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Diagnose tough MSD problems

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Discover the best GC/MS columns

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Access powerful support

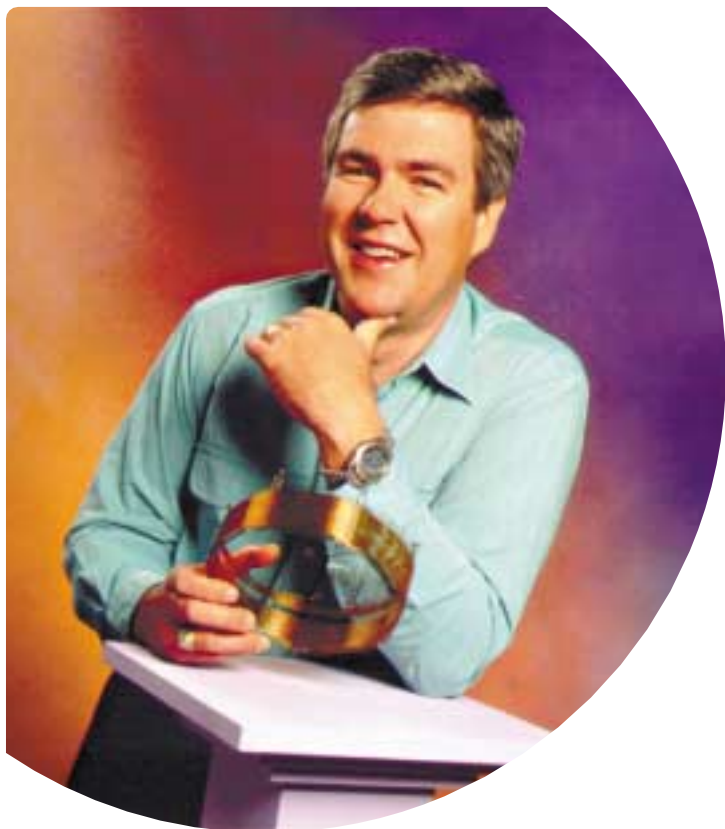


Maintaining Your GC/MS System

Operate your Agilent GC/MS System with maximum efficiency.



Agilent Technologies



Maintaining Your GC/MS System

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The GC/MS Resource Guide will help you keep your GC/MS system operating at peak performance with essential maintenance, product information and troubleshooting tips. It's also a convenient guide for identifying the part numbers of Agilent consumables and accessories—and it's all right at your fingertips.


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Phil Stremple
Ph.D., Chemistry
GC Columns Program Manager

Maintaining Mass Selective Detectors (MSD)

Your GC/MSD system contains a high level of sensitivity. To continue achieving optimal results, it is critical to maintain your system properly by performing the essential tasks within this guide. Some of the benefits for maintaining your GC/MSD include:

- less downtime for repairs
- a longer lifetime for your MSD system
- a reduction in overall operating costs



“We don’t really sell chemical analysis. Our business is giving you real business solutions you can use.”

Linda Doherty, Ph.D., Analytical Chemistry
Software Program Manager

Maintenance Schedule

Some parts of the MSD require regularly scheduled maintenance.

Common maintenance tasks are listed in the table below. It is advisable to keep a log book of system performance, Autotune, and maintenance operations performed. This makes it easier to identify variations from normal performance and to take corrective action.



Every day

Check, and if necessary, replace the septum. Check the injection port liners. Check the tightness of the column nuts.

Every week

Check the foreline pump oil level and diffusion pump fluid. Change the injection port liners and O-rings. Gas ballast the foreline pump.

Every month

Clean the split/splitless inlet vent line trap. Check for leaks (inlet and column connections).

Every three months

Replace gas cylinders (when below 500 psig).

Every six months

Replace the foreline pump oil. Check, and if necessary, refill the calibration vial.

Every year

Replace the diffusion pump fluid. Recondition or replace internal and external traps and chemical filters on the GC.

As needed

Tune the MSD. Clean the ion source. Replace the carrier gas trap. Replace worn-out parts (filaments, EM, etc.). Replace the column. Lubricate seals.

Monitor

Record all tune values such as electron multiplier and ion source parameters in a log book to monitor instrument performance. In addition note the high vacuum and foreline vacuum pressures.

TASK	EVERY WEEK	EVERY 6 MONTHS	EVERY YEAR	AS NEEDED
Tune the MSD				•
Change injection port liners	•			
Check the foreline pump oil level	•			
Gas ballast the foreline pump	•			
Check the calibration vial		•		
Replace the foreline pump oil		•		
Check the diffusion pump fluid	•			
Replace the diffusion pump fluid			•	
Replace the traps and filters			•	
Clean the ion source				•
Change the carrier gas trap(s) and purifier				•
Replace the worn out parts				•
Lubricate seals (where appropriate)				•
Replace column				•

● ● ● ● ● Contamination

Contamination is usually identified by excessive background in the mass spectra. It can come from the GC or from the MSD. The source of the contamination can sometimes be determined by identifying the contaminants. Some contaminants are much more likely to originate in the GC, others are likely to originate in the MSD.

Contamination sources in the GC:

- column or septum bleed
- dirty injection port
- injection port liner
- contaminated syringe
- poor quality carrier gas
- dirty carrier gas tubing
- fingerprints
- air leaks
- cleaning solvents and materials

Contamination sources in the MSD:

- air leak
- cleaning solvents and materials
- diffusion pump fluid
- foreline pump oil
- fingerprints inside the manifold



The action required to remove the contamination depends on the type of contamination and the level of contamination. Minor contamination by water or solvents can usually be removed by allowing the system to pump (with a flow of clean carrier gas) overnight. Serious contamination by rough pump oil, diffusion pump fluid or fingerprints is much more difficult to remove; it may require extensive cleaning. For further details contact your Agilent Customer Engineer (CE).

● Air Leaks

Air leaks are a problem for any instrument that requires a vacuum to operate. Leaks are generally caused by vacuum seals that are damaged or not fastened correctly.

Symptoms of leaks include:

- higher than normal vacuum manifold pressure or foreline pressure
- higher than normal background
- peaks characteristic of air (m/z 18, 28, 32, and 44 or m/z 14 and 16)
- poor sensitivity
- low relative abundance of m/z 502 (this varies with the tune program and MSD used)

Leaks can occur in either the GC or the MSD. In the GC, most leaks occur in:

- injection port septum
- injection port column nut
- broken or cracked capillary column

Contamination

● Air Leaks

Leaks can occur in many more places in the MSD:

- GC/MSD interface column nut
- side/top plate O-ring (all the way around)
- vent valve O-ring
- calibration valve
- high vacuum gauge tube fitting
- cracked ion gauge tube
- front and rear end plate O-rings
- GC/MSD interface O-ring (where the interface attaches to the vacuum manifold)
- diffusion pump co-seal and/or baffle adapter O-ring
- turbomolecular pump O-ring
- new Vespel/graphite ferrules contract when heated



Corrective Action

- Check interface nut for tightness. Replace if necessary.
- Check leak/test the GC injection port.



Helpful Hint:

The most likely point for an air leak is a seal you recently opened.

Description

MS interface column nut
Column nut for GC/MS and two hole ferrules
Universal Column Nut (2/pk)

Part No.

05988-20066
05921-21170
5181-8830

● Cleaning Solvents

It is common to see cleaning solvent peaks in the mass spectra shortly after the ion source is cleaned.



Corrective Action

- Dry all cleaned metal parts in the GC oven before reassembling and reinstalling them. Refer to specific cleaning procedures in your MSD Hardware Manual.

- Use a temperature above the boiling point of the solvent but below the limit of the column.

● Fingerprints

Fingerprints contain hydrocarbons that can appear in mass spectra. Hydrocarbon contamination is characterized by a series of mass peaks 14 amu apart. The abundances of these peaks decrease as peak mass increases. Fingerprint contamination is usually caused by the failure to wear lint-free,

nylon gloves during ion source cleaning, GC inlet maintenance, or from installing the column. Use special care to avoid recontamination of parts after you clean them. This typically occurs after some maintenance or part replacement.



Corrective Action

- Reclean using clean, nylon gloves and proper cleaning techniques.

Description

Nylon gloves, lint-free, Large
Nylon gloves, lint-free, Small

Part No.

8650-0030
8650-0029

● Diffusion Pump Fluid

If the diffusion pump is allowed to operate with no column (carrier gas) flow into the vacuum system, vapor from the diffusion pump fluid can drift up into the vacuum manifold. A more serious problem is when fluid is back streamed into the vacuum

manifold by sudden or improper venting of the vacuum system. If a diffusion pump has back streamed, a prominent peak will often be seen at m/z 446 and the spectral baseline will exhibit increased background noise.



Corrective Action

- If m/z 446 appears please call Agilent for assistance.

Contamination



Foreline Pump Oil

Foreline pump oil contamination is characterized by peaks spaced 14 amu apart (hydrocarbons). Contamination with foreline pump oil is less common than contamination with diffusion pump fluid.



Corrective Action

- Call Agilent for assistance.

Contamination Identification

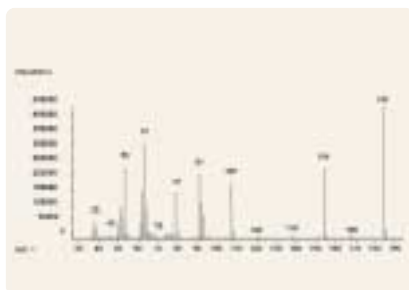
The following table lists some of the more common contaminants, the ion characteristic of those contaminants, and the likely sources of those contaminants.

Common Contaminants

Ions (m/z)	Compound	Possible Source
13,14,15,16	Methane	CI gas
18, 28, 32, 44 or 14, 16	H ₂ O, N ₂ , O ₂ , CO ₂ or N, O	Residual air and water, air leaks, outgassing from Vespel™ ferrules
31, 51, 69, 100, 119, 131, 169, 181, 214, 219, 264, 376, 414, 426, 464, 502, 576, 614	PFTBA and related ions	PFTBA (tuning compound)
31	Methanol	Cleaning solvent
43, 58	Acetone	Cleaning solvent
78	Benzene	Cleaning solvent
91, 92	Toluene or xylene	Cleaning solvent
105, 106	Xylene	Cleaning solvent
151, 153	Trichloroethane	Cleaning solvent
69	Foreline pump fluid or PFTBA	Foreline pump oil vapor or calibration valve leak
73, 147, 207, 221, 281, 295, 355, 429	Dimethylpolysiloxane	Septum bleed or methyl silicone column coating
77, 94, 115, 141, 168, 170, 262, 354, 446	Diffusion pump fluid	Diffusion pump fluid and related ions
149	Plasticizer (phthalates)	Vacuum seals (O-rings) damaged by high temperatures, use of vinyl or plastic gloves
Peaks spaced 14 amu apart	Hydrocarbons	Fingerprints, foreline pump oil

Mass Spectral Symptoms

This section describes symptoms you might observe in mass spectra. Some of these symptoms will appear in the mass spectra of samples or in a tune report. Some of these can be corrected by the operator, or may require service by an Agilent Customer Engineer.



Sensitivity

Symptoms	Corrective Action
Wrong retention time	Check GC, method, application and carrier gas velocity
Low signal	Check GC, tune vacuum system
Leaking injection port	Clean the injection port Replace the injection port liner and septa
Air leak	Check and tighten interface nut, leak test GC injection port
Peak widths	Do Autotune, check flow rate and temperature stability
Interfering peaks	Check time parameters, coeluting peaks, column type
Excessive background	Do Autotune and compare to background specifications Check time parameters
Incorrect mass assignment	Retune
Abnormal spectra – excessive background contamination	Check for contamination
Incorrect tuning	Check tune file, retune, check sample
Repeller voltage is too low	Raise voltage to test for response
Dirty ion source	Clean source

Repeatability

Symptoms	Corrective Action
Dirty syringe needle	Clean or replace the syringe
Wrong syringe needle	Replace syringe and septa
Leaking injection port	Perform injection port maintenance Replace the injection port liner
Injection is too large	Check method and injection volume, split ratio and/or splitless purge time
Loose column connections	Tighten column nuts on injection port or transfer line Replace column nuts and ferrule
Variations in pressure, column flow, and temperature	Ensure the MSD is located in an environment where the temperature is stable – Keep MSD out of drafts and direct sunlight – Check that the carrier gas is steady and well regulated – Service the foreline pump and/or diffusion pump
Dirty ion source	Clean source
Loose connections in the analyzer	Check internal and external analyzer wiring connections, make sure all are secure
Ground loops	Check main electrical lines

● ● ● ● ● Ion Source



5973 Ion Source Assembly (EI)

● Ion Source

The ion source operates by electron ionization (EI) or chemical ionization (CI). The sample enters the ion source from the GC/MSD interface. Electrons emitted by a filament enter the ionization chamber, guided by a magnetic field. The high-energy electrons interact with the sample mole-

cules, ionizing and fragmenting them. The positive voltage on the repeller pushes the positive ions into the lens stack, where they pass through several electrostatic lenses. These lenses concentrate the ions into a tight beam, which is directed into the mass filter.

● Maintaining the Ion Source

Cleaning procedures for MSDs vary. Refer to your MSD Hardware Manual for specific ion source cleaning procedures.

Common measures of instrument performance:

- abundance of certain ions (e.g. percentage of the 502 ion from the Autotune report)
- shape of lens ramps and the chosen voltages, especially Repeller Ramp
- sensitivity obtainable for a given analysis
- ability to tune to a given reference compound (e.g. DFTPP)

When to Clean:

The ion source should be cleaned:

- according to a customer's predefined schedule
- based on instrument performance (e.g. deteriorated performance over time)

Frequency of Cleaning

- the number of samples run (throughput)
- the type of samples
- unique, established laboratory protocol

Selecting a Cleaning Method

The primary action of any cleaning procedure is to remove contamination from surfaces. Removing this contamination restores the electrostatic properties of the ion source lensing system. Numerous cleaning methods have been developed for restoring ion source performance. The cleaning methods include abrasive, sonic, and electropolish.

Abrasive methods offer several advantages:

- provide adequate energy to remove contamination from surfaces
- require minimal equipment
- pose minimal risks to the user

A popular material used to abrasively clean stainless steel ion source parts is aluminum oxide. It is available in either powder form or an abrasive film. After the critical surfaces have been abrasively cleaned, the loose particles must be removed. One method of removing particles is swabbing with a cotton swab or a clean cloth dipped in acetone. A clean swab should be used for each element followed by a sonication. These cleaning supplies are listed on page 11.

Preparing to Clean

Prior to cleaning, the mass spectrometer must be vented and the ion source must be removed. Before venting the system, the following conditions must be met:

- heated zones are less than 100 °C
- the diffusion pump is off and cool
- the turbo pump is off and not spinning
- the rough pump is off

Improper venting may deposit diffusion pump fluid in the analyzer (backstream).

Cleaning and Maintenance Supplies



★ **Note:**
Details about specific MSD maintenance can be found in your model's specific hardware manual.

Description	Part No.
Cleaning and Maintenance	
Nylon gloves, lint-free, Large	8650-0030
Nylon gloves, lint-free, Small	8650-0029
Lint-free industrial wipes, 100% cotton, 9 x 9 in. (300/pk)	9310-4828
Generic ion source cleaning kit for all GC/MS types Includes: Cloths, lint-free (15/pk), Abrasive sheets (5/pk), Cotton swabs (100/pk), Nylon gloves, lint-free, Alumina powder, abrasive Cloths, lint-free (15/pk)	5181-8863
Abrasive Sheets, aluminum oxide green lapping paper for ion source cleaning, 600 mesh (5 sheets)	05980-60051
Alumina powder, abrasive	5061-5896
PFTBA sample, certified (10 g)	8660-0791
PFTBA sample kit, 1 mL	8500-0656
Activated alumina, absorbent pellets for Edwards rough pump traps, non-LC/MS (1 lb can)	05971-60571
PFTBA glass vial	8500-1233
Cotton swabs (100/pk)	05980-20018
	5080-5400
Tools	
Screwdriver, Pozidriv #1 pt, 3 in., fits no. 2 - 4 screws	8710-0899
Screwdriver, Pozidriv #2 pt, 4 in., fits no. 5 - 10 screws	8710-0900
Wrench, open-end, 1/4 x 5/16 in.	8710-0510
Hex nut driver, 5.5 mm	8710-1220
Screwdriver, TORX, T20	8710-1615
Screwdriver, TORX, T15	8710-1622
Screwdriver, TORX, T10	5182-3466
Ferrules and O-rings	
Teflon 1/4 in. ferrule (back)	0100-0160
Teflon 1/4 in. ferrule (front)	0100-0787
Retainer rings (10/pk)	5181-1258
5973 One Year Maintenance Kit (for diffusion pump systems)	5183-2096
Includes: Big Universal Trap for He, Abrasive sheets (5/pk), Cloths, lint-free (15/pk), Cotton swabs (100/pk), SantoVac Ultra, 18.5 mL (2 ea.), Rough pump oil, 1 liter, Filament assembly, Octafluoronaphthalene (OFN)	
MSD Tool Kit	05971-60561
Includes: Small cleaning rod, Large cleaning rod, Source hold tool, Cotton swabs (100/pk), Nylon gloves, lint-free, Abrasive sheet, 30 mm (5/pk), Tool kit (wrenches, driving tools)	

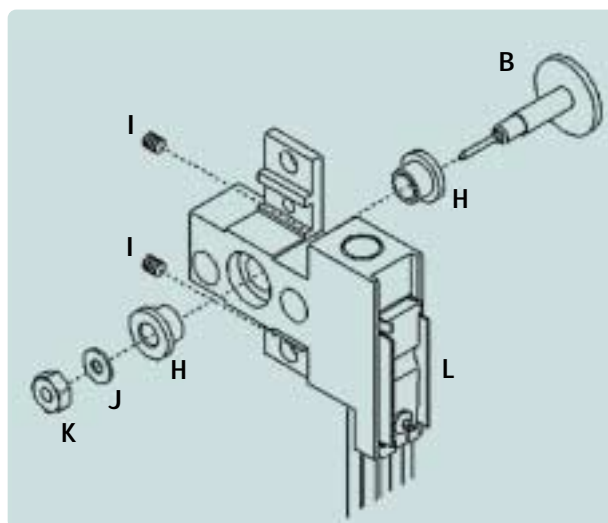
● ● ● ● ● Ion Source

● 5973 MSD Ion Source Parts (EI)



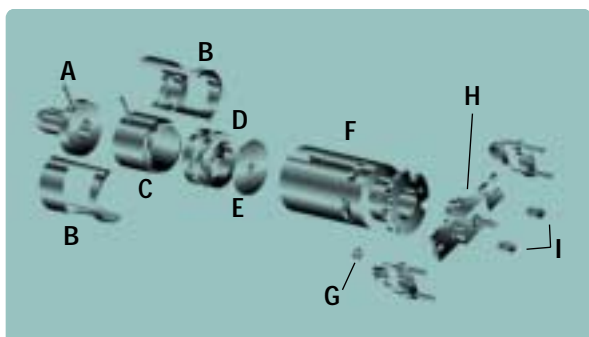
5973 Ion Source Parts (EI).

Description	5973 Part No.
Ion source assembly	G1099-60106
Source heater assembly	G1099-60177
Repeller assembly	G1099-60170
Screw (for filament on the source)	0515-1046
(A) Ion source body	G1099-20130
(B) Repeller	G1099-20132
(C) Interface socket	G1099-20136
(D) Drawout plate	05971-20134
(E) Drawout cylinder	G1072-20008
(F) Ion focus lens	05971-20143
(G) Entrance lens	05971-20126
(H) Repeller insulator	G1099-20133
(I) Set screw	0515-1446
(J) Washer, M3 (5/pk)	3050-0891
(K) Nut, 5.5 mm	0535-0071
(L) Ion source sensor	G1099-60104
(M) Lens insulator, (2/pk)	05971-20130



5973 Repeller Assembly (EI).

Ion Source



5972/5971/GCD Ion Source (EI)

5972/5971/GCD MSD Ion Source Parts (EI)

Description	5972/5971/GCD Part No.	
(A) Entrance lens	05971-20126	
(B) Lens insulator, (2/pk)	05971-20130	
(C) Ion focus lens	05971-20143	
(D) Drawout cylinder	G1072-20008	
(E) Drawout plate	05971-20134	
(F) Ion source body	05971-20128	
(G) Set screw	0515-1446	
(H) Repeller assembly	05971-60170	
(I) Screw (for filament on the source)	0515-1046	
Ion source assembly	5972 Part No.	5971/GCD Part No.
	05972-60226	05971-60102
Transfer line tip, gold-plated	5972/5971 Part No.	GCD Part No.
	05971-20305	G1800-20305



Helpful Hint:

It is good practice to replace scratched lenses and other ion source parts. Scratched source parts lead to poor performance.

● ● ● ● ● Ion Source

● Filaments

Two filaments are located on opposite sides outside of the ion source. The active filament carries an adjustable ac emission current. The emission current heats the filament, causing it to emit electrons; these electrons ionize the sample molecules. In addition, for the 5973 and 5972, both filaments have an adjustable dc bias voltage. The bias voltage determines the energy on the electrons, usually -70 eV.



Maintaining the Filaments

Like the filament in an incandescent light bulb, the ion source filaments will eventually burn out. Certain practices will reduce the chance of early failure:

- When setting up data acquisition parameters, set the solvent delay so that the analyzer will not turn on while the solvent peak is eluting.
- When the software prompts Override solvent delay at the beginning of a run, always select "No."
- Higher emission current will reduce filament life.
- If you are controlling your MSD from the Edit Parameters screen, always select MS Off before changing any of the filament parameters.

★ Helpful Hint:

It is very useful to switch from one filament to the other every three months so that when one filament fails, you know the other will fail soon. This will allow you to change both filaments at the same time.

Filament Assembly

Description	Part No.
5973 (EI)	05972-60053
5973 (CI), 2/pk	G1099-80053
5972 (EI/CI)	05972-60053
GCD (EI)	05971-60140
5971 (EI/CI)	05971-60140

The mass filter does not require periodic maintenance. It should not be removed from the radiator or distributed in any way.

- Never put the quadrupole in an ultrasonic cleaner.
- Never change the physical orientation of the quadrupole mass filter.
- The fused-quartz quadrupole is fragile and will break if dropped or handled roughly.
- The material in the cusps of the quadrupole is very hygroscopic. If exposed to water, the quadrupole must be dried very slowly to prevent damage.

● Quadrupole Mass Filter

In the event of extreme contamination, cleaning should only be performed by a trained Agilent service representative.

Vacuum Systems and Pumps

Vacuum System Operation

The vacuum system creates the high vacuum (low pressure) required for the MSD to operate. Without this vacuum, the molecular mean free path is too short.

Ions cannot travel from the ion source through the mass filter to the electron multiplier (detector) without colliding with other molecules.



The major components of the vacuum system are:

- Vacuum manifold
- Foreline gauge
- Calibration valve
- Gauge controller (optional)
- Vacuum seals
- Foreline pump and/or trap
- Diffusion/turbo pump and fan
- High vacuum gauge tube

A properly maintained vacuum system will:

- Prevent premature filament failure
- Provide better sensitivity
- Require less frequent source cleaning
- Extend quadrupole lifetime
- Prevent premature EM Horn failure



Helpful Hint:

Keeping a pan under the vacuum pump helps to detect and identify the origin of oil leaks.

Calibration

The calibration valve is an electromechanical valve with a vial for tuning compounds. Perfluorotribuylamine (PFTBA) is the most commonly used tuning compound. It is required for automatic tuning of the MSD in EI mode. The tuning compound is usually a liquid but can be volatile or semi-volatile solid.

How to Refill

The calibration vial can be refilled without venting the system. Fill the vial to 0.5 cm from the top, DO NOT overfill. Air is trapped in the vial when it is refilled.

This sometimes causes an “Excess source pressure” error message during the first tune after refilling. This is more likely if the vial is overfilled. Be sure to purge the air upon refilling the vial.

Description	Part No.
PFTBA sample, certified (10 g) (EI)	8500-0656
PFDTD sample (10 g) (CI)	8500-8130



Note:

If using the 5973 with a CI source, use Perfluorodimethyltrioxadodecane (PFDTD) sample.

Pressure Symptoms

This section describes unusual pressure readings and their possible causes. The symptoms in this section are based on typical pressures. At typical column flow rates (0.5 – 2.0 ml/minute), the foreline pressure

will be approximately 20 to 100 mTorr. The vacuum manifold pressure will be approximately 1×10^{-6} to 1.4×10^{-4} Torr. These pressures can vary widely from instrument to instrument so it is important that you

are familiar with the pressures that are typical for your instrument at a given carrier gas flow and oven temperature.

Vacuum Systems and Pumps

Pressure Symptoms

The foreline pressures listed can only be measured on diffusion pump-equipped systems. Turbomolecular pumps are controlled according to their speed and do not have

foreline pressure gauges. The vacuum manifold pressures can only be measured if your system is equipped with the optional gauge controller.

<p>Foreline pressure is too high</p>	<p>Vacuum manifold pressure is too high</p>
<p>Symptom</p> <ul style="list-style-type: none"> • Pressure is above 100 mTorr. • Pressure for a given column flow has increased over time. 	<p>Symptom</p> <ul style="list-style-type: none"> • Pressure is above 1.4×10^{-4} Torr. • Pressure for a given column flow has increased over time.
<p>Possible Cause</p> <ul style="list-style-type: none"> • Column (carrier gas) flow is too high • Wrong carrier gas • Air leak • Foreline pump oil level is low or oil is contaminated • Foreline hose is constricted • Foreline gauge is not working correctly • Foreline pump is not working correctly 	<p>Possible Cause</p> <ul style="list-style-type: none"> • Column (carrier gas) flow is too high • Wrong carrier gas • Air leak • Foreline pump is not working correctly • Diffusion pump fluid level is low or fluid is contaminated • Foreline pump is not working correctly • Defective gauge controller • Faulty ion gauge tube
<p>Foreline pressure is too low</p>	<p>Vacuum manifold pressure is too low</p>
<p>Symptom</p> <ul style="list-style-type: none"> • Pressure is below 20 mTorr. <p>Possible Cause</p> <ul style="list-style-type: none"> • Column (carrier gas) flow is too low • Wrong carrier gas • Column plugged or crushed by an overtightened nut • Empty or insufficient carrier gas supply* • Bent or pinched carrier gas tubing* • Foreline gauge is not working correctly <p>* These could create a fault condition in the GC that would prevent the GC from operating.</p>	<p>Symptom</p> <ul style="list-style-type: none"> • Pressure is below 1.4×10^{-6} Torr. <p>Possible Cause</p> <ul style="list-style-type: none"> • Column (carrier gas) flow is too low • Wrong carrier gas • Column plugged or crushed by an overtightened nut • Empty or insufficient carrier gas supply* • Bent or pinched carrier gas tubing* • Defective gauge controller • Faulty ion gauge tube <p>* These could create a fault condition in the GC that would prevent the GC from operating.</p>

Diffusion Pump

It is not necessary to change the diffusion pump fluid more than once a year, unless you observe symptoms that suggest a problem with the diffusion pump fluid. The MSD must be vented in order to check the

diffusion pump fluid (except for the 5973). Therefore, the best time to check the fluid is when the instrument is already vented for other maintenance.

Vacuum Systems and Pumps

Diffusion Pump

Importance of the Fluid Level

The amount of fluid in the pump affects the amount of vapor and the temperature of the base plate. Too little fluid will cause the pump to run at a higher temperature because there is less fluid to carry away the heat resulting in fluid cracking or degradation and loss of high vacuum. It will also lower the pumping speed because there is less fluid vapor available to pump away gases which can affect operation in CI Mode due to higher flow rates.

How to Check the Fluid Level

1. If it is not vented already, shut down and vent the MSD according to instrument manual.
2. Unplug the MSD power cord.
3. Remove the pump and cover the top with aluminum foil.
4. After heating the pump in a GC oven at 60°C for 15 minutes to make the fluid flow down into the reservoir at the bottom, remove the stack parts.
5. Inspect the pump fluid, if the fluid is discolored or contains particulate material, the fluid must be changed.

- 6a. Use a metal ruler to determine the depth of the fluid. A pump that has been in operation should have a pool 9 mm plus or minus 1 mm deep. Fluid in freshly charged pumps will be 12 mm deep. It is normal that up to 2 ml of oil may be in the rear portion of the vacuum manifold. The recommended total fluid charge for the 5971/5972 is 18 ml (plus or minus 2 ml).
- 6b. For the 5973 use the sight glass to determine the depth of the fluid. The recommended total fluid charge is approximately 37 ml.



Helpful Hint:

Use chemical-resistant gloves and safety glasses when replacing pump fluid. Avoid contact with the fluid.

Description

Diffusion pump fluid: SantoVac Ultra 5P, 18.5 ml (5973, 5972 or 5971/GCD)
 Ion gauge controller (5973/5972A)
 Ion gauge tube for measuring vacuum (5971/5972)
 Triode gauge tube for measuring vacuum (5972/5973)

Part No.

6040-0809
 59864B
 0960-0376
 0960-0897

Foreline Pump

The oil in the foreline or rough pump should be replaced on average once every six months, but can vary depending upon applications. After oil replacement, if the foreline trap is present the molecular sieves should be replaced.

Avoid contact with the pump oil. The residue from some samples may be toxic. Dispose of used oil properly.



Note:

Subtle differences may exist between MSD models. Consult your hardware manual for specific instruction.

Description

Rough pump oil, 1 gal Inland 45 (5973, 5972 or 5971/GCD)
 Rough pump oil, 1 liter Inland 45 (5973, 5972 or 5971/GCD)
 Molecular sieve (5972 or 5971/GCD)

Part No.

6040-0798
 6040-0834
 9301-1104

Vacuum Systems and Pumps

Foreline Pump continued

General Instructions on How to Replace the Pump Oil

1. Shutdown and vent the MSD.
2. Place a container under the drain plug on the foreline pump.
3. Remove the fill cap from the top of the pump to expose the fill hole.
4. Remove the drain plug from the pump.
5. Reconnect the MSD to its power source. Switch on for 2 or 3 seconds, and then switch it off again. This displaces old oil from the internal pump cavities. Disconnect the power cord again.
6. Reinstall the drain plug and pour pump oil into the fill hole.
7. Reinstall the fill cap.
8. Reconnect the MSD power cord.
9. Start up and pump down the MSD according to the Instrument Manual procedure.

Electron Multipliers and Replacement Horn



Maximize Lifetime

The lifetime of an EM is directly related to the current that flows through it and the extent of contamination or condensation that it experiences. To maximize electron multiplier life:

- Maintain the best possible vacuum, especially in the analyzer manifold.
- Use extreme caution and be conservative with venting, pumpdown, and all vacuum system procedures to keep pump fluid background to a minimum.
- After venting, allow four hours for pumpdown and thermal equilibration before scanning.
- Actively look for background contamination and leaks and repair them immediately.
- Don't tune excessively. PFTBA can result in higher background over an extended period of time.

Description

Electron multiplier replacement horn (5973, 5972, 5971/GCD)
High energy dynode (5973 only)
Electron multiplier kit (5972, 5971/GCD only)

Part No.

05971-80103
G1099-80001
05971-80102



Note:

These are the recommended replacement multipliers and horns for the MSD. Substituting other manufacturers' products can result in reduced sensitivity and noise problems.

Symptom

- Voltage is over 2500 volts
- Poor vacuum



Corrective Action

- Replace electron multiplier

Maintaining the MS Engine

This section contains information related to the maintenance of your 5989 MS Engine. The supplies required to clean and maintain your system are listed on the pages to follow.

Cleanliness and the prevention of accidental contamination during maintenance are very important. The MS Engine is a very sensitive instrument. The slightest contamination in the interior of the vacuum system or the sample path can affect the results of your analyses.

“Our customers count on us to supply them with complete systems. This includes knowing what tools and supplies they need to avoid contamination when cleaning and maintaining their GC/MS systems. These common maintenance tasks, when performed on a regular basis, help our customers reduce overall operating costs.”

Hwee-Sian Tan
Application Manager



Maintenance Schedule

- Always wear clean, lint-free, nylon gloves when handling parts which will come in contact with the sample stream. Oil from your fingers is a particularly difficult contaminant to remove.
- If you must set parts down, place them on clean, lint-free cloths or clean aluminum foil, not directly onto a laboratory bench.
- Keep parts covered so that dust does not accumulate on them.
- Do not leave the interior of the vacuum system open to the atmosphere. For example, if you are removing the ion source for cleaning, put the vacuum manifold cover back in its normal position after you have removed the source. Reestablish a low vacuum in the vacuum manifold until you need to reinstall the ion source.



Maintenance Schedule

Common maintenance tasks are listed on page 21. Performing these tasks on a regular basis can reduce overall operating costs. Keep a record (logbook) of system performance characteristics and maintenance operations performed. This makes it easier to detect variances from normal operation and to take corrective action.

Cleaning the Ion Source

There is not a regular interval for ion source cleaning. The ion source should be cleaned when symptoms indicate. Symptoms of a dirty ion source include poor sensitivity and inadequate abundances at high masses. See the Troubleshooting chapter in your hardware manual for more information about these symptoms.

MS Engine Pump Lubricants and Oils

Lubricant Oil	5989 or 5988	Thermo or Electro Spray	5985 or 5987	5999x, 5993x or 5995x	Part No.
Turbo pump lubricant: Balzers turbo pump lubricant, 0.25 liter	•		•		6040-0468
Diffusion pump oil: SantoVac 5, 1 liter	•		•	•	6040-0370
SantoVac 5, 128 ml	•		•	•	6040-0819
Rough pump oil: Rough pump oil, 1 gal Inland 45	•	•	•	•	6040-0798
Rough pump oil, 1 liter Inland 45	•	•	•	•	6040-0834
Particle Beam pump oil, Fomblin	•				6040-0730

Maintenance Schedule



Many of the tools and supplies needed to service the 5989 MS Engine are included in the installation kit supplied with the instrument. The following tables list common consumable parts and supplies used in the maintenance of the MS Engine.

Task	Every Week	Every 3 Months	Every 6 Months	As Needed
Autotune or manual tune (save results)				•
Cabinet Maintenance				
Clean the cabinet	•			
Inspect hoses and cords		•		
Vacuum the fan filter			•	
Vacuum System Maintenance				
Check mech. pump oil	•			
Replace mech. pump oil			•	
Replace mech. pump traps			•	
Check diffusion pump fluid			•	
Degas ion gauge tube				•
Replace ion gauge tube				•
Replace seals & O-rings				•
Analyzer Maintenance				
Clean ion source				•
Replace filament				•
Replace ion source heater				•
Replace mass filter heater				•
Replace electron multiplier horn				•
GC/MS Interface Maintenance				
Refill EI calibration vial				•
Refill CI calibration vial				•
Replace interface heater				•



Note:

For cleaning and maintenance supplies, refer to the table on page 11.

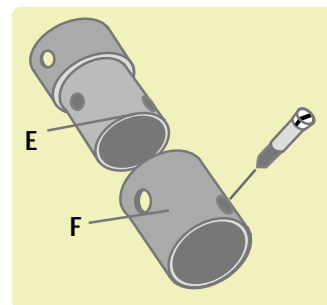


Helpful Hint:

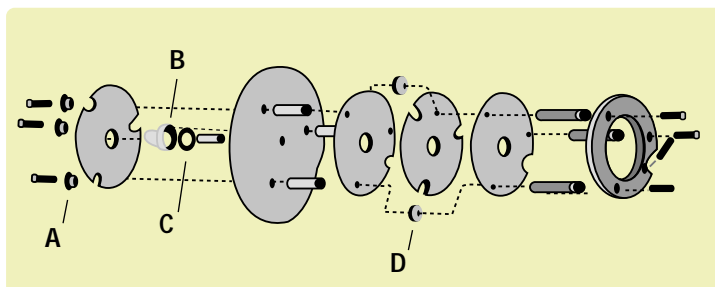
We recommend keeping a separate set of tools that have been thoroughly cleaned for working with the MS engine. These tools are needed to prevent contamination when reassembling or installing clean assemblies such as the ion source.

Ion Source Parts and Supplies

Description	Part No.
(A) Clamp insulator, ion source	05989-20110
(B) Entrance lens	05989-67002
(C) Lens insulator, ion source	05989-20111
(D) Plate insulator, ion source	05989-20109
(E) EI/CI repeller	05989-20145
(F) Repeller insulator	05989-20119
Filament block	05989-20165
Filament assembly	05985-60179
Heater cartridge	05989-60098



5989 Repeller Assembly



5989 Lens Stack

Replacement Parts and Supplies

The electron multiplier lifetime on the 5989 may be 6 to 9 months or shorter, especially with the following applications:

- Thermospray
- Particle Beam
- Purge and trap, with no jet separator
- Extensive CI
- High sensitivity work with high EM voltage

Description	Part No.
5989	
Electron multiplier kit	05989-80043
Electron multiplier replacement horn	05971-80103
Parts and Supplies	
Ferrule (2/pk)	5181-3366
Ion gauge tube, K-25 flange	0960-0799
O-rings and Seals	
Insulating ring	05989-20705
O-ring, detector flange (5/pk)	5181-3367
Diffusion pump fluid fitting	
fill and drain cap O-ring (12/pk)	0905-1145
KF 25 centering ring and O-ring	3162-0110
O-ring, manifold window	0905-1189

General GC/MS Supplies

All of the most common supplies you need to keep your Agilent GC/MS system running at optimal performance – along with their part numbers – can be found in the pages to come. You'll discover the new Agilent Semi-Volatiles Applications Kit – used to improve system performance – plus our MSD NoVents, Big Universal Trap, gas specific purifiers, liners, ferrules, inlet septa, syringes, vials, and test samples.

This section is a convenient resource that makes ordering easy for everyone. It gives you immediate access to a wide range of Agilent consumables and accessories – products that reflect the highly regarded industry expertise and world-class manufacturing procedures that have made Agilent famous.

If you can't decide which Agilent parts to use, just contact your Agilent representative to find the PerfectFit for your system.

“Our supplies are not just parts. They are solutions that enable our customers to perform precise analyses. And we provide the entire package—our knowledge and experience create the PerfectFit.”

Roger Firor, Ph.D.
Senior Applications Chemist

MSD NoVents

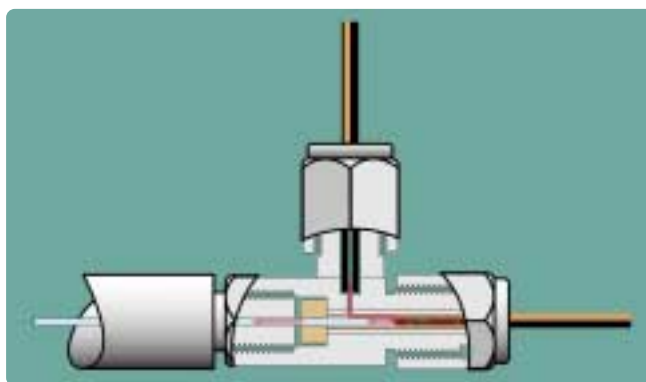
A timesaving solution

Agilent Technologies' MSD NoVents allow users to turn on the purge gas and change the column or service the inlet or column. No air or water enters the system. The MSD remains stable and is operational in minutes.



Advantages of Agilent's MSD NoVents

- No oxygen or air in your system during inlet maintenance, prolonging column life
- A constantly stable MSD, saving hours with each column change or inlet maintenance
- No MSD or interface temperature cycling, minimizing the possibility of leaks
- A cleaner ion source, with less downtime for servicing
- Convenient accessibility in the GC oven
- Proven fitting design for easy column removal or installation
- Simple operation, perfect for inexperienced users



The MSD NoVent uses a unique fluidic valve design and deactivated fused silica interface tube that mounts directly on the MS interface inside the GC oven. A soft brass threaded insert connects to the MS interface, providing no interface damage. This design ensures that a helium purge maintains a positive flow from the valve to the atmosphere when a column is disconnected, preventing air or water from entering the MS.

MSD NoVents ● ● ● ● ●



6890 MSD NoVent

Agilent offers two MSD NoVent choices

MSD NoVents are available in two different kits that include all the necessary tools, fittings and instructions:

- For Agilent 6890/5973/5972 GC/MSD. Designed for seamless integration with the Agilent 6890 GC system. Available exclusively from Agilent.
- For Agilent 5890/5972/5971 GCD.

Both MSD NoVent kits include a helium purge gas control module that, for the Agilent 6890 MSD NoVent, fits into one of the GC detector slots and is controlled by the Agilent 6890 electronics. For the Agilent 5890 MSD NoVent, the module sits externally and is controlled manually.

Both setups require a specific restrictor tube that acts as the transfer line from the GC to the MS source.

MSD NoVents

Description	Part No.
6890 MSD NoVent Includes two of each restrictors for 5973 and 5972.	5183-4782
5890 MSD NoVent Restrictors not included and must be ordered separately.	5183-4783

MSD NoVent Replacement Parts

Description	Size	ID mm	Quantity	Part No.
MSD NoVent Restrictors				
For use with 5971/5972			2/pk	5183-4785
For use with 5973			2/pk	5183-4786
For use with GCD			2/pk	5183-4787
SilTite Metal Ferrules				
For use with 0.20-0.25mm ID capillary columns Includes 2 column nuts.	1/16"	0.4mm	10/pk	5184-3569
For use with 0.32mm ID capillary columns Includes 2 column nuts.	1/16"	0.5mm	10/pk	5184-3570
For use with 1/16" OD stainless steel tubing Includes 2 column nuts.	1/16"		10/pk	5184-3571
Interface Tee				5185-5800



● G2860A 8270 Semi-Volatiles Applications Kit

The G2860A 8270 Semi-Volatiles Applications Kit is designed for use in Agilent 6890/5973A and 6890/5973N GC/MSD Systems. The kit provides modified and/or pretested components to improve system performance for USEPA Method 8270. With the kit, system linearity is maximized and activity is minimized.

Contents:

- Start-Up Guide, pub. No. 5988-3073EN
- Application Note, "Improvements in the Agilent 6890/5973 GC/MSD System for use with USEPA Method 8270", pub. no. 5988-3072EN
- Ultra Ion Source Chamber
- Ultra Repeller
- Ultra Large Aperture Drawout Plate
- Pre-tested column, 30m x 250um x 0.5um HP-5 MS, part no. 19091S – 139
- Single-taper splitless liner, 4mm i.d., deactivated, part no. 5181-3316

Description	Part No.
8270 Semi-Volatiles Applications Kit	G2860A

- Direct Connect Liner, single taper, 4mm i.d., deactivated, part no. G1544-80730
- Direct Connect Liner, dual taper, 4mm i.d., deactivated, part no. G1544-80700
- Floppy Disk with tuning macros

● ● ● ● ● Gas Purifiers

Trace level GC/MS analysis requires a system performing at its best. The GC carrier gas should be at least 99.999% helium. Even with a high purity gas there may be a trace of water, oxygen and hydrocarbons. Placing a trap in the carrier line will eliminate these contaminants.

The gas specific purifiers utilize specialty adsorptive materials to selectively capture contaminants and remove them from the gas stream. This technique dramatically reduces contaminant levels to less than the 10 to 25 parts per billion range, depending on the contaminant.

An increase in background and visible peaks of hydrocarbons and water are signals to replace the gas purifier.

● Big Universal Trap

- One Big Universal Trap unit will easily purify the contents of (13) K size cylinders of 99.997% purity helium to a cumulative level of 100 parts per billion of O₂, H₂O, CO₂, CO and hydrocarbons at a flow rate of up to 8 liters/minute.
- All tube fittings are Swagelok brand stainless steel, fitted with 40 micron stainless steel frits for particulate control.



Big Universal Trap will purify 13 "K" size cylinders of 99.997% gas

Gas Purifiers

Big Universal Trap

- Since the Big Universal Trap offers 2.5 times the capacity of leading gas specific purifiers for GC/MS, Agilent is now recommending these traps for GC/MS systems.
- Combines the contents of three individual in-line traps into a single unit, reducing the number of potential leaks and the possibility of aspirating contaminants into the gas stream.
- Single purifier simplifies installation and replacement.
- Recommended for use with the highest quality compressed gases for analytical purposes.

Specifications

O ₂ removal capacity	1.07 Liters @ STP
H ₂ O removal capacity	46 grams
Hydrocarbon removal capacity	20 grams
O ₂ removal efficiency	<2 ppb
H ₂ O removal efficiency	<20 ppb
Hydrocarbon removal efficiency	<30 ppb
CO ₂ removal efficiency	<20 ppb
CO removal efficiency	<20 ppb
Maximum pressure rating	500 PSIG
Maximum temperature rating	100 °C
Maximum flow	up to 8 liters/min
Total residual impurities based on (5) target contaminants above:	<100 ppb
Resultant gas purity, based on the adsorption of O ₂ , H ₂ O, CO ₂ , and hydrocarbons:	99.99999%
Capacity of Big Universal Trap Helium Gas Purifier to treat ultra pure helium (purity level 99.999%) to maximum efficiency based on typical analysis of grade 5 helium:	>4,000 cu/ft

Big Universal Trap

Description	Fitting	Part No.
Big Universal Trap He (for MS)	1/8 in.	RMSH-2
Big Universal Trap He (for MS)	1/4 in.	RMSH-4
Mounting Clip		UMC-5-2
Chemical ionization for MS (isobutane or methane applications only)	1/8 in.	G1999-80410

★ **Helpful Hint:**
For best results follow the replacement schedule provided on the product label.

★ **Note:** These purifiers must be installed diagonally or vertically for optimum performance. DO NOT install horizontally.

★ **Helpful Hint:**
To determine leaks, use Agilent's dedicated leak detector (115V or 220V) or our Flow Tracker 2000 flowmeter with leak detector.

Description	Part No.
115V Leak Detector	5182-9646
220V Leak Detector	5182-9648
Flow Tracker 2000	5183-4780



Inlet Liners

The proper liner to use is very dependent on the application. Volume, activity and the packing are also important considerations when choosing a liner. Liner design is one of the most difficult choices simply because of the variety of liners available. Often, the most appropriate liner must be determined through experimentation.

Volume

The volume of the liner and the volume of the sample, when evaporated, are extremely important when determining the correct liner. If the liner is too small, there will be flashback and loss of sample, possibly affecting accuracy, reproducibility and sensitivity.

Activity

Deactivated liners are available for the split/splitless and PTV inlets. Deactivated liners have been treated to prevent adsorption of the sample and to minimize degradation of labile compounds. Untreated liners are available for split/splitless inlet. These liners are not recommended for polar or labile samples unless deactivated by the user before use.



Packing

Packing helps to increase the surface area in the liner. This helps with evaporation and with the retention of non-volatile sample components. For best performance, the packing should be of high quality and deactivated.

Application

High sensitivity
Large volume injections ($\geq 2 \mu\text{L}$)
Small volume injections ($\leq 0.5 \mu\text{L}$)
Trace level analysis

Recommendation

4 mm single tapered, deactivated liner, without glass wool
deactivated liner with glass wool
deactivated liner with glass wool
single tapered, deactivated liner

MSD Flowrates (ml/min)

Each MSD has its own maximum flow rate requirement. Refer to the MSD Flowrates below for flow limitations.

	Min	Max Diff Pump	Max Turbo Pump	Tuning Max
5973	0.1	2.0	4.0	2.0
5972	0.1	2.0	NA	2.0
5971	0.1	1.5	NA	1.0
GCD	0.1	1.0	NA	1.0

Inlet Liners

Agilent Choice Liners

Our engineering and testing efforts focus on these parameters when designing liners for Agilent inlet systems. Intensive liner development and testing have resulted in a set of liners that we recommend whenever new methods are being developed, when methods are being optimized, or when problems with existing methods are encountered. These liners are:



Split injection:

Agilent split liner with glass wool, bottom taper, glass bead for easy positioning, and deactivated, Agilent Part No. 5183-4647 (with extraordinarily tight dimensional control for optimum split performance).

Splitless injection:

Single tapered liner without glass wool, deactivated, Agilent Part No. 5181-3316.

General purpose split/splitless injection:

Similar design to Agilent Part No. 5183-4647, but with a different deactivation and outer diameter that compromises for both split and splitless injections, Agilent Part No. 5183-4711.

Direct injection:

Straight liner without glass wool, deactivated, Agilent Part No. 5181-8818 (use only for gas samples, headspace, or purge and trap applications).

Direct Connect

The Direct Connect liners provide an Agilent solution to customers running highly sensitive compounds or that are interested in getting the highest performance from their GC or GC/MS without sample exposure to inlet related degradation. These liners are included in our new 8270 EPA Applications kit designed specifically for optimizing a 6890/5973 GC/MSD to this method.

The liners are deactivated, come in either a single or double taper, and utilize a press fit connection to the column. In addition, there is a small drilled hole in the side of the liner whose size and placement was optimized by Agilent R&D engineers to allow them to work with EPC.

Focus Liner













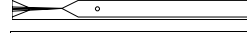
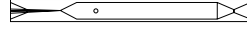


Improve reproducibility, improve results. The Focus Liner traps a precisely controlled amount of glass wool in the ideal position in the injection port liner. At the point of injection, the glass wool provides extra surface area for vaporization, traps nonvolatile sample residue, and wipes any residual sample from the sample needle – reproducibility is the result.

In addition to these liners, we offer a broad selection of liners for your specific application needs.

Liner O-Rings

Liners are sealed in the inlet with O-rings or graphite seals. O-ring seals are easier to remove and to replace than graphite that deforms and flakes apart. The graphite seals should be used when inlet temperatures exceed 350 °C.

● ● ● ● ● Inlet Liners

	Application	Liner Volume (μl)	Single Liner	5/pk	25/pk
	Split Inlet Liners Liner, split, low press. drop, glass wool, taper, deactivated	For split injection	870	5183-4647	5183-4701 5183-4702
	Split Inlet Liner Liner, split, glass wool, non-deactivated		990	19251-60540	5183-4691 5183-4692
	Split Inlet Liners For Manual Injection Liner, split, with cup, no glass wool		800	18740-80190	5183-4699 5183-4700
	Liner, split, with cup, glass wool, and packing [not recommended for use with electronic pressure control (EPC)], for manual injection		800	18740-60840	5183-4697 5183-4698
	Split/Splitless Inlet Liners Liner, general purpose split/splitless, glass wool, taper, deactivated	For split/splitless injection	870	5183-4711	5183-4712 5183-4713
	Splitless Inlet Liners Liner, splitless, single-taper, glass wool, deactivated		900	5062-3587	5183-4693 5183-4694
	Liner, splitless, double-taper, no glass wool, deactivated		800	5181-3315	5183-4705 5183-4706
	Liner, splitless, single-taper, no glass wool, deactivated	For splitless injection	900	5181-3316	5183-4695 5183-4696
	Direct Inlet Liners Liner, direct, 2 mm ID, deactivated	For direct injection (use for gas samples, headspace, or purge and trap applications)	250	5181-8818	5183-4703 5183-4704
	Liner, direct, 2 mm ID, non-deactivated, quartz		250	18740-80220	5183-4707 5183-4708
	Liner, direct, 1.5 mm ID, non-deactivated [use for gas samples, headspace, or purge and trap applications]		140	18740-80200	5183-4709 5183-4710
	Liner, straight, splitless 4 mm ID		990	210-3003	210-3003-5
	Direct Connect Liners Single taper direct connect liner, splitless, 4 mm ID, deactivated				Part No. G1544-80730
	Dual taper direct connect liner, splitless, 4 mm ID, deactivated				G1544-80700
	Focus Liners Focus liner, 4 mm, glass wool				210-4004-5
	Focus liner, 4mm, glass wool				210-4022-5
	Liner O-Rings Fluorocarbon O-ring (12/pk)				5180-4182
	Graphite O-ring for splitless liner (10/pk)				5180-4173
	Graphite O-ring for split liner (10/pk)				5180-4168

Ferrules and Nuts

Ferrules and Nuts for Capillary Columns

The proper column nut and ferrule combination are critical for a leak-tight seal. The proper ferrule will be dependent on column outer diameter. The ferrule should only be slightly larger than the column outer diameter.



Conditioning ferrules is beneficial

New ferrules tend to loosen after a few heating cycles in the GC oven. This can result in leaks. Heating ferrules to their maximum operating temperature before installation can minimize subsequent loosening. It also reduces possible chemical bleed from the ferrules.

Vespel/Graphite (85%/15%) Ferrules

The combination of graphite and Vespel results in a ferrule having low oxygen diffusion rates, which does not shrink to the same extent as pure Vespel. These ferrules are recommended for use with GC/MS.

When using Vespel/graphite ferrules, Agilent recommends tightening the column nut to a 1/4 turn after the first temperature program runs. Even preconditioned ferrules can exhibit some shrinkage after a temperature programmed run. This is especially apparent on the GC/MS interface connection.

Ferrules and Nuts

	FERRULE ID (mm)	COLUMN ID (mm)	QUANTITY	PART NO.
Preconditioned 85% Vespel, 15% Graphite Ferrules				
These ferrules are recommended for use with GC/MS.				
(Long Ferrules)				
	0.3	0.1	10/pk	5062-3507
	0.4	0.1, 0.2, 0.25	10/pk	5062-3508
	0.5	0.32	10/pk	5062-3506
	0.8	0.53	10/pk	5062-3538
85% Vespel, 15% Graphite Ferrules				
(Short Ferrules)				
	0.4	0.1, 0.2, 0.25	10/pk	5181-3323
	0.5	0.32	10/pk	5062-3514
	0.8	0.45, 0.53	10/pk	5062-3512
General Purpose Graphite Ferrules				
(Short Ferrules)				
	0.5	0.1, 0.2, 0.25, 0.32	10/pk	5080-8853
	1.0	0.53	10/pk	5080-8773
	0.4	0.05-0.25	10/pk	500-2114
	0.8	0.45, 0.53	10/pk	500-2118
100% Vespel High-Performance Ferrules				
These ferrules are recommended for use in isothermal analysis only.				
(Short Ferrules)				
	0.4	0.1, 0.2, 0.25	10/pk	5181-3322
	0.5	0.32	10/pk	5062-3513
	0.8	0.45, 0.53	10/pk	5062-3511
		1/8 in.	10/pk	0100-1332
		1/4 in.	10/pk	0100-1331
Specialty Ferrules, 85% Vespel, 15% Graphite				
Two Hole	0.4 ID holes	0.1, 0.2, 0.25	10/pk	5062-3580
	0.5 ID holes	0.32	10/pk	5062-3581
No Hole			10/pk	5181-3308
Ferrule for capping off capillary direct or open-split interface 1/16 in.		10/pk	5181-3308	
Ferrule, 1/8 in., Vespel			10/pk	0100-1328
Reducing ferrule, 1/16 in. to 0.8 mm				0100-1186
Ferrule, 1/16 in. graphite				0100-1042
Ferrule, 1.2 mm id for 1/16 in. fittings, graphite			0100-1043	
Ferrule for use on the 5989 MS Engine			2/pk	5181-3366
Column Nuts				
Short Nuts				
Universal column nut, 1/16 in. hex			2/pk	5181-8830
Finger-tight column nut for 0.53 mm columns*			1 ea	5020-8293
Finger-tight column nut for 0.32 mm columns* and smaller			1 ea	5020-8292
Blanking plug, finger-tight style			1 ea	5020-8294
6850 Column Nut			2/pk	5183-4732
Long Nuts				
MS interface column nut			1 ea	05988-20066
Column nut for GC/MS ferrules and two hole ferrules, 1/16 in.			1 ea	05921-21170
Swagelok nut, 3/8 in., for separators				05990-20175
Column nut wrench, 1/4 in. and 5/16 in.			1 ea	8710-0510
* For use with graphite ferrules only.				
Always match short nuts with short ferrules and long nuts with long ferrules for a PerfectFit.				

Inlet Septa ● ● ● ● ●

One of the key components of sample introduction is the inlet septum. All columns must have carrier gas head pressure to establish flow through the column. Septa maintain the leak-free seal and exclude air from the inlet. They come in many different sizes and are made from many different types of material specific to inlet type and analysis needs.

Septa are usually available according to their recommended upper temperature limits. Lower temperature septa are usually softer, seal better, and can withstand more punctures (injections) than their high-temperature counterparts. If used above their recommended temperatures, however, they can leak or decompose. This causes sample losses, lower column flow, decreased column life and ghosting.



Premium Septa

Agilent Premium CenterGuide Septa for Improved Performance

Our premium septa have a recess on the injection side, to guide the syringe needle to the same point with every injection.

- Center point guides the needle for easy penetration and less coring
- Reduce needle bending
- Precision molding assures accurate fit in the inlet
- Each batch tested on an Agilent 6890 GC-FID for bleed

General Purpose Septa

Agilent's General Purpose red/gray septa are cost-effective choices which provide:

- Low bleed for reduced instrument maintenance downtime and increased laboratory productivity
- Less frequent replacement for long lifetime and the ability to withstand more than 200 injections at maximum injection port temperatures
- Easy penetration and the durability to remain resistant to coring and leaking from multiple injections
- Convenient packs of 24 or 25 in airtight jar to minimize risk of contamination and the need for septa reconditioning

The Merlin Microseal Septa

- Low bleed, longer life alternative to standard septa for split/splitless injection
- Has a lifetime of more than 2000 injections, depending on samples and operating conditions
- Greatly reduced instrument downtime for septa changes and injection port liner changes due to septa particulates
- Two distinct sealing mechanisms
 - Double O-ring type seal around the syringe needle
 - Spring-assisted duckbill to seal the injection port

Inlet Septa

	PART NO.
Premium Septa	
Bleed and Temperature Optimized Septa	
11-mm septa for 5880, 5890, 6850 and 6890 GCs (50/pk)	5183-4757
5-mm septa through-hole for on-column (50/pk)	5183-4758
Agilent Advanced Green Septa	
11-mm septa for 5880, 5890, 6850 and 6890 GCs (50/pk)	5183-4759
5-mm septa through-hole for on-column (50/pk)	5183-4760
Agilent Long-Life Septa	
11-mm septa for 5880, 5890, 6850 and 6890 GCs (50/pk)	5183-4761
5-mm septa through-hole for on-column (50/pk)	5183-4762
General Purpose Septa	
Low-Bleed Gray Septa	
9.5-mm (3/8") for Agilent GCs (24/pk) for 5700 series and 5830/40 GCs	5080-8728
11-mm for 5880, 5890, 6850 and 6890 GCs (24/pk)	5080-8896
11-mm for 5880, 5890, 6850 and 6890 GCs (144/pk)	5080-8894
9.5-mm (3/8") for 5700 series and 5830/40 Agilent GCs (144/pk)	5080-8726
Low-Bleed Red Septa	
11-mm solid for 5880, 5890, 6850 and 6890 GCs (25/pk)	5181-1263*
11-mm with partial through-hole for 5880, 5890, 6850 and 6890 GCs (25/pk)	5181-3383*
5-mm through-hole for on-column inlets, automatic or manual injections (25/pk)	5181-1260*
5-mm solid (25/pk) for high column backpressure, column inlets	5181-1261*
9.5-mm (3/8") for 5700 series and 5830/40 Agilent GCs (24/pk)	5181-1283*
*Quantity Discounts Available	
Blue Septa	
11-mm for 5880, 5890, 6850 and 6890 series GCs (5/pk)	9301-1083
White Septa	
9.5-mm (3/8") teflon backed (12/pk) for 5700 series and 5830/40 GCs	5080-8745
9.5-mm (3/8") teflon backed (100/pk) for 5700 series and 5830/40 GCs	5080-8707
Merlin Microseal Septa	
High Pressure Septa	
High pressure Merlin Microseal starter kit (microseal septa and nut)	5182-3442
Microseal high pressure septum**	5182-3444
Microseal high pressure nut	5182-3445
High sample volume septum kit contains: Merlin high pressure Microseal, six 23-gauge syringes, 500 vials and caps	5181-8839
Standard Pressure Merlin Microseal Septa	
Microseal septum, stainless steel, rubber (30 psi)	5181-8815
Microseal PTFE nut liners 2/pk	5182-0853
Merlin Microseal Kit original low pressure system includes nut and septum	5181-8816
Merlin Microseal Kit original low pressure system includes nut and 2 septum	5181-8833
**Not interchangeable with older version.	

Syringes and Vials

The Agilent line of syringes is designed for the most accurate and reproducible volume delivery. They are designed for a PerfectFit with your autosamplers and come with a variety of plunger and needle choices. Choose proper needle design to maximize the septum lifetime.

Description	Gauge	Quantity	Part No.
Tapered Needle Syringes (use for split/splitless or on-column injections with 0.53 mm id columns)			
10 μ L Tapered Fixed Needle	23-26s/42	6/pk	5181-3360
5 μ L Tapered Fixed Needle	23-26s/42	6/pk	5181-8810
Straight Needle Syringes (use with Merlin Microseal)			
10 μ L Straight Fixed Needle	23/42	6/pk	9301-0725
5 μ L Straight Fixed Needle	23/42	6/pk	5182-0875



Agilent wide opening vials are a perfect fit for analyzing samples with your GC/MS. They have specially designed vial neck angles, bottom design and height to ensure compatibility with Agilent autosamplers with rotating or robotic arm trays. Agilent offers a large variety of autosampler vials in different closures, cap colors, septa choices and package options. Agilent also offers convenience packs with 500 vials and caps in a reusable blue storage box.

For small sample sizes, Agilent offers a variety of options. You can use micro-volume inserts with the wide opening vials or, for added convenience, use vials with small volume capacity.

Description	Quantity	Part No.
Vials		
2 mL Crimp top vial convenience pack with silver Al caps with PTFE/Red rubber septa	500/pk	5181-3400
2 mL Screw top vial convenience pack with blue screw caps and PTFE/Red rubber septa	500/pk	5182-0732
2 mL Snap top vial convenience pack with clear polypropylene snap caps and PTFE/Red rubber septa	500/pk	5182-0547
100 μ L Insert for wide opening vials	100/pk	5181-1270
300 μ L Polypropylene vials	1000/pk	9301-0978
100 μ L Glass lined polypropylene vials	100/pk	9301-0977
15 μ L reservoir volume, Micro-V vial, clear crimp top	100/pk	5184-3551
30 μ L reservoir volume, High recovery vial, crimp top	100/pk	5182-3454

• • • • • Test and Performance Samples

Each GC/MS has a specific test and performance sample. Refer to the chart below for the exact sample.

MSD	Tuning Samples		Verification Samples Performance			Checkout Samples	
	EI Tune	CI Tune	EI	Negative Mode CI	Positive Mode CI	Semi-Volatile	Volatile
5973	PFTBA	PFDTD	OFN 1 pg/μL	OFN 1 pg/μL	Benzophenone 100 pg/μL	DFTPP	BFB
5972	PFTBA	PFTBA	HCB 10 pg/μL	NA	Benzophenone 100 pg/μL	DFTPP	BFB
5971	PFTBA	PFTBA	HCB 10 pg/μL	NA	Benzophenone 100 pg/μL	DFTPP	BFB
GCD	PFTBA	NA	Sample A (10 ng/μL)	NA	NA	DFTPP	BFB
MS Engine							
5989A	PFTBA	PFTBA	HCB 50 pg/μL	OFN 1 pg/μL	Benzophenone 100 pg/μL	DFTPP	BFB
5989B	PFTBA	PFTBA	HCB 20 pg/μL	OFN 500 fg/μL	Benzophenone 100 pg/μL	DFTPP	BFB



Test and Performance Samples



DESCRIPTION	QUANTITY	PART NO.
Evaluation Sample for GC/MS Systems Contains 6 vials: 4 vials (Sample A, 10 ng/μL), 1 vial (Sample B, 100 pg/μL), and 1 vial (Sample C, 100 ng/μL) each of dodecane biphenyl, p-chlorodiphenyl, and methyl palmitate in isooctane, 1 mL ampoule		05970-60045
GC/MS Tuning Standard contains: DFTPP, Benzidine, Pentachlorophenol, and p,p'-DDT 1 mg/mL in methylene chloride		8500-5995
5989 Installation Sample Kit contains: HCB 50 pg/μL, HCB 20 pg/mL, Benzophenone 100 pg/μL, OFN 1 pg/μL, mix of HCB, OFN and Benzophenone 5 ng/μL		8500-6406
Extended Mass Performance Sample	0.5 g, fomblin oil	8500-5500
PFTBA certified	1 bottle, 10 g	8500-0656
PFTBA Sample Kit	0.5 mL	05971-60571
PFDTD	10 g	8500-8130
Benzophenone	100 pg/μL, 5 ampoules	8500-5440
Hexachlorobenzene	10 pg/μL, 4 ampoules 1 ng/μL, 2 ampoules	8500-5808
Hexachlorobenzene	20 pg/μL	8500-6405
Methyl stearate (in methanol); PFTBA not certified	1 ng/μL (2 ea)	05990-60075
Octafluoronaphthalene (OFN)	1 pg/μL, 5 ampoules	8500-5441
Octafluoronaphthalene (OFN)	500 fg/μL	8500-6572
p-Bromofluorobenzene (BFB)	25 μg/mL	8500-5851

Capillary Columns for GC/MS

To maintain MSD performance and reduce the frequency of required ion source maintenance, it is important to choose a phase for your application with the lowest amount of column bleed – the background generated by all columns.

The following pages will give you the dimensional considerations you need to know when choosing GC column phases, why conditioning columns is advised, and which columns are best suited for your applications.

As always, you can choose the perfect Agilent column for your application – by part number – right here.

You can also contact us for expert advice on which columns will work best for your needs, or with any requests for special columns.

“We offer intelligent, creative solutions to help our customers maximize the performance of their GC/MS systems. As an industry leader, we provide the support they need to choose the right column for every application.”

Jim McCurry, Ph.D.
Senior Applications Chemist

Selection of Capillary Columns

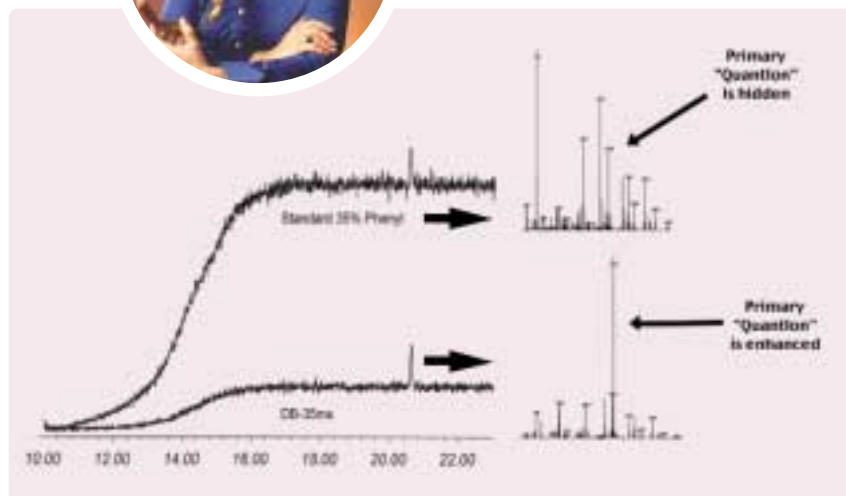


Phases

Most stationary phases can be used with a GC/MS system. However, it is a good idea to choose a phase for your application that has the lowest amount of column bleed as possible. Column bleed is the natural degradation of the stationary phase that occurs at higher temperatures, which appears as an elevated baseline as the temperature rises to the column's upper thermal limit. Column bleed will deposit in the MSD ion source, which can decrease MSD performance. By minimizing the amount of column bleed, you will help reduce the frequency of required ion source maintenance.

There are a few simple rules for choosing columns with lower bleed levels:

- Choose a low-bleed phase for your application – Agilent has developed several low-bleed versions of the most popular phases. These are chemically designed to possess minimal levels of column bleed possible and often have the benefit of an increased upper-temperature limit.
- If a low-bleed column is not available, choose a low-polarity column with a moderate film thickness. The amount of bleed will rise with increases in polarity, film thickness, and length.



Dimensions

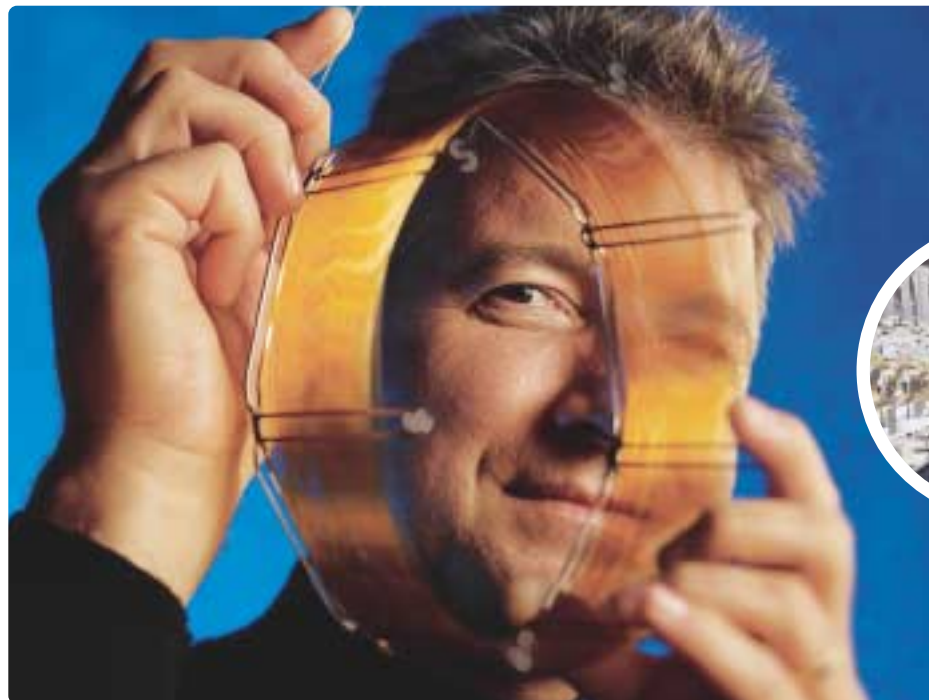
Many types of GC column phases can be used with the MSD, but there are some dimensional considerations. The maximum allowable flow rate and optimal sensitivity flow rates will vary depending upon the type of pump. In general, the column flow should be 1mL/min (2mL/min for Performance Turbo Pumps). Therefore, column length and internal diameter combinations are restricted to provide the appropriate flow to the GC/MS.

- Narrow-bore columns (0.25mm i.d. and smaller) can be installed directly into the GC interface.
- Wide-bore columns (0.32mm i.d.) that are 30m or longer can be installed directly into the 5973 GC interface (other MSDs may require 50m or longer). If using a wide-bore column with a shorter length, an effluent splitter or jet separator should be utilized.
- Columns with internal diameters greater than 0.45mm should not be directly interfaced into the GC interface. For these columns, an effluent splitter or jet separator should be installed.

Conditioning the Column

Briefly conditioning a column before installing it into the GC/MS interface is recommended. When the column and inlet are first heated, volatile materials within the flow-path and a small portion of the column stationary phase move into the gas phase. These materials are then carried by the carrier gas into the MSD and can deposit in the MSD ion source. This can decrease MSD performance. Conditioning the column briefly prior to installation into the MSD will minimize the contamination brought into the ion source.

Column Types and Characteristics



DB-1ms

- 100% Dimethylpolysiloxane
- Identical selectivity to DB-1
- Nonpolar
- Very low bleed characteristics
- Improved acid performance compared to standard 100% Dimethylpolysiloxane columns
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Excellent general purpose column
- Bonded and cross-linked
- Solvent rinsable

Similar Phases

HP-1ms, Rtx-1ms, CpSil5CBAS

Applications

General purpose: Amines, hydrocarbons, pesticides, PCBs, phenols, sulfur compounds, flavors and fragrances.

DB-1ms Ordering

Temperature Limits (-60 to 340/360 °C)

I.D.	Length	Film	Part No.
0.10	10	0.10	127-0112
0.10	10	0.40	127-0113
0.10	20	0.10	127-0122
0.10	20	0.40	127-0123
0.20	12	0.33	128-0112
0.20	25	0.33	128-0122
0.25	30	0.10	122-0131
0.25	30	0.25	122-0132
0.25	60	0.25	122-0162
0.32	30	0.10	123-0131
0.32	30	0.25	123-0132
0.32	60	0.25	123-0162

Column Types and Characteristics

DB-5ms

DB-5ms Order Guide

Temperature Limits (-60 to 325/360 °C)

I.D.	Length	Film	Part No.
0.18	20	0.18	121-5522
0.18	40	0.18	121-5542
0.20	25	0.33	128-5522
0.20	50	0.33	128-5552
0.25	25	0.25	122-5522
0.25	25	0.40	122-552A
0.25	30	0.10	122-5531
0.25	30	0.25	122-5532
0.25	30	0.50	122-5536
0.25	50	0.25	122-5552
0.25	60	0.10	122-5561
0.25	60	0.25	122-5562
0.32	30	0.10	123-5531
0.32	30	0.25	123-5532
0.32	30	0.50	123-5536
0.32	50	0.25	123-5552
0.32	50	1.00	123-5553
0.32	60	0.10	123-5561
0.32	60	0.25	123-5562



DB-5ms

- Phenyl Arylene polymer equivalent to a (5%-Phenyl)-methylpolysiloxane
- Nonpolar
- Very low bleed characteristics
- Excellent inertness for active compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Certified for MS
- Exact replacement of HP-5TA
- Close equivalent to USP Phase G27

Similar Phases

Rtx-5MS, HP-5MS, PTE-5, CP-Sil 8CBms, BPX-5

Applications

Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides

Column Types and Characteristics

HP-5ms Order Guide

Temperature Limits (-60 to 325/350 °C)

I.D.	Length	Film	Part No.
0.20	12	0.33	19091S-101
0.20	25	0.33	19091S-102
0.20	50	0.33	19091S-105
0.25	15	0.10	19091S-331
0.25	15	0.25	19091S-431
0.25	15	1.00	19091S-231
0.25	30	0.10	19091S-333
0.25	30	0.25	19091S-433*
0.25	30	0.50	19091S-133
0.25	60	0.10	19091S-336
0.25	60	0.25	19091S-436
0.32	15	1.00	19091S-211
0.32	25	0.52	19091S-112
0.32	30	0.10	19091S-313
0.32	30	0.25	19091S-413
0.32	30	0.50	19091S-113
0.32	60	0.10	19091S-316
0.32	60	0.25	19091S-416

* This column is shipped with the 5973 MSD.

HP-5ms

- (5%-Phenyl)-methylpolysiloxane
- Nonpolar
- Very low bleed characteristics
- Excellent inertness for active compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Certified for MS
- Equivalent to USP Phase G27

Similar Phases

Rtx-5MS, DB-5MS, PTE-5, CP-Sil 8CBms, BPX-5, Rtx-5 Amine

Applications

Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides

DB-XLB

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

Similar Phase

MDN-12

Applications

PCB congeners, pesticides, chlorinated herbicides, phenoxy acid methyl esters, haloacetic acids

DB-XLB Order Guide

Temperature Limits (30 to 340/360 °C)

I.D.	Length	Film	Part No.
0.18	20	0.18	121-1222
0.18	30	0.18	121-1232
0.20	12	0.33	128-1212
0.20	25	0.33	128-1222
0.25	15	0.10	122-1211
0.25	15	0.25	122-1212
0.25	15	1.00	122-1213
0.25	30	0.10	122-1231
0.25	30	0.25	122-1232
0.25	30	0.50	122-1236
0.25	30	1.00	122-1233
0.25	60	0.25	122-1262
0.32	30	0.10	123-1231
0.32	30	0.25	123-1232
0.32	30	0.50	123-1236
0.32	60	0.25	123-1262

Column Types and Characteristics

DB-35ms

- Equivalent to a (35%-Phenyl)-methylpolysiloxane
- Midpolarity
- Very low bleed characteristics
- Extended temperature limit of 360°C
- Excellent inertness for active compounds
- Certified for MS
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Replaces HP-35ms
- Close equivalent to USP Phase G42

Similar Phases

Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35

DB-35ms Order Guide

Temperature Limits (50 to 340/360 °C)

I.D.	Length	Film	Part No.
0.20	15	0.33	128-3812
0.20	25	0.33	128-3822
0.25	15	0.25	122-3812
0.25	30	0.15	122-3831
0.25	30	0.25	122-3832
0.25	60	0.25	122-3862
0.32	30	0.25	123-3832
0.32	60	0.25	123-3862

Applications

Aroclors, PCBs, amines, pesticides, chlorinated herbicides, haloacetic acids, pharmaceuticals, drugs of abuse

DB-17ms

DB-17ms Order Guide

Temperature Limits (40 to 320/340 °C)

I.D.	Length	Film	Part No.
0.18	20	0.18	121-4722
0.25	15	0.15	122-4711
0.25	15	0.25	122-4712
0.25	30	0.15	122-4731
0.25	30	0.25	122-4732
0.25	60	0.25	122-4762
0.32	30	0.15	123-4731
0.32	30	0.25	123-4732

DB-17ms

- Equivalent to (50%-Phenyl)-methylpolysiloxane
- 320/340 °C Upper temperature limit
- Very low bleed midpolarity column
- Excellent inertness for active compounds
- Enhanced mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Best column for CLP pesticides

Similar Phases

DB-17, HP-50+, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17

Applications

Drugs, glycols, pesticides, steroids

DB-225ms

- 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

HP-225, SP-2330, CP-Sil 43CB, RSL-500, Rtx-225, BP-225, CB-225, OV-225, 007-225

DB-225ms Order Guide

Temperature Limits (40 to 240 °C)

I.D.	Length	Film	Part No.
0.25	15	0.25	122-2912
0.25	30	0.25	122-2932
0.25	60	0.25	122-2962
0.32	30	0.25	123-2932

Applications

Alditol acetates, FAMES, neutral sterols

Column Types and Characteristics

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

HP-20M, SUPELCOWAX 10, CP-WAX 52CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, DB-WAXetr, ZB-WAX

Applications

Alcohols, aromatics, essential oils, solvents

HP-INNOWax Order Guide

Temperature Limits (40 to 260/270 °C)

I.D.	Length	Film	Part No.
0.20	25	0.20	19091N-102
0.20	25	0.40	19091N-202
0.20	50	0.20	19091N-105
0.20	50	0.40	19091N-205
0.25	30	0.15	19091N-033
0.25	30	0.25	19091N-133
0.25	30	0.50	19091N-233
0.25	60	0.15	19091N-036
0.25	60	0.25	19091N-136
0.25	60	0.50	19091N-236
0.32	30	0.15	19091N-013
0.32	30	0.25	19091N-113
0.32	30	0.50	19091N-213
0.32	60	0.15	19091N-016
0.32	60	0.25	19091N-116
0.32	60	0.50	19091N-216



GS-GasPro

- Unique bonded PLOT column technology
- Excellent choice for light hydrocarbons and sulfur gases
- Retention stability not affected by water
- Separates CO and CO₂ on a single column
- Ideal PLOT column for GC/MS — no particles

Similar Phase

CP-Silica PLOT

Applications

C1 to C12 hydrocarbons, CO₂, trace-level sulfurs, hydride gases, inorganic gases, halocarbons, SF₆, oxygen/nitrogen separation at -80 °C.

GS-GasPro Order guide

Temperature Limits (-80 to 260/300 °C)

I.D.	Length	Part No.
0.32	30	113-4332
0.32	60	113-4362

GC/MS Support Services

You can extend protection of your investment by selecting from a menu of Agilent support services. You can purchase only what you need, for maximum flexibility in satisfying your laboratory performance goals and meeting your budget objectives.

With these services, you can achieve:

- **Maximized instrument uptime**
- **High system productivity**
- **Extended instrument life**
- **Fast problem resolution**

Agilent support services cover all of your Agilent chemical analysis hardware and software maintenance, troubleshooting, repair, and compliance needs. And you can consolidate instrument maintenance and repair services into a single annual or multi-year contract for administrative ease.

“Our custom support packages, service and training help our customers protect their investment and extend the life of their instruments.”

Kenji Yamaguchi
Applications Support Manager



● Configure Your Own Support Package

Agilent support services cover all of your Agilent chemical analysis hardware maintenance, troubleshooting, repair and compliance needs. For more information on our products visit the Agilent web site at: www.agilent.com.



● Support Service Packages

Repair	Maintenance	Qualification
<p>At-Your-Site Instrument Repair</p> <p>The least effort for you</p> <ul style="list-style-type: none"> • Telephone support, with access to highly trained technical support professionals to isolate and resolve hardware problems • Travel expenses and labor costs for customer service engineer • Parts for on-site repair • A choice of response times <p>Optional Coverage</p> <p>Consumables used during repair</p> <p>Off-Site Instrument Repair*</p> <p>Option 1 Replacement with identical instrument—the fastest way to resolve a problem</p> <p>Option 2 Return to Agilent for repair</p>	<p>Preventive Maintenance*</p> <ul style="list-style-type: none"> • Expert cleaning, adjusting, lubricating, or inspecting • Travel and labor costs included • A predefined checklist of preventive maintenance procedures for consistent service from laboratory to laboratory <p>Mass Spectrometer Ion Source Cleaning*</p> <ul style="list-style-type: none"> • On-site disassembling • Cleaning • Re-assembling • Testing 	<p>Operational Qualification/Performance Verification*</p> <ul style="list-style-type: none"> • Verification and documentation of an instrument's ability to meet specified criteria • Procedures and documentation that fit the requirements of GLP, ISO 9000, and other regulatory agencies • Measuring equipment traceable to national and international standards <p>Preventive maintenance is recommended before Operational Qualification/Performance Verification</p> <p>Software</p> <p>Telephone Support and Updates for Software</p> <ul style="list-style-type: none"> • Telephone assistance from highly trained technical professionals to isolate and resolve software problems • All enhancements to the original chemical analysis application software purchase • Agilent software status bulletins that identify discovered defects and recommend workarounds

* For selected Agilent chemical analysis instruments.

● Service Bundles Meet Specific Needs for Less Cost

Special service bundles contain essential services to keep your chemical analysis instruments in top condition for dependable operation. These bundles cost less than purchasing each service individually.

Petrochemical Bundle

For the specific needs of the petroleum, chemical, petrochemical and other industries not subject to pharmaceutical regulatory compliance

- Telephone Support to Isolate and Resolve Hardware Problems—Included Without Charge
- At-Your-Site Service with Consumables Used during Repair
- All Off-Site Instrument Repair Services
- Annual On-Site Preventive Maintenance

Pharmaceutical Bundle

For the pharmaceutical, agricultural and other industries that must comply with rigorous quality and regulatory requirements

- Telephone Support to Isolate and Resolve Hardware Problems—Included Without Charge
- At-Your-Site Service with Consumables Used during Repair
- Annual On-Site Preventive Maintenance
- Annual Operational Qualification/Performance Verification

● Agilent Chemical Analysis Training Program for Mass Spectrometry

Agilent Technologies provides carefully planned, effective training courses in using Agilent chemical analysis hardware and software products. These courses help you

to ensure highest productivity, shorter product development cycles and improved quality of analytical results.

You can obtain information, see course schedules and register by visiting www.agilent.com and going to the Education link under chemical/biochemical.

Course Title	Course No.	No. of Days	Description
Technique			
Introduction to GC-MS	H2609A	1	Introduces the technique of GC-MS in a lecture format and includes worksheet exercises.
Techniques of GC-MS	H4040A	3	Introduces the concepts of the GC-MS analysis process, and qualitative and quantitative techniques.
Hardware/Software Operation			
Operation of the GC-MSD System Using the ChemStation for GC-MSD	H4043A	5	Teaches skills to enhance an operator's efficiency and productivity when using the Agilent GC-MSD system. Provides experience in data acquisition, data analysis, library searching, reporting, and customizing the system to meet specific laboratory or customer needs.
GC-MSD System for Environmental Applications	H4050A	5	Enhances skill in the use of mass selective detector with mass spectrometer EnviroQuant, software.
Troubleshooting and Maintenance			
Introduction to 5973 GC-MSD Troubleshooting and Preventive Maintenance	H5947A	1	Addresses how to perform preventive maintenance and troubleshooting to keep the Agilent 5973 GC-MSD system working properly. Includes discussion of typical Auto-Tunes and problem Auto-Tunes. Also offers class exercises that enhance understanding of troubleshooting and maintenance principles.
5973 GC-MSD Troubleshooting and Maintenance	H2294A	3	Covers tunes and diagnostics, the vacuum system, the 5973 MSD ion source, the quadrupole mass filter, and the 5973 MSD. Includes hands-on laboratory exercises to demonstrate and practice the principles conveyed.
Data Analysis and Reporting			
Data Analysis and Reporting Using the ChemStation for GC-MSD	H4076A	3	Enhances skills in using the Agilent ChemStation for GC-MSD. Makes users more efficient and productive while expanding their capabilities to maximize ChemStation features. Addresses how to customize the software for laboratory and customer needs.
Data Analysis and Reporting Using the EnviroQuant ChemStation for GC-MSD	H4053A	3	Improves skills in using the Agilent EnviroQuant, software. Covers data analysis and reporting, including completion of EPA-like forms. Addresses how to customize the software for laboratory and customer needs.

Not every course is available in every area worldwide. For detailed information on course availability, please call your Agilent chemical analysis representative.

www.agilent.com/chem

For more information:

For detailed information about
GC/MS supplies from Agilent,
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