40 to 325/350*	*CP7461*
0.25	30	0.15	40 to 325/350	CP7462

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-EUPAH

- Specially designed for analysis of EU regulated PAHs
- Individually tested with application-specific QC test probe mixture
- Great resolution of critical isomers, e.g. benzo(b,j,k)fluoranthenes
- Superb thermal stability for accurate analysis of high boiling PAHs, e.g. dibenzopyrenes
- Excellent signal-to-noise ratio
- Optimized column dimensions for proven performance

DB-EUPAH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.14*	*40 to 320/340*	*121-9627*
0.25	60	0.25	40 to 320/340	122-96L2
0.32	15	0.25	40 to 320/340	123-9612

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Sil PAH CB UltiMetal

- Separates all 16 PAHs according to EPA Method 610
- High temperature, low bleed phase
- Virtually unbreakable UltiMetal capillary column
- Maximum temperature of 400/425 °C

CP-Sil PAH CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.12	400/425	CP7440

Semivolatiles Columns

Semivolatiles are usually extracted from soil samples or other environmental matrices. GC columns with precise retention time reproducibility and good mass spectrometer performance are key enablers for these often demanding analyses.

CP-Sil 8 CB for PCB

- Engineered for the analysis of PCBs according to DIN method 51527
- Ideal for trace level ECD detection of PCBs
- High temperature stability provides low bleed and extended lifetime

CP-Sil 8 CB for PCB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.25	300/325	CP7482

DB-5.625

- Close equivalent to a (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Specially processed to exhibit excellent inertness for EPA Semivolatiles Methods 625, 1625, 8270 and CLP protocols*
- Surpasses EPA performance criteria for semivolatiles
- Inert for base, neutral and acidic compounds
- High temperature limit with excellent thermal stability and low bleed
- Bonded and cross-linked
- Solvent rinsable

*Pentachlorophenol, 2,4-dinitrophenol, carbazole, and N-nitrosodiphenylamine used to test response factors.

Similar Phases: XTI-5, Rtx-5, PTE-5, BPX-5

DB-5.625

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5621*	*121-5621LTM*
		0.36	*-60 to 325/350*	*121-5622*	*121-5622LTM*
0.25	30	0.25	-60 to 325/350	122-5631	122-5631LTM
		0.50	-60 to 325/350	122-5632	122-5632LTM
		1.00	-60 to 325/350	122-5633	122-5633LTM
	60	0.25	-60 to 325/350	122-5661	
0.32	30	0.25	-60 to 325/350	123-5631	123-5631LTM
		0.50	-60 to 325/350	123-5632	123-5632LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-5ms Semivolatile

- (5%-Phenyl)-methylpolysiloxane, identical selectivity to HP-5
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Specifically tested for inertness for active compounds including acidic and basic compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G27

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-6

HP-5ms Semivolatile

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.50	-60 to 325/350	19091S-139	19091S-139LTM

CP-Sil 5/C18 CB for PCB

- Engineered for high resolution PCB analysis
- Lower polarity than 100% polydimethylpolysiloxane due to its C_{18} substitution
- Provides high signal-to-noise ratios for ECD detectors
- Optimized column length for separation of critical isomer pairs: 28/31, 56/60, 149/118, 105/153/132 and 170/190

CP-Sil 5/C18 CB for PCB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.10	275/300	CP7477
	100	0.10	275/300	CP7476
0.32	100	0.10	275/300	CP7478

DB-Dioxin

- Specifically engineered for the analysis of polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs)
- Resolves 2,3,7,8-TCDD and 2,3,7,8-TCDF from all other isomers in one run
- Low bleed
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

Similar Phases: SP-2331, 007-23, Rtx-2332, Rtx-Dioxin

DB-Dioxin

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	60	0.15	40 to 250/270	122-2461	122-2461E
		0.25	40 to 250/270	122-2462	
0.32	60	0.15	40 to 250/270	123-2461	
		0.25	40 to 250/270	123-2462	

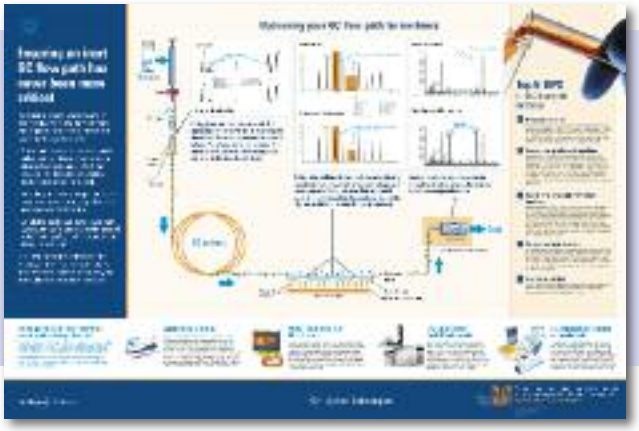
CP-Sil 88 for Dioxins

- High polarity stationary phase with specific selectivity for dioxins and dibenzofuran separations
- Integrated retention gap eliminates leaks and extends column lifetime with splitless injections
- 2,3,7,8-TCDD can be determined at low concentrations
- For fast runtimes, thin film configurations are available with maximum temperature program limit of 270 °C

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

CP-Sil 88 for Dioxins

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.10	50 to 250/270	CP7497
	50	0.20	50 to 225/240	CP7588
	60	0.10	50 to 250/270	CP7498
0.32	60	0.13	50 to 250/270	CP7499



Tips & Tools

To order your copy of the
Agilent Ultra Inert Poster, please visit
www.agilent.com/chem/UIorder

Volatiles Columns

Agilent offers a selection of advanced polymer chemistries for increasingly demanding volatiles applications. Whether for a primary analytical column or as a complementary confirmation column, Agilent J&W capillaries are chromatographers' first choice.

DB-624

- Specifically designed for the analysis of volatile priority pollutants and residual solvents
- No cryogenics needed for U.S. EPA Method 502.2
- Excellent for U.S. EPA Methods: 501.3, 502.2, 503.1, 524.2, 601, 602, 8010, 8015, 8020, 8240, 8260, and USP 467
- Excellent inertness for active compounds
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-624
- Equivalent to USP Phase G43

Similar Phases: AT-624, Rxi-624 Sil MS, Rtx-624, PE-624, 007-624, 007-502, ZB-624

DB-624

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*1.00*	*-20 to 280*	*121-1324*	*121-1324E*	*121-1324LTM*	*221-1324LTM*
0.20	25	1.12	-20 to 260	128-1324	128-1324E	128-1324LTM	
0.25	30	1.40	-20 to 260	122-1334	122-1334E	122-1334LTM	222-1334LTM
	60	1.40	-20 to 260	122-1364	122-1364E		
0.32	30	1.80	-20 to 260	123-1334	123-1334E	123-1334LTM	
	60	1.80	-20 to 260	123-1364	123-1364E		
0.45	30	2.55	-20 to 260	124-1334		124-1334LTM	
	75	2.55	-20 to 260	124-1374			
0.53	15	3.00	-20 to 260	125-1314			
	30	3.00	-20 to 260	125-1334	125-1334E	125-1334LTM	
	60	3.00	-20 to 260	125-1364	125-1364E		
	75	3.00	-20 to 260	125-1374	125-1374E		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Select 624 CB

- 6% cyanopropyl, 94% dimethylpolysiloxane
- EPA volatiles methods 524.2, 624 and 8015
- Specified by Pharmacopoeia V.3.3.9 for residual solvents
- Excellent column-to-column reproducibility
- Low bleed

Similar Phases: AT-624, Rtx-624, PE-624, 007-624, 007-502, ZB-624

CP-Select 624 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.84*	*265/280*	*CP7411*	*CP7411I5*
0.25	30	1.40	265/280	CP7412	
	60	1.40	265/280	CP7413	CP7413I5
0.32	30	1.80	265/280	CP7414	CP7414I5
	60	1.80	265/280	CP7415	CP7415I5
0.53	30	3.00	265/280	CP7416	CP7416I5
	75	3.00	265/280	CP7417	
	105	3.00	265/280	CP7418	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Tips & Tools

Don't forget, we have special offers throughout the year.

To learn more, visit **www.agilent.com/chem/specialoffers**

DB-VRX

- Unique selectivity engineered for optimum resolution of volatiles analysis: U.S. EPA Methods 502.2, 524.2 and 8260
- 0.45 mm id columns provide more plates per meter compared to 0.53 mm id columns for the fewest coelutions for GC method (an industry first)*
- No subambient cooling required to resolve the six "gases"
- Fast run time:
  <30 minutes for optimum sample throughput
  <8 minutes with 0.18 mm id
- Low polarity
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

*Two coelutions: 1) m- and p-xylene, for which U.S. EPA does not require separation, and 2) 1,1,2,2-tetrachloroethane and o-xylene which are separated by detectors PID and ELCD, respectively. **Note to GC/MS analysts:** These coeluting compounds have different primary characteristic ions of 83 and 106, respectively.

Similar Phases: VOCOL, NON-PAKD, Rtx-Volatiles, PE-Volatiles, 007-624, Rtx-VRX, Rtx-VGC

DB-VRX

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*1.00*	*-10 to 260*	*121-1524*		*121-1524LTM*	*221-1524LTM*
	40	*1.00*	*-10 to 260*	*121-1544*	*121-1544E*	*121-1544LTM*	
0.25	30	1.40	-10 to 260	122-1534		122-1534LTM	222-1534LTM
	60	1.40	-10 to 260	122-1564	122-1564E		
0.32	30	1.80	-10 to 260	123-1534		123-1534LTM	
	60	1.80	-10 to 260	123-1564	123-1564E		
0.45	30	2.55	-10 to 260	124-1534		124-1534LTM	
	75	2.55	-10 to 260	124-1574			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-VOC

- Selectivity engineered for U.S. EPA Methods 502.2, 524.2 and 8260
- Low polarity – slightly more polar than DB-VRX
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: NON-PAKD, Rtx-Volatiles, PE-Volatiles, 007-624, Rtx-VRX, Rtx-VGC

HP-VOC

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.20	30	1.10	-60 to 280/290	19091R-303	19091R-303LTM	29091R-303LTM
	60	1.10	-60 to 280/290	19091R-306		
0.32	60	1.80	-60 to 280/290	19091R-316		
	90	1.80	-60 to 280/290	19091R-319		
0.53	90	3.00	-60 to 280/290	19095R-429		
	105	3.00	-60 to 280/290	19095R-420		

Tips & Tools

As part of Agilent's ongoing commitment to be your partner in chromatography, we have created a series of GC Troubleshooting videos, featuring Daron Decker, GC Applications Specialist, and Herb Brooks, Agilent Service Engineer. To view the videos, visit **www.agilent.com/chem/gctroubleshooting**

DB-502.2

- Available in 105 m for volatiles analyses
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

DB-502.2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	60	1.40	0 to 260/280	122-1464
0.32	60	1.80	0 to 260/280	123-1464
0.45	75	2.55	0 to 260/280	124-1474
	105	2.55	0 to 260/280	124-14A4
0.53	105	3.00	0 to 260/280	125-14A4

DB-MTBE

- Low polarity stationary phase
- Resolves MTBE from 2-methylpentane and 3-methylpentane for better quantitation
- Engineered for purge and trap injection without the need for cryofocusing
- Bonded and cross-linked
- Solvent rinsable

DB-MTBE

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.45	30	2.55	35 to 260/280	124-0034		124-0034LTM
0.53	30	3.00	35 to 260/280	125-0034	125-0034E	125-0034LTM

CP-Select CB for MTBE

- Engineered for analysis of MTBE in reformulated gasoline
- Unique selectivity for MTBE
- Broad dynamic range for quantification of MTBE
- Ideal as primary or confirmation column

CP-Select CB for MTBE

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.25	200/200	CP7528

DB-TPH

- Specifically designed for the analysis of total petroleum hydrocarbons (TPHs), soil analysis, and LUFT
- Three analyses in one injection – gas range organics, diesel range organics and motor oil
- Fast run time
- Bonded and cross-linked
- Solvent rinsable

DB-TPH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	30	0.25	-10 to 320	123-1632	123-1632LTM
0.45	30	1.00	-10 to 290	124-1632	

Tips & Tools

For a precision cut on your capillary column,
use Agilent's GC column cutting tool (P/N 5183-4620).

Select Mineral Oil

- Stabilized non-polar bonded phase engineered for fast mineral oil analysis
- Optimized selectivity for reliable Total Petroleum Hydrocarbon (TPH) results per DIN H53 N-ISO 9377-2 methods
- C_4 to C_{40} hydrocarbons can be analyzed in less than ten minutes
- Low bleed
- Available in Fused Silica or UltiMetal
- Fast run time
- High temperature stability up to 375/400 °C
- Available in economical 3 and 6 packs

Note: For optimal injection performance, use the 4 m x 0.53 mm id retention gap

Similar Phases: Rtx-Mineral Oil

Select Mineral Oil

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Unit	7 in Cage	5 in Cage
0.32	15	0.10	-60 to 390/400	1/pk	CP7491	CP7491I5
	15	0.10	-60 to 390/400	3/pk	CP749103	
	15	0.10	-60 to 390/400	6/pk	CP749106	
Retention gap						
0.53	4		-60 to 325/350	3/pk	CP8015	

Select Mineral Oil UltiMetal

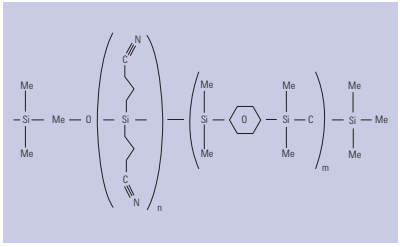
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.32	15	0.10	-60 to 390/400	CP7493

Tips & Tools

Ensure highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at **www.agilent.com/chem/gasclean**

Food, Flavors and Fragrances Columns

Food and flavor analyses place stringent demands on capillary columns. Samples have many components that are difficult to resolve and column-to-column reproducibility becomes critical. Agilent J&W GC columns are ideal for meeting these needs. Our rigorous quality control specifications and extensive QC testing ensure that the column you buy today will perform just like the column you buy tomorrow.



Structure of HP-88

HP-88

- (88%-Cyanopropyl)aryl-polysiloxane
- 250/320 °C upper temperature limits
- High polarity
- Designed for separation of cis-trans fatty acid methyl esters (FAMEs)
- Even better separation than DB-23 of cis-trans isomers

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

HP-88

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	100	0.25	0 to 250/260	112-88A7	112-88A7E	
	60	0.20	0 to 250/260	112-8867	112-8867E	
	30	0.20	0 to 250/260	112-8837	112-8837E	112-8837LTM

CP-Sil 88

- High selectivity towards positional and geometric isomers for ease-of-use
- Highly substituted cyanopropyl phase
- Highest polarity, non-chemically bonded and stabilized

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

CP-Sil 88

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.20	50 to 225/240	CP6172	CP6172I5
	50	0.20	50 to 225/240	CP6173	CP6173I5
0.32	25	0.20	50 to 225/240	CP6174	CP6174I5
	50	0.20	50 to 225/240	CP6175	

Select FAME

- Tuned for optimal cis-tans separation of FAMEs, especially C_{18} isomers
- Excellent peak shape and separation for FAME isomers – especially if one component is present at a higher concentration
- Bonded and cross-linked
- Low bleed
- High efficiency and column loadability
- Column length up to 200 m available for detailed analysis of the C_{18}:1 isomer cluster

Select FAME

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	50	275/290	CP7419	CP7419I5
	100	275/290	CP7420	CP7420I5
	200	275/290	CP7421	

CP-Sil 88 for FAME

- Optimized for analysis of FAME cis/trans isomers
- High polarity stationary phase provides improved efficiency and higher productivity
- Use for FAME separations in the C_6 to C_{26} range

CP-Sil 88 for FAME

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.20	225/240	CP7488
	60	0.20	225/240	CP7487
	100	0.20	225/240	CP7489

Tips & Tools

Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**

CP-Wax 57 CB

- Unique high polarity bonded wax column
- Industry proven for the analysis of alcohols in the brewing and wine/spirits industry
- Excellent inertness for optimum peak shape of alcohols and glycols
- Offered in 0.15 mm id for significantly high speed throughput

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX

CP-Wax 57 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*15*	*0.12*	*20 to 200/225*	*CP97711*	*CP97711I5*
	30	*0.12*	*20 to 200/225*	*CP97721*	
0.25	25	0.20	20 to 200/225	CP97713	
	50	0.20	20 to 200/225	CP97723	CP97723I5
	60	0.40	20 to 200/225	CP8120	
0.32	25	0.20	20 to 200/225	CP97743	
		1.20	20 to 200/225	CP97763	CP97763I5
	50	0.20	20 to 200/225	CP97753	CP97753I5
		1.20	20 to 200/225	CP97773	CP97773I5
0.53	25	1.00	20 to 200/225	CP97638	CP97638I5
	25	2.00	20 to 200/225	CP97658	CP97658I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Carbowax 400 for Volatiles in Alcohol

- Designed for the analysis of volatiles in alcoholic beverages
- High resolution for amyl alcohols for accurate quality control
- High efficiency
- Special testing ensure performance and column-to-column reproducibility

CP-Carbowax 400 for Volatiles in Alcohol

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	50	0.20	60/80	CP7527	CP7527I5

CP-Wax 57 CB for Glycols and Alcohols

- Optimized for the analysis of glycols, diols and alcohols
- Unique, high polarity wax phase
- Symmetrical peaks providing the most accurate results
- Cross-linked and bonded phase delivers robustness and enhanced column lifetime

CP-Wax 57 CB for Glycols and Alcohols

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	200/200	CP7615	CP7615I5
0.53	25	0.50	225/250	CP7617	CP7617I5

CP-TAP CB for Triglycerides

- Engineered phase for detailed analysis of triglycerides
- Separates complete triglyceride pattern in less than 16 minutes
- Separation based on carbon number and degree of unsaturation
- Stabilized phase for low bleed and enhanced column lifetime
- Available in Fused Silica and UltiMetal

CP-TAP CB for Triglycerides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.10	350/360	CP7483

CP-TAP CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.10	355/370	CP7463

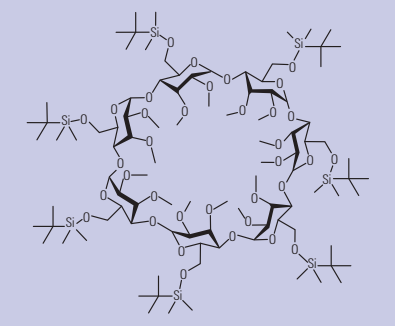
CP-FFAP CB for Free Fatty Acids in Dairy Products

- Ideal for flavors, aromas and free fatty acids C_1 to C_{26}
- Separates C_2-C_{24} acids in one run without derivatization
- Chemically-bonded for excellent longevity
- Water and solvent resistant

CP-FFAP CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.25*	*250/275*	*CP7686*	*CP7686I5*
0.32	25	0.30	250/275	CP7485	CP7485I5
0.53	25	1.00	250/275	CP7486	CP7486I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CycloSil-B

CycloSil-B

- 30% heptakis (2,3-di-O-methyl-6-O-t-butyl dimethylsilyl)-β-cyclodextrin in DB-1701
- Chiral separations without chiral-specific derivatization
- New stationary phase for improved resolution of many chiral separations
- Ideal for many chiral γ-lactones and terpenes

Note: Because CycloSil-B GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

CycloSil-B

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	35 to 260/280	112-6632	112-6632LTM
0.32	30	0.25	35 to 260/280	113-6632	113-6632LTM

Cyclodex-B

- 10.5% β-cyclodextrin in DB-1701
- Chiral separations without chiral-specific derivatization
- Broad range of resolving potential
- Excellent peak shape

Note: Because Cyclodex-B GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

Cyclodex-B

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	50 to 230/250	112-2532	112-2532E	112-2532LTM
	60	0.25	50 to 230/250	112-2562		
0.32	30	0.25	50 to 230/250	113-2532	113-2532E	113-2532LTM

HP-Chiral β

- β-cyclodextrin in (35%-Phenyl)-methylpolysiloxane
- Chiral separations without chiral-specific derivatization
- Phenyl-based polymer provides low bleed and does not interfere with nitrogen-specific detectors
- Available in two concentrations of β-cyclodextrin: 10% and 20%
- 20% β-cyclodextrin best choice for initial screening

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

HP-Chiral β

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
HP-Chiral 10β					
0.25	30	0.25	30 to 240/250	19091G-B133	
0.32	30	0.25	30 to 240/250	19091G-B113	
HP-Chiral 20β					
0.25	30	0.25	30 to 240/250	19091G-B233	19091G-B233E
0.32	30	0.25	30 to 240/250	19091G-B213	19091G-B213E

CP-Chirasil Val

- Designed for separations of optically active compounds including amino acids
- Both antipode phases are available (D and L) for maximum versatility
- Stabilized chiral phase, over 50% cross-linked for longevity
- Tested for separation of amino acid enantiomers
- Low bleed

Note: On Chirasil-L Val, D-amino acids elute before the L-amino acids, while on Chirasil-D-Val, this elution order is reversed. This is especially valuable when determining the optical purity of these compounds. Selecting the column from which the minor compound elutes before the major enantiomers results in the lowest detection levels.

CP-Chirasil Val

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
Antipode D	0.25	25	0.08	200/200	CP7494	CP7494I5
Antipode L	0.25	25	0.12	200/200	CP7495	CP7495I5

CP-Chirasil-Dex CB

- Cyclodextrin bonded to dimethylpolysiloxane for homogeneous enantioselectivity throughout the column
- High resolution factor between isomers across a broad application range
- Chemically bonded phase for excellent longevity
- No need for derivatization improved productivity
- Low elution temperature of polar compounds
- Suitable for all injection techniques

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

CP-Chirasil-Dex CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	200/200	CP7502	CP7502I5
0.32	25	0.25	200/200	CP7503	CP7503I5

CP-Cyclodextrin-β-2,3,6-M-19

- Unique selectivity for optical and positional isomer separations
- High efficiency enables wide range of applications
- Separates o-,m-, and p-xylenes
- Excellent peak shape for underivatized polar compounds

CP-Cyclodextrin-β-2,3,6-M-19

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	225/250	CP7500	CP7500I5
0.32	50	0.25	225/250	CP7501	

Tips & Tools

Agilent CrossLab GC supplies, including CrossLab Ultra Inert liners, perform seamlessly with a variety of instruments regardless of make or model, including Varian (now Bruker), PerkinElmer, Shimadzu, and Thermo Scientific GC systems. Learn more at **www.agilent.com/chem/CrossLab**

Life Sciences Columns

The life sciences offer some difficult challenges to capillary GC chromatographers. These include complex sample matrices, the necessity for low level detection and the chemically active characteristics of many of the samples. In response to this, Agilent offers a line of columns which are designed specifically for drugs of abuse testing.

DB-ALC1 and DB-ALC2

- Reliable blood alcohol analysis
- Optimized primary and confirmation column pair for U.S. blood alcohol analysis
- Faster GC run times
- Improved resolution of key ethanol/acetone peaks
- Available in 0.32 and 0.53 mm id
- Bonded and cross-linked

Similar Phases: Rtx-BAC1, Rtx-BAC2, ZB-BAC-1, ZB-BAC-2

DB-ALC1 and DB-ALC2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
DB-ALC1						
0.32	30	1.80	20 to 260/280	123-9134		123-9134LTM
0.53	30	3.00	20 to 260/280	125-9134	125-9134E	125-9134LTM
DB-ALC2						
0.32	30	1.20	20 to 260/280	123-9234	123-9234E	123-9234LTM
0.53	30	2.00	20 to 260/280	125-9234		125-9234LTM

VF-DA

- Engineered for drugs of abuse confirmation testing
- High recovery for trace level analysis and excellent resistance to direct methanol injections
- Ultra low bleed

VF-DA

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.20	12	Optimized	-60 to 325/350	CP8964

HP-Blood Alcohol

- Reliable blood alcohol analysis
- Excellent confirmation column with DB-ALC2 for method using t-butanol as internal standard

Similar Phases: Aucune

HP-Blood Alcohol

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	7.5	2.00	-60 to 270/290	19091S-510	19091S-510E	19091S-510LTM

DB-5ms EVDX

- Specially configured and tested for drugs of abuse confirmation
- Drug test mix included: caffeine, glutethimide, lidocaine, phenobarbital, EDDP, methaqualone, methadone, cocaine, desipramine, carbamazepine
- DB-5ms EVDX is equivalent to (5%-Phenyl)-methylpolysiloxane
- Consistent retention and peak shape
- Low bleed for GC/MS analysis
- Bonded and cross-linked
- Solvent rinsable

DB-5ms EVDX

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.20	25	0.33	-60 to 325/350	128-8522

HP-Fast Residual Solvent

- Equivalent to USP Phase G43
- Thinner film reduces run time by 2.5 times and increases Minimum Detection Limit (MDL) by 2 times compared to standard film thickness used for this method
- Bonded and cross-linked

Similar Phases: PE-624, 007-624, 007-502, ZB-624

HP-Fast Residual Solvent

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	1.00	-20 to 260	19095V-420	19095V-420E	19095V-420LTM

Metal Columns

DB-ProSteel and UltiMetal columns are engineered to combine the robustness of stainless steel with advanced surface deactivation for excellent peak shape.

- Configured for high temperature analyses such as simulated distillation
- Wide variety of stationary phases and configurations available
- Ideal for portable and process GC applications
- Superior replacement for MXT/Silco-steel columns

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Simulated distillation/high temperature					
DB-HT SimDis	0.53	5	0.10	145-1009	
			0.15	145-1001	
DB-PS2887	0.53	10	3.00	145-2814	
CP-SimDist UltiMetal	0.53	5	0.09	CP7569	CP7569I5
			0.17	CP7532	CP7532I5
			0.88	CP7570	
			2.65	CP7571	
		10	0.06	CP6540	
			0.17	CP7542	CP7542I5
			0.53	CP7592	
			0.88	CP7512	
			1.20	CP7562	
			2.65	CP7582	
			5.00	CP7572	
		20	0.11	CP7593	
		25	0.06	CP6550	
VF-5ht UltiMetal	0.25	15	0.10	CP9090	
	0.32	15	0.10	CP9094	CP9094I5
	0.25	30	0.10	CP9092	
	0.32	30	0.10	CP9096	
VF-5ht UltiMetal with Retention Gap UltiMetal	0.25	15	0.10	CP9091	
	0.32	15	0.10	CP9095	
	0.25	30	0.10	CP9093	
	0.32	30	0.10	CP9097	

(Continued)

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Standard phases and PEG					
DB-PS1	0.53	15	0.15	145-1011	
		30	1.50	145-1032	
CP-Sil 5 CB	0.53	10	0.50	CP7125	
			1.00	CP7120	
			2.00	CP7150	
			5.00	CP6666	CP6666I5
		25	0.50	CP7135	CP7135I5
			1.00	CP7130	
			2.00	CP7160	
			5.00	CP6670	
		50	0.50	CP7195	
			1.00	CP7140	
			2.00	CP7170	
			5.00	CP6671	
DB-HT SimDis	0.53	5	0.10	145-1009	
			0.15	145-1001	
DB-PS2887	0.53	10	3.00	145-2814	
CP-SimDist UltiMetal, 6/pk	0.53	5	0.09	CP67569	
CP-SimDist UltiMetal	0.53	5	0.09	CP7569	
			0.17	CP7532	
			0.88	CP7570	
			2.65	CP7571	
		10	0.06	CP6540	
			0.17	CP7542	
			0.53	CP7592	
			0.88	CP7512	
			1.20	CP7562	
			2.65	CP7582	
			5.00	CP7572	
		20	0.11	CP7593	
		25	0.06	CP6550	

(Continued)

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Standard phases and PEG					
CP-Sil 8 CB UltiMetal	0.53	10	1.00	CP7121	
		25	5.00	CP6680	
		50	5.00	CP7196	
				CP6681	
CP-Sil 13 CB UltiMetal	0.53	25	1.00	CP7141	
		50	0.50	CP7129	
DB-PSWAX	0.53	30	1.00	145-7032	
CP-WAX 52 CB UltiMetal	0.53	10	1.00	CP7148	
			2.00	CP7177	
		25	0.50	CP7138	
			1.00	CP7158	
			2.00	CP7178	
		50	0.50	CP7198	
			1.00	CP7168	
			2.00	CP7179	
PLOT columns					
PoraPLOT Q UltiMetal	0.53	10	20.00	CP6953	CP6953I5
		25	20.00	CP6954	CP6954I5
		50	20.00	CP6955	
CP-Al2O3/KCl UltiMetal	0.53	50	10.00	CP6918	
CP-Al2O3/Na2SO4 UltiMetal	0.53	50	10.00	CP6968	
CP-Molsieve 5Å UltiMetal	0.53	10	50.00	CP6937	
		25	50.00	CP6938	CP6938I5
		50	50		CP6937I5
Select application columns					
DB-PS624	0.53	30	3.00	145-1334	
CP-Sil PAH CB UltiMetal	0.25	25	0.12	CP7440	
CP-TAP CB	0.25	25	0.10	CP7463	
Select Biodiesel With retention gap	0.32	10	0.10	CP9076	
		15	0.10	CP9078	
Select Biodiesel	0.32	10	0.10	CP9077	
		15	0.10	CP9079	

PLOT Columns

PLOT columns are ideal for separating compounds that are gases at room temperatures. Agilent Technologies offers a comprehensive line of PLOT columns for analysis of fixed gases, low molecular weight hydrocarbon isomers, volatile polar compounds and reactive analytes such as sulfur gases, amines and hydrides. Our PLOT phases are offered in dimensions from 0.25 to 0.53 mm id, allowing for easy column selection for various detector and system requirements. For GC/MS systems, we offer several small diameter columns with truly bonded and immobilized stationary phases, eliminating potential detector fouling due to particle generation.

PoraBOND Q

- Bonded PLOT column for more reliable results for analysis of volatile solvents and hydrocarbons
- Extended analysis offers broad application range
- 300/320 °C temperature limits
- Engineered for high stability, withstands repeated water injections
- Proprietary manufacturing technique results in very pure porous polymer with virtually no catalytic activity, allowing operation to 320 °C without decomposition
- Bonding technology results in greatly reduced particle shedding, reduces the needs for particle traps

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraBOND Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	3.00	-100 to 300/300	CP7347	CP7347I5
	25	3.00	-100 to 300/320	CP7348	CP7348I5
0.32	10	5.00	-100 to 300/320	CP7350	CP7350I5
	25	5.00	-100 to 300/320	CP7351	CP7351I5
	50	5.00	-100 to 300/320	CP7352	CP7352I5
0.53	10	10.00	-100 to 300/320	CP7353	CP7353I5
	25	10.00	-100 to 300/320	CP7354	CP7354I5
	50	10.00	-100 to 300/320	CP7355	

PoraBOND U

- Highly stable polar-bonded porous polymer with maximum operating temperature of 300 °C
- Reduced bleed for low detection limits and fast stabilization time
- Bonded PLOT column for excellent longevity
- Ideal for use with method that pressure programs or valve switching

Similar Phases: Rt-U-BOND

PoraBOND U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	10	3.00	-100 to 300/300	CP7347

PoraPLOT Q and PoraPLOT Q-HT

- Recommended for column switching systems that analyze a broad range of polar and apolar volatile compounds
- Water elutes as a sharp peak enabling quantitation
- Retention of target compounds is not influenced by water in the sample
- Long term stability provides repeatable retention times
- Available in Fused Silica and UltiMetal

PoraPLOT Q

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraPLOT Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	8.00	-100 to 250/250	CP7548	
	25	8.00	-100 to 250/250	CP7549	CP7549I5
0.32	10	10.00	-100 to 250/250	CP7550	CP7550I5
	25	10.00	-100 to 250/250	CP7551	CP7551I5
	50	10.00	-100 to 250/250	CP7552	
0.53	10	20.00	-100 to 250/250	CP7553	CP7553I5
	25	20.00	-100 to 250/250	CP7554	CP7554I5
	50	20.00	-100 to 250/250	CP7555	

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraPLOT Q UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	20.00	-100 to 250/250	CP6953	CP6953I5
	25	20.00	-100 to 250/250	CP6954	CP6954I5
	50	20.00	-100 to 250/250	CP6955	

PoraPLOT Q-HT

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraPLOT Q-HT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	10.00	-100 to 290/290	CP7556	
	25	10.00	-100 to 290/290	CP7557	CP7557I5
0.53	10	20.00	-100 to 290/290	CP7558	CP7558I5
	25	20.00	-100 to 290/290	CP7559	CP7559I5

Tips & Tools

Complete your ultra inert flow path with the industry leading Agilent Ultra Inert Inlet Liner, **www.agilent.com/chem/uiliner**

HP-PLOT Q

- Bonded polystyrene-divinylbenzene based column
- Polarity between Porapak-Q and Porapak-N
- Excellent column for C_1 to C_3 isomers and alkanes to C_{12}, CO_2, methane, air/CO, oxygenated compounds, sulfur compounds and solvents
- Replaces packed gas-solid columns
- Separates ethane, ethylene and ethyne (acetylene)
- Improved resolution in less time than conventional packed columns
- Minimal conditioning time required – 1 hour
- Preferred "Q" column due to its robust nature

Similar Phases: Rt-QPLOT, SupelQ PLOT

HP-PLOT Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	20.00	-60 to 270/290	19091P-QO3		19091P-QO3LTM
	30	20.00	-60 to 270/290	19091P-QO4	19091P-QO4E	19091P-QO4LTM
0.53	15	40.00	-60 to 270/290	19095P-QO3	19095P-QO3E	19095P-QO3LTM
	30	40.00	-60 to 270/290	19095P-QO4	19095P-QO4E	19095P-QO4LTM

GS-Q

- Porous divinylbenzene homopolymer
- Polarity between Porapak-Q and Porapak-N
- Separates ethane, ethylene and ethyne (acetylene)
- Not recommended for quantification of polar compounds
- Minimal conditioning time required – 1 hour

Similar Phases: Rt-QPLOT, SupelQ PLOT

GS-Q

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	30	-60 to 250	113-3432	113-3432E	113-3432LTM
0.53	10	-60 to 250	115-34H2		115-34H2LTM
	15	-60 to 250	115-3412		115-3412LTM
	25	-60 to 250	115-3422		115-3422LTM
	30	-60 to 250	115-3432	115-3432E	115-3432LTM

PoraPLOT U and PoraPLOT S

- The most polar porous polymer PLOT column ideal for halogenated compounds, C_1-C_6 hydrocarbons, ketones and solvents
- Excellent peak shape of polar and non-polar volatiles
- Water has no effect on retention times and elutes as a sharp quantifiable peak
- Reliable retention time repeatability

PoraPLOT U

Similar Phases: Rt-U-BOND

PoraPLOT U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	8.00	-100 to 190/190	CP7579	
0.32	10	10.00	-100 to 190/190	CP7580	
	25	10.00	-100 to 190/190	CP7581	
0.53	10	20.00	-100 to 190/190	CP7583	CP7583I5
	25	20.00	-100 to 190/190	CP7584	CP7584I5

PoraPLOT S

- Divinylbenzene/vinylpyridine polymer for hydrocarbons and ketones
- Ideal for the analysis of medium polarity volatile including hydrocarbons and ketones
- Higher temperature limit than PoraPLOT U

Similar Phases: Rt-S-BOND, MXT-SBOND

PoraPLOT S

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	25	20.00	-100 to 250/250	CP7574	CP7574I5

HP-PLOT U

- Bonded divinylbenzene/ethylene glycol dimethacrylate
- More polar than HP-PLOT Q
- Excellent column for C_1 to C_7 hydrocarbons, CO_2, methane, air/CO, water, oxygenates, amines, solvents, alcohols, ketones, and aldehydes
- Improved resolution in less time than conventional packed columns

Similar Phases: RTU PLOT

HP-PLOT U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	30	10.00	-60 to 190	19091P-UO4	19091P-UO4E	19091P-UO4LTM
0.53	15	20.00	-60 to 190	19095P-UO3		19095P-UO3LTM
	30	20.00	-60 to 190	19095P-UO4	19095P-UO4E	19095P-UO4LTM

HP-PLOT Al_2O_3 KCl

- Least "polar" Alumina phase
- Aluminum oxide deactivated with KCl
- Standard column choice for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Low retention of olefins relative to comparable paraffin
- Excellent for quantitation of dienes, especially propadiene and butadiene from ethylene and propylene streams
- Recommended phase for many ASTM methods
- Preferred KCl deactivated Alumina

Similar Phases: Rt-Alumina PLOT, Alumina PLOT, Al_2O_3/KCl, AB-PLOT Al_2O_3 KCl, AT-Alumina

HP-PLOT Al_2O_3 KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	5.00	-60 to 200	19091P-K33	19091P-K33E	19091P-K33LTM
0.32	50	8.00	-60 to 200	19091P-K15	19091P-K15E	
0.53	30	15.00	-60 to 200	19095P-K23		19095P-K23LTM
	50	15.00	-60 to 200	19095P-K25	19095P-K25E	

GS-Alumina KCl

- Least "polar" Alumina phase
- Aluminum oxide deactivated with KCl
- Good choice for light hydrocarbon analysis
- Good resolution of propadiene and butadiene from ethylene and propylene streams

Similar Phases: Al_2O_3/KCl, Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, AB-PLOT Al_2O_3 KCl, AT-Alumina

GS-Alumina KCl

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	-60 to 200	115-3332		115-3332LTM
	50	-60 to 200	115-3352	115-3352E	

CP-Al_2O_3/KCl and CP-Al_2O_3/Na_2SO_4

- Aluminum oxide PLOT columns offer high selectivity for separating ppm levels of C_1-C_5 hydrocarbons in process streams
- High capacity thick films
- No need for sub-ambient cooling
- Choice of two selectivities covers a broad range of applications
- Available in Fused Silica and UltiMetal

Note: The KCl deactivation salt results in a relatively apolar Al_2O_3 surface while the Na_2SO_4 deactivation provides a polar surface. Unsaturated compounds such as ethylene and acetylene (ethyne) are retained longer.

Selectivity Through KCl or Na_2SO_4 Deactivation

Note: Aluminum oxide PLOT columns are deactivated using KCl or NA_2SO_4 treatments which provides a reproducible and stable deactivation up to 200 ºC. The KCl salt deactivation results in a relatively apolar Al_2O_3 surface, while the NA_2SO_4 deactivation provides a polar surface. Unsaturated compounds such as ethylene and acetylene (ethyne) are retained longer.

Similar Phases: Al_2O_3/KCl, Rt-Alumina PLOT, Alumina PLOT, RT-Alumina BOND/KCl , Alumina chloride PLOT, AB-PLOT Al_2O_3 KCl

CP-Al_2O_3/KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	4.00	-100 to 200/200	CP7576	
	50	4.00	-100 to 200/200	CP7577	CP7577I5
0.32	10	5.00	-100 to 200/200	CP7511	CP7511I5
	50	5.00	-100 to 200/200	CP7515	CP7515I5
	25	5.00	-100 to 200/200	CP7519	CP7519I5
0.53	10	10.00	-100 to 200/200	CP7516	
	25	10.00	-100 to 200/200	CP7517	
	50	10.00	-100 to 200/200	CP7518	

Similar Phases: Al_2O_3/KCl, Rt-Alumina PLOT, Alumina PLOT, RT-Alumina BOND/KCl , Alumina chloride PLOT, AB-PLOT Al_2O_3 KCl

CP-Al_2O_3/KCl UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	50	10.00	-100 to 200/200	CP6918

Similar Phases: Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, Rt-Alumina BOND/Na_2SO_4, MXT-AluminaBOND/Na_2SO_4, Alumina sulfate PLOT

CP-Al_2O_3/Na_2SO_4

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	4.00	-100 to 200/200	CP7586	
	50	4.00	-100 to 200/200	CP7587	
0.32	10	5.00	-100 to 200/200	CP7561	
	50	5.00	-100 to 200/200	CP7565	CP7565I5
0.53	25	10.00	-100 to 200/200	CP7567	
	50	10.00	-100 to 200/200	CP7568	

Similar Phases: Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, Rt-Alumina BOND/Na_2SO_4, MXT-AluminaBOND/Na_2SO_4, Alumina sulfate PLOT

CP-Al_2O_3/Na_2SO_4 UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	50	10.00	-100 to 200/200	CP6968

Tips & Tools

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

HP-PLOT Al_2O_3 S

- Middle range of "polarity" for Alumina phases
- Aluminum oxide deactivated with sodium sulfate
- Excellent general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Best for resolving acetylene from butane and propylene from isobutane

Similar Phases: Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, Rt-Alumina BOND/Na_2SO_4, MXT-AluminaBOND/Na_2SO_4, Alumina sulfate PLOT, AT-Alumina

HP-PLOT Al_2O_3 S

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	5.00	-60 to 200	19091P-S33		19091P-S33LTM
0.32	25	8.00	-60 to 200	19091P-S12		19091P-S12LTM
	50	8.00	-60 to 200	19091P-S15	19091P-S15E	
0.53	15	15.00	-60 to 200	19095P-S21		19095P-S21LTM
	30	15.00	-60 to 200	19095P-S23		19095P-S23LTM
	50	15.00	-60 to 200	19095P-S25	19095P-S25E	

GS-Alumina

- Most "polar" Alumina phase
- Aluminum oxide with proprietary deactivation
- Excellent general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Separates C_1 to C_4 saturated and unsaturated hydrocarbons
- Best for resolving cyclopropane from propylene
- Faster, more efficient and provides more sensitivity than packed equivalents
- Minimal conditioning time required
- Preferred substitution for sodium sulfate deactivated Alumina because of its regenerative nature

Note: Alumina columns have a tendency to adsorb water and CO_2 which, over time, results in changes in retention time. We use an advanced, proprietary deactivation process which allows for rapid regeneration. Fully water saturated GS-Alumina columns regenerate in 7 hours or less at 200 ºC.

Similar Phases: Al_2O_3/KCl, Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, AB-PLOT Al_2O_3 KCl, AT-Alumina

GS-Alumina

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	-60 to 200	115-3532	115-3532E	115-3532LTM
	50	-60 to 200	115-3552		

HP-PLOT Al_2O_3 M

- Most "polar" Alumina phase (similar to GS-Alumina)
- Aluminum oxide deactivated with proprietary deactivation
- Good general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Good for resolving acetylene from butane and propylene from isobutane

Similar Phases: AB-PLOT Al_2O_3 M, BGB-PLOT Al_2O_3 M, AT-Alumina

HP-PLOT Al_2O_3 M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	50	8.00	-60 to 200	19091P-M15	19091P-M15E	
0.53	30	15.00	-60 to 200	19095P-M23		19095P-M23LTM
	50	15.00	-60 to 200	19095P-M25		

GS-GasPro

- Unique bonded silica PLOT column technology
- Excellent choice for light hydrocarbons and sulfur gases
- Retention stability not affected by water
- Separates CO and CO_2 on a single column
- Ideal PLOT column for GC/MS – no particles

Similar Phases: CP-Silica PLOT

GS-GasPro

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	5	-80 to 260/300	113-4302
	15	-80 to 260/300	113-4312
	30	-80 to 260/300	113-4332
	60	-80 to 260/300	113-4362

CP-SilicaPLOT

- No influence of water on retention times
- Elution of CO_2 and sulfur gases at ppm levels
- Separates cyclopropane from propylene
- Ideal for a wide range of applications such as COS in ethylene, Freons, hydrocarbons, propylene and sulfur compounds
- High selectivity for C_1-C_4 isomers in the presence of water
- No negative influence on retention or peak shape when water is present in the sample
- Inert surface preparation results in no decomposition pentadienes or Freons

CP-SilicaPLOT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	30	3.00	-80 to 225/225	CP8564	
	60	3.00	-80 to 225/225	CP8565	
0.32	10	4.00	-80 to 225/225	CP8574	
	15	4.00	-80 to 225/225	CP8566	CP8566I5
	30	4.00	-80 to 225/225	CP8567	CP8567I5
	60	4.00	-80 to 225/225	CP8568	CP8568I5
0.53	30	6.00	-80 to 225/225	CP8570	CP8570I5
	60	6.00	-80 to 225/225	CP8571	

CarboBOND and CarboPLOT P7

- Single column solution for ASTM D 2505 for higher productivity
- Stable and robust for high repeatability of results
- Available in bonded and PLOT versions for improved versatility and enhanced productivity

CarboBOND

CarboBOND

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	25	5.00	-100 to 200/300	CP7371
		10.00	-100 to 200/300	CP7374
	50	5.00	-100 to 200/300	CP7372
		10.00	-100 to 200/300	CP7375

CarboPLOT P7

CarboPLOT P7

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	10	25.00	-200 to 115/115	CP7513
	25	25.00	-200 to 115/115	CP7514

GS-CarbonPLOT

- High stability, bonded carbon layer stationary phase
- Unique selectivity for inorganic and organic gases
- Extended temperature limit of 360 ºC
- Ideal for GC/MS – no particle generation
- Retention stability not affected by water

Similar Phases: Carbopack, CLOT, Carboxen-1006 PLOT

GS-CarbonPLOT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	15	1.50	0 to 360	113-3112	
	30	1.50	0 to 360	113-3132	113-3132LTM
		3.00	0 to 360	113-3133	113-3133LTM
	60	1.50	0 to 360	113-3162	
0.53	15	3.00	0 to 360	115-3113	
	30	3.00	0 to 360	115-3133	115-3133LTM

Tips & Tools

Ensure a lifetime of peak performance and maximum productivity with Agilent's comprehensive GC supplies portfolio, learn more at **www.agilent.com/chem/GCsupplies**

HP-PLOT Molesieve

- A PLOT column for the analysis of permanent gases
- O_2, N_2, CO and CH_4 resolve in less than 5 min
- Durable molecular sieve 5Å coating minimizes baseline spiking and damage to multiport valves
- Select a thick film for Ar/O_2 separation without cryogenic cooling
- Select thin film HP-PLOT Molesieve columns for routine air monitoring applications
- Replaces GS-Molesieve

Note: Molecular sieve columns will absorb water, which, over time results in changes in retention time. We use an advanced, proprietary deactivation process which allows for rapid regeneration. Fully saturated HP-PLOT Molesieve columns regenerate in 7 hours or less at 200 ºC.

Similar Phases: Rt-Msieve 5A, MXT-Msieve 5A

HP-PLOT Molesieve

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	25.00	-60 to 300	19091P-MS7		19091P-MS7LTM
	30	12.00	-60 to 300	19091P-MS4	19091P-MS4E	19091P-MS4LTM
		25.00	-60 to 300	19091P-MS8		19091P-MS8LTM
0.53	15	25.00	-60 to 300	19095P-MS5		19095P-MS5LTM
		50.00	-60 to 300	19095P-MS9		19095P-MS9LTM
	30	25.00	-60 to 300	19095P-MS6	19095P-MS6E	19095P-MS6LTM
		50.00	-60 to 300	19095P-MS0	19095P-MS0E	19095P-MS0LTM

CP-Molsieve 5Å

- Separate argon and oxygen at ambient temperature to reduce costs
- High efficiency for increased productivity
- Symmetrical peaks for accurate results

Similar Phases: Rt-Msieve 5A, MXT-Msieve 5A, Mol Sieve 5A PLOT

CP-Molsieve 5Å

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	30.00	-200 to 350/350	CP7533	
0.32	10	30.00	-200 to 350/350	CP7535	CP7535I5
	25	30.00	-200 to 350/350	CP7536	CP7536I5
	30	10.00	-200 to 350/350	CP7534	CP7534I5
	50	30.00	-200 to 350/350	CP7540	CP7540I5
0.53	10	50.00	-200 to 350/350	CP7537	
	15	15.00	-200 to 350/350	CP7543	
	25	50.00	-200 to 350/350	CP7538	CP7538I5
	30	15.00	-200 to 350/350	CP7544	CP7544I5
	50	50.00	-200 to 350/350	CP7539	

Similar Phases: Rt-Msieve 5A, MXT-Msieve 5A, Mol Sieve 5A PLOT

CP-Molsieve 5Å UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	50.00	-200 to 350/350	CP6937	CP6937I5
	25	50.00	-200 to 350/350	CP6938	CP6938I5

Particle Traps for Use with PLOT Columns

Though highly stabilized, it is impossible to guarantee that no particles will dislodge from the column wall. When used in valve-switching applications, the use of a particle trap can prevent scarring of the rotors.

Particle Traps for Use with PLOT Columns

ID (mm)	Length (m)	Part No.
0.32	2.5	5181-3351
0.53	2.5	5181-3352

Particle Traps for PoraPLOT Columns

ID (mm)	Length (m)	Material	Part No.
0.32	2.5	Fused Silica	CP4016
0.53	2.5	Fused Silica	CP4017
0.53	2.5	UltiMetal	CP4018*

*Includes CP-UltiMetal connector

Particle Trap Connectors for PoraPLOT Columns

ID (mm)	Material	Unit	Part No.
0.25/0.32	Fused Silica	10/pk	CP4788
0.53	Fused Silica	10/pk	CP4789
0.25	UltiMetal	5/pk	CP4795
0.53	UltiMetal	5/pk	CP4796

Non-Bonded Stationary Phases

Whenever possible Agilent recommends the use of bonded and cross-linked polymers. Bonded polymers are more rugged, will have longer lifetimes and can be solvent rinsed. However, Agilent recognizes that some methods have been developed on non-bonded phases and therefore maintains these columns to support established methods.

HP-101

• 100% Dimethylpolysiloxane

Because HP-101 columns are not bonded or cross-linked, we do not recommend solvent rinsing.

HP-101

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	10	0.20	-60 to 280	19091Y-101		
	25	0.20	-60 to 280	19091Y-102		19091Y-102LTM
	50	0.20	-60 to 280	19091Y-105		
	12	0.25	-60 to 280	19091-60010	19091-60010E	
0.32	25	0.30	-60 to 280	19091Y-012	19091Y-012E	19091Y-012LTM
	50	0.30	-60 to 280	19091Y-015		

HP-17

• 50% Phenyl and 50% Methyl siloxane

Because the HP-17 is not bonded or cross-linked, we do not recommend solvent rinsing.

HP-17

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.53	10	2.00	25 to 260/280	19095L-121	19095L-121LTM

CAM

- Base deactivated polyethylene glycol
- Specifically designed for amine analysis
- Excellent peak shape for primary amines
- Replaces HP-Basicwax

Because the CAM is not bonded or cross-linked, we do not recommend solvent rinsing.

CAM

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	60 to 220/240	112-2112		112-2112LTM
	30	0.25	60 to 220/240	112-2132		112-2132LTM
		0.50	60 to 220/240	112-2133		112-2133LTM
	60	0.25	60 to 220/240	112-2162		
0.32	30	0.25	60 to 220/240	113-2132	113-2132E	113-2132LTM
		0.50	60 to 220/240	113-2133	113-2133E	113-2133LTM
0.53	30	1.00	60 to 200/220	115-2132		115-2132LTM

DX-1 and DX-4

- DX-1: 90% Dimethylpolysiloxane 10% Polyethylene Glycol
- DX-4: 15% Dimethylpolysiloxane 85% Polyethylene Glycol

Because DX series GC columns are not bonded and cross-linked, we do not recommend solvent rinsing.

DX-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	1.00	50 to 250/270	122-6133	
0.32	30	1.00	50 to 250/270	123-6133	123-6133LTM

DX-4

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	50 to 250/270	122-6432	122-6432LTM
	60	0.25	50 to 250/270	122-6462	
0.32	15	0.25	50 to 250/270	123-6412	123-6412LTM
	30	0.25	50 to 250/270	123-6432	123-6432LTM
	60	0.25	50 to 250/270	123-6462	

SE-30 and SE-54

- SE-30: 100% Dimethylpolysiloxane
- SE-54: (5%-Phenyl)(1%-Vinyl)-methylpolysiloxane

Because SE series GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

SE-30

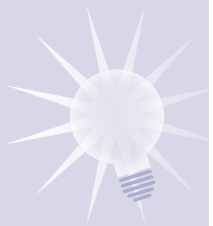
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	30	0.25	0 to 325/350	113-3032	113-3032LTM

SE-54

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	0 to 325/350	112-5432	112-5432LTM
	60	0.25	0 to 325/350	112-5462	
0.32	30	0.25	0 to 325/350	113-5432	113-5432LTM

Tips & Tools

Column contamination from sample matrix components is the number one cause of column failure. Use Agilent DuraGuard GC columns with built-in guard if you do not want to use column connectors.



Guard Columns

- DuraGuard and EZ-Guard columns with "built-in" guard columns, no press-fit connectors
- Minimize front-end contamination and increase column lifetime
- Aid in focusing sample onto the front of the column for better peak shape
- Minimize MSD contamination originating from the column (when used in transfer line)

Guard columns (or retention gaps) are often added to the front of the analytical column to protect against contamination, or to act as a band-focusing device for liquid samples introduced by on-column and splitless injection techniques.

When resolution or response in a chromatogram diminishes, remove a coil from the guard column so that peak shapes will improve. By removing a coil, the column length is shortened and peaks will elute somewhat faster. For best results, check the integration time windows of your data system.

DuraGuard

DuraGuard

Phase	ID (mm)	Length (m)	Film (µm)	Guard Length (m)	Part No.
DB-1	0.25	30	0.25	10	122-1032G
DB-XLB	0.25	30	0.25	10	122-1232G
DB-5ms	0.25	30	0.25	10	122-5532G
			0.50	10	122-5536G
			1.00	10	122-5533G
		60	0.25	10	122-5562G
	0.32	30	1.00	10	123-5533G
	0.53	30	0.50	10	125-5537G
DB-5.625	*0.18*	*20*	*0.36*	*5*	*121-5622G5*
	0.25	30	0.25	5	122-5631G5
DB-1701	0.53	30	1.00	10	125-0732G
DB-624	0.53	30	3.00	5	125-1334G5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

A special tab clearly distinguishes the EZ-Guard guard column section from the analytical column

EZ-Guard

EZ-Guard

Phase	ID (mm)	Length (m)	Film (µm)	Guard Length (m)	Part No.
VF-1ms	0.20	12	0.33	5	CP9023
	0.25	30	0.25	5	CP9010
			0.25	10	CP9011
VF-5ms	0.25	15	0.25	5	CP9021
		30	0.25	5	CP9012
			0.25	10	CP9013
			0.50	5	CP9014
			0.50	10	CP9015
		60	0.25	5	CP9016
	0.53	30	0.25	10	CP9020
VF-Xms	0.25	30	0.10	10	CP9022
			0.25	5	CP9018
			0.25	10	CP9019
VF-17ms	0.25	30	0.25	5	CP9024
			0.25	10	CP9025
VF-1701ms	0.25	30	0.25	5	CP9176
			0.25	10	CP9177
VF-35ms	0.25	30	0.25	5	CP9026
			0.25	10	CP9027

Agilent J&W LTM Column Modules

Shorten analytical cycle times and boost your high speed gas chromatography capabilities

Agilent J&W LTM column modules combine a high quality fused silica capillary column with heating and temperature sensing components for a low thermal mass column assembly. The LTM column module contains a patented design which heats and cools the column very efficiently for significantly shorter analytical cycle times compared to conventional air-bath GC oven techniques, while simultaneously using less power.

Agilent offers LTM technology for our popular 7890 and 6890 Series GC systems, as well as the new 5875T GC/MS. Compatible with Agilent LTM and LTM II series GC systems and retrofit upgrades.

All LTM column modules are packaged with:

- Two 1 m guard columns (one each for the inlet and detector) made from deactivated fused silica tubing of the same id as the analytical column
- Five non-reusable ferrules that fit the dimensions of the analytical and guard columns

Agilent J&W LTM Column Modules for 7890 and 6890 Series GC Systems

This groundbreaking column technology is designed specifically for Agilent 7890A and 6890 series gas chromatographs, and delivers:

- The capacity to run up to four column modules simultaneously – with four different temperature programs – to maximize your productivity
- Rapid temperature programming rates of up to 1800 °C/min for higher analysis speeds
- Faster cooling times – as low as one minute or less – to decrease idling and downtime
- Shorter analytical cycle times than conventional air-bath GC oven techniques
- Excellent retention time repeatability and performance – comparable to conventional GC

Most Agilent J&W Capillary GC columns – including Wall Coated Open Tubular (WCOT) and Porous Layer Open Tubular (PLOT) columns – can be used for LTM column modules.

Tips & Tools

Agilent LTM column module technology is compatible with metal capillary columns. However, LTM modules are generally not recommended for fast GC applications because of their poor cooling performance compared to fused silica capillaries.

Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

This groundbreaking column technology is designed specifically for Agilent 5975T GC/MS systems. These modules include an integrated 3 in LTM capillary column toroid assembly with heated transfer lines, cooling fan assembly and sheet metal enclosure. Replacement column toroid assemblies are also available. Benefits of the LTM column modules include:

- Rapid temperature programming rates of up to 1200 °C/min
- Faster heating and cooling times – as low as one minute or less – for more rapid analytical cycle times than standard air-bath GC oven techniques
- Excellent retention time repeatability and performance comparable to conventional GC
- Less power consumption for longer in-field operation
- Integrated module design to facilitate easy column module change in the field

For more information, **visit www.agilent.com/chem/LTMcol**

Tips & Tools

LTM column modules should never be programmed beyond the GC column temperature limits recommended by Agilent. For very fast ramping applications (e.g. 600 °C/min), limiting the maximum temperatures to 10-20 °C below the GC column temperature limits can increase the lifetime of the column modules.

Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

Phase	ID (mm)	Length (m)	Film (µm)	Toroid Assembly	Column Module
DB-5ms Ultra Inert	0.18	20	0.18	221-5522UILTM	G3900-63014
	0.25	15	0.25	222-5512UILTM	G3900-63031
		30	0.25	222-5532UILTM	G3900-63005
HP-5ms Ultra Inert	0.18	20	0.18	29091S-577UILTM	G3900-63039
	0.25	15	0.25	29091S-431UILTM	G3900-63038
		30	0.25	29091S-433UILTM	G3900-63001
DB-1	0.25	30	0.25	222-1032LTM	G3900-63002
DB-1ms	0.18	20	0.18	221-0122LTM	G3900-63009
	0.25	15	0.25	222-0112LTM	G3900-63016
		30	0.25	222-0132LTM	G3900-63017
DB-1ht	0.25	15	0.10	222-1111LTM	G3900-63018
		30	0.10	222-1131LTM	G3900-63019
HP-1ms	0.18	20	0.18	29091S-677LTM	G3900-63040
	0.25	30	0.10	29091S-833LTM	G3900-63041
		15	0.25	29091S-931LTM	G3900-63042
DB-5ms	0.18	20	0.18	221-5522LTM	G3900-63013
	0.25	15	0.25	222-5512LTM	G3900-63030
		30	0.25	222-5532LTM	G3900-63004
DB-5ht	0.25	15	0.10	222-5731LTM	G3900-63033
		30	0.10	222-5711LTM	G3900-63032

(Continued)

Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

Phase	ID (mm)	Length (m)	Film (µm)	Toroid Assembly	Column Module
HP-5ms	0.25	30	0.25	29091S-433LTM	G3900-63007
DB-35ms	0.18	20	0.18	221-3822LTM	G3900-63011
	0.25	15	0.25	222-3812LTM	G3900-63026
		30	0.25	222-3832LTM	G3900-63027
DB-17ms	0.18	20	0.18	221-4722LTM	G3900-63012
	0.25	15	0.25	222-4712LTM	G3900-63028
		30	0.25	222-4732LTM	G3900-63029
DB-225ms	0.25	15	0.25	222-2912LTM	G3900-63022
		30	0.25	222-2932LTM	G3900-63023
DB-1701	0.25	30	0.25	222-0732LTM	G3900-63003
DB-WAX	0.25	15	0.50	222-7013LTM	G3900-63034
		30	0.50	222-7033LTM	G3900-63035
HP-INNOWax	0.18	20	0.18	29091N-577LTM	G3900-63036
	0.25	30	0.25	29091N-133LTM	G3900-63008
DB-FFAP	0.25	15	0.25	222-3212LTM	G3900-63024
		30	0.25	222-3232LTM	G3900-63025
DB-608	0.18	20	0.18	221-6822LTM	G3900-63015
DB-VRX	0.18	20	1.00	221-1524LTM	G3900-63006
	0.25	30	1.40	222-1534LTM	G3900-63021
DB-624	0.18	20	1.00	221-1324LTM	G3900-63010
	0.25	30	1.40	222-1334LTM	G3900-63020
HP-VOC	0.20	30	1.12	29091R-303LTM	G3900-63037

Fused Silica Tubing

Deactivated Tubing

Deactivated tubing can be used as retention gaps, guard columns, or transfer lines. Our standard deactivation process is a phenyl methyl deactivation – the preferred choice for most applications due to its inertness and robustness.

Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.05	0.36	1	160-2655-1
		5	160-2655-5
		10	160-2655-10
0.10	0.19	1	160-1010-1
		5	160-1010-5
		10	160-1010-10
	0.36	1	160-2635-1
		5	160-2635-5
		5	19091-60620E
		10	160-2635-10
0.15	0.36	1	160-2625-1
		5	160-2625-5
		10	160-2625-10
0.18	0.34	1	160-2615-1
		5	160-2615-5
		10	160-2615-10

(Continued)

Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.20	0.36	1	160-2205-1
		5	160-2205-5
		10	160-2205-10
0.25	0.36	1	160-2255-1
		5	160-2255-5
		10	160-2255-10
		30	160-2255-30
0.32	0.43	1	160-2325-1
		5	160-2325-5
		10	160-2325-10
		30	160-2325-30
0.45	0.67	1	160-2455-1
		5	160-2455-5
		10	160-2455-10
0.53	0.67	1	160-2535-1
		5	160-2535-5
		10	160-2535-10
		30	160-2535-30

Deactivated Fused Silica High Temperature (400 °C)

ID (mm)	OD (mm)	Length (m)	Part No.
0.05	0.36	5	160-2815-5
0.10	0.36	5	160-2825-5
0.25	0.35	5	160-2845-5
		10	160-2845-10
0.32	0.43	5	160-2855-5
		10	160-2855-10
0.53	0.67	5	160-2865-5
		10	160-2865-10

ProSteel Deactivated Fused Silica

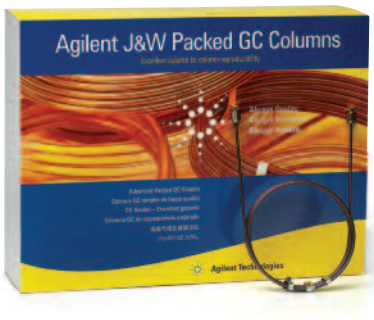
ID (mm)	OD (mm)	Length (m)	Part No.
0.53	0.67	5	160-4535-5

Undeactivated Fused Silica

Undeactivated tubing or bare fused silica is commonly used for capillary electrophoresis. It can also be used for transfer lines and other applications where inertness is not critical.

Undeactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.02	0.36	5	160-2660-5
0.05	0.36	5	160-2650-5
		10	160-2650-10
0.075	0.36	5	160-2644-5
		10	160-2644-10
0.10	0.36	5	160-2634-5
		10	160-2634-10
0.18	0.34	5	160-2610-5
		10	160-2610-10
0.20	0.36	5	160-2200-5
		10	160-2200-10
		50	19091-20050
0.25	0.36	5	160-2250-5
		10	160-2250-10
0.32	0.43	5	160-2320-5
		10	160-2320-10
		50	19091-21050
0.45	0.67	5	160-2450-5
		10	160-2450-10
0.53	0.67	5	160-2530-5
		10	160-2530-10

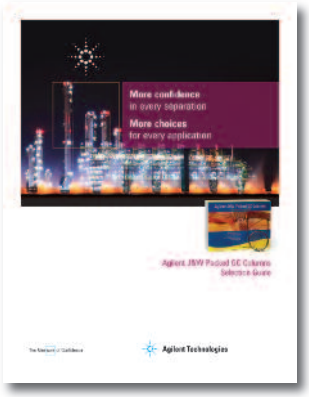


Agilent J&W Packed GC Columns

Agilent J&W Packed GC Columns are designed and manufactured to offer excellent and reproducible performance for all sample types associated with packed column separations, most important in the hydrocarbon processing industry.

The highly efficient and rigorous packing technology used in Agilent J&W Packed GC Columns assures column-to-column reproducibility and ultimate efficiency, while the UltiMetal treated stainless steel tubing allows for improved inertness and peak shape performance.

You can choose from a wide range of tubing materials – including stainless steel, UltiMetal, nickel, glass, copper and PTFE – plus hundreds of stationary phases, packings, and supports. Please see the Agilent J&W Packed GC Column Selection Guide for the complete listing of our part numbers, as well as product diagrams, descriptions and specific instructions for ordering your own custom packed GC column configuration.



You can find the Agilent J&W Packed GC Column Selection Guide at **www.agilent.com/chem/packedcolumns**

And, you can create your custom configurations by visiting **www.agilent.com/chem/packedcolumnsordering**

Custom GC Column Ordering

Even though we offer over a thousand readily available columns, Agilent recognizes that sometimes you need something a little out of the ordinary. That's why we developed our Custom Column Shop. If you can't find what you're looking for in our standard order guides, we will design, build, and test capillary GC columns to meet your needs.

- We can create columns with non-standard lengths or unusual film thickness.
- We can connect columns together in series or as dual columns.
- We recognize that sometimes customers have specific column performance requirements for their applications that might not be met with standard test mixes. As a result, we can also custom-test your columns with your desired test mixture and test conditions to meet specific performance requirements.
- We can create DuraGuard or EZ-Guard columns with an integrated guard column (retention gap). Most phases can be manufactured with a built-in guard column, which means you get the advantages of a guard column without the union. Available in DB, CP and VF phases.

Custom columns are ordered using the P/Ns below. Be sure to provide the details of your desired custom service or column including phase, length, id, and film thickness.

- 100-2000 Custom Capillary DB & HP columns
- 100-6000 Custom Capillary CP & VF columns
- 100-9000 UltiMetal treated tubing and parts
- 100-2000 LTM – Custom Low Thermal Mass column configurations
- 100-5000 Custom packed columns or bulk phases/supports

Contact your local Agilent office or Authorized Agilent Distributor to receive a quote for your custom column needs. You can find order forms in the back of *Agilent's Essential Chromatography Catalog*.

Customers in the United States, Canada, and Puerto Rico can request a custom column quote online at **www.agilent.com/chem/CustomColumn**

Agilent J&W GC Column Test Standards

Compare your column's performance to the test chromatogram shipped with your Agilent J&W column. The column test standard contains components that test the column for resolution characteristics, efficiency, and inertness. The test mixes are supplied at a concentration of 250 ng/µL in 2 mL vials. Match the phase and column diameter in the chart below to find the test mix for your column.

Agilent J&W GC Column Test Standards

Column Description	Microbore (0.05 & 0.10 mm ID) Part No.	Capillary (0.18 & 0.32 mm ID) Part No.	Megabore (0.45 & 0.53 mm ID) Part No.
OV-351		200-0032	
DB-1ht		200-0010	
DB-1	200-0010	200-0310	200-0110
DB-5	200-0010	200-0310	200-0110
DB-5ht		200-0010	
DB-5ms		200-0185	200-0185
DB-624		200-0113	200-0113
DB-2887			200-0110
DB-WAX	200-0070	200-0370	200-0070
DB-WAXetr		200-0370	200-0070
SE-30		200-0010	
SE-52		200-0010	
SE-54		200-0010	200-0010
HP-1		5080-8858	8500-6812
HP-5		5080-8858	8500-6812
HP-FFAP	8500-6813	8500-6813	8500-6813
GS-OxyPLOT			5188-5379

Test Standards for Agilent J&W CP and VF Columns

Test Mix 31 Hazardous, 1/pk	Part No.
VF-1ms	CP0031
VF-5ms	CP0031
VF-17ms	CP0031
VF-35ms	CP0031
VF-Xms	CP0031
VF-1301ms	CP0031
VF-200ms	CP0031
VF Rapid-MS	CP0031
CP-Sil 5 CB	CP0031
CP-Sil 8 CB	CP0031
CP-Sil 24 CB	CP0031
CP-1301	CP0031
Test Mix 5, 1/pk	**Part No.**
CP-Sil 43 CB	CP0005

Tips & Tools

Ensure highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at **www.agilent.com/chem/gasclean**

COLUMN INSTALLATION AND TROUBLESHOOTING

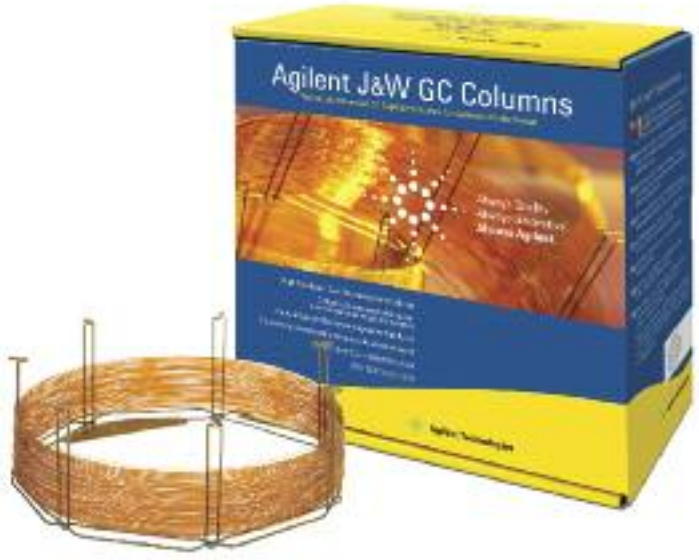
Quick reference guides and tips to ensure peak performance

Agilent J&W GC columns are backed by decades of chromatography experience, so you can count on superior quality and dependability. And you can help ensure maximum performance, efficiency, and column life by implementing the most current installation and troubleshooting procedures.

In this section, you'll discover tips, techniques, and easy-reference guides that will help you:

- Confidently install any capillary column
- Condition and test new columns
- Alleviate and avoid column performance degradation due to thermal damage, oxygen damage, and other factors
- Pinpoint and fix the most common column problems

So you'll expand your hours of continuous operation, decrease downtime, and get the reproducible results that your lab demands.



Capillary Column Installation Quick Reference Guide

For more detailed installation information, refer to the *GC Column Installation Guide* which is provided with your column, or visit **www.agilent.com/chem/columninstall**

Precolumn Installation Check List

1. Replace oxygen, moisture, and hydrocarbon traps as needed.
2. Clean the injection port, replace critical injection port seals, replace injection port liners, and change septa as needed.
3. Check detector seals, and replace as necessary. Clean or replace detector jets as necessary.
4. Carefully inspect the column for damage or breakage.
5. Check your GC manufacturer's gas pressure requirements and verify gas cylinder delivery pressures to ensure that an adequate supply of carrier, makeup, and fuel gases are available. Minimum recommended carrier gas purity percentages are: Helium 99.995% and Hydrogen 99.995%, with $H_20 < 1$ppm and $O_2 < 0.5$ppm.
6. Gather the necessary installation tools: You will need a column cutter, column nuts, column nut wrench, ferrules, a magnifying loupe, and typewriter correction fluid.

Table 6:

Ferrule Sizes

Column ID	Ferrule ID (mm)
0.10	0.4
0.18	0.4
0.20	0.4
0.25	0.4
0.32	0.5
0.45	0.8
0.53	0.8

Installing the Column

1. Uncoil approximately 0.5 m of tubing (1 coil ~ 0.5 m) from the column basket at both ends of the column for injector and detector installation. Avoid using sharp bends in the tubing.
2. Mount the column in the oven. Use a handling bracket if available.
3. Install the column nut and Graphite/Vespel or Graphite ferrule at each column end; pull the nut and ferrule down the tubing approximately 15 cm. (**Table 6**)
4. Score (scratch) the column. Use a light touch to score the column about 4 to 5 cm from each end.

5. Make a clean break. Grasp the column between the thumb and forefinger as close to the score point as possible. Gently pull and bend the column. The column should part easily. If the column does not break easily, do not force it. Score the column again in a different place (farther from the end than before) and try again for a clean break.
6. Use a magnifying loupe to inspect the cut. Make sure the cut is square across the tubing with no polyimide or "glass" fragments at the end of the tube.
7. Install the column in the inlet. Check the GC manufacturer's instrument manual for the correct insertion distance in the injection port type being used. Slide the column nut and ferrule to the proper distance and then mark the correct distance on the column with typewriter correction fluid just behind the column nut. Allow the fluid to dry. Insert the column into the injector. Finger tighten the column nut until it starts to grab the column, and then tighten the nut an additional 1/4 to 1/2 turn, so that the column cannot be pulled from the fitting when gentle pressure is applied. Verify that the correct column insertion distance has been maintained by looking at the typewriter correction fluid mark.
8. Turn on the carrier gas and establish the proper flow rate. Set head pressure, split flow, and septum purge flow to appropriate levels. See **Table 7** for nominal head pressures. If fusing a split/splitless inlet, check that the purge (split) valve is "on" (open).
9. Confirm carrier gas flow through the column. Immerse the end of the column in a vial of solvent and check for bubbles.
10. Install the column into the detector. Check the instrument manufacturer's manual for the proper insertion distance.
11. Check for leaks. **This is very important**. Do not heat the column without thoroughly checking for leaks.
12. Establish proper injector and detector temperatures.
13. Establish proper makeup and detector gas flows. Ignite or turn "on" the detector.
14. Purge the column for a minimum of 10 min at ambient temperature. Add the appropriate additional purge time following inlet or trap maintenance.
15. Inject non-retained substance to check for proper injector installation. Examples: butane or methane (FID), headspace vapors from Acetonitrile (NPD), headspace vapors from methylene chloride (ECD), air (TCD), argon (mass spectrometer). Proper installation is indicated by a symmetrical non-retained peak. If tailing is observed, reinstall the column into the inlet.

Tips & Tools

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Conditioning and Testing the Column

1. Set oven temperature 20 °C above the maximum temperature of the analysis or at the maximum temperature of the column (whichever is lower) for 2 hours. If after 10 min at the upper temperature the background does not begin to fall, immediately cool the column and check for leaks.
2. If you are using Vespel or Graphite/Vespel ferrules, recheck column nut tightness after the conditioning process.
3. Confirm final proper average linear velocity by injecting a non-retained substance again.

Table 7:

Approximate Head Pressures (psig)						
	Column ID (mm)					
Column Length (m)	**0.18**	**0.2**	**0.25**	**0.32**	**0.45**	**0.53**
10	5-10					
12		10-15				
15			8-12	5-10		1-2
20	10-20					
25		20-30				
30			15-25	10-20	3-5	2-4
40	20-40					
50		40-60				
60			30-45	20-30	6-10	4-8
75					8-14	5-10
105						7-15

Causes of Column Performance Degradation

Column Breakage

Fused silica columns break wherever there is a weak point in the polymide coating. The polymide coating protects the fragile but flexible fused silica tubing. The continuous heating and cooling of the oven, vibrations caused by the oven fan, and being wound on a circular cage all place stress on the tubing. Eventually breakage occurs at a weak point. Weak spots are created where the polymide coating is scratched or abraded. This usually occurs when a sharp point or edge is dragged over the tubing. Column hangers and tags, metal edges in the GC oven, column cutters, and miscellaneous items on the lab bench are just some of the common sources of sharp edges or points.

It is rare for a column to spontaneously break. Column manufacturing practices tend to expose any weak tubing and eliminate it from use in finished columns. Larger diameter columns are more prone to breakage. This means that greater care and prevention against breakage must be taken with 0.45-0.53 mm id tubing than with 0.18-0.32 mm id tubing.

A broken column is not always fatal. If a broken column was maintained at a high temperature either continuously or with multiple temperature program runs, damage to the column is very likely. The back half of the broken column has been exposed to oxygen at elevated temperatures which rapidly damages the stationary phase. The front half is fine since carrier gas flowed through this length of column. If a broken column has not been heated or only exposed to high temperatures or oxygen for a very short time, the back half has probably not suffered any significant damage.

A union can be installed to repair a broken column. Any suitable union will work to rejoin the column. Problems with dead volume (peak tailing) may occur with improperly installed unions.

Thermal Damage

Exceeding a column's upper temperature limit results in accelerated degradation of the stationary phase and tubing surface. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). Fortunately, thermal damage is a slower process, thus prolonged times above the temperature limit are required before significant damage occurs. Thermal damage is greatly accelerated in the presence of oxygen. Overheating a column with a leak or high oxygen levels in the carrier gas results in rapid and permanent column damage.

Setting the GC's maximum oven temperature at or only a few degrees above the column's temperature limit is the best method to prevent thermal damage. This prevents the accidental overheating of the column. If a column is thermally damaged, it may still be functional. Remove the column from the detector. Heat the column for 8-16 hours at its isothermal temperature limit. Remove 10-15 cm from the detector end of the column. Reinstall the column and condition as usual. The column usually does not return to its original performance; however, it is often still functional. The life of the column will be reduced after thermal damage.

Oxygen Damage

Oxygen is an enemy to most capillary GC columns. While no column damage occurs at or near ambient temperatures, severe damage occurs as the column temperature increases. In general, the temperature and oxygen concentration at which significant damage occurs is lower for polar stationary phases. It is constant exposure to oxygen that is the problem. Momentary exposure such as an injection of air or a very short duration septum nut removal is not a problem.

A leak in the carrier gas flow path (e.g., gas lines, fittings, injector) is the most common source of oxygen exposure. As the column is heated, very rapid degradation of the stationary phase occurs. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). These are the same symptoms as for thermal damage. Unfortunately, by the time oxygen damage is discovered, significant column damage has already occurred. In less severe cases, the column may still be functional but at a reduced performance level. In more severe cases, the column is irreversibly damaged.

Maintaining an oxygen and leak-free system is the best prevention against oxygen damage. Good GC system maintenance includes periodic leak checks of the gas lines and regulators, regular septa changes, using high quality carrier gases, installing and changing oxygen traps, and changing gas cylinders before they are completely empty.

Chemical Damage

There are relatively few compounds that damage stationary phases. Introducing nonvolatile compounds (e.g., salts) in a column often degrades performance, but damage to the stationary phase does not occur. These residues can often be removed and performance returned by solvent rinsing the column.

Inorganic or mineral bases and acids are the primary compounds to avoid introducing into a column. The acids include hydrochloric (HCl), sulfuric (H_2S0_4), nitric (HNO_3), phosphoric (H_3PO_4), and chromic (CrO_3). The bases include potassium hydroxide (KOH), sodium hydroxide (NaOH), and ammonium hydroxide (NH_4OH). Most of these acids and bases are not very volatile and accumulate at the front of the column. If allowed to remain, the acids or bases damage the stationary phase. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). The symptoms are very similar to thermal and oxygen damage. Hydrochloric acid and ammonium hydroxide are the least harmful of the group. Both tend to follow any water that is present in the sample. If the water is not or only poorly retained by the column, the residence time of the HCl and NH_4OH in the column is short. This tends to eliminate or minimize any damage by these compounds. Thus, if HCl or NH_4OH are present in a sample, using conditions or a column with no water retention will render these compounds relatively harmless to the column.

The only organic compounds that have been reported to damage stationary phases are perfluoroacids. Examples include trifluoroacetic, pentafluoropropanoic, and heptafluorobutyric acid. They need to be present at high levels (e.g., 1% or higher). Most of the problems are experienced with splitless or Megabore direct injections where large volumes of the sample are deposited at the front of the column.

Since chemical damage is usually limited to the front of the column, trimming or cutting 0.5-1 meter from the front of the column often eliminates any chromatographic problems. In more severe cases, five or more meters may need to be removed. The use of a guard column or retention gap will minimize the amount of column damage; however, frequent trimming of the guard column may be necessary. The acid or base often damages the surface of the deactivated fused silica tubing which leads to peak shape problems for active compounds.

Tips & Tools

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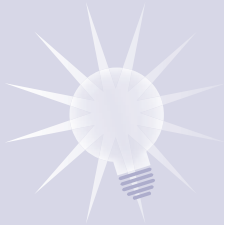
Tips & Tools

Column contamination from sample matrix components is the number one cause of column failure. Use Agilent DuraGuard GC columns with built-in guard if you do not want to use column connectors.



Column Contamination

Column contamination is one of the most common problems encountered in capillary GC. Unfortunately, it mimics a very wide variety of problems and is often misdiagnosed as another problem. A contaminated column is usually not damaged, but it may be rendered useless.

There are two basic types of contaminants: nonvolatile and semivolatile. Nonvolatile contaminants or residues do not elute and accumulate in the column. The column becomes coated with these residues which interfere with the proper partitioning of solutes in and out of the stationary phase. Also, the residues may interact with active solutes resulting in peak adsorption problems (evident as peak tailing or loss of peak size). Active solutes are those containing a hydroxyl (-OH) or amine (-NH) group, and some thiols (-SH) and aldehydes. Semivolatile contaminants or residues accumulate in the column, but eventually elute. Hours to days may elapse before they completely leave the column. Like nonvolatile residues, they may cause peak shape and size problems, and, in addition, are usually responsible for many baseline problems (instability, wander, drift, ghost peaks, etc.).

Contaminants originate from a number of sources, with injected samples being the most common. Extracted samples are among the worst types. Biological fluids and tissues, soils, waste and ground water, and similar types of matrices contain high amounts of semivolatile and nonvolatile materials. Even with careful and thorough extraction procedures, small amounts of these materials are present in the injected sample. Several to hundreds of injections may be necessary before the accumulated residues cause problems. Injection techniques such as on-column, splitless, and Megabore direct place a large amount of sample into the column, thus column contamination is more common with these injection techniques.

Occasionally, contaminants originate from materials in gas lines and traps, ferrule and septa particles, or anything coming in contact with the sample (vials, solvents, syringes, pipettes, etc.). These types of contaminants are probably responsible when a contamination problem suddenly develops and similar samples in previous months or years did not cause any problems.

Minimizing the amount of semivolatile and nonvolatile sample residues is the best method to reduce contamination problems. Unfortunately, the presence and identity of potential contaminants are often unknown. Rigorous and thorough sample cleanup is the best protection against contamination problems. The use of a guard column or retention gap often reduces the severity or delays the onset of column contamination induced problems. If a column becomes contaminated, it is best to solvent rinse the column to remove the contaminants.

Maintaining a contaminated column at high temperatures for long periods of time (often called baking-out a column) is not recommended. Baking-out a column may convert some of the contaminating residues into insoluble materials that cannot be solvent rinsed from the column. If this occurs, the column cannot be salvaged in most cases. Sometimes the column can be cut in half and the back half may still be useable. Baking-out a column should be limited to 1-2 hours at the isothermal temperature limit of the column.

Column rinse kit, 430-3000

Solvent Rinsing Columns

Solvent rinsing columns involves removing the column from the GC and passing milliliters of solvent through the column. Any residues soluble in the rinse solvents are washed from the column. Injecting large volumes of solvent while the column is still installed is not rinsing and doing so will not remove any contaminants from the column. **A capillary GC column must have a bonded and cross-linked stationary phase before it can be solvent rinsed**. Solvent rinsing a non-bonded stationary phase results in severe damage to the column.

A column rinse kit is used to force solvent through the column (see picture). The rinse kit is attached to a pressurized gas source (N_2 or He), and the column is inserted into the rinse kit. Solvent is added to the vial, and the vial is pressurized using the gas source. The pressure forces solvent to flow through the column. Residues dissolve into the solvent and are backflushed out of the column with the solvent. The solvent is then purged from the column, and the column is properly conditioned.

Before rinsing a column, cut about 0.5 meter from the front (i.e., injector end) of the column. Insert the detector end of the column into the rinse kit. Multiple solvents are normally used to rinse columns. Each successive solvent must be miscible with the previous one. High boiling point solvents should be avoided especially as the last solvent. The sample matrix solvent(s) is often a good choice.

Methanol, methylene chloride and hexane are recommended and work very well for the majority of cases. Acetone can be substituted for methylene chloride to avoid using halogenated solvents; however, methylene chloride is one of the best rinsing solvents. If aqueous based samples (e.g., biological fluids and tissues) were injected, use water before the methanol. Some residues originating from aqueous based samples are only soluble in water and not organic solvents. Water and alcohols (e.g., methanol, ethanol, isopropanol) should be used to rinse bonded polyethylene glycol based stationary phases (e.g., DB-WAX, DB-WAXetr, DB-FFAP, HP-Innowax) **only as a last resort**.

Table 8:

Solvent Volumes for Rinsing Columns

Column ID (mm)	Solvent Volume (mL)
0.18-0.2	3-4
0.25	4-5
0.32	6-7
0.45	7-8
0.53	10-12

Using larger volumes will not damage the column

Table 8 lists the suggested solvent volumes for different diameter columns. Using larger solvent volumes is not harmful, but rarely better and merely wasteful. After adding the first solvent, pressurize the rinse kit, but stay below 20 psi. Use the highest pressure that keeps the solvent flow rate below 1 mL/min. Except for most 0.53 mm id columns, the rinse kit pressure will reach 20 psi before the flow rate reaches 1 mL/min. Longer rinse times are required when using heavy or viscous solvents, and for longer or smaller diameter columns. When all or most of the first solvent has entered the column, add the next solvent. The previous solvent does not have to vacate the column before the next solvent is started through the column.

After the last solvent has left the column, allow the pressurizing gas to flow through the column for 5-10 min. Install the column in the injector and turn on the carrier gas. Allow the carrier gas to flow through the column for 5-10 min. Attach the column to the detector (or leave it unattached if preferred). Using a temperature program starting at 40-50 °C, heat the column at 2-3 °/min until the upper temperature limit is reached. Maintain this temperature for 1-4 hours until the column is fully conditioned.

Column Storage

Capillary columns should be stored in their original box when removed from the GC. Place a GC septa over the ends to prevent debris from entering the tubing. Upon reinstallation of the column, the column ends need to be trimmed by 2-4 cm to ensure that a small piece of septa is not lodged in the column.

If a column is left in a heated GC, there should always be carrier gas flow. The carrier gas flow can be turned off only if the oven, injector, detector and transfer lines are turned off (i.e., not heated). Without carrier gas flow, damage to the heated portion of the column occurs.

Evaluating the Problem

The first step in any troubleshooting effort is to step back and evaluate the situation. Rushing to solve the problem often results in a critical piece of important information being overlooked or neglected. In addition to the problem, look for any other changes or differences in the chromatogram. Many problems are accompanied by other symptoms. Retention time shifts, altered baseline noise or drift, or peak shape changes are only a few of the other clues that often point to or narrow the list of possible causes. Finally, make note of any changes or differences involving the sample. Solvents, vials, pipettes, storage conditions, sample age, extraction, preparation techniques, or any other factor influencing the sample environment can be responsible.

Checking the Obvious

A surprising number of problems involve fairly simple and often overlooked components of the GC system or analysis. Many of these items are transparent in the daily operation of the GC and are often taken for granted ("set it and forget it"). The areas and items to check include:

- Gases: pressures, carrier gas average linear velocity, and flow rates (detector, split vent, septum purge)
- Temperatures: column, injector, detector, and transfer lines
- System parameters: purge activation times, detector attenuation and range, mass ranges, etc.
- Gas lines and traps: cleanliness, leaks, and expiration
- Injector consumables: septa, liners, O-rings, and ferrules
- Sample integrity: concentration, degradation, solvent, and storage
- Syringes: handling technique, leaks, needle sharpness, and cleanliness
- Data system: settings and connections

The Most Common Problems

Ghost Peaks or Carryover

System contamination is responsible for most ghost peaks or carryover problems. If the extra ghost peaks are similar in width to the sample peaks (with similar retention times), the contaminants were likely introduced into the column at the same time as the sample. The extra compounds may be present in the injector (i.e., contamination) or in the sample itself. Impurities in solvents, vials, caps and syringes are only some of the possible sources. Injecting sample and solvent blanks may help to find possible sources of the contaminants. If the ghost peaks are much broader than the sample peaks, the contaminants were most likely already in the column when the injection was made. These compounds were still in the column when a previous GC run was terminated. They elute during a later run and are often very broad. Sometimes numerous ghost peaks from multiple injections overlap and elute as a hump or blob. This often takes on the appearance of baseline drift or wander.

Increasing the final temperature or time in the temperature program is one method to minimize or eliminate a ghost peak problem. Alternatively, a short bake-out after each run or series of runs may remove the highly retained compounds from the column before they cause a problem.

Condensation Test

Use this test whenever injector or carrier gas contamination problems are suspected (e.g., ghost peaks or erratic baseline).

1. Leave the GC at 40-50 °C for 8 or more hours.
2. Run a blank analysis (i.e., start the GC, but with no injection) using the normal temperature conditions and instrument settings.
3. Collect the chromatogram for this blank run.
4. Immediately repeat the blank run as soon as the first one is completed. Do not allow more than 5 min to elapse before starting the second blank run.
5. Collect the chromatogram for the second blank run and compare it to the first chromatogram.
6. If the second chromatogram contains a substantially larger amount of peaks and baseline instability, the incoming carrier gas line or the carrier gas is contaminated.
7. If the second chromatogram contains few peaks or very little baseline drift, the carrier gas and incoming carrier gas lines are relatively clean.

Troubleshooting Guides

Excessive Baseline Noise		
Possible Cause	**Solution**	**Comments**
Injector contamination	Clean the injector; replace liner, gold seal	Try a condensation test; gas lines may also need cleaning
Column contamination	Bake-out the column	Limit the bake-out to 1-2 hours
	Solvent rinse the column	Only for bonded and cross-linked phases
		Check for inlet contamination
Detector contamination	Clean the detector	Usually the noise increases over time and not suddenly
Contaminated or low quality gases	Use better grade gases; also check for expired gas traps or leaks	Usually occurs after changing a gas cylinder
Column inserted too far into the detector	Reinstall the column	Consult GC manual for proper insertion distance
Incorrect detector gas flow rates	Adjust the flow rates to the recommended values	Consult GC manual for proper flow rates
Leak when using an MS, ECD, or TCD	Find and eliminate the leak	Usually at the column fittings or injector
Old detector filament, lamp or electron multiplier	Replace appropriate part	
Septum degradation	Replace septum	For high temperature applications use an appropriate septum

Baseline Instability or Disturbances		
Possible Cause	**Solution**	**Comments**
Injector contamination	Clean the injector	Try a condensation test; gas lines may also need cleaning
Column contamination	Bake-out the column	Limit a bake-out to 1-2 hours
Unequilibrated detector	Allow the detector to stabilize	Some detectors may require up to 24 hours to fully stabilize
Incompletely conditioned column	Fully condition the column	More critical for trace level analyses
Change in carrier gas flow rate during the temperature program	Normal in many cases	MS, TCD and ECD respond to changes in carrier gas flow rate

Tailing Peaks

Possible Cause	Solution	Comments
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
		Check for inlet contamination
Column activity	Irreversible; Replace the column	Only affects active compounds
Solvent-phase polarity mismatch	Change sample solvent to a single solvent	More tailing for the early eluting peaks or those closest to the solvent front
	Use a retention gap	3-5 m retention gap is sufficient
Solvent effect violation for splitless or on-column injections	Decrease the initial column temperature	Peak tailing decreases with retention
Too low of a split ratio	Increase the split ratio	Flow from split vent should be 20 mL/min or higher
Poor column installation	Reinstall the column	More tailing for early eluting peaks
Some active compounds always tail	None	Most common for amines and carboxylic acids

Split Peaks

Possible Cause	Solution	Comments
Injection technique	Change technique	Usually related to erratic plunger depression or having sample in the syringe needle; Use an auto injector
Mixed sample solvent	Change sample solvent to a single solvent	Worse for solvents with large differences in polarity or boiling points
Poor column installation	Reinstall the column	Usually a large error in the insertion distance
Sample degradation in the injector	Reduce the injector temperature	Peak broadening or tailing may occur if the temperature is too low
	Change to an on-column injection	Requires an on-column injector
Poor sample focusing	Use a retention gap	For splitless and on-column injection

Tips & Tools

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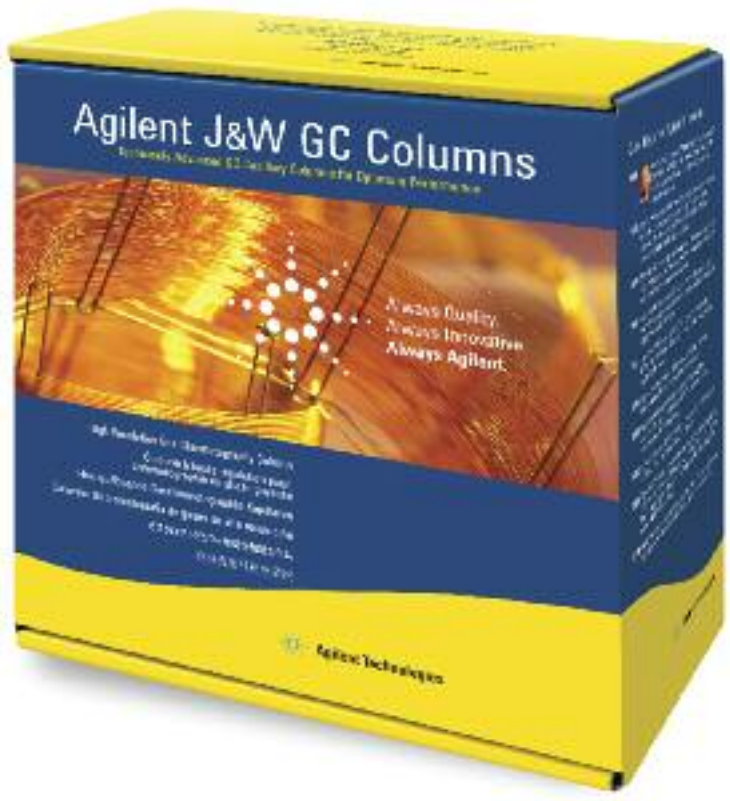
Retention Time Shift		
Possible Cause	**Solution**	**Comments**
Change in carrier gas velocity	Check the carrier gas velocity	All peaks will shift in the same direction by approximately the same amount
Change in column temperature	Check the column temperature	Not all peaks will shift by the same amount
Change in column dimension	Verify column identity	
Large change in compound concentration	Try a different sample concentration	May also affect adjacent peaks; Sample overloading is corrected with an increase in split ratio or sample dilution
Leak in the injector	Leak check the injector	A change in peak size usually occurs
Blockage in a gas line	Clean or replace the plugged line	More common for the split line; also check flow controllers and solenoids
Septum leak	Replace septum	Check for needle barb
Sample solvent incompatibility	Change sample solvent to a single solvent Use a retention gap	For splitless injection



Change in Peak Size		
Possible Cause	**Solution**	**Comments**
Change in detector response	Check gas flows, temperatures and settings	All peaks may not be equally affected
	Check background level or noise	May be caused by system contamination and not the detector
Change in the split ratio	Check split ratio	All peaks may not be equally affected
Change in the purge activation time	Check the purge activation line	For splitless injection
Change in injection volume	Check the injection technique	Injection volumes are not linear
Change in sample concentration	Check and verify sample concentration	Changes may also be caused by degradation, evaporation, or variances in sample temperature or pH
Leak in the syringe	Use a different syringe	Sample leaks past the plunger or around the needle; Leaks are not often readily visible
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Column activity	Irreversible	Only affects active compounds
Coelution	Change column temperature or stationary phase	Decrease column temperature and check for the appearance of a peak shoulder or tail
Change in injector discrimination	Maintain the same injector parameters	Most severe for split injections
Sample flashback	Inject less, use a larger liner, reduce the inlet temperature	Less solvent and higher flow rates are most helpful
Decomposition from inlet contamination	Clean the injector; replace liner, gold seal	Only use deactivated liners and glass wool in the inlet

Loss of Resolution

Possible Cause	Solution	Comments
Decrease in separation		
Different column temperature	Check the column temperature	Differences in other peaks will be visible
Different column dimensions or phase	Verify column identity	Differences in other peaks will be visible
Coelution with another peak	Change column temperature	Decrease column temperature and check for the appearance of a peak shoulder or tail
Increase in peak width		
Change in carrier gas velocity	Check the carrier gas velocity	A change in the retention time also occurs
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Change in the injector	Check the injector settings	Typical areas: split ratio, liner, temperature, injection volume
Change in sample concentration	Try a different sample concentration	Peak widths increase at higher concentrations
Improper solvent effect, lack of focusing	Lower oven temperature, better solvent, sample phase polarity match, use a retention gap	For splitless injection

GC APPLICATIONS

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Energy and Fuels – here you'll find applications – such as the analysis of sulfur compounds in propylene – that you can use right away to meet regulatory requirements, improve efficiency, and maintain good environmental stewardship. *Turn to page 246.*

Food, Flavors, and Fragrances – we'll discuss how to ensure quality, safety, and regulatory compliance for fragrances, perfumes, and essential oils. Applications focus on chiral compounds, menthol, and FAMEs. *Turn to page 250.*

Industrial Chemicals – we'll help you maintain product quality – and production efficiency – by sharing the latest applications for alcohols, halogenated hydrocarbons, aromatic solvents, phenols, and inorganic gases. *Turn to page 258.*

Life Sciences – we'll bring you fully up-to-date on the newest screening methods for controlled substances such as amphetamines, narcotics, and alcohol. We'll also review the latest techniques for monitoring residual solvents. *Turn to page 261.*

Tips & Tools

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Environmental Applications

Agilent's Ultra Inert Test Probe Mixture

Column: **DB-5MS Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen, constant pressure, 38 cm/s

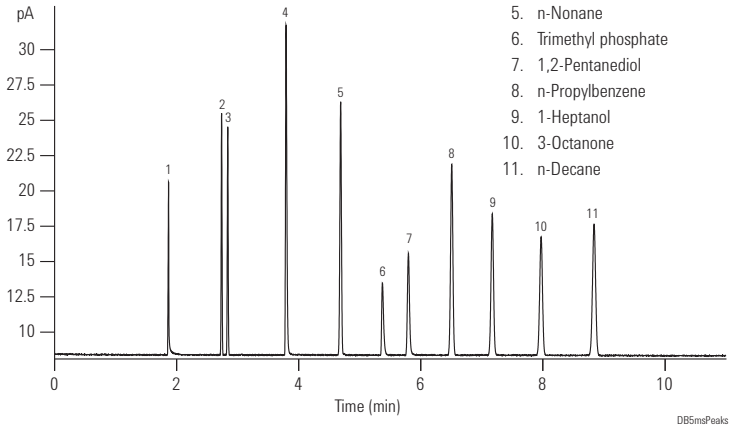
Oven: 65 °C isothermal

Sampler: Agilent 7683B, 0.5 µL syringe (P/N 5188-5246), 0.02 µL split injection

Injection: Split/splitless; 250 °C, 1.4 mL/min; split column flow 900 mL/min; gas saver flow 75 mL/min at 2.0 min

Detector: FID at 325 °C; 450 mL/min air, 40 mL/min hydrogen, 45 mL/min nitrogen makeup

A properly deactivated DB-5ms Ultra Inert column delivers symmetrical peak shapes, along with increased peak heights, which allow for accurate integration and detection of trace analytes.



1. 1-Propionic acid
2. 1-Octene
3. n-Octane
4. 4-Picoline
5. n-Nonane
6. Trimethyl phosphate
7. 1,2-Pentanediol
8. n-Propylbenzene
9. 1-Heptanol
10. 3-Octanone
11. n-Decane

US EPA Method 8270 Short Mix

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

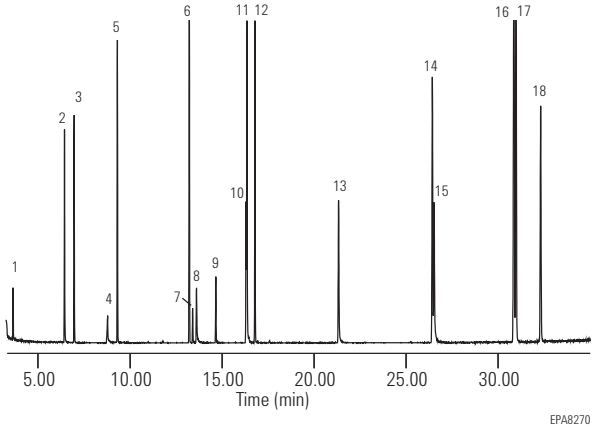
Carrier: Helium constant flow 30 cm/s

Oven: 40 °C (1 min) to 100 °C (15 °C/min), 10 °C to 210 °C (1 min), 5 °C/min to 310 °C (8 min)

Injection: Split/splitless; 260 °C, 53.7 mL/min total flow, purge flow 50 mL/min on at 0.5 min, gas saver flow 80 mL/min on at 3.0 min

Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 290 °C, full scan m/z 50-550

Sample: 1.0 µL splitless injection, 5 ng each component on-column



1. N-nitrosodimethylamine
2. Aniline
3. 1,4 dichoronezene-D4
4. 1,4 dichlorobenzene
5. Naphthalene-D8
6. Acenapthene-D10
7. 2,4-dinitrophenol
8. 4-nitrophenol
9. 2-methyl-4,6-dinitrophenol
10. Pentachlorophenol
11. 4-aminobiphenyl
12. Phenanthrene- D10
13. Benzidine
14. Chrysene-D12
15. 3,3'-dichlorobenzidine
16. Benzo [b] fluoranthene
17. Benzo [k] fluoranthene
18. Perylene-D12

Suggested Supplies

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: Autosampler syringe, 0.5 µL, 23g, cone, 5188-5246

Semivolatile analysis using methods similar to US EPA Method 8270 is becoming increasingly important in environmental laboratories worldwide. Acidic compounds such as benzoic acid or 2,4-dinitrophenol – along with strong bases such as pyridine or benzidine – are examples of active species found in the semivolatile sample set. This DB-5ms Ultra Inert column demonstrates excellent inertness performance for these difficult analytes.

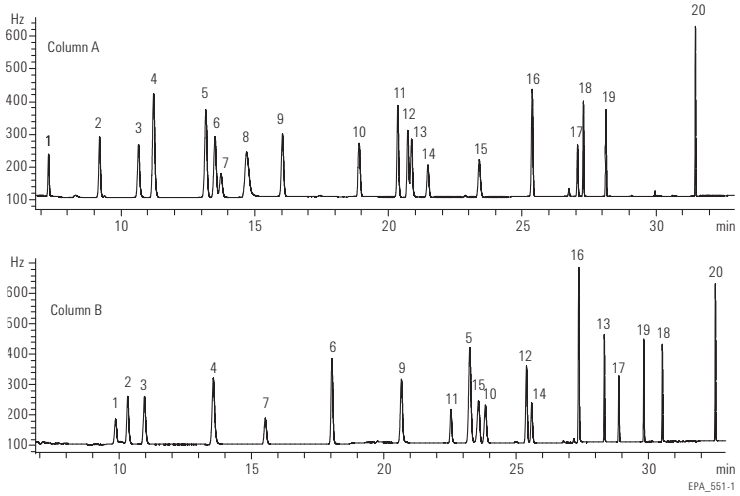
US EPA Method 551.1

Column A: **HP-1ms Ultra Inert**
19091S-733UI
30 m x 0.25 mm, 1.00 µm

Column B: **DB-1301**
122-1333
30 m x 0.25 mm, 1.00 µm

Instrument:	Agilent 7890A GC
Sampler:	Agilent 7683B, 5.0 µL syringe (Agilent p/n 5181-1273) 0.5 µL splitless injection
Carrier:	Helium 25 cm/s, constant flow
Inlet:	Splitless; 200 °C, purge flow 20 mL/min at 0.25 min
Retention Gap:	1 m, 0.32 mm id deactivated fused silica high-temperature tubing (Agilent p/n 160-2855-5)
Oven:	33 °C (14 min) to 60 °C (5 °C/min), hold 5 min, 15 °C/min to 275 °C, hold 20 min
Detector:	Dual G2397A µECD; 300 °C, const col + makeup (N_2) = 30 mL/min

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroacetonitrile
5. Dichloroacetonitrile
6. Bromodichloromethane
7. Trichloroethylene
8. Chloral hydrate
9. 1,1-Dichloro-2-propanone
10. 1,1,2-Trichloroethane
11. Chloropicrin
12. Dibromochloromethane
13. Bromochloroacetonitrile
14. 1,2-Dibromoethane
15. Tetrachloroethlyene
16. 1,1,1-Trichloro-2-propanone
17. Bromoform
18. Dibromoacetonitrile
19. 1,2,3-Trichloropropane
20. 1,2-Dibromo-3-chloropropane



Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273

This application successfully demonstrates the use of the HP-1ms Ultra Inert column for primary analysis of EPA 551.1 chlorinated solvents, trihalomethanes and disinfection by-products. The excellent peak shape of the chloral hydrate and resolution between bromodichloromethane and trichloroethylene emphasize the high column inertness of the HP-1ms Ultra Inert column, making it an excellent choice for EPA Method 551.1 analysis.

Tips & Tools

Learn more about the Agilent 7890A GC System at
www.agilent.com/chem/7890A

15+1 EU Priority PAHs

Resolution of Critical Pairs on an Agilent J&W DB-EUPAH Column

Column: **DB-EUPAH**
121-9627
20 m x 0.18 mm, 0.14 µm

Instrument: Agilent 6890N/5975B MSD

Sampler: Agilent 7683B, 5.0 µL syringe, 0.5 µL splitless injection, injection speed 75 µL/min

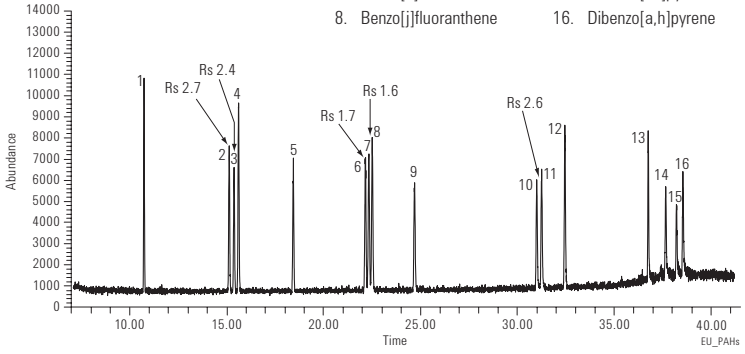
Carrier: Helium, ramped flow 1.0 mL/min (0.2 min), 5 mL/min^2 to 1.7 mL/min

Inlet: 325 °C splitless, purge flow 60 mL/min at 0.8 min

Oven: 45 °C (0.8 min) to 200 °C (45 °C/min), 2.5 °C/min to 225 °C, 3 °C/min to 266 °C, 5 °C/min to 300 °C, 10 °C/min to 320 °C (4.5 min)

Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 330 °C, scan range 50-550 AMU

1. Benzo[c]fluorene
2. Benz[a]anthracene
3. Cyclopenta[c,d]pyrene
4. Chrysene
5. 5-Methylchrysene
6. Benzo[b]fluoranthene
7. Benzo[k]fluoranthene
8. Benzo[j]fluoranthene
9. Benz[a]pyrene
10. Indeno[1,2,3-cd]pyrene
11. Dibenz[a,h]anthracene
12. Benzo[g,h,i]perylene
13. Dibenzo[a,l]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo[a,i]pyrene
16. Dibenzo[a,h]pyrene



All 15+1 EU regulated priority PAHs are well resolved with the DB-EUPAH column. Challenging benzo[b,k,j]fluoranthene isomers are baseline resolved, allowing for accurate quantitation of each isomer. In addition, baseline resolution is achieved for critical pairs benz[a]anthracene and cyclopenta[c,d]pyrene, cyclopenta[c,d]pyrene and chrysene, and indeno[1,2,3-cd]pyrene and dibenz[a,h]anthracene. This application demonstrates that the DB-EUPAH column can provide excellent sensitivity and selectivity for the analysis of EU regulated PAHs.

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Tips & Tools

Agilent CrossLab GC supplies, including CrossLab Ultra Inert liners, perform seamlessly with a variety of instruments regardless of make or model, including Varian (now Bruker), PerkinElmer, Shimadzu, and Thermo Scientific GC systems. Learn more at **www.agilent.com/chem/CrossLab**

CLP Pesticide Analysis

Column: **DB-XLB**
121-1222
20 m x 0.18 mm, 0.18 µm

Carrier: H_2, constant flow, 77.3 cm/s at 120 °C

Oven: 120 °C for 0.49 min
120 °C to 160 °C at 59.4 °/min
160 °C to 260 °C at 23.7 °/min
260 °C to 300 °C (1.69 min) at 35.6 °/min

Injection: Pulsed splitless, 220 °C
Pulse pressure & time:
35 psi for 0.5 min flow
ramp at 6.25 min of 99 mL/min
2 to 3 mL/min
2 mm id liner

Detector: µ-ECD, 320 °C
Ar/CH_4 (P5) makeup gas at 60 mL/min

Sample: 0.5 µL, 50 ppb

Column: **DB-XLB**
123-1232
30 m x 0.32 mm, 0.25 µm

Carrier: He, constant flow, 38 cm/s at 120 °C

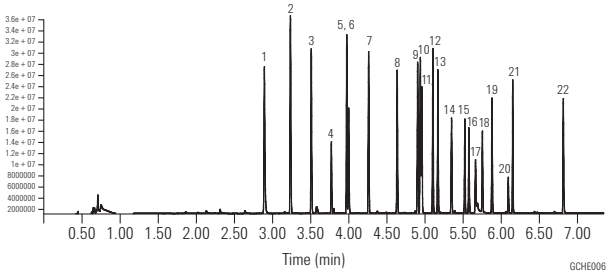
Oven: 120 °C for 1.17 min
120 °C to 160 °C at 25 °/min
160 °C to 260 °C at 10 °/min
260 °C to 300 °C (4 min) at 15 °/min

Injection: Pulsed Splitless, 220 °C
Pulse pressure & time: 35 psi for 1.15 min

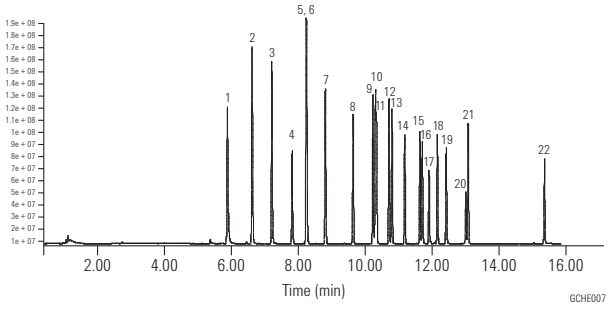
Detector: µ-ECD, 320 °C
Ar/CH_4 (P5) makeup gas at 60 mL/min

Sample: 2 µL, 50 ppb

Faster Method
(using a High Efficiency GC column and H_2 carrier)



Original Method
(using a 0.32 mm id column and Helium carrier)



1. Tetrachloro-m-xylene
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor Epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4' DDE
13. Dieldrin
14. Endrin
15. 4,4' DDD
16. Endosulfan II
17. 4,4' DDT
18. Endrin Aldehyde
19. Endosulfan Sulfate
20. Methoxychlor
21. Endrin Ketone
22. Decachlorobiphenyl

Contract Laboratory Program (CLP) pesticide analysis on High Efficiency (0.18 mm id) GC columns. In this example, the analysis of 22 CLP pesticides were achieved in 16 minutes using the original method, whereas the improved method was completed in just under 7 minutes. That's a 56% faster sample run time.

Analysis of Semivolatiles

Column A: **DB-5.625**
122-5632
30 m x 0.25 mm, 0.50 µm

Column B: **DB-5.625**
121-5622
20 m x 0.18 mm, 0.36 µm

Carrier: He constant-flow mode, 1.1 mL/min

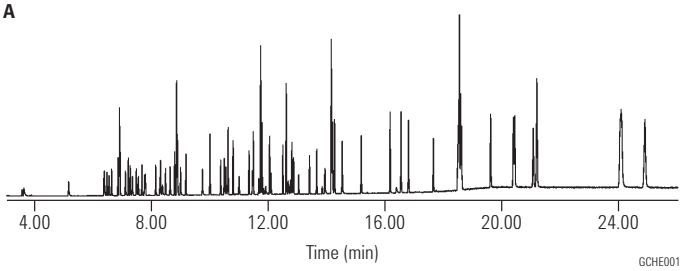
Oven: 40 °C (1 min), 25 °C/min to 320 °C
4.80 min hold

Injection: Splitless 0.5 µL injected at 300 °C, QuickSwap pressure 5.0 psi during acquisition, 80.0 psi during backflush with inlet set to 1.0 psi during backflush

Detector: Agilent 5975C Performance Turbo MSD equipped with 6 mm large-aperture drawout lens, P/N G2589-20045

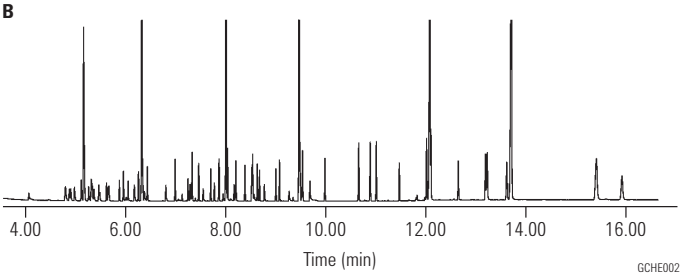
Translating 0.25 mm id column method to 0.18 mm id format results in 32% reduction in analysis time. Resolution of 77 peaks of interest is also maintained for the faster 0.18 mm id separation.

A



U.S. EPA Method 8270, 5 ng/mL System Performance Check Compounds
Chromatogram using a DB-5.625, 30 m x 0.25 mm, 0.5 µm

B



U.S. EPA Method 8270, 5 ng/mL System Performance Check Compounds
Chromatogram using a DB-5.625, 20 m x 0.18 mm, 0.36 µm

Tips & Tools

Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**

Organochlorine Pesticides I EPA Method 8081A

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-100 °C at 25 °/min
100-300 °C at 5 °/min
300 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
Full scan at m/z 50-500

Sample: 1 µL of 35 µg/mL composite 8081A standards, AccuStandard Inc.

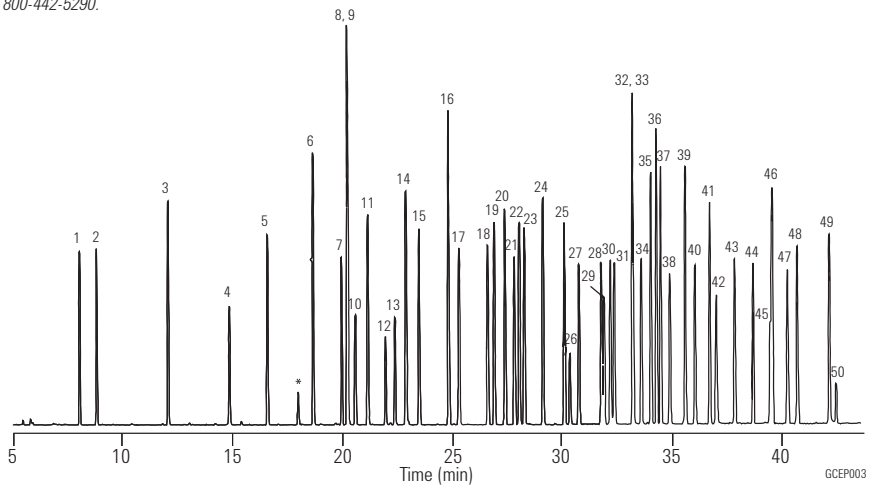
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor
30. α-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard



Organochlorine Pesticides II EPA Method 8081A

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-100 °C at 25 °/min
100-300 °C at 5 °/min
300 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

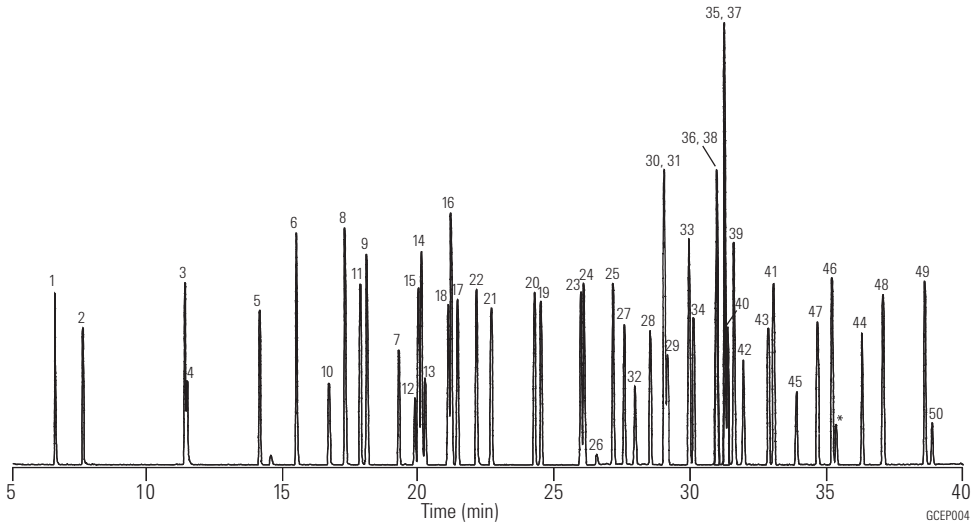
Detector: MSD, 300 °C transfer line
Full scan at m/z 50-500

Sample: 1 µL of 35 µg/mL composite 8081A standards, AccuStandard Inc.

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor
30. α-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard



Pesticides, EPA 508.1

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 45 cm/sec
(EPC in constant flow mode)

Oven: 75 °C for 0.5 min
75-300 °C at 10 °C/min
300 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow =
30 mL/min constant flow)

Sample: 50 pg per component

Suggested Supplies

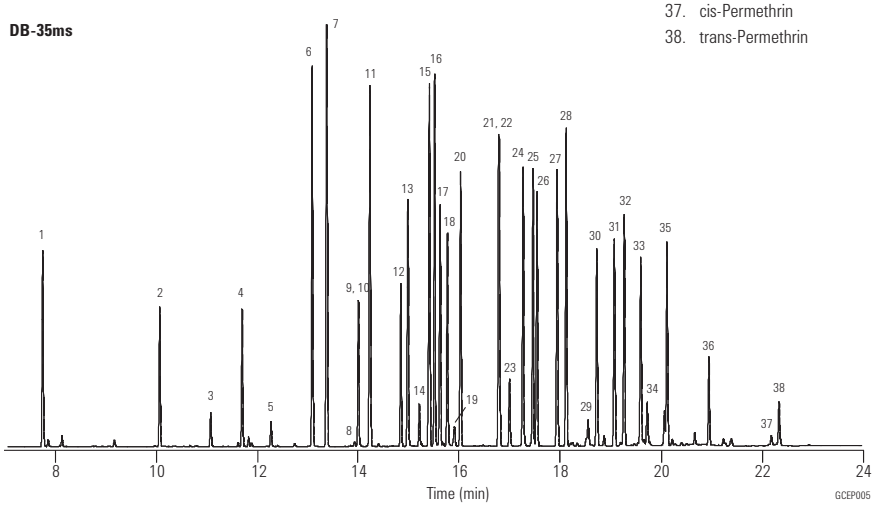
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

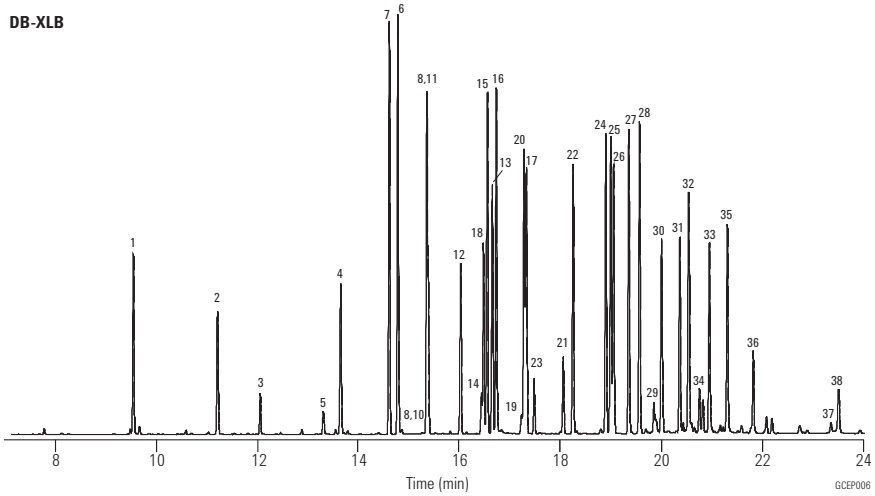
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Hexachlorocyclopentadiene
2. Etridiazole
3. Chloroneb
4. Trifluralin
5. Propachlor
6. Hexachlorobezene
7. α-BHC
8. Atrazine
9. Pentachloronitrobenzene
10. Simazine
11. γ-BHC
12. β-BHC
13. Heptachlor
14. Alachlor
15. δ-BHC
16. Chlorothalonil
17. Aldrin
18. Metribuzin
19. Metolachlor
20. DCPA
21. 4,4'-Dibromobiphenyl
22. Heptachlor epoxide
23. Cyanazine
24. γ-Chlordane
25. α-Chlordane
26. Endosulfan I
27. 4,4'-DDE
28. Dieldrin
29. Chlorobenzilate
30. Endrin
31. 4,4'-DDD
32. Endosulfan II
33. 4,4'-DDT
34. Endrin aldehyde
35. Endosulfan sulfate
36. Methoxychlor
37. cis-Permethrin
38. trans-Permethrin

DB-35ms



DB-XLB



Phenoxy Acid Herbicides – Methyl Derivatives, EPA 8151A

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 50 °C for 0.5 min
50-100 °C at 25 °C/min
100-320 °C at 12 °C/min
320 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

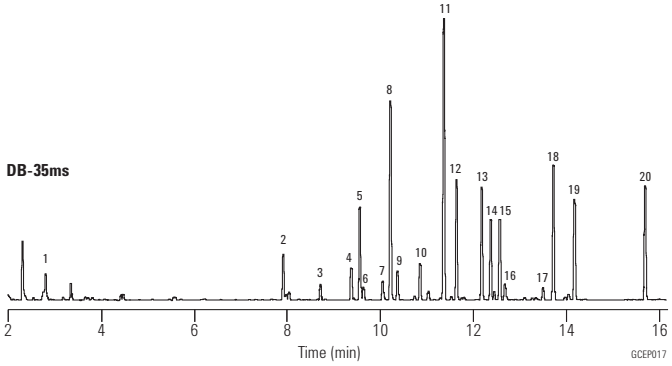
Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Dalapon
2. 3,5-Dichlorobenzoic acid
3. 4-Nitrophenol
4. Methyl-2,4-dichlorophenylacetate (SS)
5. Dicamba
6. MCPP
7. MCPA
8. 4,4'-Dibromooctafluorobiphenyl (IS)
9. Dichloroprop
10. 2,4-D
11. Pentachlorophenol
12. 2,4,5-T,P
13. 2,4,5-T
14. Chloramben
15. Dinoseb
16. 2,4-DB
17. Bentazone
18. DCPA
19. Picloram
20. Acifluorofen



Herbicides I

Column: **DB-XLB**
122-1232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 32 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-180 °C at 10 °/min
180-230 °C at 5 °/min
230-320 °C at 10 °/min
320 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
Full scan 50-400

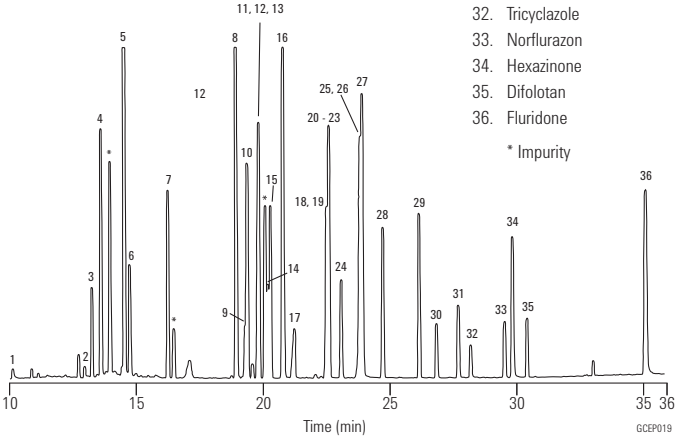
Sample: 2 µL x 10-50 ng/µL solution
in acetone

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Monuron
2. Diuron
3. EPTC
4. Dichlobenil
5. Vernolate
6. Pebulate
7. Molinate
8. Sulfallate
9. Atraton
10. Prometon
11. Atrazine
12. Propazine
13. Simazine
14. Terbuthylazine
15. Pronamide
16. Secbumeton
17. Terbacil
18. Alachlor
19. Propanil
20. Ametryn
21. Prometryne
22. Simetryn
23. Metribuzin
24. Terbutryn
25. Metolachlor
26. Bromacil
27. Dacthal
28. Diphenamid
29. Butachlor
30. Napropamide
31. Carboxin
32. Tricyclazole
33. Norflurazon
34. Hexazinone
35. Difolotan
36. Fluridone

* Impurity



PBDEs by ECD

Column: **DB-XLB**
15 m x 0.18 mm, 0.07 µm
Agilent Technologies custom column

Carrier: Hydrogen at 72 cm/sec at 100 °C (4.0 mL/min), constant flow mode

Oven: 100 °C for 0.5 min
100 °C to 300 °C at 30 °C/min
300 °C for 5 min

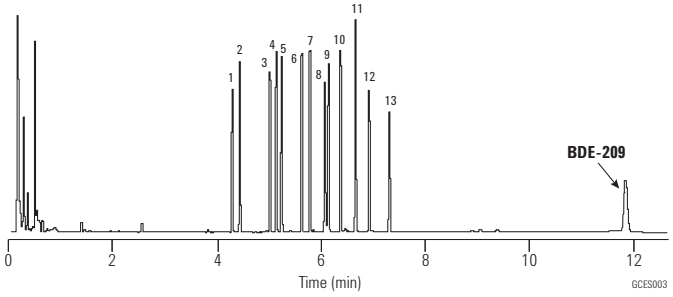
Injection: Split, 250 °C
Split ratio 20:1

Detector: ECD, 300 °C
Peak, Congener (2.5 mg/mL)

Sample: 1 µL

Special thanks to AccuStandard, Inc. of New Haven, CT, for PBDE standards.

1. 2,2',4-TriBDE (BDE-17)
2. 2,4,4'-TriBDE (BDE-28)
3. 2,3',4',6-Tetra-BDE (BDE-71)
4. 2,2',4,4'-Tetra-BDE (BDE-47)
5. 2,3',4,4'-TetraBDE (BDE-66)
6. 2,2',4,4',6-PentaBDE (BDE-100)
7. 2,2',4,4',5-PentaBDE (BDE-99)
8. 2,2',3,4,4'-PentaBDE (BDE-85)
9. 2,2',4,4',5,6'-HexaBDE (BDE-154)
10. 2,2',4,4',5,5'-HexaBDE (BDE-153)
11. 2,2',3,4,4',5'-HexaBDE (BDE-138)
12. 2,2',3,4,4',5',6-HeptaBDE (BDE-183)
13. 2,3,3',4,4',5,6-HeptaBDE (BDE-190)
14. DecaBDE (BDE-209) (12.5 mg/mL)



Aroclors 1016-1268 (without 1221)

Column: **DB-XLB**
121-1232
30 m x 0.18 mm, 0.18 µm

Carrier: Helium at 37 cm/sec, measured at 150 °C

Oven: 100 °C for 1 min
100-265 °C at 1.2 °/min

Injection: Hot on-column, 250 °C

Detector: MSD, 340 °C transfer line, SIM

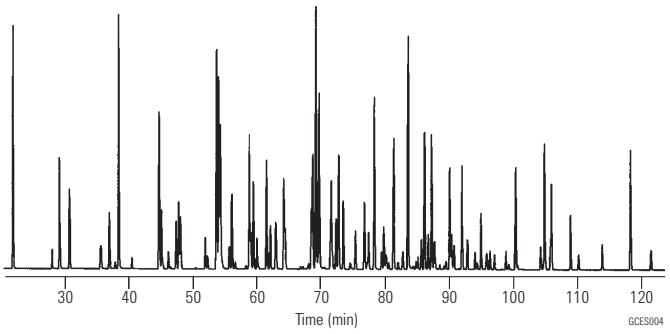
Sample: 1 µL in isooctane, 12.5 ppm

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



PBDEs

Column: **DB-XLB**
122-1231
30 m x 0.25 mm, 0.10 µm

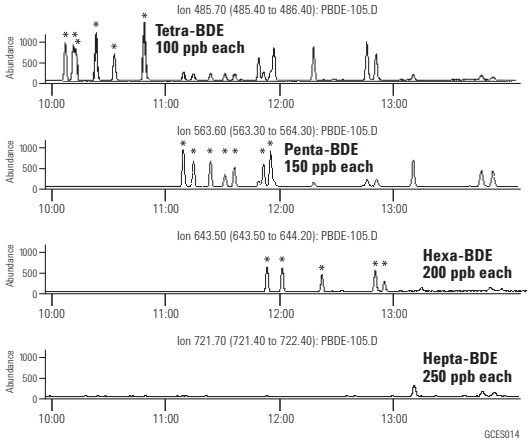
Carrier: Helium at 38 cm/sec at 100 °C (1.2 mL/min), constant flow mode

Oven: 100 °C for 1 min; 100 °C to 340 °C at 20 °C/min, 340 °C for 12 min

Injection: Cool on-column, oven-track mode

Detector: Agilent 5973 MSD, 325 °C transfer line, EI SIM (ions monitored: 231.8, 248.0, 327.9, 398.6, 400.5, 405.8, 845.7, 563.6, 643.5, 721.4, 799.3)

Sample: 0.5 µL



For a complete Application Note, visit **www.agilent.com/chem**, select "Online Literature" from the Literature Library and type 5989-0094EN into the "Keyword" field.

Large Mix 5 ng Column AccuStandard 8720 Mixes 1, 2, 3, 4a, 4b, 5 & 6 (93 compounds)

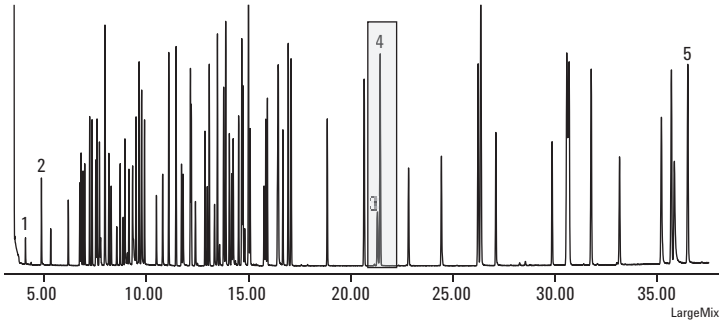
Column: **DB-5MS Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

Oven: 40 ºC (1 min) to 100 ºC (15 ºC/min), 10 ºC/min to 210 ºC (1 min), 5 ºC/min to 310 ºC (8 min)

Injection: Splitless @ 260 ºC, purge flow 50 ºmL/min at 0.5 min, gas saver 80 mL/min on at 1 min

Detector: MSD; Transfer line 290 ºC, Source 300 ºC, Quad 180 ºC

1. n-Nitrosodimethylamine
2. 2-methyl pyridine
3. Benzidene
4. Flouranthene
5. Benzo (g,h,i) perylene



EPA Method 525.2

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 32 cm/sec, measured at 45 °C, constant flow mode

Oven:
45 °C for 1 min
45-130 °C at 30 °/min
130 °C for 3 min
130-180 °C at 12 °/min
180-240 °C at 7 °/min
240-325 °C at 12 °/min
325 °C for 5 min

Injection: Splitless, 300 °C
1.0 min purge activation time
Focus liner

Detector: MSD, 325 °C transfer line
Full scan m/z 45-450

Sample: Composite mixture of AccuStandard Method 525.2 standards (M-525.2-SV-ASL, M-525.2-FS-ASL, M-525.2-CP-ASL, M-525.2-NP1-ASL, M-525.2-NP2-ASL): target compounds at 2 ng/µL, IS/SS at 5 ng/µL

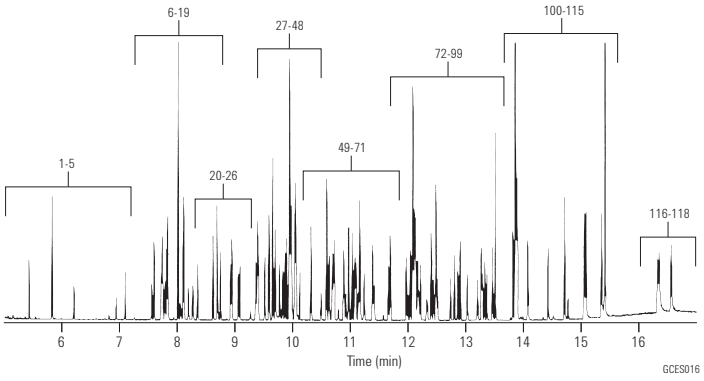
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

	Compound	RT	m/z
1.	Isophorone	5.85	82
2.	1,3-Dimethyl-2-nitrobenzene (SS)	6.65	134
3.	Dichlorvos	7.41	109
4.	Hexachlorocyclo-pentadiene	8.87	237
5.	EPTC	9.17	128
6.	Mevinphos	10.09	127
7.	Butylate	10.18	57/146
8.	Vernolate	10.42	128
9.	Dimethyl phthalate	10.45	163
10.	Terrazole (Etridazole)	10.47	211/183
11.	2,6-Dinitrotoluene	10.56	165
12.	Tillam (Pebulate)	10.61	128
13.	Acenaphthylene	10.65	152
14.	Acenaphthene-d10 (IS)	11	164
15.	Chloroneb	11.17	191
16.	2-Chlorobiphenyl	11.19	188
17.	Tebuthiuron	11.37	156
18.	2,4-Dinitrotoluene	11.51	165
19.	Molinate	11.68	126
20.	Diethyl phthalate	12.21	149
21.	Fluorene	12.35	166
22.	Propachlor	12.46	120
23.	Ethoprop	12.82	158
24.	Cycloate	12.86	83/154
25.	Chlorpropham	13.08	127
26.	Trifluralin	13.14	306
27.	α-BHC	13.69	181
28.	2,3-Dichlorobiphenyl	13.74	222/152
29.	Hexachlorobenzene	13.77	284
30.	Gesatamine (Atraton)	13.99	196/169
31.	Prometon	14.14	225/168
32.	Atrazine	14.26	200/215
33.	Simazine	14.27	201/186
34.	β-BHC	14.28	181
35.	Pentachlorophenol	14.35	266
36.	Propazine	14.35	214/172
37.	γ-BHC	14.52	181
38.	Terbufos	14.62	57
39.	Pronamide	14.69	173
40.	Diazinon	14.76	137/179
41.	Phenanthrene-d10 (IS)	14.85	188
42.	Chlorothalonil	14.89	266
43.	Phenanthrene	14.92	178
44.	Terbacil	15.02	161
45.	Methyl paraoxon	15.04	109
46.	Disulfoton	15.05	88
47.	Anthracene	15.06	178
48.	δ-BHC	15.20	181
49.	2,4,5-Trichlorobiphenyl	15.59	256
50.	Metribuzin	15.95	198

	Compound	RT	m/z
51.	Alachlor	16.14	160
52.	Simetryn	16.23	213
53.	Ametryn	16.33	227/170
54.	Heptachlor	16.36	100
55.	Prometryne	16.40	241/184
56.	Prebane (Terbutryne)	16.72	226/185
57.	Bromacil	16.79	205
58.	Di-n-butyl phthalate	16.90	149
59.	2,2',4,4'-Tetrachlorobiphenyl	17.02	292
60.	Metolachlor	17.11	162
61.	Dursban (Chlorpyrifos)	17.15	197/97
62.	Cyanazine	17.23	225/68
63.	Dacthal (DCPA methyl ester)	17.27	301
64.	Aldrin	17.29	66
65.	Triadimefon	17.43	57
66.	Diphenamid	17.73	72/167
67.	MGK-264 (Isomer A)	17.78	164/66
68.	MGK-264 (Isomer B)	18.11	164
69.	Heptachlor epoxide	18.28	81
70.	2,2',3',4,6-Pentachlorobiphenyl	18.34	326
71.	Merphos	18.36	209/153
72.	γ-Chlordane	18.88	373
73.	Tetrachlorvinphos (Stirifos)	18.95	109
74.	Butachlor	19.03	176/160
75.	Pyrene-d10 (SS)	19.13	212
76.	Pyrene	19.18	202
77.	α-Chlordane	19.21	375/373
78.	Endosulfan I	19.22	195
79.	trans-Nonachlor	19.28	409
80.	Fenamiphos	19.33	303/154
81.	Napropamide	19.39	72
82.	Tricyclazole	19.61	189
83.	p,p'-DDE	19.76	246
84.	DEF	19.84	57/169

	Compound	RT	m/z
85.	2,2',4,4',5,6'-Hexachlorobiphenyl	19.90	360
86.	Dieldrin	19.92	79
87.	Carboxin	19.97	143
88.	Endrin	20.43	67/81
89.	Chlorobenzilate	20.56	139
90.	Endosulfan II	20.68	195
91.	p,p'-DDD	20.77	235/165
92.	Endrin aldehyde	21.01	67
93.	Norflurazon	21.36	145
94.	Benzyl butyl phthalate	21.49	149
95.	Endosulfan sulfate	21.53	272
96.	p,p'-DDT	21.61	235/165
97.	Hexazinone	21.68	171
98.	Bis(2-ethylhexyl) adipate	21.87	129
99.	Triphenylphosphate (SS)	21.98	326/325
100.	Endrin ketone (breakdown product)	22.52	67/317
101.	2,2',3,3',4,4',6-Heptachlorobiphenyl	22.59	394/396
102.	Benz[a]anthracene	22.66	228
103.	Chrysene-d12 (IS)	22.68	240
104.	2,2',3,3',4,5',6,6'-Octachlorobiphenyl	22.70	430/428
105.	Methoxychlor	22.73	227
106.	Chrysene	22.74	228
107.	Bis(2-ethylhexyl) phthalate	23.10	149
108.	Fenarimol	23.80	139
109.	cis-Permethrin	24.38	183
110.	trans-Permethrin	24.50	183
111.	Benzo[b]fluoranthene	25.06	252
112.	Benzo[k]fluoranthene	25.12	252
113.	Fluridone	25.66	328
114.	Benzo[a]pyrene	25.67	252
115.	Perylene-d12 (SS)	25.78	264
116.	Indeno[1,2,3-c,d]pyrene	27.63	276
117.	Dibenz[a,h]anthracene	27.69	278
118.	Benzo[g,h,i]perylene	28.11	276



EPA Volatiles by GC/MS (Split Injector)

Column: **DB-VRX**
122-1564
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 30 cm/sec, measured at 45 °C

Oven: 45 °C for 10 min
45-190 °C at 12 °/min
190 °C for 2 min
190-225 °C at 6 °/min
225 °C for 1 min

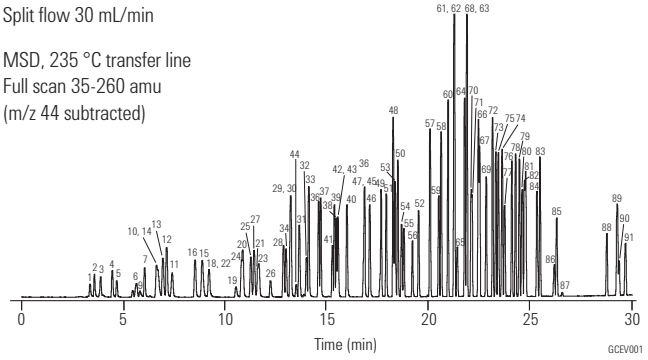
Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C
Split flow 30 mL/min

Detector: MSD, 235 °C transfer line
Full scan 35-260 amu
(m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



Column: **DB-624**
122-1364
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 31 cm/sec, measured at 40 °C

Oven: 45 °C for 3 min
45-90 °C at 8 °/min
90 °C for 4 min
90-200 °C at 6 °/min
200 °C for 5 min

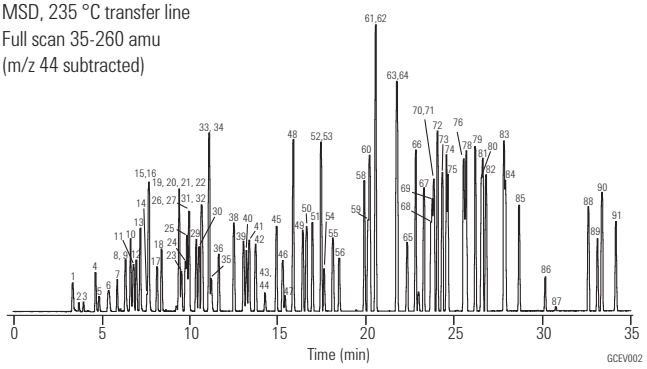
Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C
Split flow 30 mL/min

Detector: MSD, 235 °C transfer line
Full scan 35-260 amu
(m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile
15. Methyl-tert-butyl ether
16. trans-1,2-Dichloroethene
17. Hexane
18. 1,1-Dichloroethane
19. 2-Butanone
20. cis-1,2-Dichloroethene
21. 2,2-Dichloropropane
22. Propionitrile
23. Methyl acrylate
24. Methacrylonitrile
25. Bromochloromethane
26. Tetrahydrofuran
27. Chloroform
28. Pentafluorobenzene (IS)
29. 1,1,1-Trichloroethane
30. 1-Chlorobutane
31. 1,1-Dichloropropene
32. Carbon tetrachloride
33. Benzene
34. 1,2-Dichloroethane
35. 2,2-Dimethylhexane
36. Fluorobenzene (IS)
37. 1,4-Difluorobenzene (IS)
38. Trichloroethene
39. 1,2-Dichloropropane
40. Methyl methacrylate
41. Dibromomethane
42. Bromodichloromethane
43. 2-Nitropropane
44. Chloroacetonitrile
45. cis-1,3-Dichloropropene
46. 4-Methyl-2-pentanone
47. 1,1-Dichloro-2-propanone
48. Toluene
49. trans-1,3-Dichloropropene
50. Ethyl methacrylate
51. 1,1,2-Trichloroethane
52. Tetrachloroethene
53. 1,3-Dichloropropane
54. 2-Hexanone
55. Dibromochloromethane
56. 1,2-Dibromoethane
57. 1-Chloro-3-fluorobenzene (IS)
58. Chlorobenzene
59. 1,1,1,2-Tetrachloroethane
60. Ethylbenzene
61. m-Xylene
62. p-Xylene
63. o-Xylene
64. Styrene
65. Bromoform
66. Isopropylbenzene
67. 4-Bromofluorobenzene (SS)
68. 1,1,2,2-Tetrachloroethane
69. Bromobenzene
70. 1,2,3-Trichloropropane
71. trans-1,4-Dichloro-2-butene
72. n-Propylbenzene
73. 2-Chlorotoluene
74. 1,3,5-Trimethylbenzene
75. 4-Chlorotoluene
76. tert-Butylbenzene
77. Pentachloroethane
78. 1,2,4-Trimethylbenzene
79. sec-Butylbenzene
80. 1,3-Dichlorobenzene
81. p-Isopropyltoluene
82. 1,4-Dichlorobenzene
83. n-Butylbenzene
84. 1,2-Dichlorobenzene
85. Hexachloroethane
86. 1,2-Dibromo-3-chloropropane
87. Nitrobenzene
88. 1,2,4-Trichlorobenzene
89. Hexachlorobutadiene
90. Naphthalene
91. 1,2,3-Trichlorobenzene

IS - Internal Standard
SS - Surrogate Standard

Note: Some compounds not present in both chromatograms

High Speed VOC, EPA Method 8260

Column: **DB-VRX**
121-1524
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven: 45 °C for 3.0 min
45-190 °C at 36 °C/min
190-225 °C at 20 °C/min
225 °C for 0.5 min

Sampler: Purge and trap (Tekmar 3100)
Purge: 11 min
Trap: Vocarb 3000
Preheat: 245 °C
Desorb: 250 °C for 1min
Bake: 260 °C for 10 min
Line & valve: 100 °C

Injection: Split, 150 °C
Split ratio 60:1

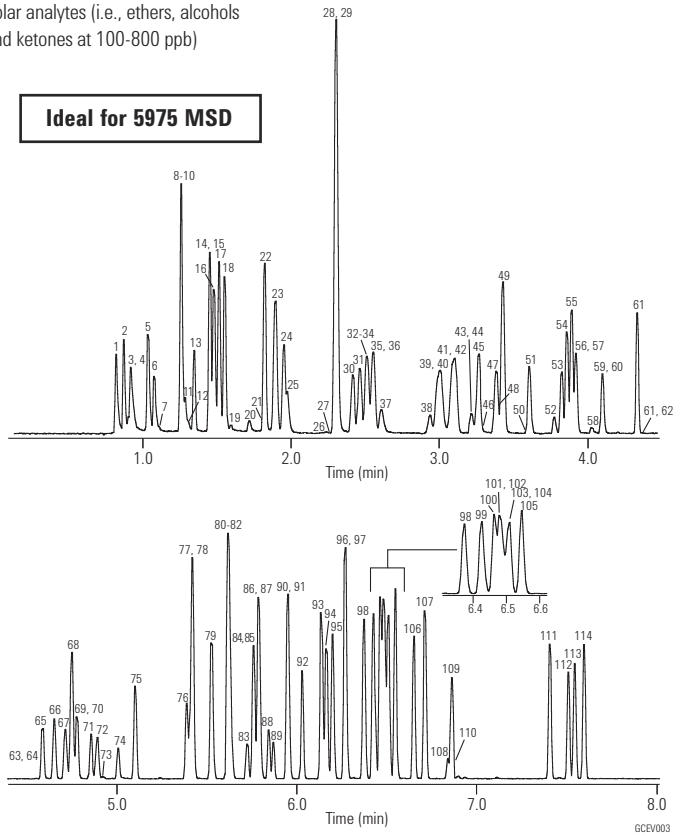
Detector: Agilent 5975 MSD,
Scan range: 35-260 amu
Scan rate: 3.25 scans/sec
Quad temperature: 150 °C
Source temperature: 200 °C
Transfer line temp: 200 °C

Sample: 5 mL
- Halogentated and aromatic analytes at 40 ppb
- Internal standards at 20 ppb
- Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

Ideal for 5975 MSD



1. Dichlorodifluoromethane
2. Chloromethane
3. Hydroxypropionitrile
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Ethanol
8. Acetonitrile
9. Acrolein
10. Trichlorofluoromethane
11. Isopropyl alcohol
12. Acetone
13. Ethyl ether
14. 1,1-Dichloroethene
15. tert-Butyl alcohol
16. Acrylonitrile
17. Methylene chloride
18. Allyl chloride
19. Allyl alcohol
20. 1-Propanol
21. Propargyl alcohol
22. trans-1,2-Dichloroethene
23. MTBE
24. 1,1-Dichloroethane
25. Propionitrile
26. 2-Butanone
27. Diisopropyl ether
28. cis-1,2-Dichloroethene
29. Methacrylonitrile
30. Bromochloromethane
31. Chloroform
32. 2,2-Dichloropropane
33. Ethyl acetate
34. Ethyl-tert-butyl ether
35. Methyl acrylate
36. Dibromofluoromethane (IS)
37. Isobutanol
38. Dichloroethane-d4 (IS)
39. Pentafluorobenzene
40. 1,2-Dichloroethane
41. 1,1,1-Trichloroethane
42. 1-Chlorobutane
43. Crotonaldehyde
44. 2-Chloroethanol
45. 1,1-Dichloropropene
46. 1-Butanol
47. Carbon tetrachloride
48. Chloroacetonitrile
49. Benzene
50. tert-Amylmethyl ether
51. Fluorobenzene (IS)
52. 2-Pentanone
53. Dibromomethane
54. 1,2-Dichloropropane
55. Trichloroethene
56. Bromodichloromethane
57. 2-Nitropropane
58. 1,4-Dioxane
59. Epichlorohydrin
60. Methyl methacrylate
61. cis-1,3-Dichloropropene
62. Propiolactone
63. Bromoacetone
64. Pyridine
65. trans-1,3-Dichloropropene
66. 1,1,2-Trichloroethane
67. Toluene-d8 (IS)
68. Toluene
69. 1,3-Dichloropropane
70. Paraldehyde
71. Ethyl methacrylate
72. Dibromochloromethane
73. 3-Chloropropionitrile
74. 1,2-Dibromoethane
75. Tetrachloroethene
76. 1,1,1,2-Tetrachloroethane
77. 1-Chlorohexane
78. Chlorobenzene
79. Ethylbenzene
80. Bromoform
81. m-Xylene
82. p-Xylene
83. trans-Dichlorobutene
84. 1,3-Dichloro-2-propanol
85. Styrene
86. 1,1,2,2-Tetrachloroethane
87. o-Xylene
88. 1,2,3-Trichlropropane
89. cis-Dichlorobutene
90. 4-Bromofluorobenzene (IS)
91. Isopropylbenzene
92. Bromobenzene
93. Propylbenzene
94. 2-Chlorotoluene
95. 4-Chlorotoluene
96. 1,3,5-Trimethylbenzene
97. Pentachloroethane
98. tert-Butylbenzene
99. 1,2,4-Trimethylbenzene
100. sec-Butylbenzene
101. 1,3-Dichlorobenzene
102. Benzylchloride
103. 1,4-Dichlorobenzene-d4 (IS)
104. 1,4-Dichlorobenzene
105. Isopropyltoluene
106. 1,2-Dichlorobenzene
107. Butylbenzene
108. 1,2-Dibromo-3-chloropropane
109. Hexachloroethane
110. Nitrobenzene
111. 1,2,4-Trichlorobenzene
112. Naphthalene
113. Hexachlorobutadiene
114. 1,2,3-Trichlorobenzene

EPA Air Analysis Method TO-15 (1 ppbV Standard)

Column: **DB-5ms**
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min

Oven: 35 °C for 5 min
35-140 °C at 6 °C/min
140-220 °C at 15 °C/min
220 °C for 3 min

Sampler: Entech 7100 cryogenic sample preconcentrator

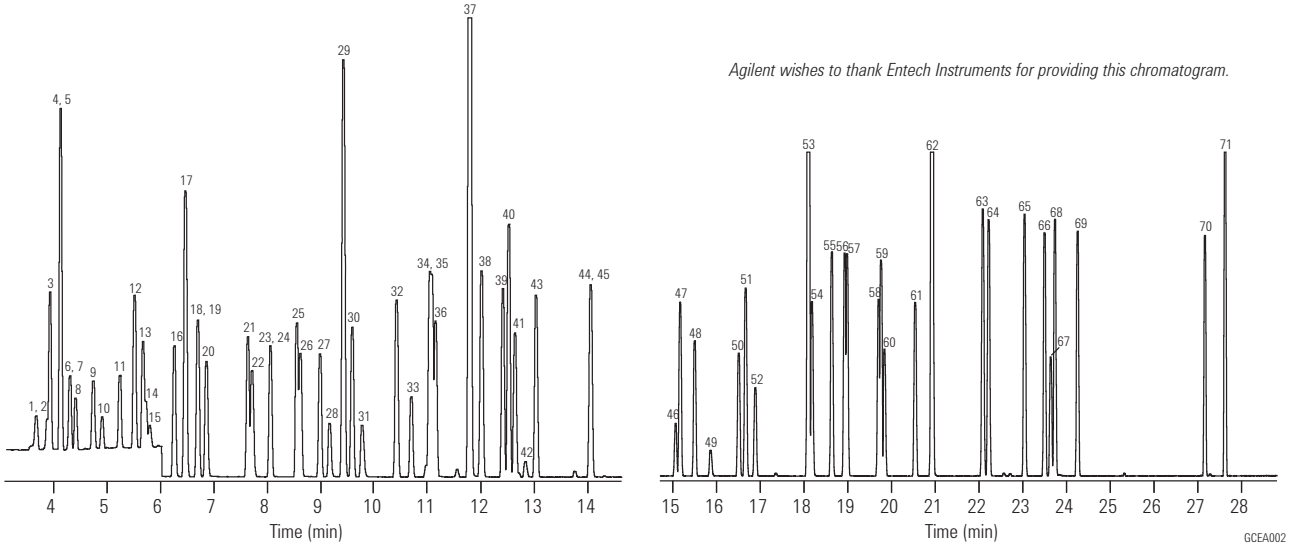
Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV

Sample: 400 mL sample load,
All compounds at 10 ppbV except
Formaldehyde (50 ppbV),
Acetaldehyde (20 ppbV),
Propanol (20 ppbV),
Acetone (30 ppbV),
2-Butanone (30 ppbV)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

		Quantitation Ion
1.	Formaldehyde	30
2.	Propene	41
3.	Dichlorodifluoromethane	85
4.	Chloromethane	50
5.	Dichlorotetrafluoroethane	85
6.	Acetaldehyde	29
7.	Vinyl chloride	62
8.	1,3-Butadiene	39
9.	Bromomethane	94
10.	Chloroethane	64
11.	Bromoethene	106
12.	Trichlorofluoromethane	101
13.	Acetone	58
14.	Propanal	29
15.	Isopropyl alcohol	45
16.	1,1-Dichloroethene	61
17.	1,1,2-Trichloro-1,2-2-trifluoroethane	101
18.	Methylene chloride	49
19.	3-Chloro-1-propene (Allyl chloride)	76
20.	Carbon disulfide	76
21.	trans-1,2-Dichloroethene	96
22.	tert-Butyl methyl ether (MTBE)	73
23.	1,1-Dichloroethane	63
24.	Vinyl acetate	43
25.	2-Butanone (MEK)	72
26.	n-Hexane	57
27.	cis-1,2-Dichloroethene	96
28.	Ethyl acetate	43
29.	Bromochloromethane (IS)	128
30.	Chloroform	83
31.	Tetrahydrofuran	42
32.	1,1,1-Trichloroethane	97
33.	1,2-Dichloroethane	62
34.	Benzene	78
35.	Carbon tetrachloride	117
36.	Cyclohexane	56
37.	1,4-Difluorobenzene (IS)	114
38.	2,2,4-Trimethylpentane (Isooctane)	57
39.	n-Heptane	41
40.	Trichloroethene	130
41.	1,2-Dichloropropane	63
42.	1,4-Dioxane	88
43.	Bromodichloromethane	83
44.	4-Methyl-2-pentanone (MIBK)	43
45.	cis-1,3-Dichloropropene	75
46.	trans-1,3-Dichloropropene	75
47.	Toluene	91
48.	1,1,2-Trichloroethane	97
49.	2-Hexanone	43
50.	Dibromochloromethane	129
51.	Tetrachloroethene	166
52.	1,2-Dibromoethane	107
53.	Chlorobenzene-d5 (IS)	117
54.	Chlorobenzene	112
55.	Ethylbenzene	91
56.	m-Xylene	91
57.	p-Xylene	91
58.	Styrene	104
59.	o-Xylene	91
60.	Bromoform	173
61.	1,1,2,2-Tetrachloroethane	83
62.	4-Bromofluorobenzene	95
63.	4-Ethyltoluene	105
64.	1,3,5-Trimethylbenzene	105
65.	1,2,4-Trimethylbenzene	105
66.	1,3-Dichlorobenzene	146
67.	Benzyl chloride	91
68.	1,4-Dichlorobenzene	146
69.	1,2-Dichlorobenzene	146
70.	1,2,4-Trichlorobenzene	180
71.	Hexachlorobutadiene	225



Agilent wishes to thank Entech Instruments for providing this chromatogram.

GCEA002

C_1 and C_2 Halocarbons (Freons)

Column: **GS-GasPro**
113-4362
60 m x 0.32 mm,

Carrier: Helium at 35 cm/sec, constant velocity

Oven: 40 °C for 2 min,
40-120 °C at 10 °/min
120 °C for 3 min
120-200 °C at 10 °/min

Injection: Splitless, 250 °C
0.20 min purge activation time

Detector: MSD, 280 °C,
full scan 45-180 amu

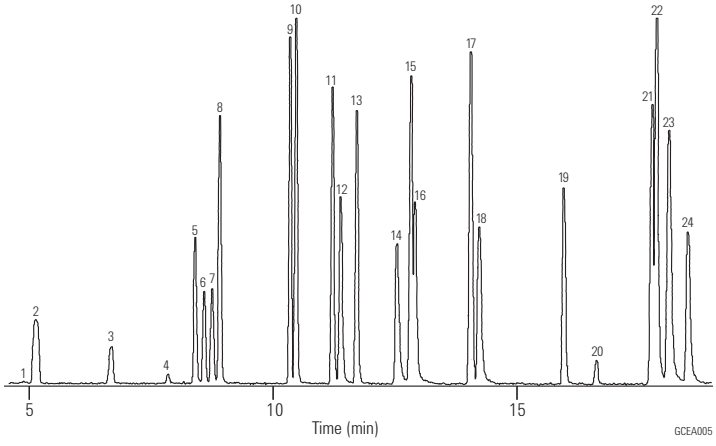
Sample: 1.0 µL of 100 ppm mixture
of AccuStandard M-REF &
M-REF-X in methanol

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

		Freon #
1.	Chlorotrifluoromethane*	13
2.	Trifluoromethane	23
3.	Bromotrifluoromethane	13B1
4.	Chloropentafluoroethane	115
5.	Pentafluoroethane	125
6.	1,1,1-Trifluoroethane	143a
7.	Dichlorodifluoromethane	12
8.	Chlorodifluoromethane	22
9.	1,1,1,2-Tetrafluoroethane	134a
10.	Chloromethane	40
11.	1,1,2,2-Tetrafluoroethane	134
12.	Bromochlorodifluoromethane	12B1
13.	1,1-Difluoroethane	152a
14.	1,2-Dichloro-1,1,2,2-tetrafluoroethane	114
15.	2-Chloro-1,1,1,2-tetrafluoroethane	124
16.	1-Chloro-1,1-difluoroethane	142b
17.	Dichlorofluoromethane	21
18.	Trichlorofluoromethane	11
19.	Chloroethane	160
20.	Dichloromethane	30
21.	1,1-Dichloro-1-fluoroethane	141b
22.	2,2-Dichloro-1,1,1-trifluoroethane	123
23.	1,1,2-Trichloro-1,2,2-trifluoroethane	113
24.	1,2-Dibromo-1,1,2,2-tetrafluoroethane	114B2

*Peak not shown



Pesticides and Fire Retardants (US EPA 527)

Column: **DB-5MS Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

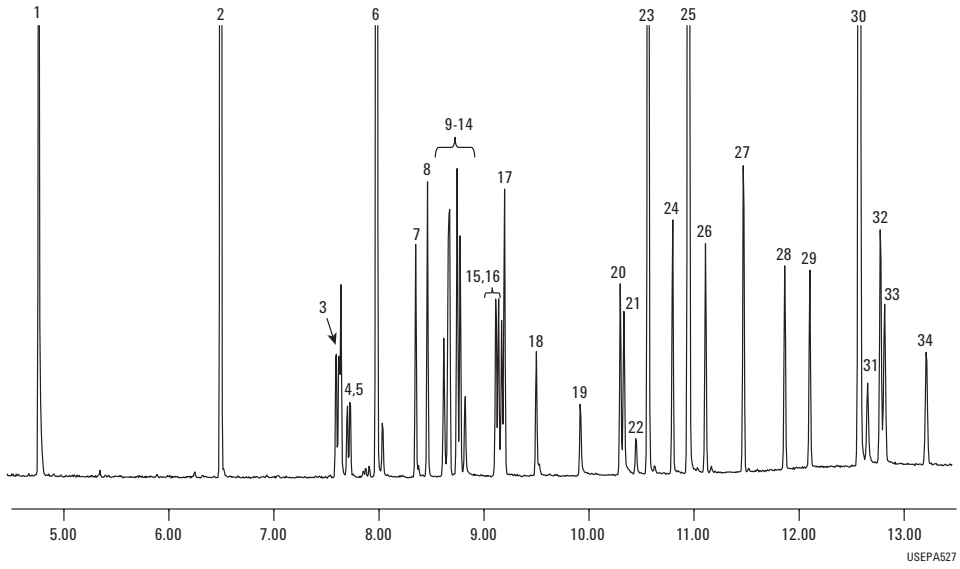
Carrier: Helium, 52 cm/sec, constant flow

Oven: 60 °C (1 min) to 210 °C (25 °/min),
20 °C/min to 310 °C (3 min)

Injection: Splitless, 250 °C, purge flow 50 mL/min @ 1 in,
gas saver 80 mL/min on @ 3 min

Detector: Transfer line 290 °C, source 300 °C, quad 180 °C

Sample: Pesticide/PBDE standards,
1 ng with 5 ng IS/SS on-column



1. 1,2-Dimethyl-2-nitrobenzene
2. Acenaphthalene-D10
3. Dimethoate
4. Atrazine
5. Propazine
6. Anthracene-D10
7. Vinclozoline
8. Prometryne
9. Bromacil
10. Malathion
11. Thiazopyr
12. Dursban
13. Benthiocarb
14. Parathion
15. Terbus sulfone
16. Bioallethrin
17. Oxychlordane
18. Fenamiphos
19. Nitrophen
20. Norflurazone
21. Kepone
22. Hexazinone
23. Triphenyl phosphate
24. Bifenthrin
25. Chrysene-D12
26. BDE-47
27. Mirex
28. BDE-100
29. BDE-99
30. Perylene-D12
31. Fenvalerate
32. Esfenvalerate
33. Hexabromobiphenyl
34. BDE-153

Determination of Chlorophenols in Water and Soil

Column: **VF-5ms**
CP8961
60 m x 0.32 mm, 0.25 µm

Oven: 60 °C, 30 °C/min to 300 °C

Carrier: He 80 kPa, 0.8 bar, 5.7 psi

Injection: Splitless, initial time: 1 min; Splitflow: 50 mL/min
250 °C
2 µL

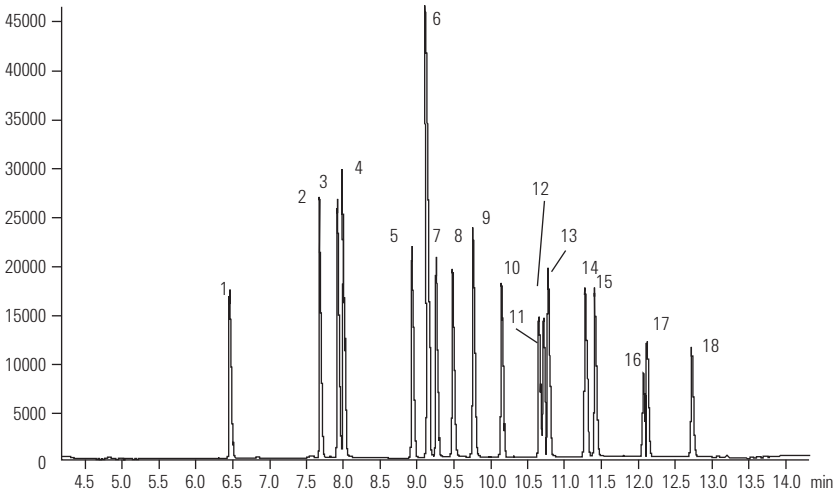
Detector: MS
280 °C

Sample: Isohexane

Sample Conc: Standard, 1 µg/mL, derivatization with acetic acid anhydride

Dr. Weßling, Laboratorien GmbH

1. Phenol
2. 2-chlorophenol
3. 3-chlorophenol
4. 4-chlorophenol
5. 2,6-dichlorophenol
6. 2,4+2,5-dichlorophenol
7. 3,5-dichlorophenol
8. 2,3-dichlorophenol
9. 3,4-dichlorophenol
10. 2,4,6-trichlorophenol
11. 2,3,6-trichlorophenol
12. 2,3,5-trichlorophenol
13. 2,4,5-trichlorophenol
14. 2,3,4-trichlorophenol
15. 3,4,5-trichlorophenol
16. 2,3,5,6-tetrachlorophenol
17. 2,3,4,6-tetrachlorophenol
18. 2,3,4,5-tetrachlorophenol



Polybrominated Diphenyl Ethers (PBDEs)

Column: **DB-5MS Ultra Inert**
122-5512UI
15 m x 0.25 mm, 0.25 µm

Instrument: Agilent 6890N/5973B MSD

Sampler: Agilent 7683B, 5.0 µL syringe (P/N 5188-5246), 1.0 µL splitless injection, 5 ng each component on-column

Carrier: Helium 72 cm/s, constant flow

Inlet: Pulsed splitless; 325 °C, 20 psi until 1.5 min, purge flow 50 mL/min at 2.0 min

Oven: 150 to 325 °C (17 °C/min), hold 5 min

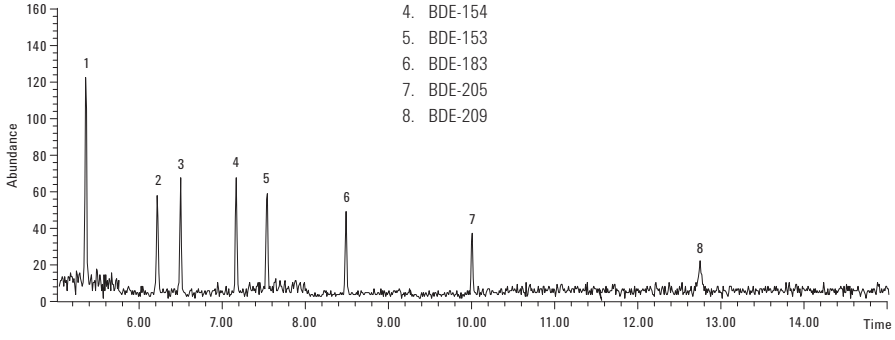
Detector: MSD source at 300 °C, quadropole at 150 °C, transfer line at 300 °C, scan range 200-1000 amu

Suggested Supplies

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: Autosampler syringe, 0.5 µL, 23g, cone, 5188-5246

1. BDE-47
2. BDE-100
3. BDE-99
4. BDE-154
5. BDE-153
6. BDE-183
7. BDE-205
8. BDE-209



Energy and Fuels Applications

Fast Analysis of Aromatic Solvent

Column: **HP-INNOWax**
19091N-577
20 m x 0.18 mm, 0.18 µm

Carrier: Helium at 33 psi constant pressure mode

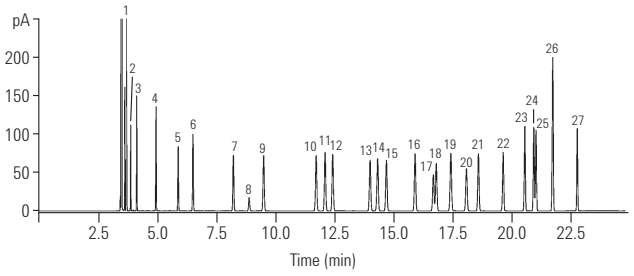
Oven: 70 °C (3 min); 45 °C/min to 145 °C (1 min)

Injection: Split/splitless at 250 °C
100:1 to 600:1 split ratio

Detector: FID at 250 °C

Sample: 0.2 to 1.0 µL

Unified aromatic solvent method



Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi constant pressure mode

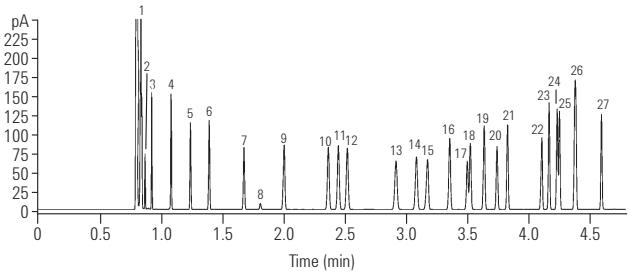
Oven: 75 °C (10 min); 3 °C/min to 100 °C (0 min)
10 °C/min to 145 °C (0 min)

Injection: Split/splitless at 250 °C
100:1 split ratio

Detector: FID at 250 °C

Sample: 1.0 µL

Optimized unified aromatic solvent method



GCHE003

1. Heptane
2. Cyclohexane
3. Octane
4. Nonane
5. Benzene
6. Decane
7. Toluene
8. 1,4-Dioxan
9. Undecane
10. Ethylbenzene
11. p-Xylene
12. m-Xylene
13. Cumene
14. Dodecane
15. o-Xylene
16. Propylbenzene
17. p-Ethyltoluene
18. m-Ethyltoluene
19. t-Butylbenzene
20. s-Butylbenzene
21. Styrene
22. Tridecane
23. 1,3-Diethylbenzene
24. 1,2-Diethylbenzene
25. n-Butylbenzene
26. a-Methylstyrene
27. Phenylacetylene

This application showcases the practicality using High Efficiency GC columns in daily aromatic solvent analysis. The result: a three-fold reduction in run time (compared to a 0.32 mm id column) with no compromise in resolution.

Refinery Gas I

Column: **HP PLOT Q**
19095P-Q04
30 m x 0.53 mm, 40.00 µm

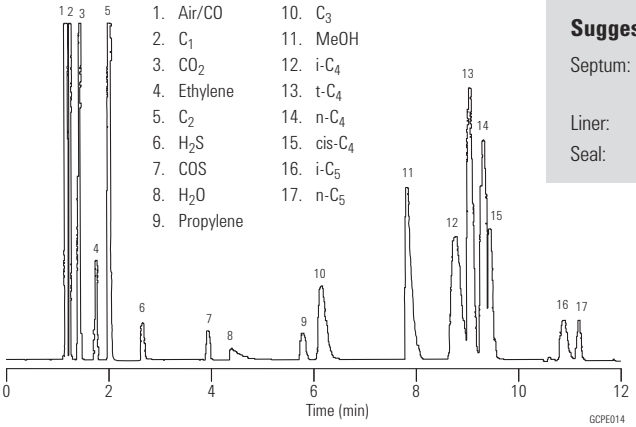
Carrier: Helium p=9.0 psi at 60 °C

Oven: 60 °C for 5 min
60-200 °C at 20 °C/min
200 °C for 1 min

Injection: Split, 250 °C
Split flow 100 mL/min
0.25 cc valve

Detector: TCD, 250 °C

Sample: Refinery gas and others



1. Air/CO
2. C_1
3. CO_2
4. Ethylene
5. C_2
6. H_2S
7. COS
8. H_2O
9. Propylene
10. C_3
11. MeOH
12. i-C_4
13. t-C_4
14. n-C_4
15. cis-C_4
16. i-C_5
17. n-C_5

GCPE014

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

Volatile Sulfur Compounds

Column: **DB-1**
123-1035
30 m x 0.32 mm, 5.00 µm

Carrier: Helium at 23 cm/sec (H_2S at 50 °C)

Oven: 50 °C for 4 min, 50-120 °C at 20 °/min,
120 °C for 4 min, 120-220 °C at
25 °/min, 220 °C for 2.5 min

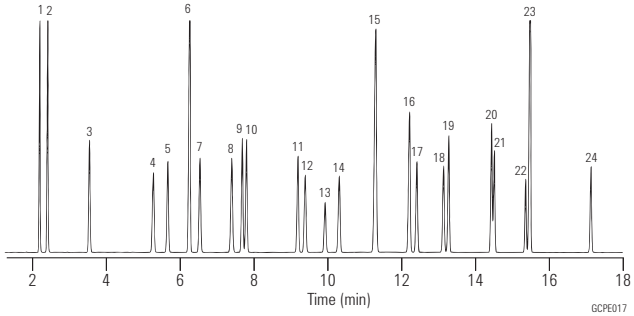
Injection: Split, 200 °C
Split ratio 1:10

Detector: PFPD (OI Analytical), 220 °C

Sample: 600 µL of sulfur gas standard
3 ppmV each component

Agilent wishes to thank Air Toxics, Ltd. (Folsom, CA) for providing the standard mixture shown in this chromatogram.

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Carbon disulfide
7. 2-Propanethiol
8. 2-Methyl-2-propanethiol
9. 1-Propanethiol
10. Ethyl methyl sulfide
11. Thiophene
12. 2-Methyl-1-propanethiol
13. Diethyl sulfide
14. 1-Butanethiol
15. Methyl disulfide
16. 2-Methylthiophene
17. 3-Methylthiophene
18. Tetrahydrothiophene
19. 1-Pentanethiol
20. 2-Ethylthiophene
21. 2,5-Dimethylthiophene
22. 1-Hexanethiol
23. Ethyl disulfide
24. 1-Heptanethiol



Unleaded Gasoline

Column: **DB-Petro**
122-10A6
100 m x 0.25 mm, 0.50 µm

Carrier: Helium at 25.6 cm/sec

Oven: 0 °C for 15 min
0-5 0 °C at 1 °/min
50-130 °C at 2 °/min
130-180 °C at 4 °/min
180 °C for 20 min

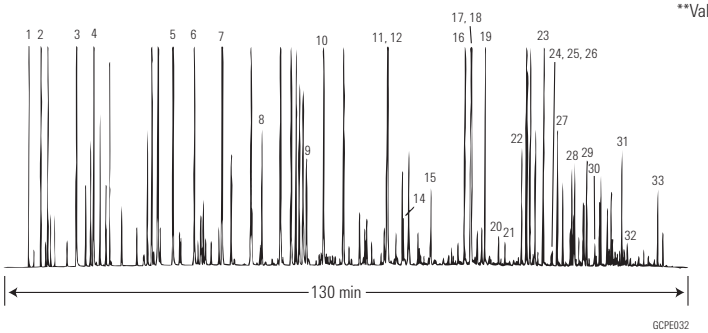
Injection: Split, 200 °C
Split ratio 1:300

Detector: FID, 250 °C
Nitrogen makeup gas
at 30 mL/min

Sample: 1 µL of neat sample

1. Methane
2. n-Butane
3. Isopentane
4. n-Pentane
5. n-Hexane
6. Methylcyclopentane
7. Benzene
8. Cyclohexane
9. Isooctane
10. n-Heptane
11. Toluene *
12. 2,3,3-Trimethylpentane
13. 2-Methylheptane
14. 4-Methylheptane
15. n-Octane
16. Ethylbenzene
17. m-Xylene **
18. p-Xylene
19. o-Xylene
20. n-Nonane
21. Isopropylbenzene
22. Propylbenzene
23. 1,2,4-Trimethylbenzene
24. Isobutylbenzene
25. sec-Butylbenzene
26. n-Decane
27. 1,2,3-Trimethylbenzene
28. Butylbenzene
29. n-Undecane
30. 1,2,4,5-Tetramethylbenzene
31. Naphthalene
32. Dodecane
33. Tridecane

*Valley point with 12 = 78%
**Valley point with 18 = 87%



n-Paraffin Standard

Column: **DB-HT SimDis**
145-1001
5 m x 0.53 mm, 0.15 µm

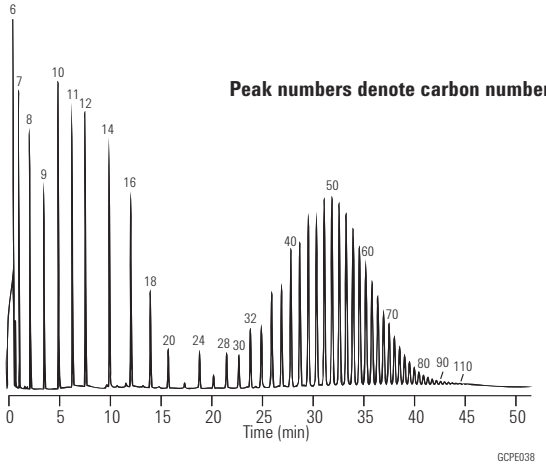
Carrier: Helium at 18 mL/min, measured at 35 °C

Oven: -30-430 °C at 10 °/min

Injection: OPTIC PTV
55-450 °C at 2 °/sec

Detector: FID, 450 °C
Nitrogen makeup gas at 15 mL/min

Sample: 0.5 µL of about 2% n-paraffins in CS_2



Sulfur Impurities in Propylene

Column: **Select Low Sulfur**
CP8575
60 m x 0.32 mm

Oven: 65 °C for 4 min, 30 °C/min to 120 °C for 5 min

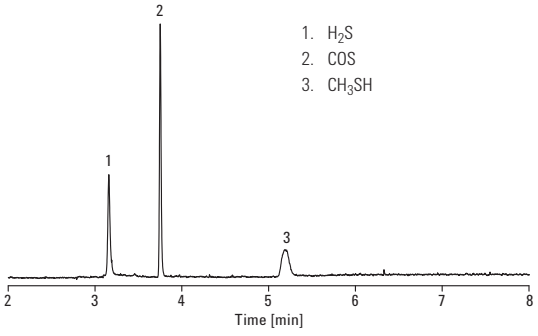
Carrier: Helium, constant flow, 2.0 mL/min

Injection: Gas sampling valve
220 °C, split 1:10

Detector: SCD, 200 °C

Sample: Polypropylene matrix containing ~300 ppb H_2S and CH_3SH, ~500 ppb COS

Injection Volume: 1 mL



Sulfur Compounds in Propylene (1 ppm)

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

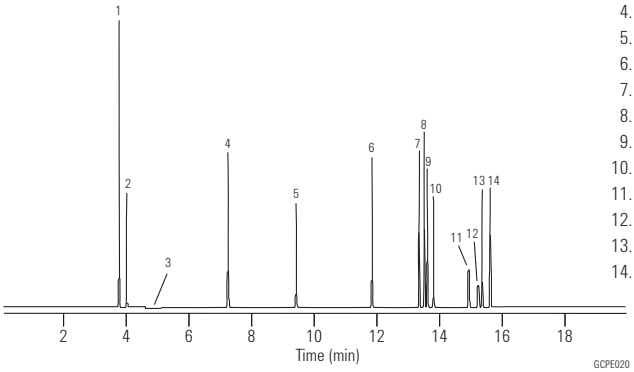
Oven: 60 °C for 2.5 min
60-250 °C at 10 °C/min

Injection: OI Analytical Volatiles Inlet
Split ratio 5:1
200 µL gas sampling valve

Detector: OI Analytical Model 5380 PFPD

Sample: 1 ppm Sulfur compounds in Propylene

Chromatogram courtesy of OI Analytical.



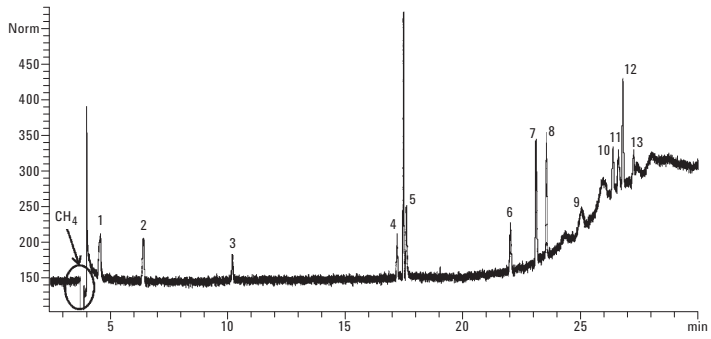
1. COS
2. H_2S
3. Propylene
4. CS_2
5. Methyl mercaptan
6. Ethyl mercaptan
7. Thiophene
8. Dimethyl sulfide
9. 2-Propanethiol
10. 1-Propanethiol
11. 2-Methyl-2-propanethiol
12. 2-Methyl-1-propanethiol
13. 1-Methyl-1-propnaethiol
14. 1-Butanethiol

Trace Sulfur Compounds in Methane (50 ppbv)

Column: **Select Low Sulfur**
CP8575
60 m x 0.32 mm,

Oven: 40 °C (6 min), to 120 °C at 6 °C/min,
to 180 °C (5 min) at 10 °C/min

Sample: 1 mL, split ratio: 3:1



	Compound	Signal/noise
1.	Hydrogen sulfide	3.8
2.	Carbonyl sulfide	4.0
3.	Methylmercaptan	2.2
4.	Ethylmercaptan	3.8
5.	Dimethyl sulfide	6.3
6.	2-Propanethiol	4.3
7.	Methyl ethyl sulfide	11
8.	Thiophene	11
9.	Tert-Butyl mercaptan	2.1
10.	2-Butanthiol	4.5
11.	2-Methyl-1 propanethiol	3.7
12.	Diethylsulfide	9.8
13.	1-Butanethiol	2.4

Food, Flavor, and Fragrance Applications

Spearmint Oil

Column A: DB-1
122-1032
30 m x 0.25 mm, 0.25 µm

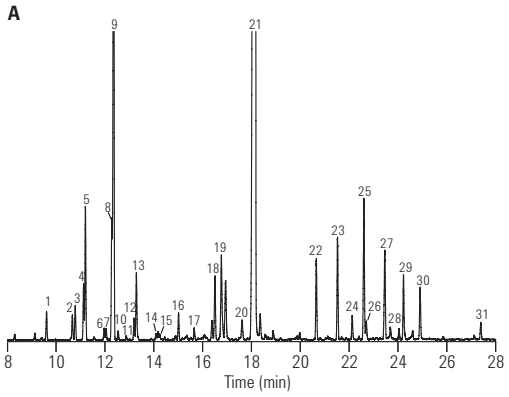
Column B: DB-1
121-1022
20 m x 0.18 mm, 0.18 µm

Carrier: A: Helium 25 cm/sec measured at 40 °C
B: Hydrogen 47 cm/sec measured at 40 °C

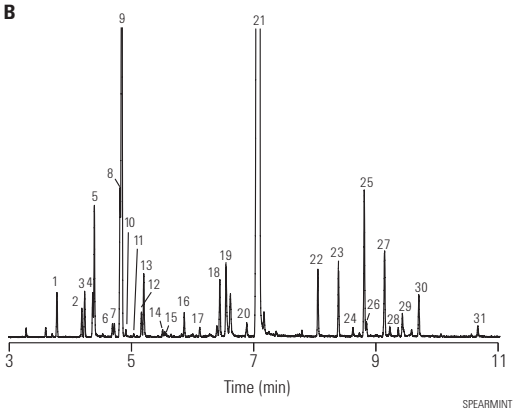
Oven: A: 40 °C hold 1 min, 5 °C/min to 290 °C
B: 40 °C hold 0.38 min, 13 °C/min to 290 °C hold 13.09 min

Injection: 250 °C, Split 40:1, 1 µL injection

Original Method with a DB-1, 30 m x 0.25 mm, 0.25 µm column and Helium carrier



Faster Method with a high efficiency DB-1, 20 m x 0.18 mm, 0.18 µm column and Hydrogen carrier



1. α-Pinene
2. Sabinene
3. β-Pinene
4. 3-Octanol
5. Myrcene
6. α-Terpinene
7. ρ-Cymene
8. 1,8-Cineol
9. Limonene
10. cis-Ocimene
11. trans-Ocimene
12. γ-Terpinene
13. trans-Sabinene hydrate
14. Terpinolene
15. Linalool
16. 3-Octyl acetate
17. Isomenthone
18. Terpinen-4-ol
19. Dihydrocarvone
20. trans-Carveol
21. l-Carvone
22. trans-Dihydrocarveol acetate
23. cis-Carvyl acetate
24. cis-Jasmone
25. β-Bourbonene
26. α-Bourbonene
27. β-Caryophylene
28. α-Copaene
29. trans-β-Farnesene
30. Germacrene-d
31. Viridiflorol

Using hydrogen as a carrier gas in conjunction with the high efficiency column resulted in an overall speed gain of 61% compared to the original method. In addition, the resolution was well maintained throughout the method translation process.

Lavender Oil Characterization

Column: DB-1ms Ultra Inert
122-0132UI
30 m x 0.25 mm, 0.25 µm

Instrument: Agilent 7890A/5975B MSD and a 6890N FID equipped

Sampler: Agilent 7683B, 5.0 µL syringe (Agilent p/n 5188-5246), 1.0 µL injection

Carrier: Helium 40 cm/s, constant flow MSD system, 35 cm/s FID system

Inlet: 200:1 split

Oven: 62 °C 12.5 min hold, 3 °C/min to 92 °C, then 5 °C/min to 165 °C, then 100 °C/min to 310 °C, 2.5 min hold

Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 280 °C, scan range 45-450 amu

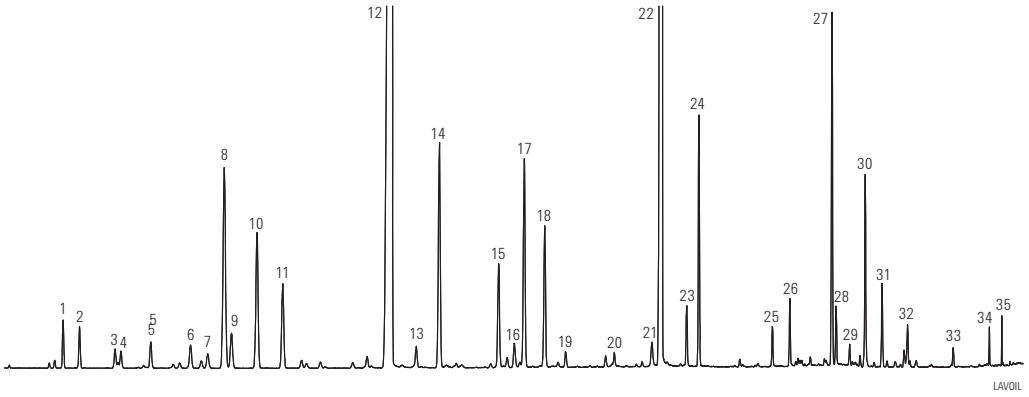
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split liner, single taper MS certified liner with restriction to hold glass wool, 5188-6576

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. α-Pinene
2. Camphene
3. 1-Octen-3-ol
4. 3-Octanone
5. β-Myrcene
6. 3-Carene
7. o-Cymene
8. Eucalyptol
9. D-Limonene
10. β-trans-Ocimene
11. β-cis-Ocimene
12. β-Linalool
13. Octen-1-ol acetate
14. Camphor
15. Borneol
16. Lavandulol
17. Terpinen-4-ol
18. α-Terpinol
19. Hexyl butyrate
20. Cumic aldehyde
21. cis-Geraniol
22. Linalool acetate
23. Borneol acetate
24. Lavandulyl acetate
25. Nerol acetate
26. Geranyl Acetate
27. Caryophyllene
28. α-Santoloene
29. α-Bergamotene
30. β-Farnesene
31. Germacrene D
32. γ-Cardinene
33. Caryophyllene oxide
34. tau-Cardinol
35. α -Bisabolol



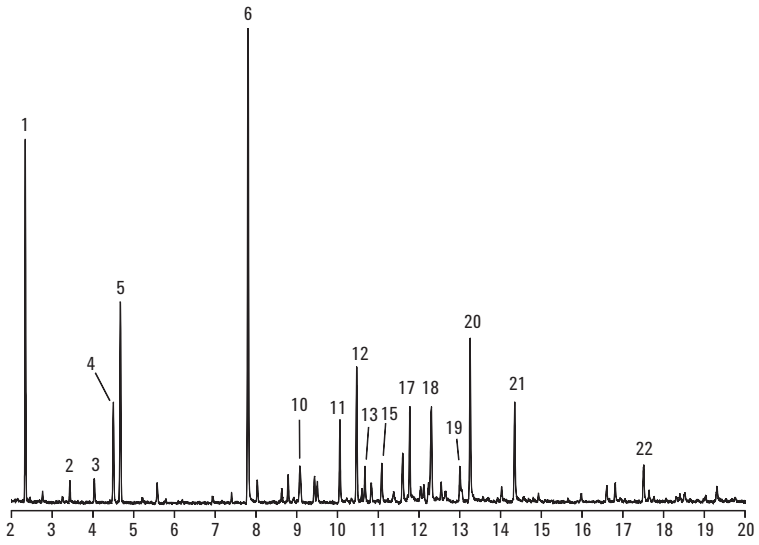
GC/MS total ion chromatogram of lavender oil sample on an Agilent J&W DB-1ms Ultra Inert 30 m x 0.25 mm, 0.25 µm capillary GC column (P/N 122-0132UI). The well-resolved, sharp peaks observed on the column ensure reliable analysis and fingerprinting of lavender oils

Essential Oils

Column: **DB-WAX**
121-7022
20 m x 0.18 mm, 0.18 µm

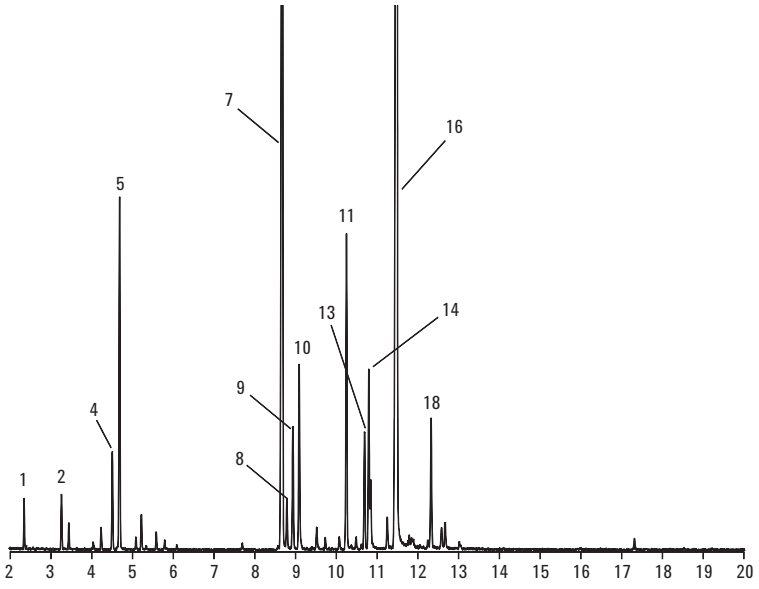
Carrier:	Hydrogen @ 44.3 cm/sec Measured @ 45 °C	Injection:	Split 1:30, 250 °C 1 µL of 1:35 oil in acetone
Oven:	45 °C hold 0.77 min 7.79 °C/min to 250 °C	Detector:	MSD full scan at m/z 40-500 250 °C transfer line

Wild chamomile



1. α-Pinene
2. β-Pinene
3. β-Myrcene
4. D-Limonene
5. Eucalyptol
6. 2,4-Hexadienal
7. Menthone
8. γ-Terpinene
9. Menthofuran
10. Iso-Menthone
11. Δ-Carane
12. Bornyl acetate
13. β-Caryophyllene
14. Isomenthol
15. Citronellyl formate
16. Menthol
17. t-β-Farnesene
18. γ-Cadinene
19. δ-Cadinene
20. Citronellol
21. Nerol
22. β-Maaliene

Peppermint



Fragrance Reference Standard

Column: **DB-WAX**
122-7032
30 m x 0.25 mm, 0.25 µm

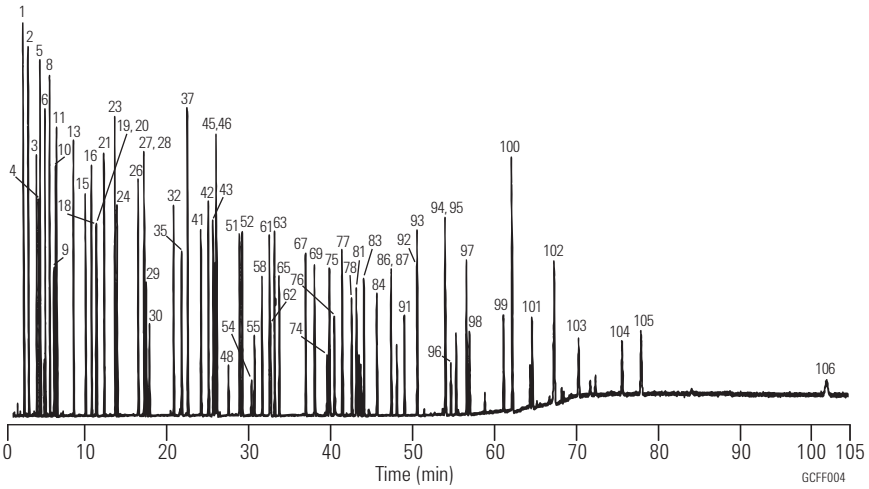
Carrier:	Helium at 25 cm/sec, measured at 150 °C	Injection:	Split, 250 °C Split ratio 1:50
Oven:	45 °C for 2 min 45-250 °C at 3 °/min 250 °C for 34 min	Detector:	MSD, 250 °C transfer line
		Sample:	1 µL of a 1:20 dilution of neat sample in acetone

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Split, single taper, low pressure drop, glass wool, 5183-4647
Seal:	Gold plated seal, 18740-20885
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273

Many thanks to Carl Frey, Manager of Analytical Services, Dragoco, and Kevin Myung, Director of Flavor and Perfumery Research, Bush Boake Allen, Inc. for contributing to this work.

1. Acetone
2. Ethyl acetate
3. Ethyl propionate
4. 2,3-Butanedione (diacetyl)
5. Methyl butyrate
6. Isobutyl acetate
7. α-Pinene
8. Ethyl butyrate
9. 2,3-Pentanedione (acetyl propionyl)
10. Camphene
11. Ethyl isovalerate
12. β-Pinene
13. Ethyl pentanoate
14. Myrcene
15. Allyl butyrate
16. Limonene
17. 1,8-Cineol
18. 3,5,5-Trimethylhexanol
19. 3-Methylbutyl alcohol
20. 2-Methylbutyl alcohol
21. Ethyl hexanoate
22. γ-Terpinene
23. p-Cymene
24. Hexyl acetate
25. Terpinolene
26. Ethyl heptanoate
27. 2,6-Dimethylhept-5-enal (MelonalTM)
28. Rose oxide, cis-rose
29. Hexanol
30. Rose oxide, trans-rose
31. Methyl-para-cresol
32. Ethyl octanoate
33. cis-Linalool oxide
34. Menthone
35. Furfural
36. trans-Linalool oxide
37. Octyl acetate
38. Isomenthone
39. α-Copaene
40. Camphor
41. Benzaldehyde
42. Ethyl nonanoate
43. Linalool
44. Linalyl acetate
45. Vertenex (isomer 1)
46. Octanol
47. β-Caryophyllene
48. Vertenex (isomer 2)
49. Terpinen-4-ol
50. Methyl benzoate
51. Hexylene glycol
52. Ethyl decanoate
53. Citronellyl acetate
54. Isoborneol
55. Neral
56. α-Terpineol
57. Geranyl formate
58. Borneol
59. β-Bisabolene
60. Benzyl acetate
61. Neryl acetate
62. Geranial
63. Ethyl undecanoate
64. δ-Cadinene
65. Geranyl acetate
66. Citronellol
67. Ethyl dodecanoate
68. Geraniol
69. Benzyl alcohol
70. Geranyl butyrate
71. Nonadecane
72. Benzene ethanol
73. Nonadec-1-ene
74. Florazone (isomer 1)
75. Florazone (isomer 2)
76. Hydroxycitronellal
77. Dodecanol
78. Diphenyl oxide
79. Citronellyl tiglate
80. Eugenyl methyl ether
81. γ-Nonalactone
83. Ethyl tetradecanoate
84. n-Amyl salicylate
85. Geranyl tiglate
86. Ethyl pentadecanoate
87. Isopropylmyristate
90. Phenylethyl tiglate
91. Rosatol (rosetone)
92. Eugenyl acetate
93. Ethyl hexadecanoate
94. γ-Dodecalactone
95. Dibenzyl ether
96. Tonalid
97. Ethyl octadecanoate
98. Benzophenone
99. Benzyl benzoate
100. Cetearyl octanoate
101. Musk T (ethylene brassylate)
102. Cetearyl decanoate
103. Frambione (raspberry ketone)
104. Cinnamyl phenyl acetate
105. Phenyl ethyl cinnamate
106. Cinnamyl cinnamate



Perfume

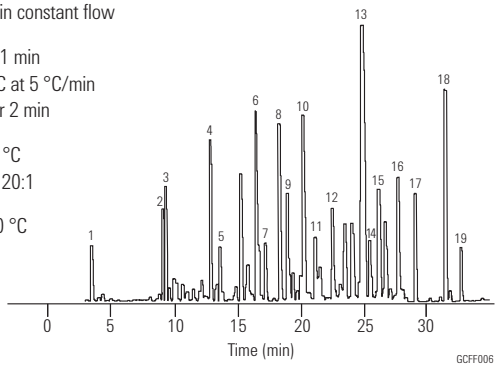
Column: **HP-INNOWax**
19091N-133
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 30 cm/sec
0.9 mL/min constant flow

Oven: 80 °C for 1 min
80-250 °C at 5 °C/min
250 °C for 2 min

Injection: Split, 250 °C
Split ratio 20:1

Detector: MSD, 280 °C



1. Limonene
2. Linalool
3. Linalyl acetate
4. Benzyl acetate
5. Citronellol
6. Benzene ethanol
7. α-Methyl Ionone
8. Carvocrol and geraiol
9. Isoamyl salicylate
10. n-Amyl salicylate
11. Commamyl acetate
12. Acetylcedrene
13. Diethyl phthalate
14. Tonalid
15. Coumarin
16. Musk xylene
17. Benzyl benzoate
18. Benzyl salicylate
19. Musk ketone

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Chiral Compounds in Essential Oils and Fragrances

Column: **HP Chiral β**
19091G-B233
30 m x 0.25 mm, 0.25 µm

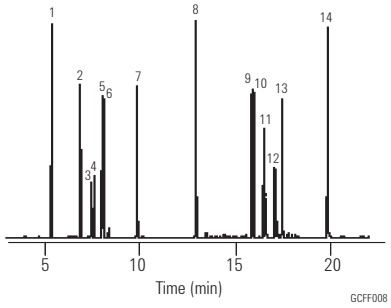
Carrier: Hydrogen, 39 cm/sec, constant pressure

Oven: 65 °C for 1 min
65-170 °C at 5 °C/min

Injection: Split, 250 °C
Split ratio 30:1

Detector: FID, 300 °C

Sample: 1 µL
0.25 ng/µL each analyte in Hexane



1. 1,2-Dimethylbenzene
2. Myrcene
3. (-)-Camphene
4. (+)-Camphene
5. (+)-β-Pinene
6. 1S-(-)-β-Pinene
7. Cineole
8. (R)-(+)-Citronellal
9. 1S,2R,5S-(+)-Menthol
10. 1R,2S,5R-(-)-Menthol
11. α-Terpineol
12. (+/-)-Isoborneol
13. (+)-Borneol
14. trans-Cinnamaldehyde

Menthol

Column: **Cyclodex-β**
112-2532
30 m x 0.25 mm, 0.25 µm

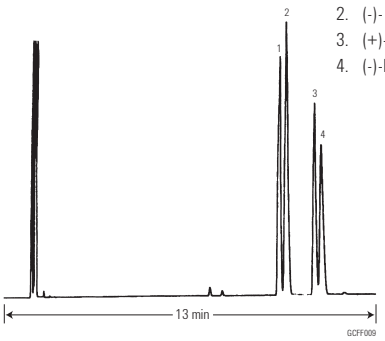
Carrier: Hydrogen, 55 cm/sec

Oven: 105 °C isothermal

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 1 µg/µL each chloroform



1. (+)-Neomenthol
2. (-)- Neomenthol
3. (+)-Menthol
4. (-)-Menthol

FAMEs I

Column: **DB-23**
122-2362
60 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 43 cm/sec, constant pressure mode

Oven: 130 °C for 1.0 min
130-170 °C at 6.5 °C/min
170-215 °C at 2.75 °C/min
215 °C for 12 min
215-230 °C at 40 °C/min
230 °C for 3 min

Injection: Split, 270 °C
Split ratio 50:1

Detector: FID, 280 °C

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

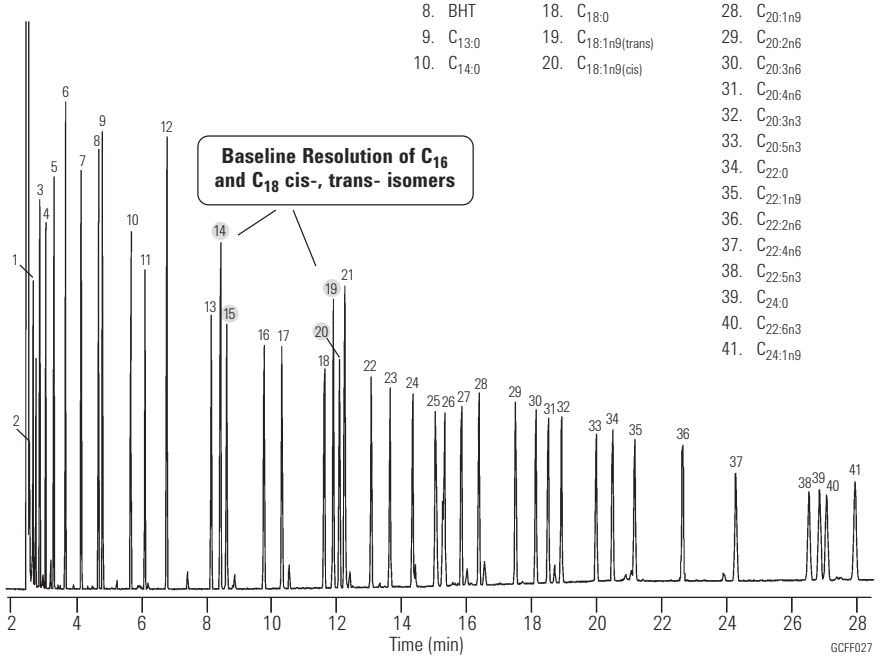
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Chromatogram provided courtesy of Steve Watkins and Jeremy Ching, FAME Analytics, http://www.fameanalytics.com

1. $C_{6:0}$
2. $C_{7:0}$
3. $C_{8:0}$
4. $C_{9:0}$
5. $C_{10:0}$
6. $C_{11:0}$
7. $C_{12:0}$
8. BHT
9. $C_{13:0}$
10. $C_{14:0}$
11. $C_{14:1n5}$
12. $C_{15:0}$
13. $C_{16:0}$
14. $C_{16:1n7(trans)}$
15. $C_{16:1n7(cis)}$
16. $C_{17:0}$
17. $C_{17:1}$
18. $C_{18:0}$
19. $C_{18:1n9(trans)}$
20. $C_{18:1n9(cis)}$
21. $C_{18:1n7}$
22. $C_{18:2n6}$
23. $C_{18:3n6}$
24. $C_{18:3n3}$
25. $C_{18:2(d9,11)}$
26. $C_{18:2(d10,12)}$
27. $C_{20:0}$
28. $C_{20:1n9}$
29. $C_{20:2n6}$
30. $C_{20:3n6}$
31. $C_{20:4n6}$
32. $C_{20:3n3}$
33. $C_{20:5n3}$
34. $C_{22:0}$
35. $C_{22:1n9}$
36. $C_{22:2n6}$
37. $C_{22:4n6}$
38. $C_{22:5n3}$
39. $C_{24:0}$
40. $C_{22:6n3}$
41. $C_{24:1n9}$



Analysis of Fragrance and Allergens

Column: **VF-WAXms**
CP9205
30 m x 0.25 mm, 0.25 µm

Oven: 100 °C to 250 °C with 10 °C/min

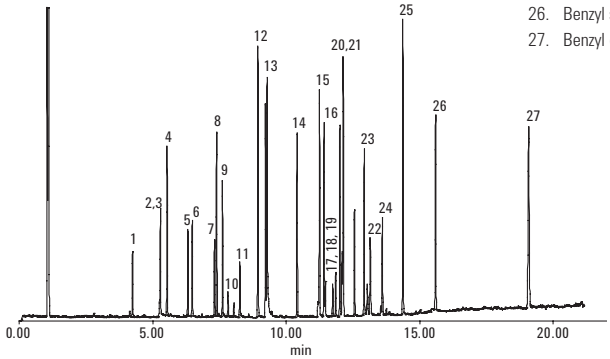
Carrier: Helium, 1.0 mL/min

Injection: Split 1:30, T = 250 °C

Detector: GC-MS Ion Trap
Trap: 200 °C
Manifold: 60 °C

Sample: 0.1 µL, Fragrances mixture (500 ppm)

1. Linalool
2. Methyl heptin carbonate
3. Phenyl acetaldehyde
4. Methyl chavicol
5. Methyl octin carbonate
6. Citronellol
7. Geraniol
8. Methyl gamma ionone
9. Benzyl alcohol
10. Cinnamaldehyde
11. Hydroxy citronellal
12. Methyl eugenol
13. Lilial
14. Eugenol
15. Amyl cinnamyl aldehyde
16. Anisic alcohol
17. Cinnamyl alcohol
18. Farnesol isomer I + II
19. Farnesol isomer III
20. iso-Eugenol
21. Hexyl cinnamic aldehyde
22. Lyral (4,4-isomer)
23. Coumarine
24. Amyl cinnamic alcohol
25. Benzyl benzoate
26. Benzyl salicylate
27. Benzyl cinnamate



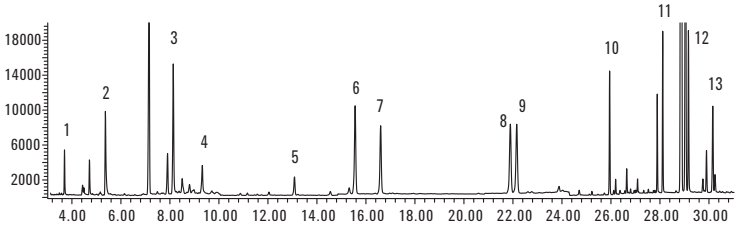
Organophosphorous Pesticides in Apple Matrix

Column: **DB-35ms Ultra Inert**
121-3822UI
20 m x 0.18 mm, 0.18 µm

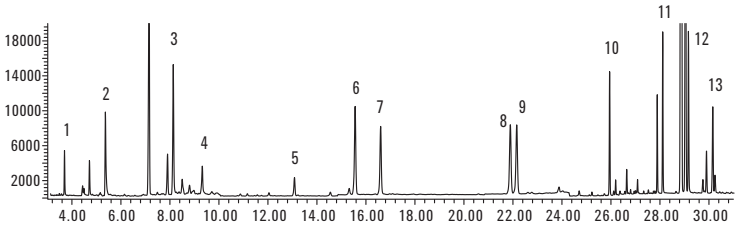
Instrument:	Agilent 7890 GC/Agilent 5975C Series GC/MSD
Sampler:	Agilent 7683B automatic liquid sampler, 5.0 µL syringe (P/N 5181-1273)
CFT Device:	Purged 2-way splitter (P/N G3180B) Split Ratio MSD:FPD = 3:1
MSD Restrictor:	1.2 m x 0.15 m id deactivated fused silica tubing
FPD Restrictor:	1.4 m x 0.15 mm id deactivated fused silica tubing
PCM 1:	3.8 psi constant pressure
Inlet:	1 µL splitless; 250 °C, purge flow 60 mL/min at 0.25 min, gas saver on at 2 min 20 mL/min
Carrier:	Helium, constant pressure 43.5 psi at 95 °C
Oven:	95 °C (1.3 min), 15 °C/min to 125 °C, 5 °C/min to 165 °C, 2.5 °C/min to 195 °C, 20 °C/min to 280 °C (3.75 min)
Postrun Backflush:	5 min at 280 °C, PCM 1 pressure 70 psi during backflush, 2 psi inlet pressure during backflush
Detector:	310 °C transfer line, 310 °C source, 150 °C quad

1. Oxydemeton-methyl
2. Methamidophos
3. Mevinphos
4. Acephate
5. Naled
6. Diazinon
7. Dimethoate
8. Chlorpyrifos
9. Malathion
10. Methidathion
11. TPP (surrogate std)
12. Phosmet

MSD (SIM): 600 ng/mL



FPD (P): 200 ng/mL



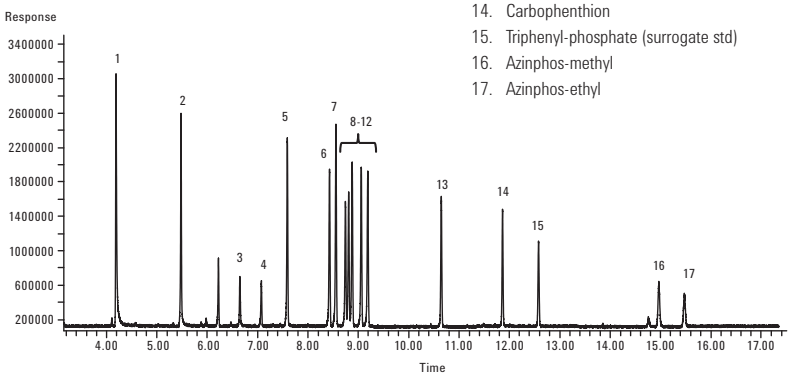
GC/MS-SIM and FPD chromatograms of a matrix matched organophosphorus pesticides standard analyzed on an Agilent J&W DB-35ms UI column. The effluent spilt ratio is MSD:FPD = 3:1.

Organophosphorous Pesticide Residues in Olive Oil Extract

Column: **DB-35ms Ultra Inert**
122-3832UI
30 m x 0.25 mm, 0.25 µm

Instrument:	Agilent 7890/5975C
Sampler:	Agilent 7683B, 5.0 µL syringe (P/N 5181-1273)
CFT Device:	Purged 2-way splitter (P/N G3180B) Split Ratio MSD:FPD = 1:1
MSD Restrictor:	1.43 m x 0.18 mm id deactivated fused silica tubing
FPD Restrictor:	0.53 m x 0.18 mm id deactivated fused silica tubing
Aux EPC:	3.8 psi constant pressure
Inlet:	2 µL splitless; 250 °C, purge flow 60 mL/min at 0.25 min, gas saver on at 2 min 20 mL/min
Carrier:	Helium, constant pressure 28.85 psi at 95 °C
Oven:	95 °C (0.5 min), 25 °C/min to 210 °C, 10 °C/min to 250 °C (0.5 min), 20 °C to 290 °C (4.5 min)
Postrun Backflush:	7.5 min at 290 °C, Aux EPC pressure 54 psi during backflush, 2 psi inlet pressure during backflush
Detector:	MSD: 300 °C transfer line, 300 °C source, 150 °C quad FPD: 230 °C, Hydrogen 75 mL/min, Air 100 mL/min, Carrier + makeup (N_2) 60 mL/min

1. Methamidophos
2. Acephate
3. Omethoate
4. Diazinon
5. Dimethoate
6. Pirimiphos-methyl
7. Parathion-methyl
8. Malathion
9. Chlorpyrifos
10. Fenitrothion
11. Parathion
12. Fenthion
13. Methidathion
14. Carbophenthion
15. Triphenyl-phosphate (surrogate std)
16. Azinphos-methyl
17. Azinphos-ethyl



GC/FPD chromatogram of a 100 ng/mL matrix-matched organophosphorus pesticide standard with analyte protectant analyzed on an Agilent J&W DB-35ms UI GC column.

Tips & Tools

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

Industrial Chemical Applications

Alcohols I

Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

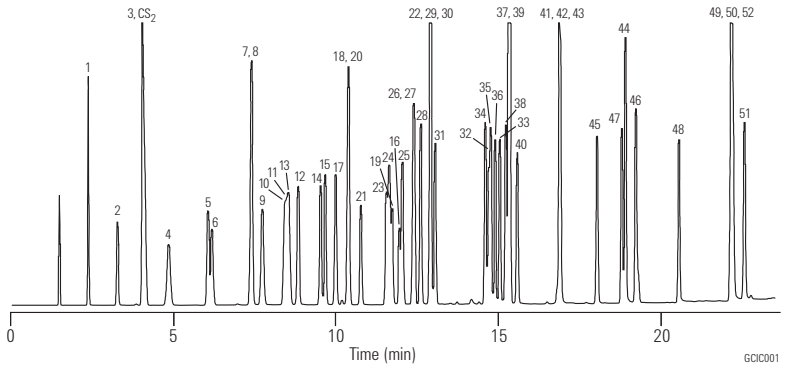
Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 0.01-0.05% each solvent in CS_2

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Methanol
2. Ethanol
3. Isopropanol
4. tert-Butanol
5. 2-Propen-1-ol (allyl alcohol)
6. 1-Propanol
7. 2-Propyn-1-ol (propargyl alcohol)
8. sec-Butanol
9. 2-Methyl-3-buten-2-ol
10. Isobutanol
11. 2-Methoxyethanol (methyl Cellosolve)
12. 3-Buten-1-ol
13. 2-Methyl-2-butanol (tert-amyl alcohol)
14. 1-Butanol
15. 2-Buten-1-ol (crotyl alcohol)
16. Ethylene glycol
17. 1-Penten-3-ol
18. 2-Pentanol
19. Glycidol
20. 3-Pentanol
21. 2-Ethoxyethanol (Cellosolve)
22. Propylene glycol
23. 3-Methyl-1-butanol (isoamyl alcohol)
24. 2-Methyl-1-butanol (active amyl alcohol)
25. 4-Methyl-2-pentanol
26. 1-Pentanol
27. 2-Penten-1-ol
28. 3-Methyl-2-buten-1-ol
29. Cyclopentanol
30. 3-Hexanol
31. 2-Hexanol
32. 4-Hydroxy-4-methyl-2-pentanone
33. Furfuryl alcohol
34. cis-3-Hexen-1-ol
35. 1-Hexanol
36. cis-2-Hexen-1-ol
37. Cyclohexanol
38. 3-Heptanol
39. 2-Heptanol
40. 2-Butoxyethanol (butyl Cellosolve)
41. cis-4-Hepten-1-ol
42. trans-2-Hepten-1-ol
43. 1-Heptanol
44. Benzyl alcohol
45. 2-Ethyl-1-hexanol
46. a-Methylphenyl alcohol
47. 1-Octanol
48. 1-Nonanol
49. 2-Phenoxyethanol
50. a-Ethylphenethyl alcohol
51. b-Ethylphenethyl alcohol
52. 1-Decanol



Halogenated Hydrocarbons I

Column: **DB-624**
123-1334
30 m x 0.32 mm, 1.80 µm

Carrier: Helium at 35 cm/sec

Oven: 35 °C for 5 min
35-245 °C at 10 °/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

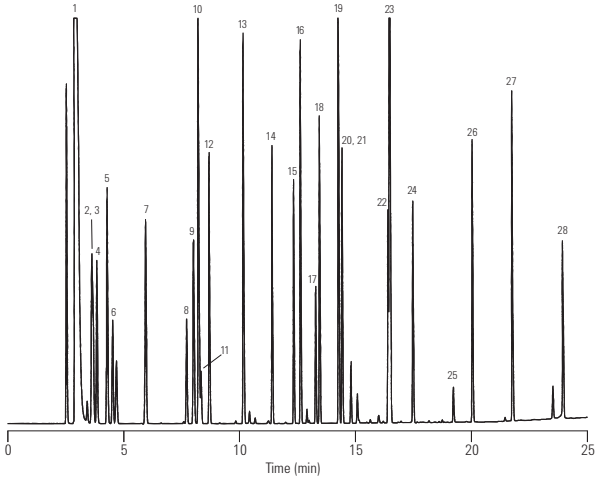
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Pentane
2. Iodomethane
3. 1,1-Dichloroethene
4. 1,1,2-Trichlorotrifluoroethane (Freon-113)
5. 3-Chloropropene (allyl chloride)
6. Methylene chloride
7. 1,1-Dichloroethane
8. Chloroform
9. 1,1,1-Trichloroethane
10. 1-Chlorobutane
11. Carbon tetrachloride
12. 1,2-Dichloroethane
13. 1,2-Dichloropropane
14. cis-1,2-Dichloropropene
15. trans-1,2-Dichloropropene
16. 1,1,2-Trichloroethane
17. 1,1,1,2-Tetrachloroethane
18. 1,2-Dibromoethane (EDB)
19. 1-Chlorohexane
20. trans-1,4-Dichloro-2-butene
21. Iodoform
22. Hexachlorobutadiene
23. 1,2,3-Trichloropropane
24. 1,1,2,2-Tetrachloroethane
25. Pentachloroethane
26. 1,2-Dibromo-3-chloropropane (DBCP)
27. Hexachloroethane
28. Hexachlorocyclopentadiene



Aromatic Solvents

Column: **DB-200**
122-2032
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec

Oven: 50 °C for 5 min
50-160 °C at 10 °/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.5 µL of 0.5 µg/µL
standard in hexane

Suggested Supplies

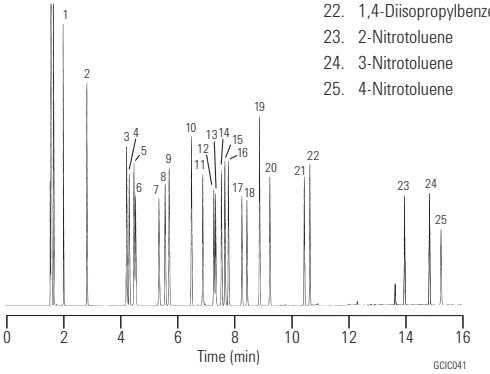
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Benzene
2. Toluene
3. Ethylbenzene
4. Chlorobenzene
5. p-Xylene
6. m-Xylene
7. o-Xylene
8. Styrene
9. Isopropylbenzene
10. n-Propylbenzene
11. 2-Chlorotoluene
12. 3-Chlorotoluene
13. 4-Chlorotoluene
14. tert-Butylbenzene
15. sec-Butylbenzene
16. Isobutylbenzene
17. 1,3-Dichlorobenzene
18. 1,4-Dichlorobenzene
19. n-Butylbenzene
20. 1,2-Dichlorobenzene
21. 1,3-Diisopropylbenzene
22. 1,4-Diisopropylbenzene
23. 2-Nitrotoluene
24. 3-Nitrotoluene
25. 4-Nitrotoluene



Phenols I

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 33 cm/sec, constant flow

Oven: 35 °C for 5 min
35-220 °C at 8 °C/min

Injection: Splitless, 250 °C

Detector: FID, 300 °C

Sample: 1 µL
20 µg/mL phenols in methylene chloride

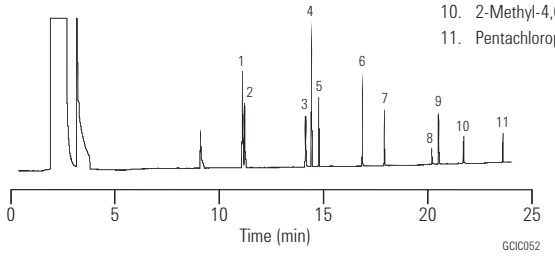
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Phenol
2. 2-Chlorophenol
3. 2-Nitrophenol
4. 2,4-Dimethylphenol
5. 2,4-Dichlorophenol
6. 4-Chloro-3-methylphenol
7. 2,4,6-Trinitrophenol
8. 2,4-Dinitrophenol
9. 4-Nitrophenol
10. 2-Methyl-4,6-dinitrophenol
11. Pentachlorophenol

Inorganic Gases

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Carrier: Helium at 53 cm/sec

Oven: 25 °C for 3 min
25-200 °C at 10 °/min
200 °C Hold

Injection: Split, 200 °C
Split ratio 1:50

Detector: TCD, 250 °C

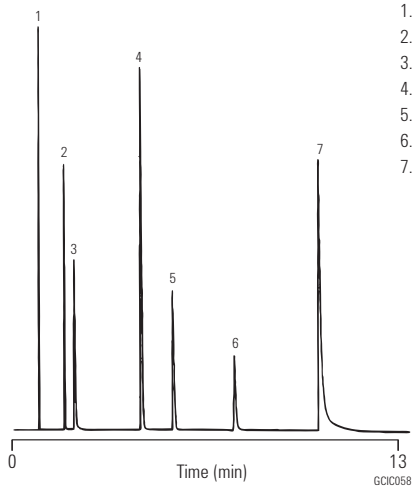
Sample: 50 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Nitrogen
2. CO_2
3. SF_6
4. COS
5. H_2S
6. Ethylene oxide
7. SO_2

Life Science Applications

Benzodiazepines I

Column: **DB-5MS Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

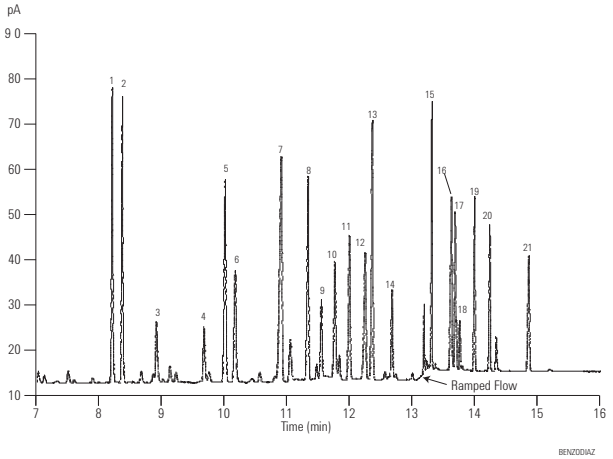
Carrier: Hydrogen, 53 cm/sec, constant flow
1.6 for 11 min
1.6 to 2.4 at 60 mL/min hold 2 min
2.4 to 5.0 at 50 mL/min hold 9 min

Oven: 170 °C for 3.2 min
170-250 °C at 24.7 °C/min, hold 5.3 min
250-280 °C at 18.6 °C/min, hold 4.0 min
280-325 °C at 50.0 °C/min, hold 4 min

Injection: Pulsed splitless, 280 °C
20 psi pulse pressure for 0.38 min
50 mL/min purge at 0.40 min
Direct connect liner G1544-80730

Detector: FID, 350 °C

Sample: 1 µL of 5-10 ppm



1. Medazepam
2. Halazepam
3. Oxazepam
4. Lorazepam
5. Diazepam
6. Desalkyl Aurazepam
7. Nordazepam
8. Clonazam
9. Oxazopam
10. Temazepam
11. Flunitrazepam
12. Bromazepam
13. Prazepam
14. Lormetazepam
15. Nitrazepam
16. Chlordiazepoxide
17. Clonazepam
18. Demoxepam
19. Estazolam
20. Alprazolam
21. Triazolam

Analysis of benzodiazepines and other drugs is particularly challenging because of their high level of activity. For this reason, all aspects of the sample path – particularly the GC Column – must be as inert as possible.

Amphetamines and Precursors – TMS Derivatives

Column: **DB-5**
121-5023
20 m x 0.18 mm, 0.40 µm

Carrier: Helium at 39 cm/sec, measured at 100 °C

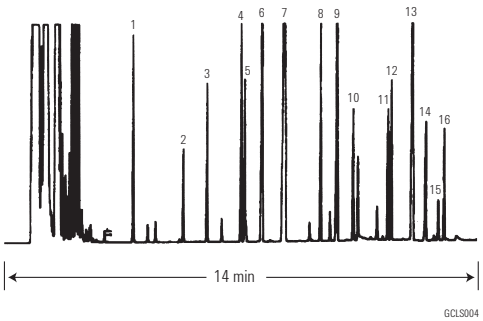
Oven: 100-240 °C at 10 °/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 2 µg/µL each in pyridine

1. Phenylacetone
2. Dimethylamphetamine
3. Amphetamine
4. Phentermine
5. Methamphetamine
6. Methyl ephedrine
7. Nicotinamine
8. Ephedrine
9. Phenacetin
10. 3,4-Methylenedioxyamphetamine (MDA)
11. 3,4-Methylenedioxymethylamphetamine
12. 4-Methyl-2,5-dimethoxyamphetamine (STP)
13. Phenyl ephedrine
14. 3,4-Methylenedioxyethylamphetamine (MDE; Eve)
15. Caffeine
16. Benzphetamine



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Barbiturates

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec, measured at 50 °C

Oven: 50 °C for 0.5 min
50-150 °C at 25 °/min
150-300 °C at 10 °/min

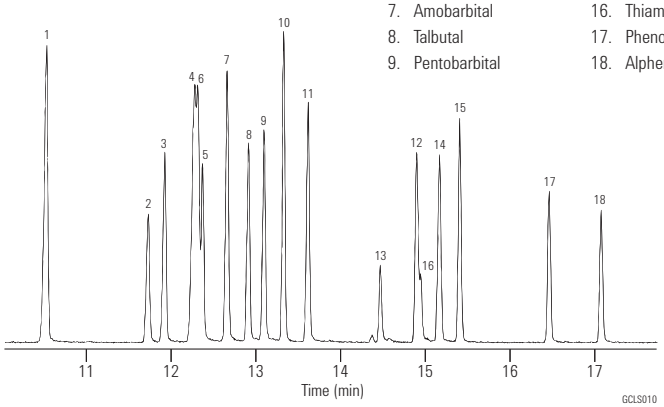
Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 280 °C transfer line
full scan at m/z 40-270

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Barbital
2. Allobarbital
3. Aprobarbital
4. Butabarbital
5. Butethal
6. Butalbital
7. Amobarbital
8. Talbutal
9. Pentobarbital
10. Methohexital
11. Secobarbital
12. Hexobarbital
13. Thiopental
14. Cyclopentylbarbital
15. Mephobarbital
16. Thiamylal
17. Phenobarbital
18. Alphenal



Narcotics

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec, measured at 50 °C

Oven: 50 °C for 0.5 min
50-150 °C at 25 °/min
150-325 °C at 10 °/min

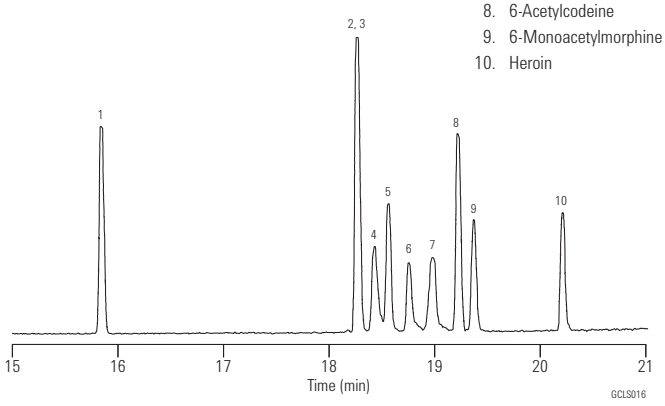
Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
full scan at m/z 40-380

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Dextromethorphan
2. Codeine
3. Dihydrocodeine
4. Norcodeine
5. Ethylmorphine
6. Morphine
7. Normorphine
8. 6-Acetylcodeine
9. 6-Monoacetylmorphine
10. Heroin



Blood Alcohols I (Static Headspace/Split)

Column: **DB-ALC1**
125-9134
30 m x 0.53 mm, 3.00 µm

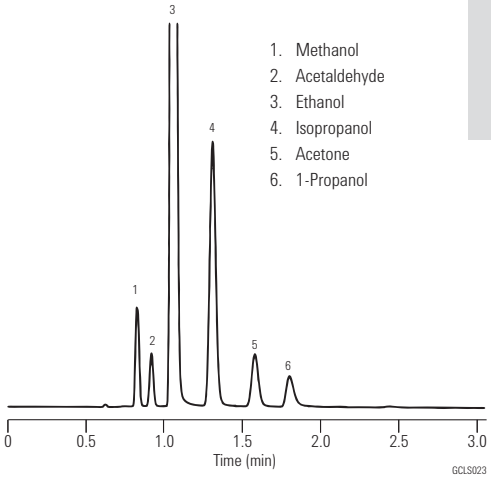
Carrier: Helium at 80 cm/sec, measured at 40 °C

Oven: 40 °C Isothermal

Sampler: Headspace

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 23 mL/min



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

Blood Alcohols II (Static Headspace/Split)

Column: **DB-ALC2**
125-9234
30 m x 0.53 mm, 2.00 µm

Carrier: Helium at 80 cm/sec, measured at 40 °C

Oven: 40 °C Isothermal

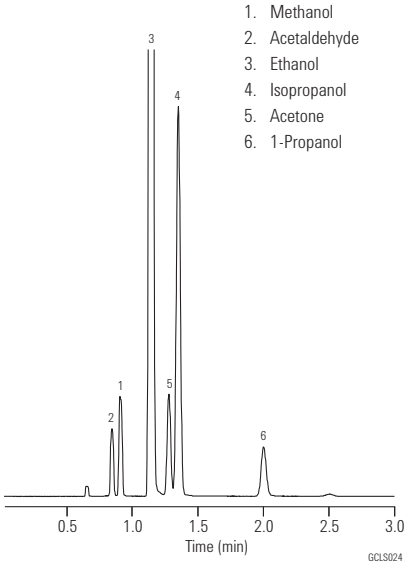
Sampler: Headspace

Oven:	70 °C
Loop:	80 °C
Transfer line:	90 °C
Vial equil. time:	10 min
Pressurization time:	0.20 min
Loop fill time:	0.20 min
Loop equil. time:	0.05 min
Inject time:	0.1 - 0.2 min
Sample loop size:	1.0 mL

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 23 mL/min

Sample: 0.1% Ethanol, 0.001% Others



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

Residual Solvents, DMI Diluent

Column: **DB-624**
123-1364
60 m x 0.32 mm, 1.80 µm

Oven: 50-60 °C, 1 °C/min
60-115 °C, 9.2 °C/min
115-220 °C, 35 °C/min
220 °C – hold 6 min

Sampler: Headspace
Platen 140 °C
Transfer line, valve 250 °C
Sample loop 2 mL

Injection: Split, 250 °C
Split ratio 1:18

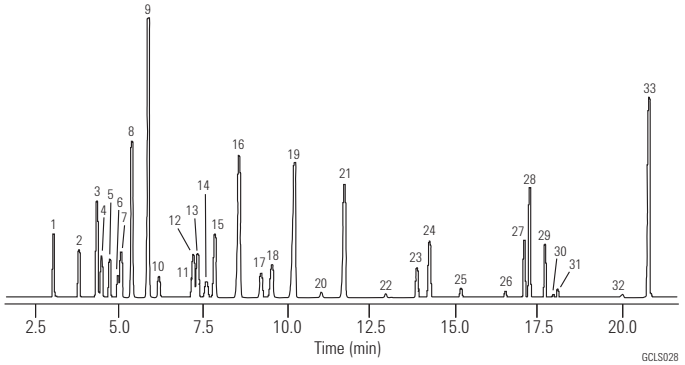
Detector: FID, 270 °C
Nitrogen makeup

Sample: 5,000 ppm standard

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Methanol
2. Ethanol
3. Acetone
4. 2-Propanol
5. Acetonitrile
6. Methylene chloride
7. 2-Methyl-2-propanol (tert-butanol)
8. MTBE
9. Hexane
10. 1-Propanol
11. DMI impurity
12. 2-Butanone (MEK)
13. Ethyl acetate
14. 2-Butanol
15. Tetrahydrofuran
16. Cyclohexane
17. Isopropyl acetate
18. 1,2-Dimethoxyethane
19. Heptane
20. 1-Methoxy-2-propanol
21. Methylcyclohexane
22. 2-Ethoxyethanol
23. MIBK (2-Pentanone)
24. Toluene
25. 1-Pentanol
26. n,n-Dimethylformamide (DMF)
27. Ethyl benzene
28. m,p-Xylene
29. o-Xylene
30. Dimethyl sulfoxide (DMSO)
31. n,n-Dimethylacetamide
32. n-Methylpyrrolidone
33. 1,3-Dimethyl-2-imidazolidinone (DMI)



Special thanks to Julie Kancler, Brian Wallace, Teledyne.

Underivatized Drugs of Abuse – Agilent Fast Toxicology Analyzer

Column: **DB-35 ms Ultra Inert**
122-3812UI
15 m x 0.25 mm, 0.25 µm

Carrier: Helium fixed pressure 35.0 psi

Injection: Splitless 1 µL 280 °C, total flow 56.4 mL/min,
3 mL/min switched septum purge, gas saver off,
50 mL/min after 0.4 min

Liner: Splitless, dual taper, deactivated, 4 mm id, 5181-3315

Sample: Agilent GC/MS Toxicology Checkout Mixture (P/N 5190-0471)

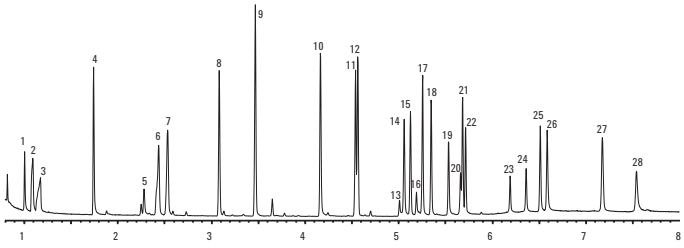
Backflush: Post run: 1 min. 1 psi inlet, 75 psi aux EPC

Oven: 100 °C (0.25 min) to 345 °C (40 °C/min, 2.25 min hold)

Detector: MSD: Transfer line 300 °C, source 300 °C,
quadrapole 180 °C scan mode
NPD: Blos bead 300 °C H_2 3 mL/min,
60 mL/min air, 11 mL/min makeup and col flow

CFT Device: 2-Way splitter with solvent venting between MSD and NPD

1. Amphetamine
2. Phentermine
3. Methamphetamine
4. Nicotine
5. Methylenedioxyamphetamine (MDA)
6. Methylenedioxymethamphetamine (MDMA)
7. Methylenedioxyethylamphetamine
8. Meperidine
9. Phencyclidine
10. Methadone
11. Cocaine
12. SKF-525a (RTL Compound)
13. Oxazepam
14. Tetrahydrocannabinol
15. Codeine
16. Lorazepam
17. Diazepam
18. Hydrocodone
19. Oxycodone
20. Temazepam
21. Diacetylmorphine
22. Flunitrazepam
23. Nitrazepam
24. Clonazepam
25. Alprazolam
26. Verapamil
27. Strychnine
28. Trazodone



Example NPD chromatogram of underivatized drugs of abuse 5 ng/component on an Agilent J&W DB-35ms UI column. Component number 12 is used for retention time locking in the deconvolution reporting software database.

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