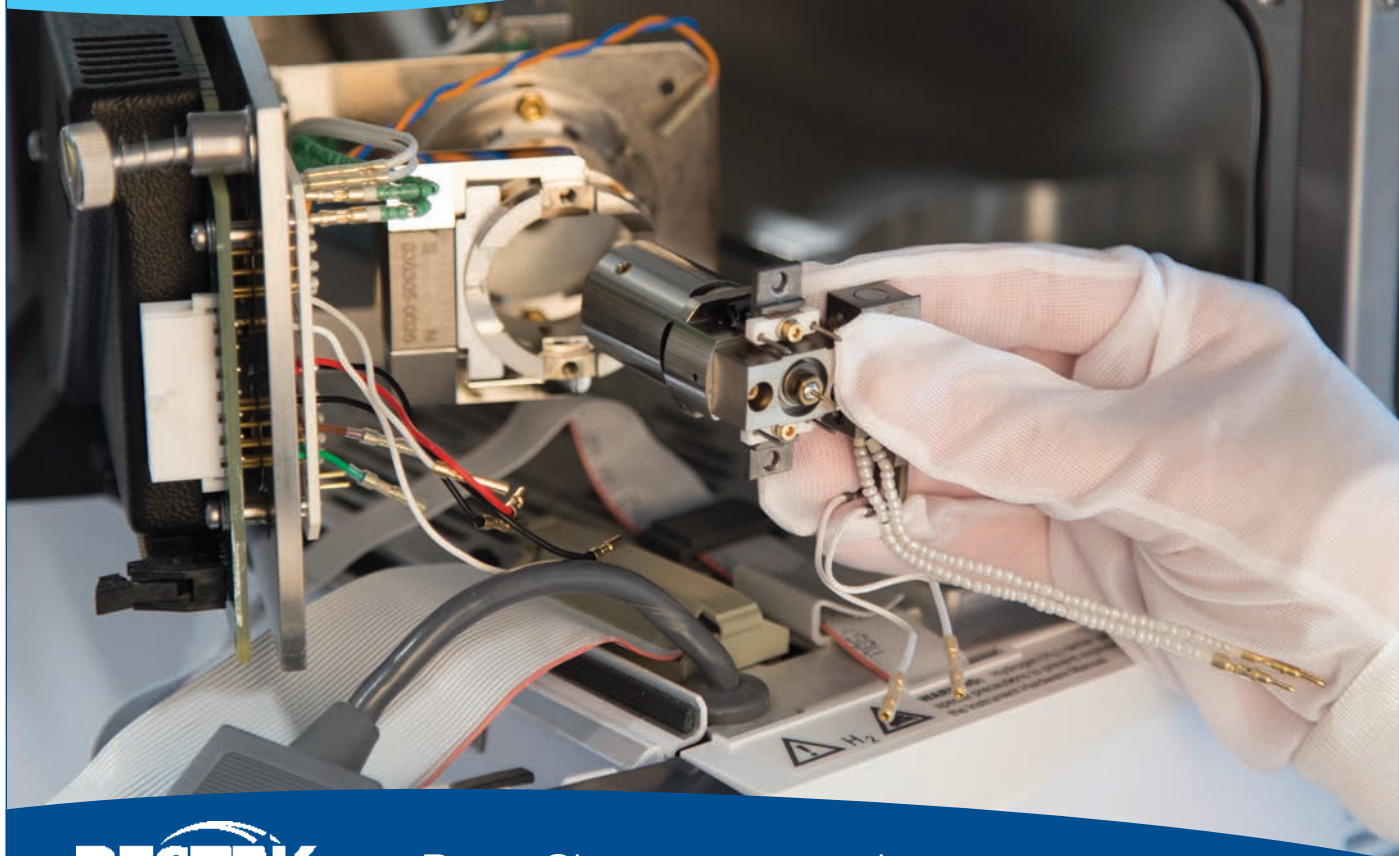
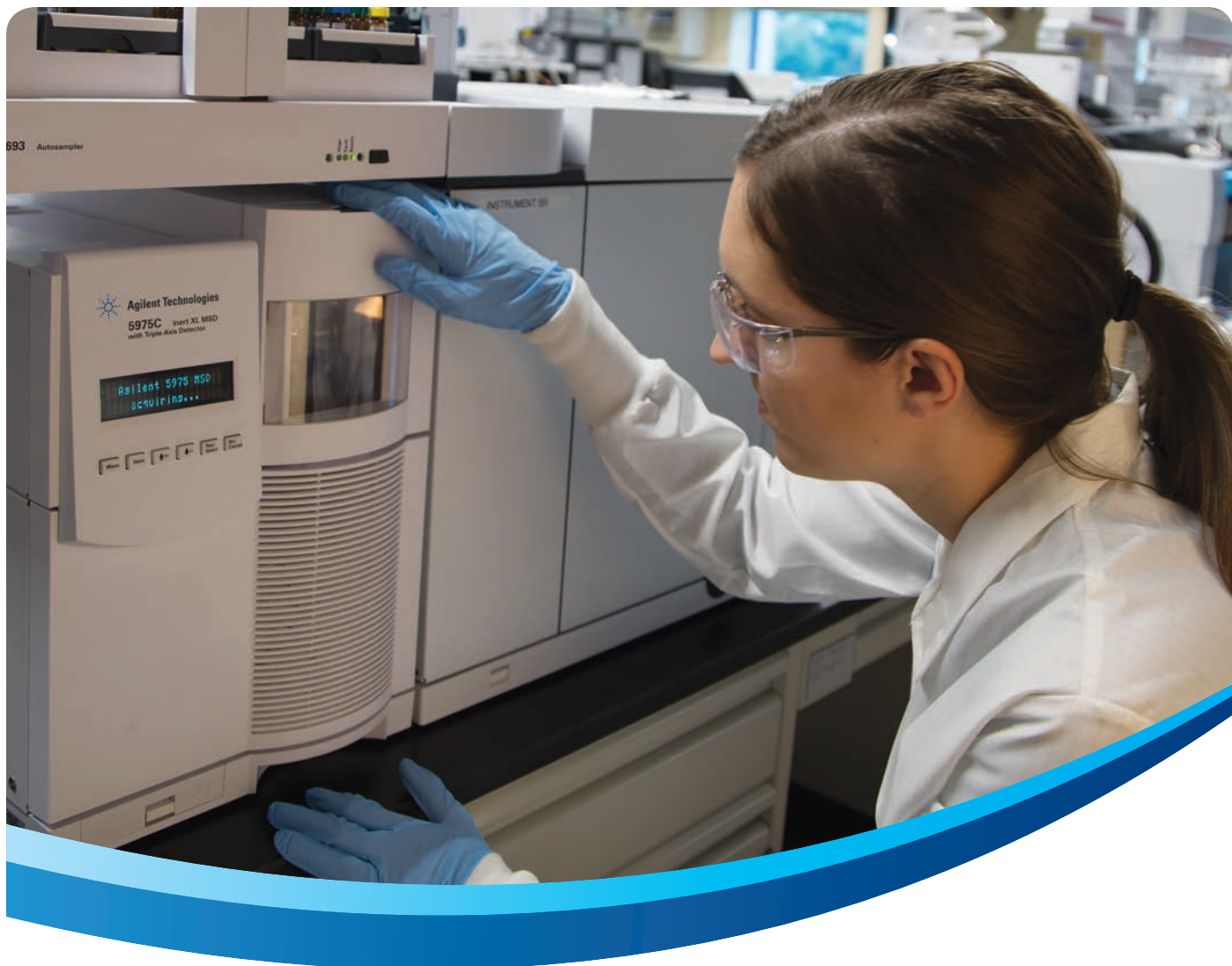


# Agilent GC-MS Maintenance: Restek's Quick Reference Guide

- Replacement parts for Agilent ion sources now available.
- Optimize performance by upgrading ion source components and electron multipliers.
- Restock your ion source cleaning supplies to keep your instrument up and running.





# Agilent GC-MS Maintenance: Restek's Quick Reference Guide

You have your GC-MS method, your samples, and a deadline. You need your instrument to operate properly so you can collect the data you need to get your job done. However, we all know that into every lab a little instrument maintenance must fall. Be prepared so that you can get your mass spectrometer back in the game quickly by having all the necessary GC-MS supplies on hand for when the time comes to service your instrument.

Whether you're performing routine maintenance on your ion source, replacing a used-up filament or aging electron multiplier, or keeping your rough pump humming away, Restek has you covered. Let us help you maintain—and even enhance—the performance of your instrument with our line of routine GC-MS maintenance and replacement parts for Agilent mass spectrometers.

# Preventing Detector-Related Problems

## The GC-MS Interface

Even though the parts associated with the interface between the gas chromatograph and the mass spectrometer are simple in nature, they can be the source of the trouble when poor GC-MS performance is observed.

Making sure the GC column is correctly installed in the mass spectrometer is a critical first step in preventing analytical problems. A leak or improper installation distance can decrease sensitivity, introduce peak tailing, or even prevent your instrument from operating at all, so take care to tighten connections carefully and be sure to set the correct installation distance.

### MSD Source Nut & Ferrules

Tightening the brass MSD source nut seems simple enough, but care must be taken to ensure it is not damaged as a result of overtightening or cross threading, both of which can cause leaks at this connection. In cases of severe damage, brass filings can even be introduced into the mass spectrometer's vacuum chamber.

What makes this point of connection so susceptible to damage is the force necessary to create a seal between the column and the graphite/Vespel ferrules that are used at the interface. Using graphite/Vespel blended ferrules solves the problem of pure graphite's semipermeability to air and avoids the risk of soft graphite fragments getting into the MS source. However, because they are not as soft as graphite alone, they require more force to create the seal, which leads to a greater risk of overtightening.

The graphite/Vespel ferrule will also shrink a little after the initial heating and cooling cycles, so be sure to snug the fitting back up to prevent a leak from developing. Once you retighten the nut, the connection shouldn't require further adjustment.

In cases where the transfer line threads have been damaged, proper GC-MS maintenance requires an additional step: first use Restek's rethreading tool to help repair the damage before installing another source nut.



Remember to install the graphite/Vespel ferrule with the conical side facing towards the nut and away from the mass spectrometer. This is opposite to the ferrule orientation in the inlet, but it is necessary to make a good seal.

## Column Installation Gauge

For certain Agilent mass spectrometers, an installation gauge may be a useful tool for installing the column at the correct installation distance. However, take care to make sure you have properly seated the relatively hard graphite/Vespel ferrule on the column so it doesn't slip while you're installing the column into the MS.

The column installation gauge is not compatible with all Agilent MS source types, so be certain to check instrument compatibility information before purchasing. The gauge can be used with a 5973 MS, a 5975 MS with a chemical ionization (CI) source, and a 5977 MS with the extractor or high-efficiency sources. Do not use the installation gauge on a 5975/5977 MS with an electron ionization (EI) source (inert or SS) because it will result in the column extending too far into the ion source.



## The Vacuum

When you marry a technique such as gas chromatography, which operates under pressure, with mass spectrometry, which operates under vacuum, you'd better have some hardworking pumps to evacuate the GC gas out of your mass spectrometer!

Typically, mass spectrometers have two types of pumps: a rough pump to start the evacuation process and a high-vacuum pump to further lower the pressure inside the mass spectrometer to the point where an ion can fly from the ion source through the mass analyzer (e.g., quadrupole) to the detector (electron multiplier) without encountering any molecules floating around inside the mass spectrometer.

There is very little service that an end user will normally perform with either pump type, but replacing the pump oil is one activity that everyone with a mechanical rough pump that requires oil (e.g., rotary vane pumps) should have on a preventative maintenance schedule. Ensuring that the proper amount of clean oil is in your pump will help make sure your mass spectrometer can reach and maintain the appropriate vacuum.

It is generally recommended that rough pump oil be replaced once every six to 12 months. Restek offers two replacement pump oil types and, while both will work, we recommend using Inland 45: it produces less vapor pressure and achieves a better vacuum with less risk of oil back streaming into the mass spectrometer.



### tech tip

The color of your rough pump oil is not a reliable indicator of quality. To protect your GC-MS system, don't change the oil only when it looks dirty; change it at regular intervals to keep your instrument running smoothly.



# The Ion Source

The power of mass spectrometry relies on the creation of ions. Turning a neutral species into a charged one places it at the mercy of electric and magnetic fields that can push and pull the ion along predetermined flight paths and ultimately separate ions from each other based on their masses and charges. As compounds elute from the gas chromatography column, their first stop is the ion source, where some of those molecules will become ions. That process is inherently inefficient, so make sure your source is clean and optimized to make the most of the ionization process and to give your analysis the best sensitivity possible.

## Ion Source Cleaning

With use, any ion source will gradually become dirty and require cleaning. Dirty sources could result in lower ionization efficiencies, which could manifest as a decrease in sensitivity or an increase in the voltage applied to the electron multiplier (fewer ions arriving at the electron multiplier means it has to work harder to boost the signal).

However, by following the manufacturer's instructions for your particular model of mass spectrometer, most ion source parts can be removed and cleaned. This is typically accomplished through the use of some abrasive material, typically a slurry of aluminum oxide and reagent-grade methanol. To avoid creating a long-lasting source of contamination after you've taken the care to clean the ion source parts, be sure to handle all MS parts with clean, lint-free gloves. Finger oils can become persistent sources of background contamination if you touch the parts with bare hands.

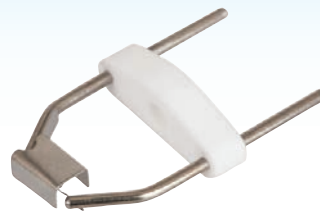
To simplify maintenance, Restek offers a complete line of GC-MS supplies, from a start-up mass spec kit with everything you need to individual replacement consumables for when you start to run low. It's important to note that the Dremel tool provided in one of Restek's kits is a small battery-powered tool, not a full-power Dremel tool. Using a particularly powerful Dremel could rapidly wear and ruin the stainless steel parts.



## Ion Source Consumables

### Filaments

The most commonly replaced ion source parts are the filaments, which will wear out over time, deforming to the point that ionization efficiency drops and the instrument has difficulty tuning. Restek offers replacement filaments that are compatible with most models of Agilent mass spectrometers.



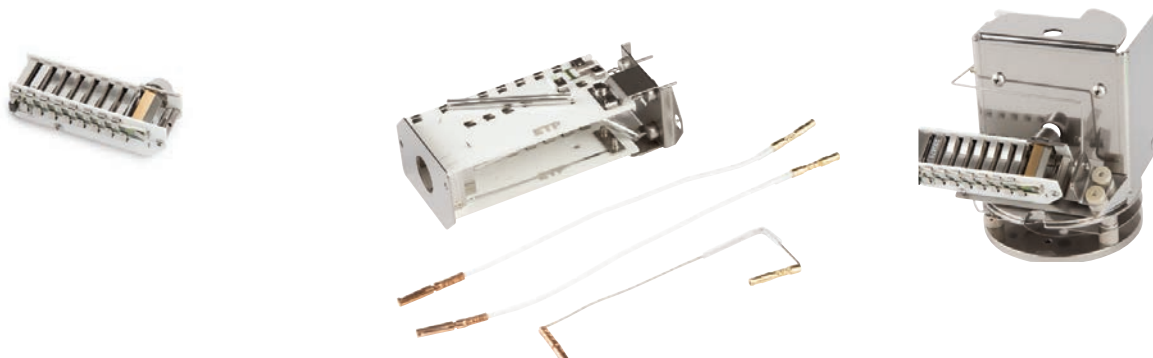
## Electron Multipliers

Well beyond the ion source, at the other end of the mass analyzer, is the electron multiplier (EM). Often boosting the small signal that makes it through the ionization and analysis stages in mass spectrometry by 100,000 times or more, the EM plays a critical role in the successful operation of your instrument. Even though their lifetime is comparatively long for a consumable part, eventually you will need to replace the electron multiplier.

The lifetime of the EM is typically monitored by the voltage that is applied to it, with higher and higher voltages being an indication that the EM is having to work harder and harder to provide the necessary sensitivity. It is possible that elevated EM voltages could be due to poor ionization, but if you've ruled that out, it might just be time for GC-MS maintenance to install a new EM.

The surfaces of the EM that produce the ever-increasing cascade of electrons are called dynodes, and electron multipliers commonly fall into one of two categories: continuous dynode or discrete dynode. Simply speaking, a continuous dynode EM is one where there is only one dynode which has a surface, commonly shaped like a curved horn that is coated with a material that will generate a cascade of secondary electron emissions after the initial charged particle strikes the surface. In contrast, discrete dynode designs often have as many as 24 distinct surfaces, focusing secondary electrons generated at one dynode to the next. These designs offer increased ion detection efficiency as well as longer lifetimes.

Restek offers a number of discrete dynode electron multipliers that work for a variety of models of Agilent mass spectrometers.



Want to learn more about how electron multipliers work?  
Visit [www.restek.com](http://www.restek.com) and enter GNBR1000 in the search for our technical brochure.

## GC-MS Interface Supplies

**MSD Source Nut** for Agilent GCs with 5971/5972, 5973, 5975, or 5977 GC-MS

- 1.2 mm nut bore permits easy removal of ferrules with a standard tapered-needle file (cat.# 20106).
- Made of brass to prevent thread stripping on the transfer line.
- Design enhances ease of threading onto the transfer line and improves overall lifetime.

Description	Similar to Agilent Part #	qty.	cat.#
(Detector) MSD Source Nut	05988-20066	2-pk.	20643



20643

**Capillary Ferrules** for 1/16-Inch Compression-Type Fittings

Vespel/Graphite Ferrules

- VG2, 60% Vespel/40% graphite blend offers the best combination of sealing and ease of workability.
- VG1, 85% Vespel/15% graphite blend offers equivalent composition to Agilent Vespel/graphite ferrules.
- Seal with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
- Stable to 400 °C.
- Recommended for mass spec transfer lines.

Ferrule ID	Fits Column ID	qty.	VG1 (85/15)	VG2 (60/40)
0.3 mm		10-pk.	27061	20275
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	10-pk.	27062	20211
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	50-pk.	27063	20229
0.5 mm	0.32 mm	10-pk.	27064	20212
0.5 mm	0.32 mm	50-pk.	27065	20231
0.6 mm	0.28 mm**	10-pk.	27066	20232
0.8 mm	0.45/0.53 mm	10-pk.	27067	20213
0.8 mm	0.45/0.53 mm	50-pk.	27068	20230
1.0 mm	0.75 mm*	10-pk.	27069	24912

\*For micropacked columns.



20211

**Capillary Installation Gauge** for Agilent 5973/5975/5977 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.



Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).



Score and remove the exposed end of the column.



Loosen the nut.

Description	Similar to Agilent Part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975/5977 MS	G1099-20030	ea.	21894

Note: Do not use on a 5975/5977 MS with an EI source (inert or SS). Doing so will extend the column too far into the ion source. This installation gauge is compatible with the 5975 MS with a CI source and the 5977 MS with the extractor or high-efficiency sources.



21894

Easily seat ferrules for consistent installations in Agilent 5973 MS.



Achieve a better seal!

## Rethreading Tool

- Repair worn or damaged threads.
- Multiple uses (fittings, injectors, detectors, etc.)
- Built-in guide to prevent cross threading.

Repeated installation, removal, and temperature changes cause wear and damage to threads on GC parts. This can cause a poor seal, and oxygen can enter the system, compromising analytical results and possibly destroying expensive analytical columns.



Repeated installation, removal, and temperature changes cause wear and damage to threads on GC parts. This can cause a poor seal, and oxygen can enter the system, compromising analytical results and possibly destroying expensive analytical columns.



Simply screw the rethreading tool onto the part, unscrew, and inspect the threads. Repeat as necessary. When done, wipe threads clean with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool for 1/16" compression fitting	ea.	23016
Rethreading Tool for 1/8" compression fitting	ea.	23017
Rethreading Tool for 1/4" compression fittings (Agilent split/splitless injection ports)	ea.	23018

## Vacuum Supplies



Inland 45 is the highest-quality rough pump oil you can use for your mass spectrometer.

### Rough Pump Oil #19 for MSD Pumps, Oil Vacuum Pump

- Formulated from crude oil stocks known for their durability and line-lubricating qualities.
- Use in Agilent 5973/5972/5971 and GCD mass spec systems, or in other manufacturers' MSD systems that require rough pump oil.
- Under average use, the oil in the foreline rough pump should be replaced every six months.

Description	qty.	cat.#
Rough Pump Oil for MSD Pumps	1 liter	22687

### Inland 45 Pump Oil

Recommended for most mass spectrometers.

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

Description	Similar to Agilent Part #	qty.	cat.#
Inland 45 Pump Oil	6040-0834, 6040-0798	1 liter	24819



# Ion Source Supplies

## GC-MS Cleaning Kit

The Restek GC-MS Cleaning Kit (cat.#s 27194, 27195) Includes:

- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)
- Aluminum oxide (1-kg jar)
- Cotton tip applicators
- Tweezers, large
- Tweezers, small
- Septum puller
- Rotary tool, battery operated (optional, 27194)
- Tool kit bag



27194

Reorder Kit (cat.# 27196) Includes:

- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)

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

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

## Ion Source Cleaning Powder

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

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



22685

## High-Temperature EI Filament

for Agilent 5972, 5973, 5975, or 5977 GC-MS

- EI (electron ionization) filaments meet or exceed original manufacturer's performance.
- Every filament is subjected to QC tests, including heat, electrical current, and resistance.
- Samples from each filament manufacturing lot are installed in an MSD for *in situ* testing.

Description	Similar to Agilent Part #	qty.	cat.#
High-Temperature EI Filament for Agilent 5972, 5973, 5975, or 5977 GC-MS	G7005-60061, G3170-60050 (obsolete)	ea.	23099



23099



## EZ No-Vent GC Column-Mass Spectrometer Connector

for Agilent GCs with 5971/5972, 5973, 5975, or 5977 GC-MS

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and eliminates the need to vent.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other “no-vent” fittings.

We designed the EZ No-Vent GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers’ vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent connector easily attaches to the MS source without special tools or extra plumbing.

Description	qty.	cat.#
EZ No-Vent Connector Kit Includes: EZ No-Vent connector; 0.4 mm ID adaptor ferrules for capillary column (2); 0.4 mm ID ferrules for transfer line (2); 100 µm deactivated transfer line (3 ft); column plug; column nut	kit	21323
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:		
0.30±0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40±0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110



## Replacement Ring Seal for MSD Conversion Fitting

for Agilent GCs with 5971/5972, 5973, 5975, or 5977 GC-MS

Description	qty.	cat.#
Replacement Ring Seal for MSD Conversion Fitting for Agilent GCs with 5971/5972, 5973, 5975, or 5977 GC-MS	2-pk.	21313

## Gold Tip Transfer Line

- For use with Agilent 5971/5972 MS systems.
- Gold-plated for inertness.
- Meets or exceeds original manufacturer’s performance.



Description	Similar to Agilent Part #	qty.	cat.#
Gold Tip Transfer Line	05971-20305	ea.	24699

# Electron Multipliers

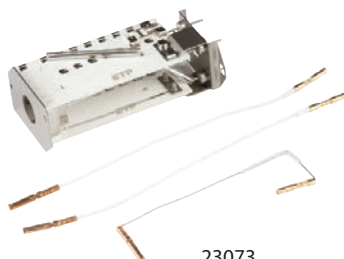
## ETP Electron Multipliers for Mass Spectrometry



23074



23075



23073

- Proprietary specialized surface material resulting in very high secondary electron emission.
- Air stable.
- Two-year shelf life guarantee.
- Discrete dynode design results in extended operating life.
- Optimized ion and electronic optics for maximum performance.
- Increased surface area for enhanced sensitivity and extended operational life.

The multi-dynode approach of all ETP electron multipliers results in longer lifetimes—and better sensitivity—compared with channel electron multipliers (CEM) or continuous-dynode multipliers.

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a two-year shelf life warranty (stored in original, sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps instrument downtime to a minimum.

For a typical ETP electron multiplier for GC-MS, the total active dynode surface area is ~1,000 mm<sup>2</sup>. This can be compared to a standard continuous dynode multiplier that has a total channel surface area of only around 160 mm<sup>2</sup> (for a channel with 1 mm diameter and 50 mm length). This increased surface area spreads out the workload of the electron multiplication process over a larger area, effectively slowing the aging process and improving operating life and gain stability.

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

\*Note: The electron multipliers have been specifically developed to retrofit the original manufacturer's equipment. The detector incorporates a modular design to facilitate ease of replacement and additional innovations intended to enhance performance. First-time installation requires a mount that includes the mechanical housing. After initial installation, only the replacement electron multiplier is required.

†This unit is designed for use in the 5975, 5973 GC, and the LC-MSD (not for 5975C Triple Axis Detector).

The Agilent GC-MS supplies you need are at  
[www.restek.com/detector-guide](http://www.restek.com/detector-guide)

Whether you need GC-MS supplies for your gas chromatograph or for your mass spectrometer, Restek has you covered with an extensive offering of products for both. Our most popular Agilent MS detector supplies are highlighted here, but explore [www.restek.com/GCacc](http://www.restek.com/GCacc) for even more options.



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