GC AND GC/MS

Your Essential Resource for Columns & Supplies

2015|16

Agilent Technologies

GC AND GC/MS

Achieve excellent, reproducible performance for difficult samples

For over 40 years, Agilent has broken new ground with innovations in Gas Chromatography. We continue our leadership tradition by offering the industry's broadest selection of GC and GC/MS columns and supplies. All are manufactured to Agilent's exact specifications to minimize downtime and ensure consistent, high-quality results that you can rely on.

Agilent Ultra Inert solutions

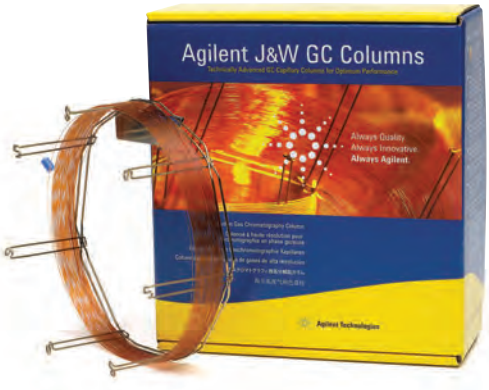
provide the flow path inertness vital to analytical success. Ultra Inert split and splitless liners are manufactured and tested to our highest level of scrutiny to ensure quality and consistency. Agilent J&W Ultra Inert GC columns are tested with the industry's most demanding test probe to reduce detection limits and produce more accurate data for difficult analytes. Agilent GC and GC/MS instruments bring together all elements for trace-level analysis, dramatically improving MS resolution, spectral integrity, and detection limits.

GC and GC/MS supplies

More samples, lower detection levels, with fewer analysts. These demands challenge laboratories to maximize the productivity and performance of their instrumentation. To help you stay ahead, Agilent is continuously improving our extensive portfolio of innovative, award winning GC columns and supplies, designed to help you resolve many of the day to day setbacks encountered in your lab. You can avoid downtime and your time can be better spent on meeting your analytical and business challenges.

For labs pushing the detection limits of trace level analysis on very active compounds, **Agilent Inert Flow Path solutions** ensure a reliably inert flow path for higher sensitivity, accuracy, and reproducibility. Install industry leading Agilent J&W GC columns with new proprietary design GC column nuts and ferrules to simplify your day yet maximize your GC and GC/MS systems output.

- Inert Flow Path components – Ultra Inert GC columns, Ultra Inert liners, Ultra Inert gold seals, UltiMetal Plus Capillary Flow Technology devices with Flexible Metal ferrules – have Agilent proprietary deactivation chemistries to ensure sample integrity.
- "Better Connectivity" with products such as Self Tightening column nuts, UltiMetal Plus Flexible Metal ferrules, and Ultra Inert liners in Touchless packaging improves productivity with ease of use and convenience.
- Full portfolio of premium GC products to support your lab needs – including Agilent CrossLab brand and Agilent Bulk supplies packaging.



Agilent J&W GC columns

deliver the best inertness for acids, bases, and mixed functional compounds, the lowest bleed levels, and the tightest column-to-column reproducibility. Mass Spec Grade GC columns (VF-ms, DB-ms and HP-ms) give you robust performance, low column bleed, and a wide range of selectivity. LTM column modules combine a fused silica capillary GC column with heating and temperature-sensing components for efficient column heating and cooling. What's more, integrated guard columns protect your analytical columns from non-volatile compounds in the sample matrix.

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PUT MORE THAN 40 YEARS OF RELENTLESS INNOVATION BEHIND YOUR EVERY RESULT

By continually raising the standards for technologies that support your routine analyses, Agilent's R&D efforts have led to breakthroughs such as:

- **New GC columns** that help you achieve higher levels of inertness and column-to-column reproducibility
- **LC column choices** that deliver the sensitivity and reliability you need for demanding applications
- **Cutting-edge sample preparation products** that promote reliable extraction and concentration
- **Fresh atomic and molecular spectroscopy ideas** for identifying and confirming targets and unknowns

Longtime Agilent customers have experienced our commitment firsthand. And now, we look forward to demonstrating how Agilent's approach to relentless innovation can work to your advantage, too.

CHEMICAL ANALYSIS SOLUTIONS

Food

From high-volume pesticide screening in food products to rapid identification of pathogens, Agilent understands the analytical needs of food producers, shippers, and regulators. Utilizing our easy-to-use analyzers and updated screening libraries, customers can quickly develop robust and reliable methods. Agilent's leading gas chromatography and mass spectrometry systems are widely regarded as valuable food testing techniques for an array of different analyses.

Environmental

Agilent offers more than 40 years of environmental testing and regulatory expertise. We help government and private labs with the full range of assays, from routine testing of soils for heavy metals to detection of pharmaceuticals in groundwater, in concentrations down to parts per trillion.

Energy & Chemicals

Agilent collaborates closely with process industry customers to offer analytical systems that meet their needs for separation, detection, throughput, and support. We'll even preconfigure custom or standard analyzers so they arrive at the lab ready-to-go. From crude oil, natural gas, and refining, to specialty chemicals and alternative fuels, Agilent provides the latest technologies and solutions to increase quality, safety, and profitability for energy and chemical labs, while meeting the industry's stringent quality requirements. Agilent leads the way in ASTM collaborations that have evolved – and will continue to evolve – into industry standards.

Forensics

Whether testing for poisons in a forensics investigation, screening athletes for performance enhancing drugs, analyzing samples for recreational drugs, or checking a crime scene for explosive residue – lives and professions may be dependent on the accuracy of your equipment. Agilent Technologies leads the industry with a comprehensive portfolio of workflow solutions that provide the ability to identify, confirm and quantify thousands of substances.

Lab Informatics

The ways labs capture, analyze and share data profoundly affect their efficiency. Agilent offers a rich, integrated suite of software products built on customer-driven architectural values with the Agilent OpenLAB Software Suite. OpenLAB delivers superior performance and connection across multiple systems, providing open systems integration and investment protection. Our commitment is to deliver more value across each step in the life cycle of scientific data – from data collection and analysis to interpretation and management.

Materials Science

Agilent offers a newly expanded portfolio of instruments used for the research, manufacturing and testing of advanced materials, from precision optics to pulp and paper. Tools for atomic spectroscopy, molecular spectroscopy, chromatography, and X-ray crystallography all support continuous progress in materials science.

LIFE SCIENCE SOLUTIONS

Biopharmaceutical

Biotherapeutics have enormous potential to improve human health, with growing numbers of protein and antibody therapeutics to address unmet medical needs. At every development stage, from disease research to QA/QC and manufacturing, Agilent can help you make the right choices for moving therapeutics to market. We understand the biopharmaceutical workflow so our product families work together seamlessly, as engines of research, discovery, and development. Agilent columns deliver complete characterization of biomolecules using reversed-phase, size exclusion, ion exchange, and affinity chromatography. Our bio-inert supplies ensure that every part of your workflow delivers the performance you need to optimize your bio-separation.

Pharmaceutical

You need the most efficient processes to evaluate drug candidates, determine efficacy, and ensure safety and compliance during development and manufacture. Agilent has worked with pharma companies for many years to ensure reliability and reproducibility for regulatory compliance, from lab-to-lab and around the world. Our pharma solutions provide high-throughput capability at every stage of the product lifecycle, with automated sample prep, industry-leading U/HPLC systems, the largest family of Fast LC columns, open access LC/MS, spectroscopy, and automated dissolution. A complete family of LC supplies and lamps help optimize every analysis and take day-to-day lab efficiency one step further.

Proteomics

Research into how large sets of proteins affect the health of an organism requires special sets of analytical tools. Agilent has built a formidable arsenal of liquid chromatograph/mass spectrometers, bioinformatics systems, multiple affinity protein removal columns, and OFFGEL electrophoresis for protein identification and protein biomarker discovery. Accurate-Mass mass spectrometry and the microfluidic HPLC-Chip/MS are two Agilent innovations speeding the work of proteomics researchers around the globe.

Metabolomics

Collections of small molecules are increasingly being seen as rich sources of biomarkers, but studying metabolites presents many challenges. The need for speed, accuracy, and powerful interpretation capabilities in looking at chemical profile snapshots is underscored because molecules are constantly entering, leaving or changing within the metabolome. Agilent's GC, LC, and MS portfolios, along with our excellent bioinformatics offerings, user-customizable METLIN metabolite database for LC/MS, and the industry's first commercial GC/MS retention time locked metabolite library align well with the needs of metabolomics researchers.

Genomics

Agilent is a global leader in microarrays, scanners, and NGS reagents used in a wide variety of genomic-based disease research experiments. Our SureSelect and HaloPlex Target Enrichment Systems dominate the category, streamlining next generation sequencing studies. Agilent offers a wide range of catalog CGH and gene expresssion microarrays and a highly-developed capability to produce custom arrays using our free online design tool, SureDesign. All Agilent microarrays feature highly sensitive, selective 60-mer probes, and, with as many as eight arrays printed on a slide, the cost per sample is cost-efficient.

Life Science Informatics

Mirroring its extensive instrument portfolio, Agilent offers the industry's most extensive suite of bioinformatics software, helping users derive knowledge from complex genomic, proteomic, metabolomic and other biological data. SureCall and CytoGenomics software analyzes NGS and aCGH data and the GeneSpring suite provides multi-omic analysis and visualization capabilities to help compare complex datasets to explore biological questions from multiple perspectives. The GeneSpring suite includes the GX module for microarray-based gene expression and genotyping data, the PA module for Pathway Analysis and multi-omic analysis and the MPP software, which analyzes mass spec data from proteomics and metabolomics experiments.

Lab Automation

To meet the skyrocketing demand for more throughput and automation, Agilent has substantially expanded its lab automation offerings. The Agilent line of liquid handlers and microplate processors are designed to streamline high-volume life science workflows. Agilent is also continually upgrading its advanced autosamplers for LC, GC, LC/MS and GC/MS, adding functionality and speed to reflect the performance of its advanced instruments.

Vacuum Technology

Agilent works with customers to solve vacuum challenges from experiments in high-energy physics to developing systems for nanotechnology. Agilent manufactures vacuum systems used in its own mass spectrometry instruments as well as those of other manufacturers. Agilent's vacuum technology has been proven by the most powerful physics experiment ever built, CERN's Big Bang machine, which was used in the discovery of the Higgs boson.

Get the Agilent Service Guarantee

Should your instrument require service while covered by an Agilent Advantage service agreement, we guarantee repair or we will replace your instrument for free.

No other company offers this level of commitment to keep your lab up and running at peak efficiency.

Agilent Service and Support for Instrument Systems

Focus on what you do best

For over 40 years, Agilent has been building and maintaining the instruments you count on to stay competitive and successful. Trust us to protect your investment with a broad portfolio of services, backed by a global network of experienced service professionals dedicated to the productivity of your lab.

Agilent Advantage Service Plans

The best service available for your Agilent instruments

Agilent offers a flexible range of service plans so that you can choose the level of coverage that is best for your lab.

- **Agilent Advantage Gold** – Priority-one coverage for ultimate uptime and productivity
- **Agilent Advantage Silver** – Comprehensive coverage for dependable laboratory operations
- **Agilent Advantage Bronze** – Total repair coverage at a fixed annual price
- **Agilent Repair Service** – Basic coverage for reliable instrument repair

Agilent Advantage service plans include Agilent Remote Advisor for real-time remote monitoring and diagnostics. Through secure internet connections, you can interact with Agilent service professionals, receive detailed asset reports, and configure text or email alerts to notify you before problems occur – helping you to maximize instrument uptime and optimize laboratory workflows.

And for Agilent-quality service on analytical instruments from other leading manufacturers, Agilent CrossLab services offer the same quality coverage you have come to expect from the expert Agilent engineers you know and trust.

Laboratory decision makers and users ranked Agilent as their first choice for general laboratory compliance services.

Agilent Compliance Services

Equipment qualification that meets the most stringent requirements

Enterprise Edition Compliance was developed to streamline qualification delivery compliance across your entire lab. Used worldwide in regulated labs, including standards organizations and regulatory agencies, Enterprise Edition enables you to:

- Improve qualification efficiency by harmonizing protocols across platforms to ensure greater efficiency and minimize regulatory risk
- Standardize your entire compliance operation with robust test designs that work with all your instruments
- Add, remove or reconfigure tests based upon your unique user requirements
- Reduce staff review time significantly with consistently formatted, computer generated, tamper-proof reports

Agilent Education and Consulting Services

Our best minds, working for you

Make the most of your instrument with training and consulting from the same experts who designed the instruments, software and processes you use every day.

- Classroom, online, and on-site training in instrument operation, troubleshooting and maintenance
- Customized consulting services to meet your lab's unique needs

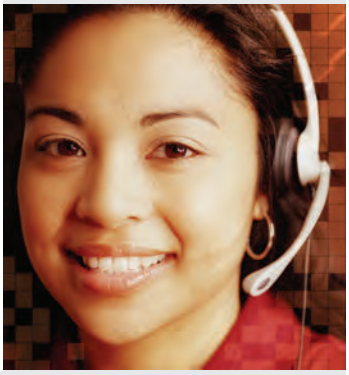
The Agilent Value Promise – 10 Years of Guaranteed Value

AGILENT VALUE PROMISE

In addition to continually evolving products, we offer something else unique to the industry – our 10-year value promise guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an upgraded model. Not only does Agilent ensure a reliable purchase now, but we also ensure that your investment is just as valuable in the future.

For more detailed information, please go to **www.agilent.com/chem/services** or contact your local Agilent Services and Support representative.

Technical Support at work for you



Have a hardware, software, application, instrument repair or troubleshooting question? Agilent's technical experts are available to answer your questions. With years of laboratory experience, our technical support specialists can provide in-depth knowledge and experience.

For questions pertaining to supplies found in this catalog, contact your local Agilent office or Authorized Agilent Distributor or visit **www.agilent.com/chem/techsupport**

Need more information?

Visit **www.agilent.com/chem/contactus** to:

- Locate your nearest Agilent office or distributor for expert technical support.
- Get fast sales and product assistance by phone. Simply use the scroll-down menu to select your country.
- Receive email assistance using our convenient online forms.

Agilent GC and GC/MS Systems

Achieve the highest level of Productivity and Performance

The industry leader in Gas Chromatography

The Agilent 7890B GC

Gives you everything you need to take your lab to the next level of performance, including advanced separation capabilities and powerful productivity tools.

The Agilent 7820A GC

An affordable, high-quality solution for small- to medium-sized labs that require routine analyses using standard GC methods.

The Agilent 6850 Series II GC

An excellent choice for any laboratory where bench space, ease of use, and independent channel flexibility are important.

The Agilent 7697A Headspace Sampler

The new 7697A Headspace Sampler from Agilent uses advanced designs based on our industry-leading gas chromatography architecture.

The broadest selection of GC and GC/MS systems, support, and supplies in the industry

The Agilent 490 Micro GC and 490-PRO

The right GC solution if you want the ability to measure anywhere, and get the results you need in seconds.

The customer-proven worldwide bestseller, Agilent 5977 Series GC/MSD

5977A GC/MSD

Superior performance, reliability, and productivity with industry-leading 7890B GC.

5975T LTM GC/MSD

Compact, transportable GC/MS with fast, lab-quality performance.

5977E GC/MSD

Affordable GC/MSD with economical 7820 GC.

More GC/MS/MS choices to suit your applications and budgets

Agilent 7010 Triple Quadrupole GC/MS

For laboratories preparing to measure tomorrow's regulated levels today, the 7010 Triple Quadrupole GC/MS delivers uncompromising results. It is well suited for high-volume labs that cannot afford downtime for routine maintenance.

Agilent 7000C Triple Quadrupole GC/MS – EASILY UPGRADABLE!

The most precise, reliable choice for laboratories that need a cost-effective, proven solution to meet today's LODs.

Your choice for exceptional qualitative analysis, Agilent 7200 Q-TOF GC/MS

The world's first Q-TOF GC/MS combines the proven separation power of Agilent's 7890B GC with the high detection selectivity and accurate mass information of a TOF analyzer.

Agilent Analyzers and Application Kits

Bringing a new application online can stretch your lab to the limit. Agilent GC, Micro GC, GC/MS, and GC/MS/MS analyzers are factory preconfigured and pre-tested to get you up and running in the shortest possible time.

Agilent Gas Clean Filters

The Agilent Gas Clean Filter System provides enhanced gas quality for maximum productivity. Clean gases reduce the risk of column damage, sensitivity loss, and instrument downtime. Oxygen, hydrocarbons and moisture can cause loss of sensitivity and accuracy of the GC, and damage your column and consumables. Inserting a Gas Clean Filter System in the gas line immediately before the instrument inlet greatly reduces the level of impurities and helps you detect any problems before they occur.

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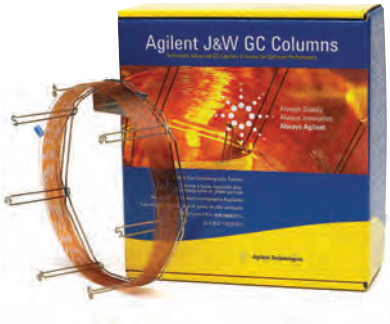

Ultra Inert GC Columns

The Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. And, each column is tested with the most demanding Ultra Inert test probe mixture in the industry, and an individual performance summary sheet is shipped with each column.

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For labs that need to perform trace level analysis on very active compounds, **Agilent Inert Flow Path solutions** ensure a reliably inert flow path for higher sensitivity, accuracy, and reproducibility.

Ultra Inert Liners

Agilent Ultra Inert Inlet liners provide a robust, reproducible and reliable inert flow path, even when containing wool. These liners are rigorously tested and certified to ensure exceptional batch-to-batch uniformity, low bleed and superior coverage, even with highly active compounds.

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Bulk GC Supplies

Ideal for high-usage laboratories, Agilent bulk gas chromatography supplies provide the high quality and consistency of Agilent chromatography supplies in convenient and economical packaging.

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Agilent CrossLab

Agilent CrossLab GC Supplies

CrossLab is a growing portfolio of supplies critical to instrument performance and productivity, regardless of the instrument manufacturer. They are backed by our risk-free, compatibility warranty for your confidence, not compromise. In the unlikely event of a problem, we guarantee:

- 90-day refund on supplies
- A technical support consultation
- Free instrument repair or service if required

CrossLab is more than supplies:

- Over 40 years of chromatography expertise
- The right supplies for both routine and challenging applications
- Hassle-free operations and reproducible results
- High-quality products manufactured to Agilent standards
- Technical and application support
- Dependable worldwide availability and delivery
- Convenience of consolidating purchasing
- 90-day risk-free money back guarantee

Confidence not Compromise

You've come to expect the highest quality from Agilent. Now we offer you that same confidence and quality in our CrossLab supplies, designed for other major brand instruments in your lab.

As further evidence of our confidence in these products, Agilent Services choose CrossLab supplies to service all major instrument brands.

With CrossLab, Agilent stands behind you, your instruments and your laboratory.

Agilent CrossLab GC supports instruments from Bruker/Varian, CTC, PerkinElmer, Thermo, Shimadzu, and more. The comprehensive range includes premium non-stick inlet septa, Ultra Inert inlet liners, liner O-rings, column ferrules and nuts, autosampler syringes, and vials and closures.

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Agilent Parts and Supplies

GC and GC/MS Maintenance Schedule

Item	Typical Schedule	Actions/Comments
Gas Management		
Gas purifiers (carrier gas and detector gas)	Every 6 to 12 months	Replacement schedule is based on capacity and grade of gas. In general, replace non-indicating traps every 6 to 12 months or when indicating traps start to change color.
Internal split vent trap	Every 6 months*	Replace to prevent material backing up into EPC control and to avoid costly repair.
External split vent trap	Every 6 months*	Replace to prevent sample analytes from escaping into the laboratory environment.
Flow meter calibration	Every 1 to 2 years	Re-calibrate electronic flow meters – follow recommended schedule for the unit (shown on the calibration certificate).
Sample Introduction and Inlets		
Syringes and/or syringe needles	Every 3 months*	Replace syringe if dirt is noticeable in the syringe, if it cannot be cleaned, if the plunger doesn't slide easily, or if clogged. Replace needle if septa wear is abnormal or the needle becomes clogged.
Inlet liner	Weekly*	Check often. Replace when dirt is visible in the liner or if chromatography is degraded.
Liner O-rings	Monthly*	Replace with every liner change.
Inlet septum	Daily*	Check often. Replace when signs of deterioration are visible (gaping holes, fragments in inlet liner, poor chromatography, low column pressure, etc.)
Inlet hardware	Every 6 months Every year	Check for leaks and clean. Check parts and replace when parts are worn, scratched, or broken.
Inlet gold or stainless steel seal	Monthly*	For highest level of reproducibility, change inlet seal with every liner change, but minimally replace monthly or when scratched, corroded, or if there is build-up of non-volatile sample components.

*Schedule is an approximation of average usage requirements. Frequency may vary widely based upon application and sample type.

(Continued)

GC and GC/MS Maintenance Schedule

Item	Typical Schedule	Actions/Comments
Columns		
Front-end maintenance	Weekly-monthly*	Remove 1/2 to 1 m from the front of the column when experiencing chromatographic problems (peak tailing, decreased sensitivity, retention time changes, etc.). Replace inlet liner and septum, and clean inlet as necessary. Guard column may be useful for increasing column lifetime.
Solvent rinse	As needed	Perform when chromatography degradation is due to column contamination. Only for bonded and cross-linked phases.
Replacement	As needed	Replace when trimming and/or solvent rinsing no longer restore chromatographic performance.
Ferrules	As needed	Replace when changing columns and inlet/detector parts.
Detectors		
FID/NPD jets and collector	As needed	Clean when deposits are present. Replace when they become scratched, bent, or damaged, or when having difficulty lighting FID or keeping flame lit.
NPD bead	As needed	Replace when signal drifts or there is a dramatic change in sensitivity.
FID	Every 6 months	Measure hydrogen, air, and makeup gas flows.
TCD	As needed	Thermally clean by "baking out" when a wandering baseline, increased noise, or a change in response is present. Replace when thermal cleaning does not resolve the problem.
ECD	Every 6 months or as needed	Wipe test. Thermally clean by "baking out" when baseline is noisy, or the output value is abnormally high. Replace when thermal cleaning does not resolve the problem.
FPD	Every 6 months or as needed	Measure hydrogen, air, and makeup gas flows. Clean/replace FPD windows and seals when detector sensitivity is reduced.
NCD and SCD	Every 3 months*	Change pump oil, oil coalescing filter and chemical trap.
Mass Selective Detectors		
Tune MSD	As needed	Keep plenty of PFTBA (p/n 05971-60571) on hand.
Check the calibration vial	Every 6 months	Vial can be refilled without venting the system.
Replace the foreline pump oil	Every 6 months	Check the fluid weekly. Change when the fluid becomes discolored or every 6 months.
Replace the diffusion pump fluid	Every year or as needed	Check the fluid weekly. Too little fluid will cause the pump to run at a higher temperature, resulting in degradation and loss of high vacuum. Change when the fluid is discolored or contains particulates.
Clean the ion source	As needed	Clean when performance deteriorates to remove contamination and to restore the electrostatic properties of the ion lens system. Replace scratched parts to maintain optimal performance.

*Schedule is an approximation of average usage requirements. Frequency may vary widely based upon application and sample type.

Bulk GC Supplies

Single taper splitless liner, no wool, 5190-2270

Ultra Inert gold plated seal and washer, 5190-6144

Liner O-rings, 5190-2269

Non-stick BTO septa, 5190-3157

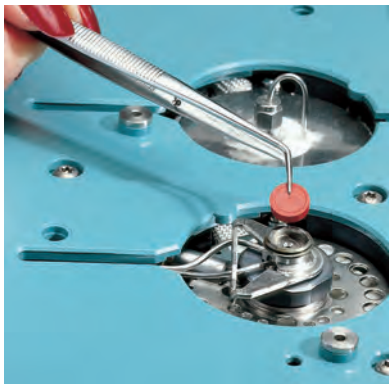
Ideal for high usage laboratories, our bulk supplies provide the quality and consistency of Agilent chromatography supplies in convenient and economical packaging. We currently offer Agilent inlet liners, septa, gold inlet seals, and liner O-rings in bulk packaging.

- Economical and convenient packaging
- Overall cost of ownership reduced
- Same great quality Agilent products

Bulk GC Supplies

Description		Unit	Part No.
Ultra Inert Liners			
	Ultra Inert liner, low pressure drop, glass wool	100/pk	5190-3173
	Ultra Inert splitless liner, single taper, no wool	100/pk	5190-3170
	Ultra Inert splitless liner, single taper, glass wool	100/pk	5190-3171
	Ultra Inert split liner, straight, glass wool	100/pk	5190-3172
Liners			
	Single taper split liner, low pressure drop	100/pk	5190-2275
	Single taper splitless liner, no wool	100/pk	5190-2270
	Single taper splitless liner, glass wool	100/pk	5190-2271
	Double taper splitless liner, no wool	100/pk	5190-2272
Seals			
Ultra Inert gold plated seal, includes washer		50/pk	5190-6149
Certified gold plated seal kit, includes washer		10/pk	5190-2209
O-Rings			
Non-stick fluorocarbon O-ring for Flip Top		100/pk	5190-2268
Certified non-stick fluorocarbon O-ring		100/pk	5190-2269
Septa			
Non-stick BTO septa, 11 mm		400/pk	5190-3157
Non-stick Advanced Green septa, 11 mm		400/pk	5190-3158

Inlet Septa



Septa are available for a variety of different applications and have different upper temperature limits. Lower temperature septa are usually softer, seal better, and can withstand more punctures (injections) than their high-temperature counterparts. If septa are used above their recommended temperatures, they can leak or decompose, causing sample loss, lower column flow, decreased column life, and ghosting. To minimize problems:

- Use within the recommended temperature range
- Change regularly
- Install the retainer nut "finger tight"
- Use septum purge when available
- Use autoinjectors
- Use sharp syringe needles

Premium Non-Stick Septa

Inlet Septa

Agilent premium non-stick inlet septa are designed and manufactured to provide a reliable non-contaminating seal. Our tri-fold blister pack ensures that each septum remains clean and ready to use.

- Proprietary plasma treatment prevents sticking and unnecessary inlet cleaning
- Innovative blister packaging keeps each septum clean and ready for use
- Center point guides the needle for easy penetration, less coring and longer life
- Precision molding assures accurate fit in the inlet
- Each batch is tested for bleed on Agilent 7890 GC-FID
- Premium formulations selected for sealing and chromatographic cleanliness
- No need to bake septa before using

Summary of Premium Inlet Septum Characteristics

Septum Type	Bleed	Lifetime	Temperature Limits
Non-Stick BTO (Bleed and Temperature Optimized)	✓✓✓	✓	to 400 °C injection port temp
Non-Stick Advanced Green	✓✓	✓✓	to 350 °C
Non-Stick Long-Life	✓	✓✓✓	to 350 °C

✓✓✓ = best ✓✓ = very good ✓ = good

TIPS & TOOLS

Need inlet septa for your non-Agilent instruments? Check the Agilent CrossLab septa starting on page 199.

Inlet Septa

Non-Stick Bleed and Temperature Optimized (BTO) Septa

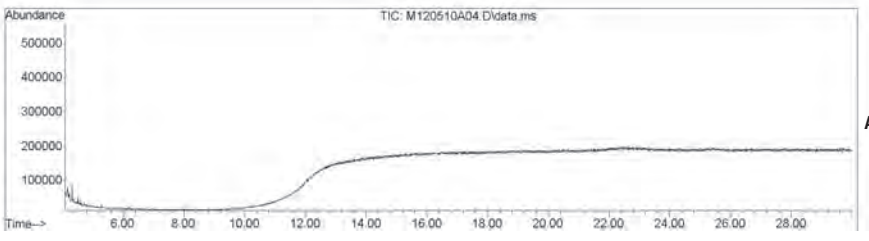
- Extended temperature range, lowest bleed
- Maximum injection port temperature 400 °C
- Plasma treatment eliminates sticking in the injection port
- Pre-conditioned; ready to use
- Blister packaging for cleanliness and convenience
- Ideal for use with low-bleed, "Mass Spec" capillary columns

BTO septa, 5183-4757

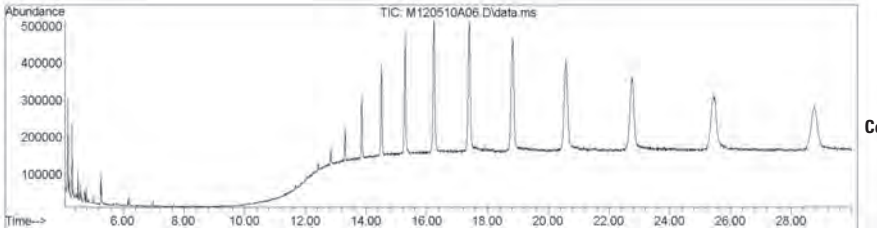
Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Unit	Part No.
Non-stick bleed and temperature optimized (BTO) septa, 11 mm	50/pk	5183-4757
Non-stick bleed and temperature optimized (BTO) septa, 11 mm	100/pk	5183-4757-100
Non-stick bleed and temperature optimized (BTO) septa, 11 mm	400/pk	5190-3157
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4758

Comparison of septum purity: TIC profile of isooctane extractions



Agilent BTO Septa with CenterGuide



Competitor's High-Temperature Septa without CenterGuide

Non-Stick Advanced Green Septa

- True long-life, high temperature green septa
- More injections per septum
- Plasma treatment eliminates sticking in the injection port
- Maximum injection port temperature 350 °C
- High-performance alternative to competitors' "green" septa
- Blister packaging for cleanliness and convenience

Non-Stick Advanced Green Septa

Description	Unit	Part No.
11 mm septa	50/pk	5183-4759
11 mm septa	100/pk	5183-4759-100
11 mm septa	400/pk	5190-3158
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4760

Advanced green septa, 5183-4759

Non-Stick Long-Life Septa

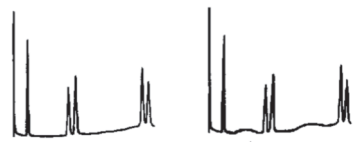
- The preferred septa for autosamplers
- Pre-pierced for extended life and reduced coring
- Ideal for overnight runs
- Up to 400 injections per septum
- Plasma treatment eliminates sticking
- Maximum injection port temperature 350 °C
- Soft, 45 durometer, easy on autosampler needles
- Blister packaging for cleanliness and convenience

Non-Stick Long-Life Septa

Description	Unit	Part No.
Non-stick long-life septa, 11 mm	50/pk	5183-4761
Non-stick long-life septa, 11 mm	100/pk	5183-4761-100
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4762

Long-life septa, 5183-4761

Septa Troubleshooting

Symptom	Possible Causes	Remedy
Extra Peaks/Humps 	Septum bleed	Turn off injector heater. If extra peaks disappear, use septum specified for higher temperature or analyze at lower inlet temperature.
Baseline Change After Large Peak 	Large leak at septum during injection and for a short time thereafter (common with large diameter needles)	Replace septum and use smaller diameter needles.
Retention Times Prolonged 	Carrier gas leaks at septum or column connection	Check for leaks. Replace septum or tighten connections if necessary.

General Purpose Septa

Agilent's general purpose septa are made from an enhanced injection-molded silicone rubber. The septa material, gray in color, is specified to withstand over 200 automatic injections at an injection port temperature of 350 °C.

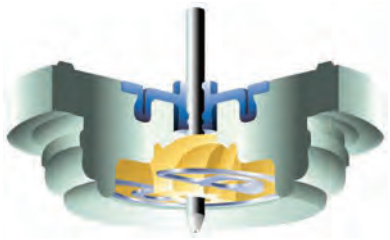
General purpose gray septa

General Purpose Septa

Description	Unit	Part No.
11 mm septa	50/pk	5080-8896-50
11 mm septa	100/pk	5080-8894-100
9.5 mm (3/8 in) septa*	50/pk	5080-8728-50
9.5 mm (3/8 in) septa*	100/pk	5080-8728-100
5 mm through-hole septa for on-column inlets, automatic or manual injections**	25/pk	5181-1260
5 mm septa for high column backpressure, on-column inlets**	25/pk	5181-1261

*For 5700 series and 5830/40 GCs

**5 mm septa are packaged in glass jars



Merlin Microseal

- Low bleed, longer life alternative to standard septa for split/splitless injection and SPME
- Requires 23-gauge syringe needle
- 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 and spring assisted duckbill to seal the injection port
- Temperature range 50-400 °C

Merlin Microseal

Description	Part No.
Merlin Microseal SPME replacement seal, 23-gauge, 1/pk	392609902
General Purpose Merlin Microseal (3-100 psi)	
Merlin Microseal starter kit, general purpose Includes Microseal septum and nut	5182-3442
Merlin Microseal general purpose replacement septum 3-100 psi	5182-3444
Merlin Microseal high pressure nut	5182-3445
High sample volume septum kit Contains general purpose Merlin Microseal, six 23-gauge syringes, 500 vials and caps	5181-8839
Low Pressure Merlin Microseal (1-45 psi)	
Merlin Microseal kit, low pressure Includes nut and septum	5181-8816
Merlin Microseal kit, low pressure Includes nut and 2 septa	5181-8833
Merlin Microseal low pressure replacement septum	5181-8815
Microseal PTFE nut liners, 2/pk	5182-0853

(Continued)

Merlin Microseal

Description	Part No.
For Bruker/Varian GCs*	
Merlin Microseal SPME kit, 1079 23-gauge, 1/pk	392609901
Merlin Microseal adapter kit for 1177 inlets Contains adapter, nut and general purpose Merlin Microseal septum	392609903
Syringes for Merlin Microseal	
Autosampler syringe, Gold Standard, 5 µL, 23-gauge	9301-0892
Autosampler syringe, Gold Standard plunger, 10 µL, 23-gauge	9301-0713
Autosampler syringe, Blue Line, 5 µL, 23-gauge	G4513-80213
Autosampler syringe, Blue Line, 10 µL, 23-gauge	G4513-80209

*Varian GC systems are now Bruker products

TIPS & TOOLS

Agilent Blue Line autosampler syringes are specifically designed to support the higher productivity features of the 7693A ALS, while increasing plunger life and reducing costly downtime. Learn more at **www.agilent.com/chem/BlueLineSyringes**

Inlet Liners

Injection port liners have a variety of features to help vaporize the sample so that a true representation of the sample enters the column. Additionally, Agilent liners are individually packaged to maintain cleanliness until used. The part number and lot are silk screened on the liner for quality control and user convenience, and lot tracking is available for quality assurance.

Liner Dimensions Driven by Inlet Operation

Well-controlled glass dimensions promote better liner-to-liner consistency, ensuring GC system accuracy and reproducibility. That is why Agilent liners are made to the following precise tolerances:

Outer Diameter (OD)

- Larger od liners fit tightly to improve analyte recovery and limit sample migration onto the inlet's metal surface. Ideal for splitless injection.
- Smaller od liners are less resistant to carrier and split flow inside the inlet. Best for split injection.

Internal Diameter (ID)

- Ensures that the sample vapor is small enough to fit within the volume of the liner.
- Prevents backflash, sample loss into the septum purge, and split lines – all of which can lower reproducibility and sensitivity.

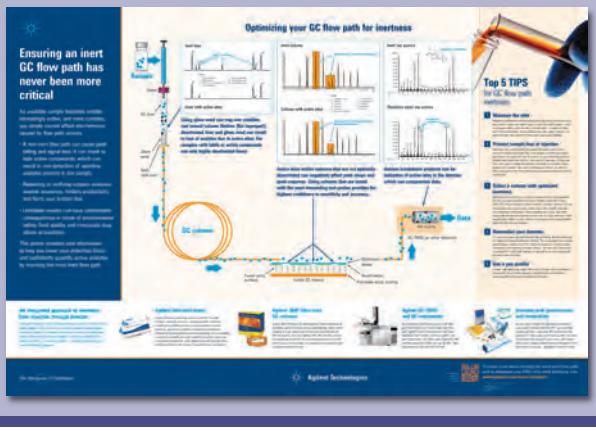
TIPS & TOOLS

Clearly Better Inertness

Confidently quantify active analytes with industry leading Inert Flow Path solutions

- Agilent industry leading GC/MS instruments
- Ultra Inert columns
- Ultra Inert liners

To learn more and order your free poster, visit **www.agilent.com/chem/inert**



Length

- Regulates internal volume and ensures proper sealing between the septum and the inlet seal.
- Precise glass bumps on the bottom of the liner allow you to repeatably position the liner relative to the inlet bottom. This is especially critical if you install liners by measuring the distance from the O-ring to the top of the liner.

Tapers

None	Bottom Tapers	Dual Tapers
• Straight tubes used in split injection with autosamplers	• Directs sample onto head of column and limits analyte exposure to bottom of inlet • Minimizes decomposition and discrimination	• Contain sample within glass liner limiting contact with metal inlet surface • Thought to limit loss through septum purge

Glass Wool

- Less molecular weight discrimination
- Provides additional surface area for sample vaporization, increasing reproducibility
- Serves as a trap for non-volatiles

For split liners, Agilent specifies the placement of glass wool in the liner so that the syringe penetrates the glass wool, wiping the syringe, to provide the most repeatable results with Agilent autosampler and split/splitless inlet design thermal profile.

Agilent Ultra Inert deactivated liners are recommended for samples with active analytes – such as phenols, amines, organic acids, pesticides and drugs of abuse – that could be irreversibly adsorbed on active surfaces in the inlet.

Deactivation

Developed for your high sensitivity analyses, Ultra Inert deactivation provides extreme surface inertness – even for liners containing glass wool. Agilent Original deactivation is recommended for your everyday analyses. With use, even deactivated liners become active. Replace the liner regularly.

TIPS & TOOLS

Tight control of liner dimensions is critical to reproducibility of GC results.

Agilent Ultra Inert Liners

Ensure a reliably inert flow path – with or without glass wool

Whether you are analyzing difficult, active environmental samples or screening for drugs of abuse, our Ultra Inert Inlet liners help ensure an inert GC flow path for higher sensitivity, accuracy, and reproducibility, especially at trace levels.

For samples that contain active or labile compounds, labs typically use liners without wool to prevent degradation or loss of active analytes. However, with Agilent Ultra Inert deactivation, liners with wool are recommended for no loss of sensitivity. The benefits provided by wool, such as homogeneous sample mixing and vaporation, non-volatile residue trapping, and column and detector protection, are gained without compromising detection of active analytes. Plus, Ultra Inert liners are more stable than liners with other deactivations, as shown on the following page. More samples can be analyzed before inlet or column maintenance is required when using Ultra Inert liners with wool.

Certified performance

Each deactivation lot is certified to ensure efficient, consistent coverage using both acidic and basic probes at trace (2 ng) levels on-column. In addition, every liner is packaged with a Performance Certificate that you can peel and stick into your lab notebook for quick compliance reference.

Easy traceability: The deactivation lot number is printed directly on the Performance Certificate; the liner lot number and part number are permanently etched on glass.

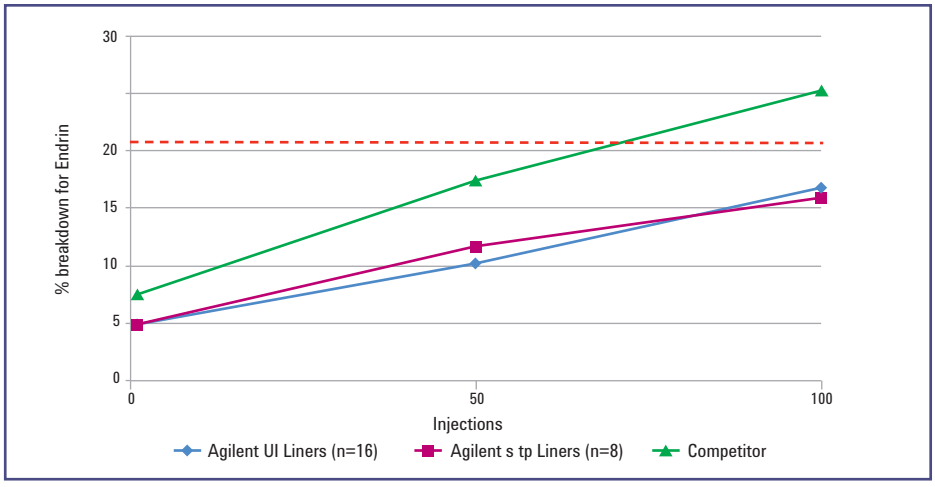
Unequalled manufacturing and quality control deliver best-in-class liner deactivation performance

Agilent's proprietary manufacturing process produces Ultra Inert liners that are rigorously tested and certified to ensure exceptional batch-to-batch uniformity, low (to no) bleed or background contamination, and superior coverage – even with highly active compounds. This rigorous process includes:

- Lot testing to ensure reproducible deactivation coverage – and the stability of deactivation over time
- QC testing with probes specifically chosen to reveal activity
- A GC method that tests liner (not column or system) inertness
- The elimination of contamination – a common side effect of manufacturing and packaging

Touchless packaging – an Agilent exclusive – eliminates O-ring hassles

Ultra Inert Inlet liners are delivered in pharmaceutical-grade PTEG tubing approved by GC/MS extraction testing. But what really sets Agilent's packaging apart is a pre-installed O-ring that has been pre-cleaned, conditioned, and non-stick plasma treated. This unique touchless packaging allows you to quickly and easily install the new liner without searching for and installing the O-ring – saving time and improving productivity, without the risk of contamination from touching.



Agilent Ultra Inert Liners with wool are superior vs. the competition as shown in this endrin breakdown comparison.

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/inert**

Single taper, Ultra Inert liner with glass wool, 5190-2293

Agilent Ultra Inert Liners

Agilent Ultra Inert Liners

Agilent Ultra Inert liners are the perfect companion to Agilent J&W Ultra Inert GC columns. They provide reproducible inertness liner after liner, maintained through a sequence of samples, and for a range of analytes. Agilent's Ultra Inert liners were developed – and are manufactured and certified – using a suite of tests specifically designed to ensure batch-to-batch uniformity.

- Exceptional batch-to-batch liner uniformity
- Low to no bleed or background contamination
- Superior coverage, allowing use of glass wool even with highly active compounds

Only Ultra Inert liners are delivered in Agilent's exclusive touchless packaging with a pre-cleaned, conditioned and non-stick plasma treated O-ring pre-installed. Touchless packaging aids in removal of the old liner, and easy installation of the new, clean, preconditioned liner – without risk of contamination from touching.

Agilent Ultra Inert Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk*
Split Inlet Liners						
Low pressure drop, Ultra Inert Liner with glass wool	870	4	5190-2295	5190-3165	5190-3169	5190-3173
Straight, Ultra Inert Liner with glass wool	990	4	5190-2294	5190-3164	5190-3168	5190-3172
Splitless Inlet Liners						
Single taper, Ultra Inert Liner	900	4	5190-2292	5190-3162	5190-3166	5190-3170
Single taper, Ultra Inert Liner with glass wool	900	4	5190-2293	5190-3163	5190-3167	5190-3171
Splitless, double taper Ultra Inert Liner, no wool	800	4	5190-3983	5190-4007		
Dimpled, splitless, Ultra Inert Liner	200	2	5190-2297	5190-4006		
Splitless, straight, Ultra Inert Liner	250	2	5190-6168			
Straight, Ultra Inert Liner	60	1	5190-4047			
Straight Ultra Inert Liner for SPME	35	0.75	5190-4048			

*The 100/pk is not in the Touchless packaging. O-rings must be purchased separately, p/n 5190-2269.

TIPS & TOOLS

Ultra Inert gold seals prevent active sites from ruining your analysis

Unlike traditional machined seals, Agilent Ultra Inert gold inlet seals are manufactured using metal injection molding, followed by gold plating to ensure a smooth, consistent surface. We then apply our Ultra Inert chemistry on the gold to produce a leak-free seal that reduces active analyte adsorption.

Turn to page 67 for ordering information.

Agilent Original Deactivation Split Liners

Agilent single taper split liners are made to strict dimension specifications for optimal inlet performance and feature the tightest tolerances for od, id, taper, and glass wool placement. For ease-of-use and reproducibility, some liners have a positioning bead, a restriction to secure the position of the glass wool, and a feature to consistently self-position to the recommended height. The liners also feature Agilent's Original proprietary deactivation.

TIPS & TOOLS

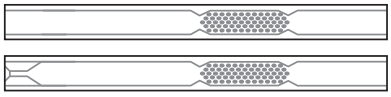
Agilent recommends part number 5190-2295 as the top split liner, and for splitless injection UI part number 5190-2293

Agilent Original Deactivation Split Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk
Single Taper Split Liners						
Single taper, glass wool, deactivated, low pressure drop	870	4	5183-4647	5183-4701	5183-4702	5190-2275
Single taper, glass wool, deactivated	870	4	5183-4711	5183-4712	5183-4713	
Straight Split Liners						
Straight, glass wool, non-deactivated	990	4	19251-60540	5183-4691	5183-4692	
Focus Liners						
Deactivated with glass wool	935	4		210-4004-5		
Tapered, deactivated with glass wool	880	4		210-4022-5		

Single taper split liner, 5183-4647, 5183-4711

Straight split liner, 19251-60540



Focus liners, 210-4004-5, 210-4022-5

View the Touchless Packaging demonstration video at **www.agilent.com/chem/touchless**

TIPS & TOOLS

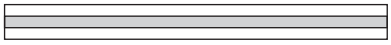
To learn more about our comprehensive portfolio of Agilent CrossLab GC supplies – including our Agilent CrossLab original deactivation liners – go to **www.agilent.com/chem/CrossLab**

Agilent Original Deactivation Splitless Liners

Single taper splitless liner, 5181-3316, 5181-3316i

Single taper, glass wool splitless liner, 5062-3587

Double taper splitless liner, 5181-3315



Straight, non-deactivated, quartz splitless liner, 18740-80220, 5181-8818

Straight, non-deactivated splitless liner, 210-3003

Direct inject liner, 18740-80200

Agilent Original Deactivation Splitless Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk
Single Taper Splitless Liners						
Single taper, deactivated	900	4	5181-3316	5183-4695	5183-4696	5190-2270
Single taper, inert	900	4	5181-3316i			
Single taper, glass wool, deactivated	900	4	5062-3587	5183-4693	5183-4694	5190-2271
Double Taper Splitless Liners						
Double taper, deactivated	800	4	5181-3315	5183-4705	5183-4706	5190-2272
Straight Splitless Liners						
Straight, deactivated, quartz	250	2	5181-8818	5183-4703	5183-4704	
Straight, non-deactivated, quartz	250	2	18740-80220	5183-4707	5183-4708	
Straight, non-deactivated	990	4	210-3003	210-3003-5		
Direct Inlet Liners						
Straight, non-deactivated (for gas samples, headspace, or purge & trap)	140	1.5	18740-80200	5183-4709	5183-4710	

TIPS & TOOLS

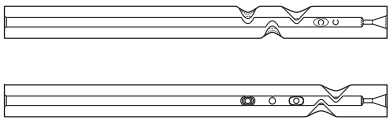
Need inlet liners and O-rings for your non-Agilent instruments? Check out the Agilent CrossLab inlet liners.

Turn to page 193.

Agilent Specialty Injection Liners

Agilent Specialty Injection Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk
MultiMode Inlet Heavy Matrix					
Dimpled					
Dimpled splitless single taper, deactivated	200	2	5190-2296		
Ultra Inert Deactivated Dimpled Liners					
Dimpled, splitless, Ultra Inert Liner	200	2	5190-2297	5190-4006	
Manual Injection					
Straight split liner with cup, glass wool, and packing, 18740-60840	800	4	18740-60840	5183-4697	5183-4698
SPME					
SPME, deactivated	70	0.75	5188-6471		
SPME, Ultra Inert deactivation	70	0.75	5190-4048		
Volatiles					
Volatiles Organic Analysis liner	60	1	5190-4047		

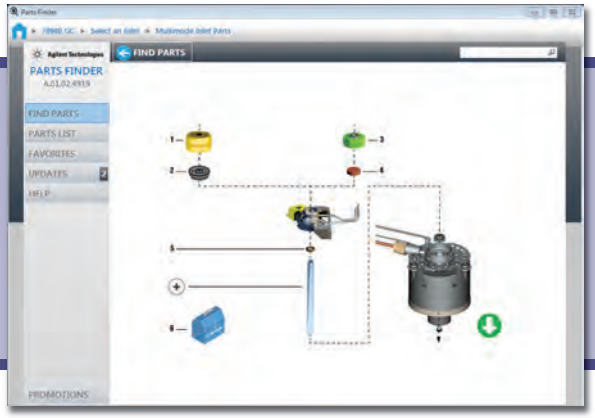


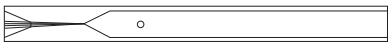
Single taper dimpled splitless liner, 5190-2296, 5190-2297

Straight split liner with cup, glass wool, and packing, 18740-60840

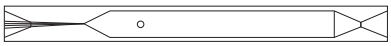
TIPS & TOOLS

With Agilent Parts Finder quickly locate replacement parts for your Agilent instruments. Finding and ordering a part is as simple as clicking on an instrument model, clicking to locate the part, adding the part to a parts list, and printing the list for easy ordering – go to **www.agilent.com/chem/go2partsfinder**





Single taper direct connect liner, G1544-80730



Dual taper direct connect liner, G1544-80700

Direct Connect

Description	ID (mm)	Part No.
Direct Connect		
Direct column connect	4	G1544-80730
Dual taper direct connect liner, splitless, Agilent proprietary deactivation	4	G1544-80700
Single taper direct connect liner, splitless, deactivated, inert	4	G1544-80731

Programmed Temperature Vaporization (PTV) Liners

Description	Volume (µL)	ID (mm)	Part No.
PTV Liners			
PTV liner, single baffle, glass wool, deactivated	180	2	5183-2038
PTV liner, single baffle, deactivated	200	2	5183-2036
PTV liner, multi baffled, deactivated	150	1.8	5183-2037
PTV liner, sintered glass, deactivated	112	1.5	5190-1426
Liners for High Temperature PTV Inlet, G3506A			
PTV liner, high temperature, quartz	713	3.4	5188-5313
PTV liner, high temperature, borosilicate	668	3.4	5188-5356

Liner O-Rings

Liner O-rings, 5188-5365

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

Only Agilent fluorocarbon liner O-rings are:

- Pre-cleaned, then conditioned to eliminate out-gassing of contaminants, which is especially important for trace, ECD and MSD analyses
- Plasma treated for a non-stick, contaminant-free surface that won't stick to the inlet metal surface
- Packaged for convenience and cleanliness in a novel dial package that delivers 1 clean O-ring at a time

Liner O-Rings

Description	Unit	Part No.
Certified non-stick fluorocarbon O-ring	10/pk	5188-5365
	100/pk	5190-2269
Graphite O-ring for splitless liner	10/pk	5180-4173
Graphite O-ring for split liner	10/pk	5180-4168
Non-stick fluorocarbon liner O-ring for Flip Top	10/pk	5188-5366
	100/pk	5190-2268
High temperature PTV inlet liner fluorocarbon O-ring	10/pk	5188-5311

Non-stick fluorocarbon liner O-ring for Flip Top, 5188-5366

TIPS & TOOLS

Agilent's Ultra Inert GC liners are delivered in Touchless packaging with a certified, non-stick O-ring pre-installed.

Turn to page 28.

Capillary Column Ferrules and Nuts

Using the wrong ferrule or a worn-out ferrule to seal your column connection can result in inconsistent and unreliable chromatography. An improper ferrule can cause leaks, which allow air and other contaminants to enter the instrument through the column seal, causing major interference with column and detector performance.

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

To minimize problems, follow these general techniques for ferrule installation:

- Don't overtighten – finger tighten the column nut, then use wrench to tighten
- Maintain cleanliness
- Bake out ferrules prior to use (polyimide and polyimide/graphite only)
- Avoid contamination, such as fingerprint oils
- Inspect used ferrules with magnifier for cracks, chips, or other damage before reusing them
- Change ferrules when new columns or injector/detector parts are installed

TIPS & TOOLS

Use Self Tightening column nuts with graphite/polyimide ferrules to provide a leak-free column connection, without the risk of overtightening.

Turn to page 40.

Self Tightening column nut

Ferrule Selection Recommendations

Ferrule Type	Upper Temp. Limit	Usages	Advantages	Limitations
Graphite (100%)	450 °C	• General purpose for capillary columns • Suitable for FID and NPD • Recommended for high temperature and cool on-column applications	• Easy-to-use stable seal • Higher temperature limit • Can be removed easily	• Not for MS or oxygen-sensitive detectors • Soft, easily deformed or destroyed • Possible system contamination
Polyimide/graphite (85%/15%)	350 °C	• General purpose for capillary columns • Recommended for MS and oxygen-sensitive detectors • Most reliable leak-free connection	• Mechanically robust • Long lifetime	• Not reusable • Flows at elevated temperature • Must re-tighten frequently
Polyimide (100%)	280 °C	• Isothermal operation • Can be reused or removed easily • Excellent sealing material when making metal or glass connections	• Mechanically robust • Long lifetime • Can be reused or removed easily	• Leaks after temperature cycle • Flows at elevated temperature • Must re-tighten frequently
UltiMetal Plus Flexible Metal Ferrules	450 °C	• Designed for Capillary Flow Technology fittings • Compatible with Agilent inlet and detector fittings • Suitable with MS interface using the swaging nut G2855-20555	• Inert surface • Robust seal • Pre-swaged for precise height into fitting	Overtightening of stainless steel nut can damage fitting

TIPS & TOOLS

Look for the following signals that indicate ferrule damage:

- Background noise from oxygen diffusing into the system
- Column bleed catalyzed by oxygen
- Sample degradation
- Sample loss
- Increase in detector signal/noise
- Poor retention time reproducibility

Short and Long Ferrules

Short Ferrules (height 3 mm)

Polyimide/graphite ferrules, 5181-3323

Universal column nut, 5181-8830

Standard fitting for Agilent GC inlet and detectors (FID, NPD, ECD) column connections use short ferrules and the Universal nut

Long Ferrules (height 3.6 mm)

Pre-conditioned long ferrule for MSD connection, 5062-3508

MS interface column nut, 05988-20066

Pre-conditioned graphite/polyimide ferrules are recommened with MSD Interface nut

Column nut for long or long two-hole ferrules, 05921-21170

Alternative nut for Agilent standard inlet or detector fittings used with long graphite/polyimide ferrules

TIPS & TOOLS

Agilent's Self Tightening column nut eliminates the need for retightening once and for all

This unique, self tightening stainless steel GC column nut delivers a tight connection – without expensive upgrades or adapters – and gives you the advantages of:

- Reliable performance
- Less wasted time
- Ease of use
- Faster maintenance

Learn how to install a column using the Self Tightening column nut, visit **www.agilent.com/chem/STnut**

Capillary Column Ferrules – for use with most brands of column, including DB, HP, CP, VF and Select columns

Column ID (mm)	Ferrule Nom ID	UltiMetal Plus Flexible Metal Ferrule Part No.	Graphite Short Ferrule Part No.	Polyimide Short Ferrule Part No.	85% Polyimide/ 15% Graphite Short Ferrule Part No.	Pre-Conditioned Long Ferrule 85% Polyimide/ 15% Graphite for MSD connection Part No.
0.025-0.05	0.4		500-2114	5062-3515	5062-3516	5062-3507
0.075	0.4		500-2114	5062-3515	5062-3516	5062-3507
0.1-0.25	0.4	G3188-27501	500-2114	5181-3322	5181-3323	5062-3508
0.1-0.25*	0.5		5080-8853	5062-3513	5062-3514	5062-3508
0.32	0.5	G3188-27502	5080-8853	5062-3513	5062-3514	5062-3506
0.45	0.8	G3188-27503	500-2118	5062-3511	5062-3512	5062-3538
0.53	0.8	G3188-27503	500-2118	5062-3511	5062-3512	5062-3538

*FactorFour, CP and VF brand columns made prior to 2013 have a larger od and require a 0.5 mm ferrule. The column test chromatogram confirms the ferrule size needed.

Specialty Application Capillary Column Ferrules

Column ID (mm)	Ferrule Nom ID	UltiMetal Plus Flexible Metal Ferrule Part No.	Graphite Short Ferrule Part No.	Polyimide Short Ferrule Part No.	85% Polyimide/ 15% Graphite Short Ferrule Part No.	Pre-Conditioned Long Ferrule 85% Polyimide/ 15% Graphite for MSD Part No.
0.32 CP-SilicaPLOT	0.8		500-2118	5062-3511	5062-3512	5062-3538
0.25 and 0.32 UltiMetal Plus column tubing		G3188-27505				
0.53 UltiMetal Plus column tubing		G3188-27506				
No hole					5190-4054	5181-3308

For additional capillary column ferrule selection, please refer to our CrossLab portfolio. **Turn to page 195.**

UltiMetal Plus Flexible Metal ferrules, G3188-27501

Polyimide ferrule, 5181-3322

Polyimide/graphite ferrules, 5181-3323

Graphite ferrules, 5080-8853

Polyimide/graphite ferrule, 5062-3514

Recommended MS Interface Connections

Description	Part No.
Recommended	
Nut	
Self Tightening column nut, for MS interface	5190-5233
Ferrule	
250 µm Polyimide/graphite ferrule, 10/pk	5181-3323
320 µm Polyimide/graphite ferrule, 10/pk	5062-3514
Tools	
MS interface column installation tool	G1099-20030
Column installation tool for 5975T	G3880-20030
Traditional	
Nut	
MS interface column nut, female	05988-20066
Ferrule	
0.4 mm Polyimide/graphite ferrule, 10/pk	5062-3508
0.5 mm Polyimide/graphite ferrule, 10/pk	5062-3506
Tools	
MS interface column installation tool	G1099-20030
Column installation tool for 5975T	G3880-20030
Alternative	
Nut	
Swaging nut, for MS interface with Flexible Metal ferrules	G2855-20555
Ferrule	
UltiMetal Plus Flexible Metal ferrule with 0.4 mm id, 10/pk	G3188-27501
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id, 10/pk	G3188-27502
Tools	
Ferrule pre-swaging tool	G2855-60200

TIPS & TOOLS

Tips and tricks for making better connections...

Watch the animation that shows how to make better column connections in a GC or GC/MS, at **www.agilent.com/chem/mbcvideo**

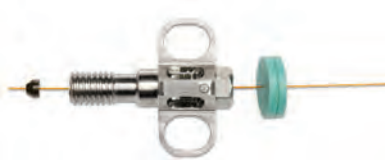
Recommended Inlet Connections

Description	Part No.
Recommended	
Nut	
Self Tightening column nut, for inlet/detector	5190-6194
Ferrule	
250 µm Polyimide/graphite ferrule, 10/pk	5181-3323
320 µm Polyimide/graphite ferrule, 10/pk	5062-3514
Tools	
Column installation pre-swaging tool, graphite ferrules	G3440-80217
Traditional	
Nut	
Universal column nut, 2/pk	5181-8830
Ferrule	
250 µm Polyimide/graphite ferrule, 10/pk	5181-3323
320 µm Polyimide/graphite ferrule, 10/pk	5062-3514
Tools	
Column installation pre-swaging tool, graphite ferrules	G3440-80217
Inert Flow Path	
Nut	
Column nut for long or long two-hole ferrules	05921-21170
Ferrule	
UltiMetal Plus Flexible Metal ferrule with 0.4 mm id, 10/pk	G3188-27501
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id, 10/pk	G3188-27502
Tools	
Column installation pre-swaging tool, metal ferrules	G3440-80218

TIPS & TOOLS

Ensuring an inert GC flow path has never been more critical. Access IFP resources here:
www.agilent.com/chem/inertflowpath

GC Column Connection Supplies



Self Tightening column nut

Self Tightening column nut, for MS interface, 5190-5233

Universal column nut, 5181-8830

MS interface column nut, 05988-20066

Column installation pre-swaging tool, metal ferrules, G3440-80218

Column installation pre-swaging tool, graphite ferrules, G3440-80217

The correct tools and supplies make proper GC column installation easier and ensure consistent, robust, leak-free connections and reliable results.

New Self Tightening column nuts have a unique, stainless steel design that delivers a tight connection – without expensive upgrades or adapters. An innovative spring-driven piston continuously presses against the short graphite/polyimide ferrule – maintaining a leak-free seal even after hundreds of injections. It is especially well suited for oxygen sensitive detectors, such as mass spec and ECD.

Column Nuts

Description	Part No.
Short Nuts	
Self Tightening column nut, for MS interface	5190-5233
Self Tightening column nut, for inlet/detector	5190-6194
Universal column nut, 1/16 in hex, 2/pk	5181-8830
Finger tight column nut for 530 µm columns*	5020-8293
Finger tight column nut for 320 µm columns and smaller*	5020-8292
Blanking plug, finger tight style	5020-8294
6850 column nut, 2/pk	5183-4732
Extended column nut, VI inlet	G3504-20504
High Temperature SimDis PTV inlet, 4 mm hex	5188-5312
Long Nuts	
MS interface column nut, female	05988-20066
Column nut for long or long two-hole ferrules	05921-21170
Accessories	
Swaging nut, for MS interface with Flexible Metal ferrules	G2855-20555
Open end wrench, 1/4 and 5/16 in	8710-0510
Column installation pre-swaging tool, metal ferrules	G3440-80218
Column installation pre-swaging tool, graphite ferrules	G3440-80217

*For use with graphite ferrules only

Specialty Ferrules, 85% Polyimide/15% Graphite

Ferrule ID (mm)	Column ID (mm)	Unit	Part No.
Two Hole			
0.5	0.1	10/pk	5181-3388
0.5	0.10, 0.20, 0.25	10/pk	5062-3580
0.5	0.32	10/pk	5062-3581
No Hole			
Capillary column long ferrule		10/pk	5181-3308
Capillary column short ferrule		10/pk	5190-4054
High Temperature PTV Inlet SS/Graphite			
0.4	0.32	10/pk	5188-5315
0.4	0.53	10/pk	5188-5314

Straight Ferrules

Description	Unit	Part No.
1/4 in PTFE	10/pk	0100-1378
1/4 in Graphite	10/pk	0100-1324
1/8 in PTFE	10/pk	0100-1365
1/8 in Graphite	10/pk	0100-1325
1/8 in 85% Polyimide/15% graphite	10/pk	0100-1332
1/16 in PTFE	10/pk	0100-1375
1/16 in Graphite	10/pk	0100-1326
1/16 in VG-2 Polyimide/40% graphite	10/pk	0100-1379
1/4 in 85% Polyimide/15% graphite	10/pk	0100-1331

1/8 in 85% Polyimide/15% graphite, 0100-1332

Reducing Ferrules

Description	Unit	Part No.
1/8 to 1/16 in Polyimide	10/pk	0100-1342
1/8 to 1/16 in VG-1 Polyimide, 15% graphite	10/pk	0100-1344
1/16 in to 0.4 mm VG-2 Polyimide, 40% graphite	10/pk	0100-1381

Ferrules for LTM Rapid Heating/Cooling System

Description	Original Design (5/pk)	2010+ Ultimate Union (10/pk)
For use with 0.25-0.4 mm id LTM columns	5190-1437	G3188-27501
For use with 0.4-0.5 mm id LTM columns	5190-1438	G3188-27502
For use with 0.5-0.8 mm id LTM columns	5190-1439	G3188-27503

UltiMetal Plus Flexible Metal ferrules, G3188-27501

Ferrules and Nuts for NCD and SCD

Description	Part No.
Spare column nut and ferrule kit	G6600-80018

Capillary Flow Technology Supplies

Agilent offers a family of GC accessories based on our proprietary Capillary Flow Technology. These accessories increase system productivity and performance:

- Deans switch device simplifies the analysis of complex samples
- Purged Effluent Splitter for inert, leak-free column effluent splitting

Ultimate Union

Ultimate Union

The Ultimate Union is part of Agilent's Capillary Flow Technology family, providing extremely low dead volume column connections. Like the QuickSwap, Deans Switch and Purged Effluent Splitter, the Ultimate Union uses special fittings and SilTite ferrules to create an inert, leak-free and robust seal that doesn't need re-tightening after temperature cycles.

Each Agilent Ultimate Union kit contains:

- 1 Union (your choice of UltiMetal Plus deactivated, or non-deactivated)
- 1 Oven wall clip
- 2 Internal nuts, p/n G2855-20530
- 1 Swaging nut, p/n G2855-20555
- 1 5/pk of UltiMetal Plus Flexible Metal ferrules for 0.25 mm column

Ultimate Union Kits, Fittings and Ferrules

Description	Part No.
Ultimate union kit, deactivated	G3182-61580
Ultimate union kit, non-deactivated	G3182-61581

TIPS & TOOLS

UltiMetal Plus ferrules can be used to install columns in the Split/Splitless inlet using the long column nut, p/n 05921-21170

Fittings, Ferrules and Supplies

For leak-free, low dead volume and inert column connections with capillary flow accessories, such as the Deans Switch or QuickSwap MS Interface, use SilTite ferrules and specified nuts. For Capillary Flow devices, use deactivated fused silica tubing. Do not use tubing that has been coated with stationary phase.

Fittings, Ferrules and Supplies

Description	Unit	Part No.
Internal nut		G2855-20530
Swaging nut, for MS interface with Flexible Metal ferrules		G2855-20555
Tee, inert		G3184-60065
Column storage fitting		G2855-20590
UltiMetal Plus Flexible Metal ferrule with 0.4 mm id	10/pk	G3188-27501
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id	10/pk	G3188-27502
UltiMetal Plus Flexible Metal ferrule with 0.8 mm id	10/pk	G3188-27503
Ferrule pre-swaging tool		G2855-60200

Column/Retention Gap Installation Supplies

Description	Part No.
250 µm retention gap, one 5 m piece	160-2255-5
320 µm retention gap, one 5 m piece	160-2325-5
530 µm retention gap, 5 m length	160-2535-5
Fused silica, deactivated, 0.15 mm x 1 m	160-2625-1
Fused silica, deactivated, 0.15 mm x 5 m	160-2625-5
Fused silica, deactivated, 0.15 mm x 10 m	160-2625-10

Internal nut, G2855-20530

Swaging nut, G2855-20555

Tee, inert, G3184-60065

UltiMetal Plus Flexible Metal ferrules, G3188-27501

Ferrule pre-swaging tool, G2855-60200

Ultra Inert universal press fit connector, 5190-6979

Ultra Inert universal press fit Y-splitter, 5190-6980

Press-fit Capillary Column Connectors

In the past it was necessary to use press-fit connectors with specific dimensions to connect columns of those dimensions. Modern press-fit connectors are "laser-milled" to provide highly reproducible taper angles throughout the length of the press-fit, ensuring an excellent seal. Agilent's Press-fit capillary column connectors are treated with Agilent Ultra Inert deactivation to provide a robust and inert flow path.

Ultra Inert Press-fit Column Connectors

Description	Unit	Part No.
Ultra Inert universal press fit connector	10/pk	5190-6979
Ultra Inert universal press fit Y-splitter		5190-6980

Graphpak Capillary Connectors

Graphpak Capillary Column Connectors (2.5 mm)*

Column ID (mm)	Connector ID (mm)	Part No.
Capillary Detector Port Connector		
0.32/0.25	0.4	5021-7166
0.53	0.7	5021-7164
Capillary Divider for Simultaneous Sampling		
0.32/0.25	0.53	5021-7148
0.53	0.7	5021-7146
Capillary Injection Port Connector		
0.2	0.3	5021-7169
0.32/0.25	0.4	5021-7170
0.53	0.7	5021-7168

*The 2.5 mm Graphpak is not compatible with the Graphpak 2M used for the PTV.

Note: Order ferrules in addition to the connector to fit your column. Ferrules must be ordered separately.

Graphpak connector for Agilent capillary detectors

Graphpak divider for simultaneous sampling

Capillary injection port connector, 5021-7170

Ferrules for Connectors

Column ID (mm)	ID (mm)	Unit	Part No.
0.2	0.3	10/pk	5021-7136
0.32/0.25	0.4	10/pk	5021-7137
0.53	0.7	10/pk	5021-7134
Graphpak plug ferrule		10/pk	5021-7133
Replacement Graphpak column nut		5/pk	5062-3525

Large Valve Oven

The Agilent Large Valve Oven (LVO) for GC is a versatile, high capacity external oven, which can be configured to support complex, multi-valve GC applications. The LVO supports several standard Agilent multi-valve Analyzers such as RGA and NGA, and is also available as a highly customizable option on the 7890B GC. Precisely engineered for thermal isolation from the GC oven, the LVO provides a homogeneous isothermal environment for up to six columns and/or valves, and convenient open-access for maintenance, adjustment or customization. Accessibility, capacity and thermal uniformity make the Agilent LVO a premium GC valving option, especially suited to support the rising trend of combining multiple complex analysis on a single GC platform.

For more information please visit **agilent.com/chem/largevalveoven**

Valves and Loops

Gas Sampling General Purpose Valves

Description	Part No.
6-port replacement valve WE series, 400 psi, 225 °C	5062-9508
6-port replacement valve WE series, Hastelloy C, 400 psi, 225 °C	5062-9509
10-port replacement valve WE series, 400 psi, 225 °C	5062-9510
10-port replacement valve WE series, Hastelloy C, 400 psi, 225 °C	5062-9511
6-port replacement valve WT series, 300 psi, 350 °C	0101-0584
10-port replacement valve WT series, 300 psi, 350 °C	0101-0585
4-port replacement valve WE series, 400 psi, 225 °C	0101-0946
4-port replacement valve WT series, 300 psi, 350 ºC	0101-0947
14-port replacement valve UWE series, Hastelloy C, 400 psi, 225 ° C	0101-1472
14-port replacement valve UWE series, 400 psi, 225 °C	0101-1473
4-port replacement valve WE series, Hastelloy C, 400 psi, 225 °C	5062-3519

General purpose gas sampling valves

Liquid Sampling General Purpose Valves

Description	Part No.
0.2 µL replacement valve UWP series, 1,000 psi, 75 °C	0101-0636
0.5 µL replacement valve UWP series, 1,000 psi, 75 °C	0101-0637
1.0 µL replacement valve UWP series, 1,000 psi, 75 °C	0101-0638
0.5 µL replacement valve UWP series, 5,000 psi, 75 °C	0101-0639

General purpose liquid sampling valves

Replacement Rotors for Gas Sampling Valves

Description	Part No.
6-port replacement rotor WE series, 400 psi, 225 °C	5181-7459
10-port replacement rotor WE series, 400 psi, 225 °C	5181-7460
6-port valve, replacement rotor, WT series, 300 psi, 350 °C	1535-4952
10-port replacement rotor WT series, 300 psi, 350 °C	1535-4954
4-port replacement rotor WE series, 400 psi, 225 °C	5190-6981
14-port replacement rotor UWE series, 400 psi, 225 °C	5190-6982

Front ferrules, stainless steel, 5181-1292

Valve Supplies

Description	Part No.
1/16 in stainless steel nut, 10/pk	5181-1291
1/16 in front ferrule, stainless steel, 10/pk	5181-1292
Straight metering valve, 1/16 in, stainless steel, for LSVs as a sample-out restrictor or as a flow-balancer for 10-100 mL/min	0101-0355
Micrometering valve, std temperature, Viton O-ring, 225 °C max, for flow balancing gas flows of 2-175 mL/min	0101-0633
Micrometering valve, Hastelloy C body, Viton O-ring, 225 °C max, for flow balancing gas flows of 2-175 mL/min	G3440-20003
Micrometering valve, high temperature, Kalrez O-ring, 350 °C max, for flow balancing gas flows of 2-175 mL/min	0101-0948
Micrometering valve, UltiMetal + treated body, Viton O-ring, 225 °C max, for flow balancing gas flows of 2-175 mL/min	G3480-60663
Air driven valve actuator for Small Valve Oven (box), short shaft	19325-60660
Air driven valve actuator for Large Valve Oven (box), long shaft	G3507-60660
10-port Actuator limiter	18900-21000
14-port Actuator limiter (for LVO only)	G3480-20002
Angle metering valve, 1/16 in, stainless steel	0101-0403
7 µm gas line filter, 7 µm (filtering element) 1/8 in x 1/8 in connectors Swagelok type gas line filter (stainless steel)	0101-0532
2 µm (filtering screen) 1/8 in x 1/16 in connectors Valco type reducing gas line filter (stainless steel)	0101-1001
2 µm (filtering frit) 1/8 in x 1/16 in connectors Valco type reducing gas line filter (Hastelloy C)	G3440-20008
2 µm replacement 1/8 in frits in Hastelloy C for Valco type reducing gas line filter G3440-20008	G3440-20007

Valve Loops for GC
Includes loop, nut and ferrule, 1/16 in

Description	Stainless Steel Part No.	Nickel Part No.	Hastelloy Part No.	UltiMetal Plus Part No.
Sample loop, 0.25 cc	0101-0303	0101-0956		G1540-30024
Sample loop, 0.50 cc	0101-0282	0101-0957	G3440-20005	G1540-30025
Sample loop, 1.00 cc	0101-0299	0101-0954		G1540-30026
Sample loop, 2.00 cc	0101-0300	0101-0955		G1540-30027
Sample loop, 5.00 cc	0101-0301			G1540-30028
Sample loop, 10.00 cc	0101-0302			
Sample loop, 25 µL	0101-0304			
Sample loop, 50 µL	0101-0667			
Sample loop, 100 µL	0101-0666		G3440-20004	

Valve Tubing Assemblies

Description	Part No.	Stainless Steel Part No.	UltiMetal Plus Part No.	Nickel Part No.
A. Tube, 1/16 in, 0.010 in x 1000 mm		G3440-20033	G3440-60033	
B. Tube, 1/16 in, 0.031 in x 1000 mm		G3440-20035	G3440-60035	G3440-20037
C. Tube, 1/16 in, 0.010 in x 1000 mm w/adapter (Modified Detector Line)		G3440-60600	G3440-60610	G3440-60620
D. Tube, 1/16 in, 0.031 in x 1000 mm w/adapter (PPI Carrier Line)		G3440-60300	G3440-60310	
E. Tube, 1/16 in, 0.038 in x 975 mm, packed col line w/bulkhead		G3440-60336	G3440-60236	G3440-60136
F. Tube, 1/16 in, 0.010 in x 1000 mm, CPM		G3440-60333	G3440-60233	
Tube, 1/16 in, 0.020 in x 1000 mm, CPM		G3440-60334	G3440-60234	
Swaging nut (for CFT connections)	G2855-20555			
Internal nut (for CFT connections), 0.80 mm id for capillary column connections	G2855-20530			
Internal nut (for CFT connections), 1.65 mm id for 1/16 in tubing connections	G2855-20532			
Nut plate assembly for valve to column connection GC oven mounting (6 Pos.)	05890-80660			
Oven Right Side Nut Plate Assembly (8 Pos.)	G3440-81664			
Oven Left Side Nut Plate Assembly (8 Pos.)	G3440-81665			
UltiMetal Plus Flexible Metal 1/16 in ferrule, for 1/16 in tubing			G3188-20509	
UltiMetal Plus Flexible Metal ferrule with 0.4 mm id, for fused silica tubing 0.1-0.25 mm id, 10/pk			G3188-27501	
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id, for fused silica tubing 0.32 mm id, 10/pk			G3188-27502	
UltiMetal Plus Flexible Metal ferrule with 0.8 mm id, for fused silica tubing 0.53 mm id, 10/pk			G3188-27503	
UltiMetal Plus Flexible Metal ferrule with no hole, 10/pk			G3188-27504	
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id, for 0.25 and 0.32 mm id UltiMetal column tubing, 10/pk			G3188-27505	
UltiMetal Plus Flexible Metal ferrule with 0.8 mm id, for 0.25 mm and 0.32 mm UltiMetal column tubing, 10/pk			G3188-27506	

A.

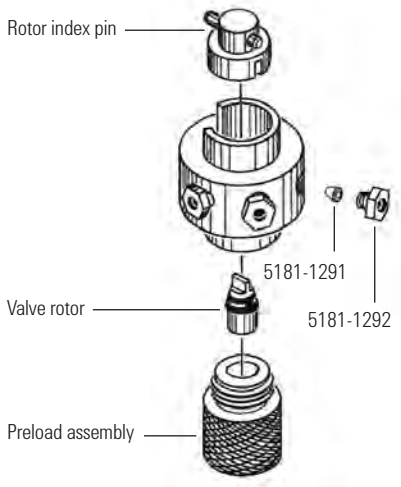
D.

B.

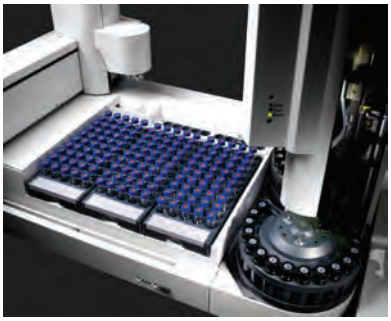
E.

C.

F.



Valve body, disassembled



7693A Automatic Liquid Sampler

Sample Introduction Systems

7693A Automatic Liquid Sampler Replacement Parts and Supplies

To support the higher productivity, performance, and flexibility offered by the 7693A ALS, Agilent has expanded its supplies offering. Agilent Blue Line autosampler syringes are specifically designed to support the 7693A, while increasing plunger life and reducing costly downtime. For cost-conscious laboratories, economical shell vials and caps provide quality at an attractive price. Additional accessories, such as color-coded sample trays and vial caps, add to system ease-of-use.

7693A Replacement Parts and Supplies

Description	Unit	Part No.
Gripper finger caps	16/pk	G4514-60710
Injector mounting post		G4513-20561
Dual parking post for autosampler		05890-61525
Needle support insert, standard		G4513-40525
Needle support insert, on-column		G4513-40529
Vial rack, set of 3. Includes 3 white label tags		G4514-67505
Vial rack label kit		G4525-60701
Vial rack label kit, red	3/pk	G4525-60702
Vial rack label kit, yellow	3/pk	G4525-60703
Vial rack label kit, green	3/pk	G4525-60704

Diffusion caps for 4 mL vials, 07673-40180

Wash Vials (also for standards, diluents)

Description	Unit	Part No.
4 mL wash vials with fill markings and caps	25/pk	5182-0551
Diffusion caps for 4 mL vials	12/pk	07673-40180
Septa for 4 mL vials*	144/pk	9301-1031
4 mL wash vial with screw caps	144/pk	9301-0723

*Septa for 4 mL vials should only be used for sample storage

Automatic Liquid Sampler Supplies

Automatic Liquid Sampler Supplies

Description	Part No.
Screw for mounting syringe	07673-20570
Quadrant tray (4 tray sections)	18596-40015
7673 Basic Supply Kit Contains 6 10 µL syringes, 23/26 gauge needles, 4 mL vials with diffusion caps (144/pk), 2 mL automatic sampler vials with screw caps (1,000/pk), GC septa (25/pk), vial racks (5/pk)	07673-60840

Bar Code Reader Labels

Description	Part No.
Labels numbered (1,000/roll)	
1 to 1,000	5958-9450
1,001 to 2,000	5958-9441
2,001 to 3,000	5958-9442
3,001 to 4,000	5958-9443
4,001 to 5,000	5958-9444
5,001 to 6,000	5958-9445

7697A Headspace Sampler

7697A Headspace Sampler Supplies

The new 7697A Headspace Sampler from Agilent uses advanced designs based on our industry-leading gas chromatography architecture. The headspace sampling technique allows introduction of volatile compounds to the GC or GC/MS from virtually any sample matrix, while leaving unwanted components in a disposable sample vial. With up to 111 sample vial positions and removable vial racks, the 7697A supports nearly continuous operation to satisfy even the busiest laboratory.

- Built-in legendary Agilent pneumatics for superior control and easier setup
- Proven valve and loop sampling technology
- Fully-automatic sample vial leak checking and available bar code reader help ensure greater confidence in results method compatibility
- Instrument control software that is fully integrated in Agilent data systems
- Resource conserving programmable instrument scheduler

7697A Headspace Replacement Parts and Supplies

Description	Part No.
Tray vial racks	G4556-60019
Vial rack label	G4556-90500
Split vent trap with 3 cartridges, 1/8 in Swagelok fitting	RDT-1020
Leak test kit Includes instruction sheet, no-hole ferrule, 1/8 in nylon tube fitting plug, headspace leak test vial, 1/16 in stainless steel ZDV plug, 11 mm low bleed septa (5/pk)	G4556-67010
UltiMetal Plus Inert sample probe	G4556-60125
6-port valve, replacement rotor, WT series, 300 psi, 350 °C	1535-4952
Standards	
OQ/PV Headspace Sample Contains 2 g/L t-butyl disulfide, 1,2-dichlorobenzene, and nitrobenzene in ethanol	5182-9733

(Continued)

TIPS & TOOLS

The transfer line heater assembly is 1 m in length and accommodates the following tubing types:

- Fused silica capillary of 0.25 mm, 0.32 mm, and 0.53 mm id with maximum od of 0.67 mm
- Metal capillary of 0.53 mm id, such as Agilent UltiMetal or ProSteel, with maximum od of 0.67 mm

For one transfer line, a piece of fused silica or ProSteel approximately 1 m in length is required in addition to one ferrule and one nut and reducing union. Order a ProSteel sleeve to protect the transfer line when operating above 200 °C. ProSteel operated above 200 °C in the transfer line without the sleeve can permanently bind to the heated conduit tube.

7697A Headspace Replacement Parts and Supplies

Description	Part No.
Transfer Line Components	
Deactivated fused silica, 5 m length	
0.25 mm	160-2255-5
0.32 mm	160-2325-5
0.45 mm	160-2455-5
0.53 mm	160-2535-5
ProSteel deactivated stainless steel, 5 m length	
0.53 mm	160-4535-5
Polyimide sleeve for ProSteel	4177-0607
Polyimide ferrule, 5/pk, 0.50 mm, 0.80 mm	0100-2595
Polyimide, Valco ferrule, 5/pk	
Ferrule, low thermal mass, column id 320 µm, 0.5 mm id, 5/pk	5190-1438
Ferrule, low thermal mass, column id up to 250 µm, 0.4 mm id, 5/pk	5190-1437
Nut and reducing union for 6 port valve and transfer line connection	0100-2594
Septum nut, transfer line, split/splitless and multimode inlets	G3452-60835

G3520A XLSI Accessory Supplies

Description	Part No.
G3520A XLSI Accessory kit	
Ceramic wafer column cutter	5181-8836
Transfer line nut fitting	G3520-20210
Column storage fitting	G2855-20590
Magnifier, 3x, 6x, paddle, plastic	G2855-40001
Plug for microfluidic manifold or unions	G2855-60570
Ferrule pre-swaging tool	G2855-60200
Ultra Inert Straight 2.0 mm liner	5190-6168
Transfer line support bracket	G3504-60620

7697A Headspace Sampler

The 12-vial 7697A Headspace Sampler is compatible with Agilent 7820 Series GC systems, and will also work with Agilent 7890B Series GC systems

G1888A Network Headspace Sampler Supplies

Description	Part No.
Stainless Steel Sample Loops	
Certified sample loop, 1 mL, deactivated	5190-2265
Certified sample loop, 3 mL, deactivated	5190-2266
Sample loop, 1 mL, deactivated	2321700003
Sample loop, 3 mL, deactivated	2321700004
Probes and Unions	
Sample probe, deactivated	2322700011
M6 union, brass	2302533140
Union, zero dead volume, deactivated	2307230001
Union	2307232901
Transfer Line Needles and Unions	
Needle only, headspace transfer line, deactivated 0.5 mm od	2322590004
Needle only, headspace transfer line, deactivated 0.7 mm od	2322590005
Strain relief septum nut	6410090050
Tubing	
Tubing, solenoids to 6-port valve, deactivated	410105017
Tubing, probe to 6-port valve, deactivated	1300502506
Transfer line, 1.45 m	G1890-60000
Standards	
OQ/PV Headspace Sample Contains 2 g/L t-butyl disulfide, 1,2-dichlorobenzene, and nitrobenzene in ethanol	5182-9733
PM Kits	
G1888A PM kit with 1 mL loop	G1888-60702
G1888A PM kit with 3 mL loop	G1888-60703
G1888A enhanced PM kit with valves, transfer line and vent tube	G1888-60704

G1883A Network Headspace Supplies

Description	Part No.
Needles	
Needle only, headspace transfer line, deactivated 0.5 mm od	2322590004
Needle for transfer line, 0.25 mm id, 0.5 mm od, nickel	301-016-HSP
Needle only, headspace transfer line, deactivated 0.7 mm od	2322590005
Needle for transfer line, 0.4 mm id, 0.8 mm od, nickel	301-015-HSP
Needle assembly vial probe, deactivated	232-2790012-EHS
Needle assembly vial probe, nickel	232-2790010-EHS
Fittings	
Union elbow M5	998-0000053-EHS
Transfer line nut	19258-20830
Transfer line ferrule	19258-20870
Union FF 6MB, 5-piece set	325-062-HSP
Union T6 MB, 5-piece set, brass	325-132-HSP
Union T5 MA	325-185-HSP
Valves	
Restrictor, stainless steel	321-002-HSP
Valve, solenoid vent Kalrez	3600500001
Valve, solenoid vial pressurization	3600500002
Tubing and Transfer Lines	
Sample loop, 1 mL, deactivated	2321700003
Sample loop, 1 mL, nickel	321-055-HSP
Sample loop, 2 mL, nickel	169-0013-HSP
Sample loop, 3 mL, deactivated	2321700004
Sample loop, 3 mL, nickel	321-056-HSP
Oven adapter for 10 mL vials	301-017-HSP
Tube, needle, 6-port valve, deactivated	301-212-HSP
Tube, needle, 6-port valve, nickel	301-169-HSP
Tube, vent-valve stainless steel	301-170-HSP
Sensor tube, 125 mm PTFE	321-057-HSP
Transfer line, deactivated, 1 m	301-211-HSP
Transfer line, 1 m, nickel	301-152-HSP
Transfer line, 80 cm, nickel	301-011-HSP
Repair, Leak Test, and OQ/PV Supplies	
Strain relief septum nut	301-205-HSP
Headspace leak test kit	G1888-60701
OQ/PV Headspace Sample Contains 2 g/L t-butyl disulfide, 1,2-dichlorobenzene, and nitrobenzene in ethanol	5182-9733

Agilent Vials and Closures for GC, GC/MS and GC/HS

Headspace Vials and Closures

Beveled-neck headspace vials are available in both 10 mL and 20 mL capacities, flat or rounded bottom. The 20 mm crimp caps provide a consistently secure seal. Agilent also offers cost-saving convenience packs with vials, caps, and septa packaged together.

- Certified for full warranted compatibility with Agilent autosamplers
- Choice of crimp or screw top vials
- Beveled top for maximum secure seal
- Two neck lengths available
- Choice of a pressure safety release cap at 45 psi
- Available in flat or rounded bottom designs

Clear headspace crimp top vials with graduation marks and write-on spot, 5190-2285

Amber headspace crimp top vials with graduation marks and write-on spot, 5190-2286

Certified Headspace Crimp Top Glass Vials

Description	Unit	Flat Bottom	Rounded Bottom
10 mL, 23 x 46 mm			
Clear	100/pk	5182-0838	5183-4475
Amber	100/pk	5067-0227	5190-2238
Clear, graduation marks and write-on spot	100/pk	5190-2285	
Amber, graduation marks and write-on spot	100/pk	5190-2287	
20 mL, 23 x 75 mm			
Clear	100/pk	5182-0837	5183-4474
Amber	100/pk	5067-0226	5190-2239
Amber, graduation marks and write-on spot	100/pk	5190-2286	
Clear, graduation marks and write-on spot	100/pk	5190-2288	

TIPS & TOOLS

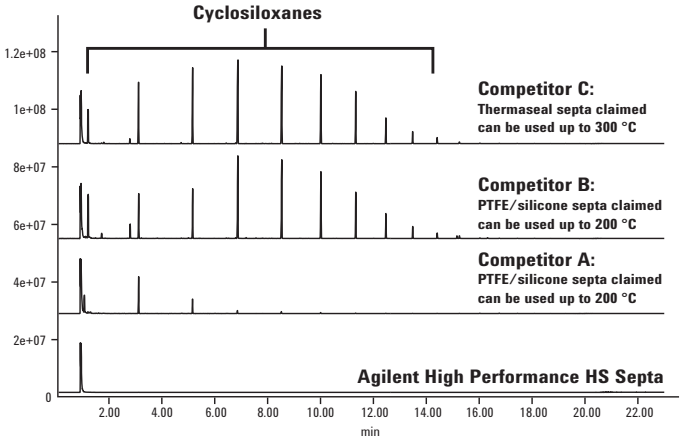
Agilent has made vial, cap and septum selection easy with its new Interactive Vial Selection Tool, available online in both desktop and mobile versions. The tool identifies the right vial and closures for your particular application, and provides the rationale for the choices offered. Visit **www.agilent.com/chem/SelectVials**

High Performance Septa

Agilent introduces the first septa that can withstand extreme temperatures and conditions for today's demanding headspace applications.

- Proven to withstand temperatures up to 300 °C with no degradation
- Leakproof
- Available in your choice of crimp or screw

Headspace screw top vial blank chromatogram comparison at 300 °C with different septa

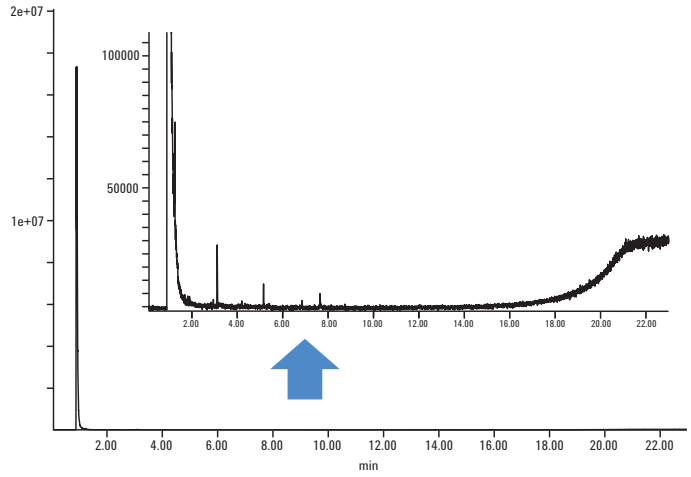


GC/MS conditions

Inlet:	Split mode w/ 10:1 ratio, 250 °C
Column:	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm, Constant flow: 2.5 mL/min
Oven:	40 °C hold 1.5 min, then 15 °C/min to 325 °C and hold for 2.5 min, 23 min total run time
Thermal Aux/MS source/MS guard:	250 °C/230 °C/150 °C
MSD:	Scan mode 25-550 m/z

Vial blank sample chromatogram at 300 °C with Agilent High Performance HS Septa

Agilent High Performance Septa provide significantly cleaner blank background at high temperature HS testing. Even with small abundance scale, the 300 °C vial blank chromatogram with High Performance Septa only shows few siloxane peaks with very small abundance.



Headspace conditions

Septa Type:	Agilent High Performance Septa, 5190-3986
Temperature:	Oven/loop & valve/transfer line: 300 °C/300 °C/300 °C
Times:	GC cycle time: 32 min, Vial equib time: 30 min
Vial:	Fill pressure: 15 psi, Fill flow: 50 mL/min, Loop fill ramp rate: 20 psi/min, Loop final pressure: 10 psi, Vial Size: 20 mL, Shaking: 1
Carrier:	GC controlled

TIPS & TOOLS

For information on CrossLab High Performance Septa, turn to page 199.

High Performance Septa

Description	Unit	Agilent Certified Part No.	Compatible With
18 mm steel screw cap with High Performance Septa	100/pk	5190-3986	5188-2753, 5188-6537, 5188-5392, 5188-6538
20 mm steel crimp cap with High Performance Septa	100/pk	5190-3987	5182-0837, 5183-4474, 5067-0226, 5190-2239, 5182-0838, 5183-4475, 5067-0227, 5190-2238

20 mm Headspace Crimp Caps and Septa

Cap Color	Septa Type	Specifications	Certified	100/pk	10000/pk
Silver aluminum	PTFE/silicone septa	-60 °C to 180 °C	✓	5183-4477	5190-2257
Silver aluminum with safety feature	PTFE/silicone septa	-60 °C to 180 °C	✓	5183-4478	
Silver aluminum	Molded PTFE/butyl septa	-40 °C to 125 °C	✓	5183-4479	5190-2258
Silver aluminum with safety feature	Molded PTFE/butyl septa	-40 °C to 125 °C		5183-4480	
Silver aluminum	No septa			9301-0721	
Silver aluminum with safety feature	No septa			9301-0718	
Septa only	Gray PTFE/black butyl molded	-40 °C to 125 °C		9301-0976	
Septa only	Tan PTFE/white silicone	-60 °C to 180 °C		9301-0719	5067-0234

Aluminum crimp caps, 5183-4477

Headspace vial convenience kit

Certified Headspace Vial Convenience Packs

Septa Type	Vial Type	Cap Color	Specifications	Unit	Part No.
Molded PTFE/black butyl septa	Flat bottom	Silver aluminum with safety feature	<125 °C	100/pk	5182-0839
PTFE/silicone septa	Flat bottom	Silver aluminum with safety feature	<180 °C	100/pk	5182-0840

CombiPAL Headspace Vials and Closures

Screw top vials and caps are recommended for the tightest seal and the most reproducible headspace results. CombiPAL headspace vials and caps are precision-threaded, making them an excellent choice for dependability and ease-of-use. They are ideal for applications in the environmental, food and beverage, industrial hygiene, drug analysis, and clinical chemistry industries.

CombiPAL Headspace Screw Top Vials

Description	100/pk
10 mL, 23 x 46 mm	
Clear	5188-5392
Amber	5188-6538
20 mL, 23 x 75 mm	
Clear	5188-2753
Amber	5188-6537

CombiPAL 18 mm Screw Top Caps with Septa

Cap Color	Septa Type	100/pk
Silver aluminum, magnetic	PTFE/silicone septa (top white, bottom blue)	5188-2759

Crimping and Decapping Tools

Electronic Crimpers and Decappers

Designed to replace awkward and bulky manual crimping pliers, the Agilent electronic handheld crimpers give tight, reproducible seals every time. Adjustable, slim steel jaws fit around closely spaced vials, enabling you to crimp vials directly in crowded autosampler trays. Using the same handheld design as the crimpers, Agilent's electronic decappers remove caps instantly and are designed for laboratories that recycle or reuse vials.

- More vials crimped per battery charge – new lithium ion battery lasts three times longer
- Increased crimping speed – new model is 50% more powerful (6.4 volt battery)
- Less hand strain – lighter weight means less effort
- Improved power signal – clearly shows when battery needs recharging
- Easily used in right or left hand – display on top for easier viewing
- More efficient charging – no overheating during recharging
- Extended productivity – significantly longer motor life

11 mm electronic crimper, 5190-3188

20 mm electronic crimper, 5190-3189

11 mm electronic decapper, 5190-3190

20 mm electronic decapper, 5190-3191

Electronic Crimpers and Decappers

Description	Part No.
11 mm electronic crimper with lithium battery	5190-3188
20 mm electronic crimper with lithium battery	5190-3189
11 mm electronic decapper with lithium battery	5190-3190
20 mm electronic decapper with lithium battery	5190-3191
Replacement lithium battery for crimper and decapper	5190-3192
High power electronic crimping tool with power supply	5190-4061
11 mm Crimper jaw set for HP electronic crimper	5190-4062
11 mm Decapper jaw set for HP electronic crimp tool	5190-4063
20 mm Crimper jaw set	5190-4064
20 mm Decapper jaw set	5190-4065
Base for electronic crimping tool	5190-4066
20 mm HP Crimping tool and jaw sets bundle	5190-4067

Manual Crimpers and Decappers

Agilent's ergonomic manual crimpers and decappers remove the pain and discomfort of wrist strain with a lightweight, tailored design. Weighing 25-30% less than predecessors and eliminating sore, pinched hands, the new design dramatically improves your experience. Extensively tested with Agilent vials for optimal fit, and color-coded for ease-of-use, this tool is a necessity for every lab. The new crimpers are built for lasting performance: the 11 mm crimper will cap at least 100,000 caps and the 20 mm at least 60,000 before wear starts to impact performance.

- Comfortable, lightweight, ergonomically designed handles fit smoothly in the hand and eliminate pinching
- Top-mounted adjustment knob shows directionality for tightening/loosening
- Adjustment knob doubles as an indicator that the crimp (or decap) is complete
- Crimpers are color-coded with blue knobs and labels, decappers with orange
- Narrow jaws provide better vertical clearance over vials
- Bottom handle motion allows for better control and enhanced stability of crimping jaw
- Sturdy construction of rugged, fiber-reinforced resin with steel reinforcement in the handles

Manual Crimpers and Decappers

Description	Part No.
Ergonomic manual crimper for 11 mm caps	5040-4667
Ergonomic manual decapper for 11 mm caps	5040-4668
Ergonomic manual crimper for 20 mm caps	5040-4669
Ergonomic manual decapper for 20 mm caps	5040-4671

Ergonomic manual crimper, 5040-4667

Stratum PTC Sample Concentrator

Teledyne Tekmar Purge and Trap Supplies

Glassware for Teledyne Tekmar Purge and Trap Concentrators, 1/2 in Mount

Description	Part No.
5 mL frit sparger (glassware only)	5182-0852
5 mL frit sparger kit with fittings	5182-0846
25 mL frit sparger (glassware only)	5182-0851
25 mL frit sparger kit with fittings	5182-0845
5 mL fritless sparger (glassware only)	5182-0850
5 mL fritless sparger kit with fittings	5182-0844
25 mL fritless sparger (glassware only)	5182-0849
25 mL fritless sparger kit with fittings	5182-0796
5 mL needle sparger (glassware only)	5182-0848
5 mL needle sparger kit	5182-0795
25 mL needle sparger (glassware only)	5182-0847
25 mL needle sparger kit	5182-0794

Tekmar AQUATek 70 and AQUATek 100 Purge and Trap Autosampler Supplies

Description	Part No.
Sample loop, 5 mL PEEK	5190-3151
Sample loop, 25 mL PEEK	5190-3152
Sample loop, 20 mL PEEK	5190-3153
Sample loop, 10 mL PEEK	5190-3154
Septa for 40 mL vials, pre-cleaned, 72/pk	14-3823-000
Screw caps for 40 mL vials, 24/pk	14-6855-000

Traps for Teledyne Tekmar Stratum and Atomx Purge and Trap Concentrator

Description	Part No.
Trap, BTEX + MTBE	5188-8813
Trap #5, OV-1/Tenax/Silica Gel/Charcoal	5188-8814
Trap #8, Carbopak B/Carbosieve S-III	5188-8815
Trap #9, Proprietary	5188-8816
Trap, Tenax/Silica Gel/Carbosieve S-III, #10	5188-8817
Strat-Trap, Tenax/Silica Gel, #2	5188-8818
Strat-Trap, Tenax/Silica Gel/Charcoal, #3	5188-8819
Strat-Trap, OV-1/Tenax, #7	5190-1445
Strat-Trap, Tenax, #1	5190-1446
Trap, Vocarb 3000, Stratum and Atomx P&T	5188-8820
Trap, Vocarb 4000	5188-8821
Trap, BTEX	5188-8822
Trap, Tenax, #1A	5188-1447
Trap, VPH, #11	5188-1448

Stratum and Atomx traps are U-shaped

U-trap for Stratum and Atomx,Trap, BTEX + MTBE, 5188-8813

Atomx Purge and Trap Concentrator

Atomx VOC Autosampler Supplies

Description	Part No.
Antifoam agent, Antifoam 1520, 10 mL	5190-2235
Syringe with side port, 27 mL	5190-2234
Vessel, amber IS, 15 mL	5190-2233
Frit sparge glassware kit, 25 mL	5190-2232
Fritless sparge glassware kit, 25 mL	5190-2231

Traps for Teledyne Tekmar Velocity Purge and Trap Concentrator

Description	Part No.
Trap, Vocarb 3000, 7695 and 3100 P&T	5182-0775
Trap, Vocarb 4000 (I Trap)	5182-0774
Trap, Tenax (A Trap)	5182-0783
Trap, Tenax/silica gel/charcoal (C Trap)	5182-0781
Trap, BTEX	5182-0773
DryFlow moisture trap	14-8911-003

Velocity traps are straight

TIPS & TOOLS

Compared to a frit sparger, the fritless sparger may be the better choice when a water sample has a tendency to foam. This sparger is not appropriate for soil samples, which tend to clog the capillary tube.

Agilent Archon Purge and Trap Autosampler

Agilent Archon Purge and Trap Autosampler with removable tray

Archon removable 51 position sample tray

Archon Purge and Trap Supplies

Description	Part No.
Vial kit, 40 mL, precleaned vials, caps, and septa, 72/pk	5183-4741
Water reservoir bottle without cap, 80 oz	DY50390600
22 mm septa, PTFE/silicone, 72/pk	5190-3978
22 mm septa, EPA lowbleed, 60/pk	5190-3976
Syringe mount O-ring	DY50549500
Water probe replacement kit, for S/N above 995, screw in mount	DY50573990
Sparge probe replacement kit, for S/N above 13160, square base	DY70007791
Sparge probe replacement kit, for S/N 995-13160, hexagonal base	DY50574190
Sparge probe replacement kit, for S/N below 995, hexagonal base	DY50549290
Standard reservoir	DY50548400
Water transfer line	DY50551400
I.S. pickup/waste lines	DY70001990
Soil transfer line	DY50574500
75 µm screen for water probe	DY50559800
Water probe, cleaned, for S/N 695-995, screw in mount	DY50549100
Sparge probe cleaned, for S/N above 13160	DY70007701
10 µm soil probe frit	DY50559900
Valco rotor loop, 1 µL	DY50572600
Flangeless nuts and ferrules, 8/pk	DY70008101
PTFE stir bar for 40 mL vials	DY50295500
Spin bar for soil vial	DY50402400
Stir magnet	DY50546100
Valco valve and actuator	DY50540700
Glass barrel with decal, 26 mL	DY50296800
Kit, chiller option, field	DY70008590
Soil probe replacement kit, for SV S/N above 13160	DY70007691
Lower soil probe replacement kit, for SV units	DY50546390
Soil probe replacement kit, for SV S/N 995-13160	DY50574390

Markes Thermal Desorption

Agilent now offers a comprehensive line of supplies for Markes Thermal Desorption (TD) instrumentation. Thermal desorption allows the introduction of volatile and semivolatile compounds from a wide range of sample matrices, directly into a GC or GC/MS.

Markes Thermal Desorption system

Markes Thermal Desorption Instrument Supplies

Description	Unit	Part No.
O-rings, Markes 7 mm cold trap seals	10/pk	MKI-U-COV07
O-rings, Markes 6 mm cold trap seals	10/pk	MKI-U-COV06
PTFE filter disks, 5.1 mm Markes TD	10/pk	MKI-U-DISK1
PTFE filter disks, 6.3 mm Markes TD	10/pk	MKI-U-DISK3
Quick fit connectors, Markes UNITY	10/pk	MKI-C-QSC10
O-ring insertion tool, Markes UNITY TDI		MKI-Z-0285
O-ring extraction tool, Markes UNITY TDI		MKI-Z-0351
O-rings, 010 Markes UNITY	10/pk	MKI-U-COV10

Cold Traps

Description	Unit	Part No.
Cold trap, universal, UNITY		MKI-U-T11GPC
Cold trap, universal, UNITY 2		MKI-U-T11GPC-2S
Cold trap, air toxics, C_2-C_{14}, UNITY 2		MKI-U-T3ATX-2S
Cold trap, air toxics, C_2-C_{14}, UNITY		MKI-U-T3ATX
Cold trap, materials emissions, UNITY		MKI-U-T12ME
Cold trap, materials emissions, UNITY 2		MKI-U-T12ME-2S
Cold trap for DHS applications, UNITY		MKI-U-T13DHS
Cold trap for DHS applications, UNITY 2		MKI-U-T13DHS-2S
Cold trap, for EPA TO-15/TO-17 air toxics analysis methods, Markes UNITY 2		MKI-U-T15ATA-2S
Stainless steel Difflok cap, Markes UNITY		MKI-MTD-1169
Inert Difflok cap, Markes UNITY		MKI-MTD-1204
Cold trap, Tenax, UNITY		MKI-U-T9TNX
Cold trap, Tenax, UNITY 2		MKI-U-T9TNX-2S
Cold trap, high boilers, C_6-C_{40}, UNITY 2		MKI-U-T1HBL-2S
Cold trap, ozone precursor, UNITY 2		MKI-U-T17O3P-2S
Cold trap, sulfur, UNITY 2		MKI-U-T6SUL-2S
Cold trap, chemical weapons, C_6-C_{40}, UNITY 2		MKI-U-T10CW-2S
Cold trap, green house gases, UNITY 2		MKI-U-T16GHG-2S

Markes Thermal Desorption system

Standard TD Sorbent tube and related sampling accessories

Description	Unit	Part No.
Empty stainless steel TD tubes	10/pk	C-TBE10
Tenax stainless steel tubes, preconditioned/capped	10/pk	C-TBP1TC
Empty glass TD tubes	10/pk	C-GT010
PTFE inserts	10/pk	C-PL010
Long term TD tube storage caps	10/pk	C-CF020
Cap-LOK Tool for long term storage caps		C-CPLOK
Diffusive sampling caps	10/pk	C-DF010
Bio-VOC breath samplers	10/pk	C-BIO10
Disposable card mouth piece for Bio-VOC	10/pk	C-B010M
Tenax TA 34-60 Mesh, 10 g		C-TNXTA
General purpose hydrophobic tubes, stainless steel Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling n-C_5 to n-C_{20}.	10/pk	C-HY010C
Tenax/S'carb 'Sulphur' tubes Preconditioned and capped with 1/4 in brass storage caps. For odor and landfill gas analysis.	10/pk	C-102SSC
Carbograph 1 stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling C_5 to C_{14}, plus diffusion of BTX.	10/pk	C-TBP1C1C
Carb X stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped/diffusion of 1.3-butadiene & benzene.	10/pk	C-TBP1CXC
Air toxics (TO-17) stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling VOCs n-C_3 to n-C_{12}.	10/pk	C-AT010C
Universal stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling VOCs/SVOCs n-C_3 to n-C_{30}.	10/pk	C-UN010C
Glass tubes with 1 cm Tenax For direct liquid injection	10/pk	C-G1CM10
Glass air toxics (TO-17) tubes Pre-packed with 2 carbon-based sorbents; preconditioned and capped with 1/4 in brass storage caps	10/pk	C-GAT010C
CRS BTX Standards, 1 µg	10/pk	C-BTX1UG
Cold trap alignment tool, Markes UNITY		MKI-UTD-5064
Split filter tube, stainless steel, 3 1/2 in, packed with charcoal		MKI-SERUTD-5065

Inlet Systems

Split/Splitless Inlet Seals

For samples with active analytes or sensitive compounds, only Agilent combines the best mechanical sealing with an inert surface. Our Ultra Inert chemistry is applied on top of the gold plating to produce a leak-free seal that also reduces active analyte adsorption. This is a critical component of the Agilent Inert Flow Path.

Split/Splitless Inlet Seals

Description	Unit	Part No.
Ultra Inert gold plated seal with washer		5190-6144
	10/pk	5190-6145
	50/pk	5190-6149
Gold plated inlet seal kit with washer		5188-5367
	10/pk	5190-2209
Gold plated seal with cross, split only		5182-9652
Inlet seal, stainless steel		18740-20880

Note: Due to the deactivation process, the surface of the UI gold plated seal may have spots or darker colored areas. These are normal side effects of the deactivation process, and do not affect the performance or inertness of the seal.

Ultra Inert gold plated seal with washer, 5190-6145

Certified gold plated seal kit, 5190-2209

AGILENT INERT FLOW PATH

TIPS & TOOLS

Ensuring an inert GC flow path has never been more critical. Access IFP resources here:
www.agilent.com/chem/inertflowpath

Flip Top Inlet Sealing System

Agilent's Flip Top Inlet Sealing System is the faster, smarter way to change inlet liners on Agilent 7820, 6890, 6850 and 5890 GC systems.

- Cuts liner replacement time to as little as 30 seconds
- Eliminates frustrating searches for special wrenches or tools
- Improves inlet ergonomics – no more handling of heated parts, no more burns or scrapes
- Decreases downtime and increases productivity
- Minimizes exposure to ambient air, extending column life
- Easily installed by user in 15 minutes

Available exclusively from Agilent, the Flip Top has a levered arm that attaches to any 6890/6850/5890 insert weldment and locks to the injection port using an adapter ring screwed onto the inlet. Once installed, simply lift the arm of the Flip Top which releases the insert weldment from the injection port, and allows instant access to the liner. The process is simply reversed to reseal the weldment to the port.

Flip Top Inlet Sealing System installation kit, 5188-2717

Flip Top Inlet Sealing System

Description	Unit	Part No.
Flip Top Inlet Sealing System For 6890, 6850, 5890 only; not compatible with 7890		5188-2717
Non-stick fluorocarbon liner O-ring for Flip Top	10/pk	5188-5366
	100/pk	5190-2268

Split/Splitless Inlets

The combined split/splitless inlet is the most popular inlet for capillary column gas chromatography. Because it can be used in either split or splitless mode, it provides a very effective combination that can cover most analysis requirements.

Split Inlet Troubleshooting

Split inlets are spared from most band-broadening phenomena, since the splitting process generates narrow peaks. Peak broadening or tailing is usually due to:

- Improper column installation
- Low inlet temperature
- Low split flow (<20 mL/min on 6890)
- Inlet and needle discrimination and decomposition

If your results are inaccurate or inconsistent:

- Check the column and reinstall if necessary
- Increase inlet temperature by 50 °C and compare results
- Check inlets and needles for wear and replace as necessary

Splitless Inlet Troubleshooting

Most problems encountered with a splitless injection are related to:

- Incorrect purge time
- Degradation
- Improper focusing
- Inappropriate column temperature
- Backflash

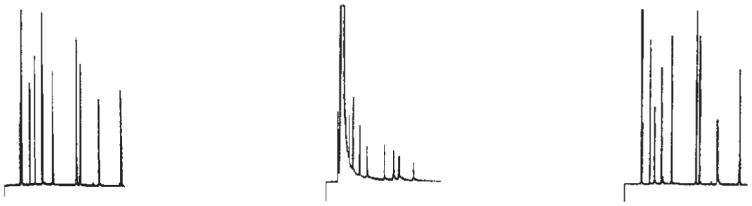
You can also improve the reproducibility and linearity of peak areas and avoid backflash by matching:

- Inlet temperature
- Liner volume
- Injection volume

Decomposition

Loss of peak area or generation of new peaks can sometimes be dramatically reduced by changing liner type or by deactivating the liner and inlet with silanizing reagents. Removing or reducing the amount of liner packing can also decrease inlet activity.

Column Troubleshooting



Normal Peaks	Tailing Solvent Peaks	Wrong Peak Ratios
Correct column positioning in both injection port and FID	Column positioned incorrectly in the injection port or possible ferrule particle in the carrier gas flow path	Column positioned in the inlet (either too far or not far enough; verify 4-6 mm installation distance)

For the most reproducible split injection results, try Agilent's low pressure drop split liner (p/n 5183-4647), with built in positioning bead, tight dimension tolerances, glass wool placement, and proprietary deactivation.

Split Mode Variables, Practices and Rationales		
Parameter	**Selection/Setting**	**Rationale**
Inlet temperature	Try 250 °C or BP of last eluting compound	Ensures flash vaporization Minimizes inlet discrimination
Inlet liner	Large volume, deactivated	Minimizes backflash Minimizes degradation
Inlet packing	Silanized glass wool	Retains non-volatiles Minimizes inlet discrimination
	Glass beads or frit	Less active than wool
	None	Least active
Injection volume	0.5-3 µL liquid	Split easily adjusted
	0.10-10 mL gas	Split adjusted accordingly
Injection technique	Fast autoinjection	Less needle discrimination
	Hot-needle fast manual injection	Reproducible discrimination
Split ratio	50:1 to 500:1	Depends on sample and injection volume, and column id
Initial column temperatures	Not critical	Narrow initial peaks
Septum purge	2-3 mL/min	Minimizes ghosting

Splitless Mode Variables, Practices and Rationales

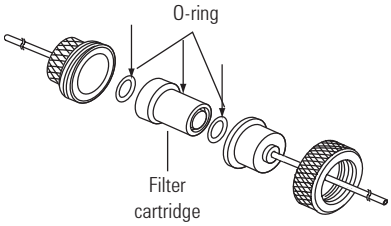
Parameter	Selection/Setting	Rationale
Inlet temperature	Just above highest boiling point of solutes (+20 °C)	Ensures flash vaporization Reduce if degradation occurs Use higher for dirty samples and higher-boiling solutes
Inlet liner	Large volume >0.8 mL	Use with autoinjector
	Small volume <0.2 mL	Use only for slow manual injections and gas injections
Inlet packing	None	Use only with slow injection Decreases degradation
	Silanized glass wool	Use for fast autoinjection and dirty samples
Injection volume	0.5-2 µL liquid	Depends on solvent, liner and conditions
Injection technique	Fast autoinjection	Most reproducible Less needle discrimination
	Hot-needle slow manual	Inject 1-2 µL/s if narrow liner is used and >1 µL injection
	Hot-needle fast manual	Use for <1 µL injections
Split flow	20-50 mL/min	Higher for concentrated samples
Splitless time	20-80 s	Adjust according to column flow rate/liner type and sample conditions
Oven temperature	10-25 °C below solvent BP	Necessary for solvent focusing
Column flow	Typical flow rates between 1 mL/min and 2 mL/min. Use of higher flow rates depends on separation conditions of compounds.	Change of flow rates can provide better chromatographic separation
Septum purge	2-3 mL/min	Reduces ghosting and septum contamination
Quantification	Internal standard	Maximizes reproducibility
	External standard addition	Use only with constant injection volume
Retention gap	1-3 m, deactivated (1-2 m per µL injected)	Promotes solvent and stationary phase focusing Protects analytical column from matrix contamination

Split/Splitless Inlet Maintenance

Changing the Split Vent Trap*

1. Remove the retaining clip.
2. Remove the old filter cartridge and two O-rings.
3. Verify the new O-rings are seated properly on the new filter cartridge.
4. Install the new filter cartridge then reassemble the trap. Do not fully tighten yet.
5. Place the filter trap assembly in the mounting bracket and install the retaining clip.
6. Fully tighten the split vent front weldment onto the trap.
7. Check for leaks.

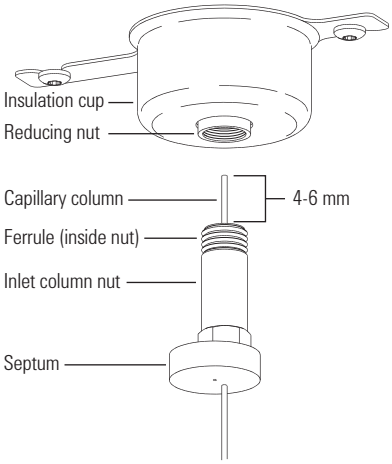
*Change every 6 months



Split vent trap, 5188-6495

Installing a Capillary Column in a Split/Splitless Inlet

1. Prepare the column for installation.
2. Position the column so it extends 4 to 6 mm past the end of the ferrule.
3. Slide the septum to place the nut and ferrule in the correct position.
4. Insert the column in the inlet.
5. Slide the nut up the column to the inlet base and finger tighten the nut.
6. Adjust the column position so the septum is even with the bottom of the column nut.
7. Tighten the column nut an additional 1/4 to 1/2 turn. The column should not slide with a gentle tug.
8. Start carrier gas flow.
9. Verify flow by submerging the free end of the column in isopropanol. Look for bubbles.



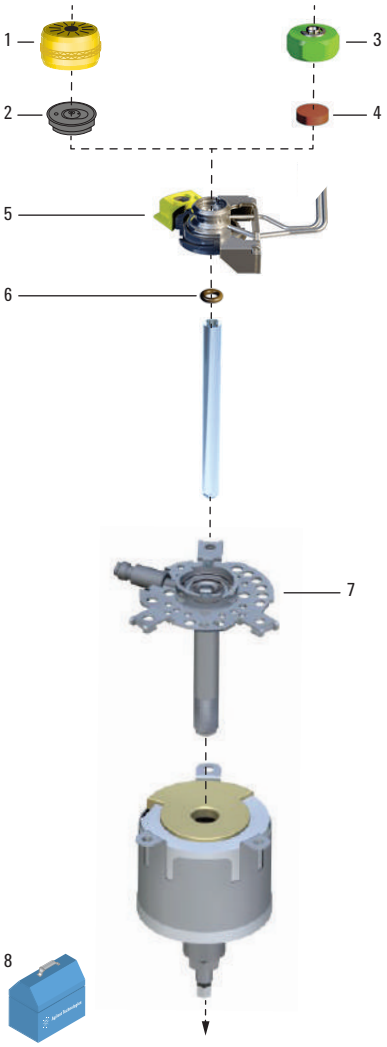
WARNINGS & CAUTION

The split vent trap may contain residual amounts of any samples or other chemicals you have injected into the GC. Follow your company's safety procedures for handling these types of substances while replacing the trap filter cartridge.

TIPS & TOOLS

Tools for capillary column installation

Make sure your lab always has the tools you need to install columns correctly. We recommend a column cutting tool such as a diamond-, carbide-, or sapphire-tipped pencil, or a ceramic cutter, a supply of an appropriate nonretained compound, a column test mixture, an electronic flowmeter, and an electronic leak detector. The free Agilent J&W GC Column Installation Guide can help you make good connections for good chromatography, **www.agilent.com/chem/gcinstallationguide**



Split/Splitless Inlet assembly (top)

7890/6890/6850 Split/Splitless Inlet Supplies (Top)

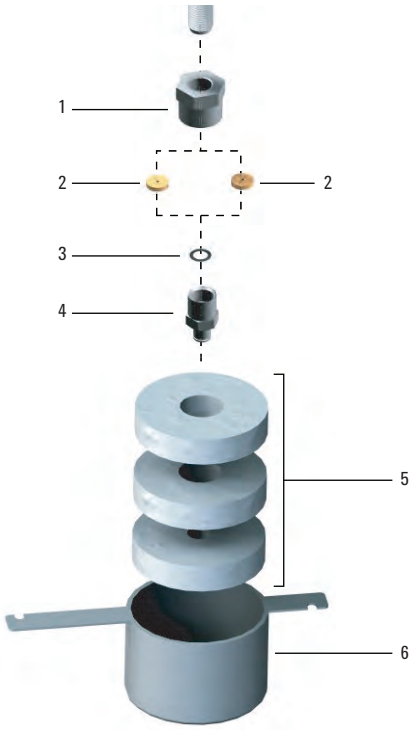
Item	Description	Unit	Part No.
1	Merlin Microseal kit, low pressure		5181-8816
	General purpose Merlin Microseal starter kit		5182-3442
	Merlin Microseal high pressure nut		5182-3445
2	Merlin Microseal low pressure replacement septum		5181-8815
	Merlin Microseal general purpose replacement septum 3-100 psi		5182-3444
3	Septum nut, purged inlets		18740-60835
	Headspace septum retainer nut		18740-60830
4	Non-stick bleed and temperature optimized (BTO) septa, 11 mm	50/pk	5183-4757
		100/pk	5183-4757-100
	Non-stick long-life septa, 11 mm	50/pk	5183-4761
		100/pk	5183-4761-100
5	7890 Top insert assembly, standard		G3452-60730
	7890 Top insert, AC gang fitting weldment		G3430-60011
	7890 Top insert assembly, valve		G3480-67585
	7890 Insert weldment, UltiMetal Plus treated		G3452-60586
	6890 Top insert assembly, standard		G1544-60585
6	Graphite O-ring for splitless liner	10/pk	5180-4173
	Graphite O-ring for split liner	10/pk	5180-4168
	Certified non-stick fluorocarbon O-ring	10/pk	5188-5365
7	Cap inlet shell weldment assembly		G3452-80570
	7890 Cap inlet shell weldment assembly, UltiMetal Plus treated		G3452-60570
8	QuickPick split inlet PM kit		5188-6493
	QuickPick splitless vent and inlet PM kit		5188-6497
	FID collector cleaning brush		8710-1346
	QuickPick split vent and inlet PM kit		5188-6496
	Column installation pre-swaging tool, metal ferrules		G3440-80218
	Column installation pre-swaging tool, graphite ferrules		G3440-80217

Column installation pre-swaging tool, metal ferrules, G3440-80218

Column installation pre-swaging tool, graphite ferrules, G3440-80217

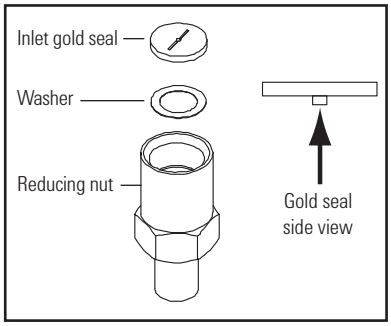
7890/6890/6850 Split/Splitless Inlet Supplies (Bottom)

Item	Description	Unit	Part No.
1	Inlet heater weldment retaining nut		G1544-20590
2	Gold plated inlet seal kit with washer		5188-5367
	Certified gold plated seal kit, includes washer	10/pk	5190-2209
	Ultra Inert gold plated seal with washer		5190-6144
	Ultra Inert gold plated seal with washer	10/pk	5190-6145
	Gold plated seal with cross, split only		5182-9652
3	Washers, 0.375 od		5061-5869
4	Reducing nut for split/splitless inlet		18740-20800
5	S/SL insulation kit, 3 pieces		5188-5241
6	Cover, lower insulation		19243-00070



Split/splitless inlet assembly (bottom)

Gold seal on the split/splitless inlet




Reducing nut, 18740-20800


Gold plated seal kit, 5188-5367

TIPS & TOOLS

Agilent's Self Tightening column nut eliminates the need for retightening once and for all

This unique, self tightening stainless steel GC column nut delivers a tight connection – without expensive upgrades or adapters – and gives you the advantages of:

- Reliable performance
- Less wasted time
- Ease of use
- Faster maintenance

Learn how to install a column using the Self Tightening column nut, visit **www.agilent.com/chem/STnut**

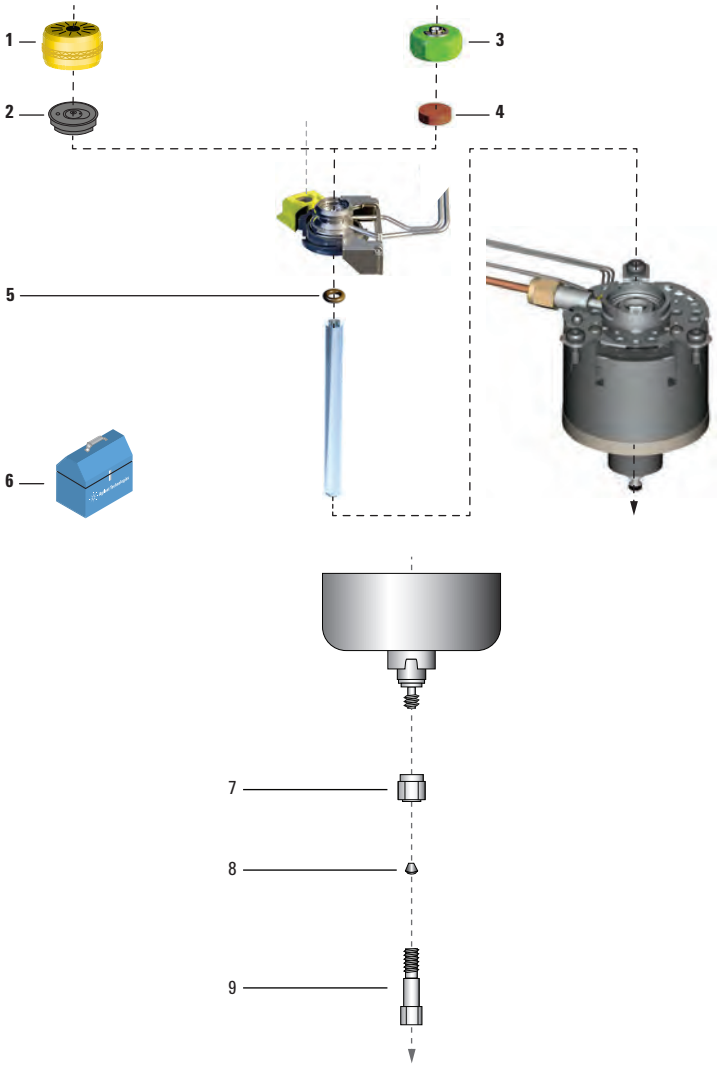
Multimode Inlet

Agilent's premium inlet – two inlets in one for maximum performance and flexibility for the 7890B GC

The MMI combines the functionality of the split/splitless and PTV inlets. Perform standard injection techniques when SOPs require; use large volume or temperature programs as needed.

Multimode Inlet Body

Item	Description	Unit	Part No.
1	Merlin cap		5182-3445
	Merlin Microseal kit, low pressure		5181-8816
	General purpose Merlin Microseal starter kit		5182-3442
2	Merlin Microseal low pressure replacement septum		5181-8815
	Merlin Microseal general purpose replacement septum 3-100 psi		5182-3444
3	Septum nut, purged inlets		18740-60835
	Headspace septum retainer nut		18740-60830
4	Non-stick bleed and temperature optimized (BTO) septa, 11 mm	50/pk	5183-4757
		100/pk	5183-4757-100
	Non-stick long-life septa, 11 mm	50/pk	5183-4761
		100/pk	5183-4761-100
5	Certified non-stick fluorocarbon O-ring	10/pk	5188-5365
	Graphite O-ring for split liner	10/pk	5180-4168
	Graphite O-ring for splitless liner	10/pk	5180-4173
6	Wrench for multimode inlet		G3452-20512
	Column installation pre-swaging tool, metal ferrules		G3440-80218
	Column installation pre-swaging tool, graphite ferrules		G3440-80217
7	Column nut adapter		G3510-20018
8	For complete offering of column ferrules, **see page 37**.		
9	For complete offering of column nuts, **see page 40**.		

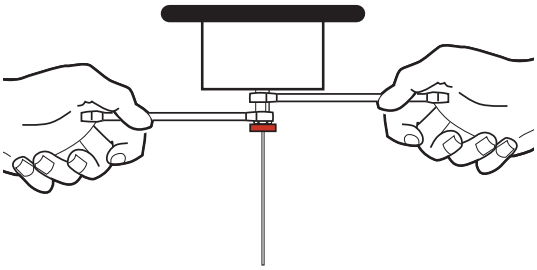


Exploded parts view of the Multimode Inlet

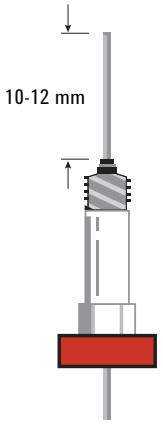
Installing a Capillary Column in a Multimode Inlet

1. Prepare the column for installation.
2. Thread the column adapter nut onto the base of the inlet and make sure it can spin freely.
3. Place a septum, capillary nut, and graphite ferrule on the column.
4. Score and snap off the end of the column.
5. Position the column so it extends 10-12 mm past the end of the ferrule.
6. Slide the septum to place the nut and ferrule in the correct position.
7. Insert the column in the inlet.
8. While holding the adapter with a wrench, thread the column nut into the inlet (but do not tighten).
9. Adjust the column position so that the septum contacts the bottom of the column nut. Finger tighten the column nut until it begins to grip the column.
10. While holding the inlet base with one wrench, use the second wrench to tighten the column nut an additional 1/4 to 1/2 turn so that the column cannot be pulled from the fitting with gentle pressure.

Step 2



Step 5



Cleaning the Multimode Inlet

Agilent recommends using the G3510-60820 Multimode Cleaning Kit, which ships with detailed cleaning instructions.

Depending on the inlet mode used, the liner installed, and the cleanliness of the sample, the frequency of cleaning may range from weekly to monthly. When establishing your cleaning frequency, start with a visual inspection of the inlet bottom whenever a liner is changed. A small ring of material will collect at the bottom of the inlet when dirty samples such as food extracts or solid waste extracts are injected. An initial cleaning schedule of every two weeks for dirty samples and every two months for clean samples is appropriate and can be adjusted subsequently.

WARNINGS & CAUTION

The inside of the wall of the inlet is only 0.005 in thick and can be damaged with hard scrubbing.

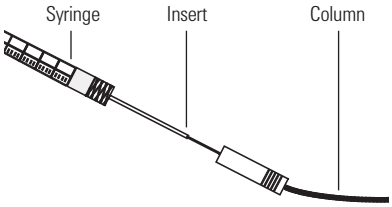
TIPS & TOOLS

Because of temperature programmability, graphite is the preferred ferrule for the MMI. However, graphite/polyimide ferrules can be used with Self Tightening column nuts to prevent leaks.

Turn to page 36.

Cool On-Column Inlets

Cool On-Column Inlet Maintenance



Installing a Capillary Column into a Cool On-Column Inlet

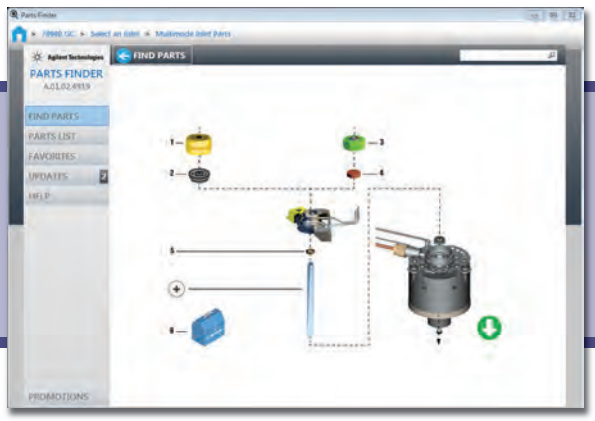
1. Gently insert the column into the inlet until it bottoms.
2. Insert the column nut into the inlet fitting and finger tighten.
3. Tighten the column nut an additional 1/4 turn with a wrench or until the column does not move. Use two wrenches to support inlet (5/16 in and 1/4 in).
4. If using an automatic injection system with a 0.25 mm or 0.32 mm column, verify that the column installation by manually pushing the syringe into the inlet.

Checking the Needle-to-Column Size on the Cool On-Column Inlet

1. Check the needle-to-column size to make certain that the needle fits in the column.
2. Identify the correct insert for the column size. Use the insert that is the same size as the syringe needle to verify that the column you plan to use is the correct size.
3. Insert the column into one end of the insert.
4. Insert the syringe needle through the other end of the insert and into the column. If the needle cannot pass easily into the column, reverse the insert to try the needle and column in the other end.

TIPS & TOOLS

Download the Agilent Parts Finder Tool for simplified parts ordering and troubleshooting, **www.agilent.com/chem/go2partsfinder**

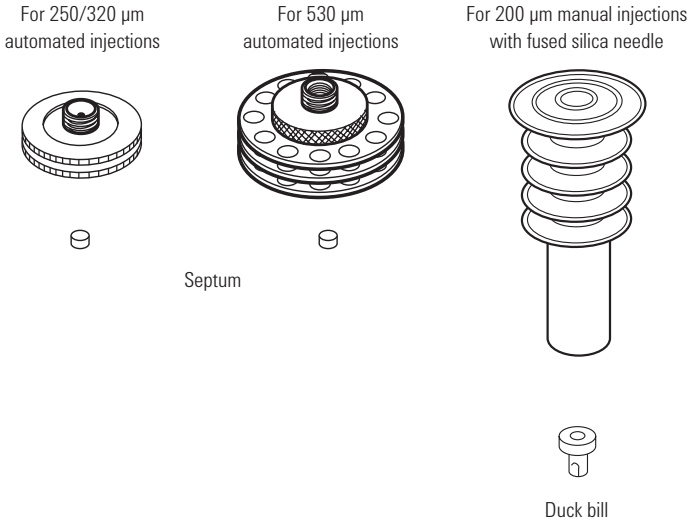


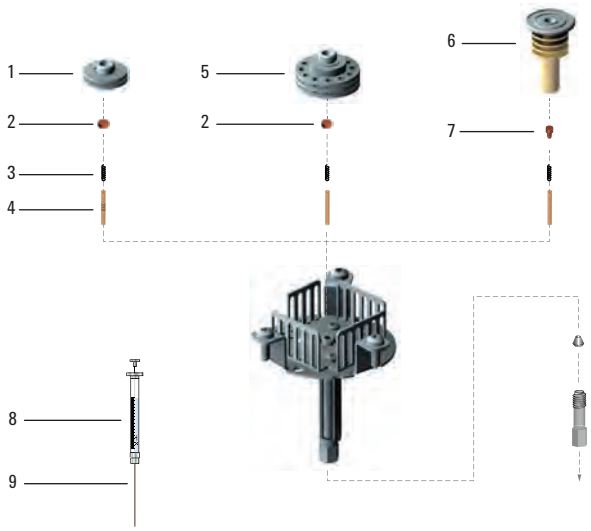
Changing the Septum on the Cool On-Column Inlet

1. Replace the septum.

   If you are using a septum nut, grasp the knurling and unscrew. Remove the old septum with tweezers. Use tweezers to install a new septum. Push the septum into the septum nut until properly seated. Firmly tighten the nut.

   If you are using a cooling tower, grasp the three rings and unscrew. The spring and duck bill septum may pop out of the inlet when you remove the cooling tower. Be careful not to lose them. If they do not pop out, use a thin wire to remove them from the inlet. Insert the replacement duck bill septum into the spring and place in the inlet. Reattach the cooling tower assembly, then finger tighten.
2. Before making an injection, check the alignment of the entire assembly using the proper size syringe.
3. Restore the analytical method.
4. Reset the septum counter.





Cool On-Column Inlet Parts

7890/6890 Cool On-Column Inlet Supplies

Part No.	Description	Unit	Part No.
1	Septum nut for 320 µm columns		19245-80521
2	5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4760
	5 mm through-hole septa	25/pk	5181-1260
	5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4762
	5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4758
3	Spring		19245-60760
4	Insert for 320 µm columns, 5 silver rings		19245-20525
	Insert for 530 µm columns, no rings		19245-20580
	Insert for 250 µm columns, 6 rings		19245-20515
	Insert, 530 µm aluminum clad, 4 rings		19245-20780
	Insert for 200 µm, 1 ring		19245-20510
5	Septum nut base for 530 µm assembly		G1545-80520
6	Cooling tower assembly		19320-80625
7	Duck bill	10/pk	19245-40050
8	On-column syringe, fused silica (barrel only)		9301-0658
	Removable needle, syringe only		5182-0836
	Syringe ferrule, PTFE		0100-1389
	On-column syringe, stainless steel		5182-9633
9	Needle, on-column syringe, 3/pk	3/pk	5182-9645
	Stainless steel needle for 0.25 mm column	3/pk	5182-0833
	Stainless steel needle for 0.32 mm column	3/pk	5182-0831
	Fused silica syringe needles	6/pk	19091-63000

Programmable Temperature Vaporizer (PTV) Inlets

PTV inlets combine the benefits of split, splitless and on-column inlets. The sample is usually injected into a cool liner, so syringe needle discrimination does not occur. Then the inlet temperature is increased to vaporize the sample. The user programs vent times and temperature to achieve the equivalent of split or splitless transfer of sample vapors to the column. PTV injection is considered the most universal sample introduction system because of its flexibility.

Advantages

- No syringe-needle discrimination
- Minimal inlet discrimination
- Use of large injection volumes
- Removal of solvent and low boiling components
- Trapping of nonvolatile components in liner
- Split or splitless operation
- Retention time and area reproducibility approaching cool on-column injection

PTV inlets are actively cooled before and during injection by Peltier devices or by forced gases (air, liquid N_2, or liquid CO_2). Cryogenic cooling of the inlet can reduce inlet temperature enough to thermally focus gas injections from other sampling devices in the liner. This is a distinct advantage of using PTV inlets in comparison to conventional inlets for coupling auxiliary sampling devices to capillary columns.

Post-injection, PTV inlets are heated using electrical heaters or preheated compressed air. Depending on design, inlet temperature ramps are either ballistic (i.e., ramped to the maximum temperature at an uncontrolled maximum rate) or programmable.

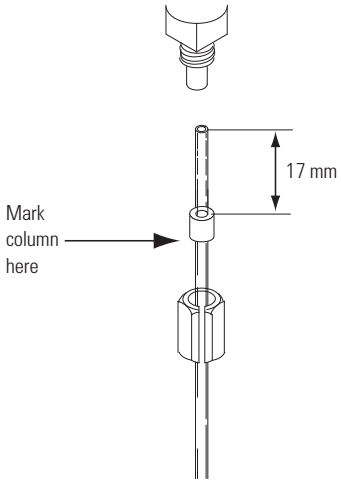
PTV Inlet Practices and Rationales (Cold Split/Splitless Modes)

Parameter	Selection/Setting	Rationale
Injection mode	Cold split	For general use and sample screening
	Cold splitless	For trace analysis
	Cold solvent vent	LVI
Inlet temperature ramp rate	Adjustable (i.e., 2 °C/s to 720 °C/s max)	Use slower ramp rates for labile, complex, or large volume samples Use faster ramp rates for most samples Use faster ramp rates to shorten splitless purge delay time
	Ballistic	Simpler, less expensive instrumentation
Inlet liner	Straight with silanized wool	For general use
	Baffled	For labile samples
	Packed with an adsorbent	For focusing gaseous injections from auxiliary sampling devices
Injection volume	0.1-1.5 µL 5-50 µL for LVI	Use lower volumes for volatile solvents and fast ramp rates Use volumes larger than 1.5 µL only in solvent-elimination mode
Sample Injection technique	Autosampler or manual, fast or slow	Not critical for cold split and splitless modes
Oven temperature	10-25 °C below solvent BP	For proper solvent effect in splitless mode
	Sample dependent	For split mode
Column flow	30-50 cm/s	Clears inlet faster Less backflash
Septum purge	1-5 mL/min	Minimizes ghosting
Quantification	Any method	Inherently reproducible Low discrimination in cold injection modes
Retention gap	1-3 m, deactivated	Compensates for extended flooded zone and solvent-column incompatibility

PTV Inlet Maintenance

Installing a Capillary Column into the PTV Inlet

1. Position the column so it extends 17 mm above the end of the ferrule. Mark the column behind the ferrule with correction fluid or a marker. Slide the nut over the column.
2. Insert the column into the adapter and finger tighten the column nut. Looking through the slot in the nut, adjust the column until the mark is correctly positioned below the Graphpak 2M ferrule.
3. Tighten the column nut an additional 1/8 to 1/4 turn with a wrench. Do not overtighten.



7890/6890 Septumless PTV Inlet Supplies

Description	Column ID (mm)	Unit	Part No.
Merlin Microseal high pressure nut			5182-3445
Merlin Microseal			5182-3444
Septumless head			G2617-60507
Septum head			G2618-80500
Septum nut, purged inlets			18740-60835
PTV inlet assembly			G2617-60506
PTV LCO_2 cooling jacket			G2617-60508
PTV LN_2 cooling jacket			G2619-60501
Silver seal		5/pk	5182-9763
Graphpak 2M inlet adapter, 0.2 mm	0.20		5182-9754
	0.25-0.33		5182-9761
	0.53		5182-9762
Ferrules for Graphpak 2M inlet, 0.2 mm	0.20	10/pk	5182-9756
	0.25	10/pk	5182-9768
	0.32	10/pk	5182-9769
	0.53	10/pk	5182-9770

(Continued)

7890/6890 Septumless PTV Inlet Supplies

Description	Column ID (mm)	Unit	Part No.
Replacement Graphpak column nut			5062-3525
PTV insulation block			G2617-20510
PTV Cryo insulator			G2617-60510
PTFE ferrule (needle seal)		10/pk	5182-9748
Kalrez seal			5182-9759
Valve body			5182-9757
Pressure spring			5182-9758
Viton seal		5/pk	5182-9775
Sealing element			5182-9760
CO_2 Cryo inline filter			3150-0602
Service kit for septumless head Contains Kalrez seal, valve body, and pressure spring			5182-9747
Graphpak 3D ferrules		5/pk	5182-9749
Assembly tool for Graphpak 3D ferrules			G2617-80540

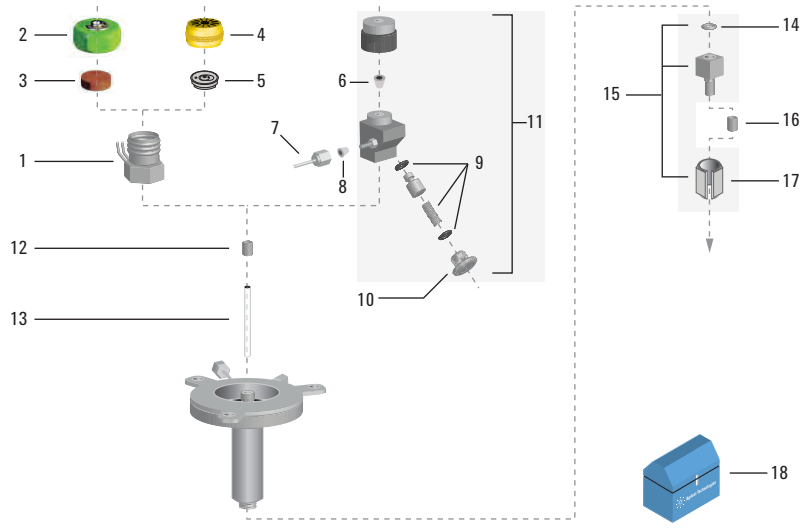
PTV Inlet Body

Item	Description	Unit	Part No.
1	Septum head		G2618-80500
2	Septum nut, purged inlets		18740-60835
3	11 mm septa	50/pk	5183-4759
		100/pk	5183-4759-100
	Non-stick long-life septa, 11 mm	50/pk	5183-4761
		100/pk	5183-4761-100
4	Merlin Microseal high pressure nut		5182-3445
5	Merlin Microseal general purpose replacement septum 3-100 psi		5182-3444
6	PTFE ferrule (needle seal)		5182-9748
7	PTV column adapter tube (includes 1/6 in nut and ferrule)		G2617-80550
8	Straight ferrule, 1/16 in	10/pk	0100-1375
9	Service kit for septumless head		5182-9747
10	Sealing element		5182-9760
11	Septumless head		G2617-60507
12	Graphpak 3D ferrules	5/pk	5182-9749
13	PTV liner, high temperature, borosilicate		5188-5356
	PTV liner, single baffle, deactivated		5183-2036
	PTV liner, sintered glass, deactivated		5190-1426
	PTV liner, high temperature, quartz		5188-5313

(Continued)

PTV Inlet Body

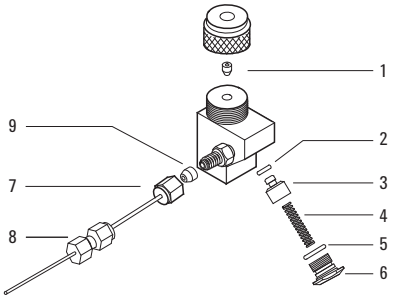
Item	Description	Unit	Part No.
14	Silver seal		5182-9763
15	Graphpak 2M inlet adapter, 0.53 mm		5182-9762
	Graphpak 2M inlet adapter, 0.32/0.25 mm		5182-9761
	Graphpak 2M inlet adapter, 0.2 mm		5182-9754
16	Ferrules for Graphpak 2M inlet, 0.32 mm	10/pk	5182-9769
	Ferrules for Graphpak 2M inlet, 0.2 mm	10/pk	5182-9756
	Ferrules for Graphpak 2M inlet, 0.25 mm	10/pk	5182-9768
	Ferrules for Graphpak 2M inlet, 0.53 mm	10/pk	5182-9770
17	Replacement Graphpak column nut	5/pk	5062-3525
18	Swabs for cleaning GC/MS	100/pk	5080-5400
	Injection port cleaning kit		480-0003
	Septum tool, knurled handle		450-1000
	Service kit for septumless head		5182-9747



PTV Inlet Body Parts

PTV Septumless Head

Item	Description	Part No.
	Septumless head	G2617-60507
1	PTFE ferrule (needle seal)	5182-9748
2	Kalrez seal	5182-9759
3	Valve body	5182-9757
4	Pressure spring	5182-9758
5	Viton seal	5182-9775
6	Sealing element	5182-9760
7	PTV column adapter tube (includes 1/6 in nut and ferrule)	G2617-80550
8	Septumless head weldment	G3500-80000
9	Straight ferrule, 1/16 in, 10/pk	0100-1375



Programmable Temperature Vaporizing (PTV) Liners

Description	ID (mm)	Volume (µL)	Part No.
Liners for Septumless PTV Inlet, G3501A, G3502A, G3503A			
PTV liner, single baffle, glass wool, deactivated	2	180	5183-2038
PTV liner, single baffle, deactivated	2	200	5183-2036
PTV liner, multi baffled, deactivated	1.8	150	5183-2037
PTV liner, sintered glass, deactivated	1.5	112	5190-1426
Liners for High Temperature PTV Inlet, G3506A			
PTV liner, high temperature, quartz	3.4	713	5188-5313
PTV liner, high temperature, borosilicate	3.4	668	5188-5356

Syringes for Septumless and High Temperature PTV Inlets

Volume (µL)	Description	Needle	Part No.
0.5	Removable	23/70/HP	5182-9651
5	Straight, fixed	23/42/HP	9301-0892
10	Straight, fixed	23/42/HP	9301-0713
50	Straight, fixed, for large volume injections	23/42/HP	5183-0318
100	Straight, fixed, for large volume injections	23/42/HP	5183-2058

Purged Packed Inlets

Packed column analysis is frequently done when high efficiency separations are not needed or when gases are analyzed by gas-solid chromatography. Purged packed inlets are simple in both design and use. Few parameters need to be set, and all carrier gas flow flushes through the inlet into the column in the standard configuration.

Purged Packed Inlet Practices and Rationales

Parameter	Selection/Setting	Rationale
Inlet temperature	BP of solvent +50 °C	Ensures flash vaporization
	BP of major solute(s)	Use for neat samples
Insert type	1/8 in stainless steel	Use for stainless steel column only
	1/4 in stainless steel 530 µm	Inserts permit connection of columns up to 1/4 in od
Liner	Glass	Use to lower activity (replaceable)
Initial column temperature	Temperature programming	Sharpens peaks and reduces run time
Column type	1/8 in packed stainless	Will not break
	1/4 in packed glass 530 µm	Better for polar or labile compounds
Carrier gas flow	10-40 mL/min	Use with N_2 carrier gas
	10-60 mL/min	Use with He or H_2 carrier gas

For more information on our new expanded and refreshed Agilent packed column portfolio, see page 470.

Purged Packed Inlet Troubleshooting

Purged packed inlets are active, have low volume and are generally flow controlled. This means that most packed column inlet problems involve sample decomposition, flashback, or leaks.

Decomposition

Diagnose inlet sample decomposition by comparing retention times for decomposition products to their standard retention times. Then try these options to improve results:

- Intracolumn direct injection
- Deactivated glass liners
- Lower inlet temperatures
- Remove column packing in the inlet zone
- Increase flow rates

Backflash

Large sample injections can exceed liner capacity and backflash into the gas supply lines and onto the septum. This can cause:

- Ghost peaks
- Sample losses
- Irreproducible peak areas
- Decomposition

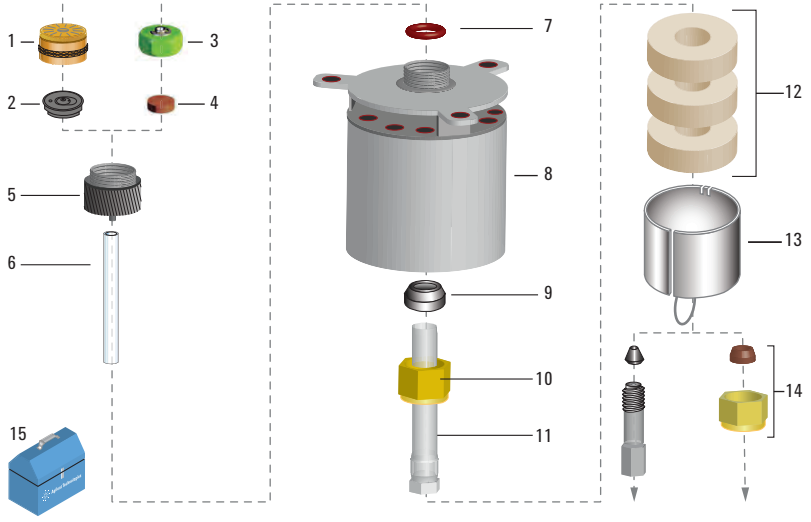
Leaks

Septum and column leaks can cause column degradation and stationary phase decompositions on flow-controlled column inlets.

- Change the septum on a regular basis and check column connections to help eliminate leak holes.
- Keep the oven and inlet at room temperature when not in use or while changing the septum.

Purged Packed Inlet

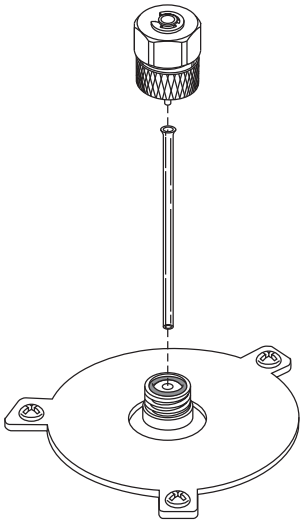
Item	Description	Unit	Part No.
1	Merlin Microseal high pressure nut		5182-3445
2	Merlin Microseal general purpose replacement septum 3 to 100 psi		5182-3444
	Merlin Microseal low pressure replacement septum		5181-8815
3	Septum nut, purged inlets		18740-60835
4	Non-stick advanced green septa, 11 mm	50/pk	5183-4759
	Non-stick long-life septa, 11 mm	50/pk	5183-4761
	General purpose gray septa 11 mm	50/pk	5080-8896-50
	Non-stick bleed and temperature optimized (BTO) septa, 11 mm	50/pk	5183-4757
5	Packed port insert weldment		19243-80570
6	Disposable glass insert, deactivated, 170 µL internal volume		5181-3382
	Disposable glass liner, 170 µL internal volume		5080-8732
7	O-ring, Viton	12/pk	5080-8898
8	Inlet weldment		G3451-80501
9	Polyimide ferrule, 1/4 in	10/pk	5080-8774
10	1/4 in nut, brass	10/pk	5180-4105
11	Packed column adapter		G1540-80013
	1/4 in column adapter		19243-80540
	1/8 in column adapter		19243-80530
	530 µm column adapter for use with glass liners		19244-80540
12	Nut warmer insulation		19234-60715
13	Nut warmer cup assembly		19234-60700
14	For complete offering of column nuts, **see page 40**.		
15	QuickPick purged packed inlet PM kit		5188-6498
	Swabs for cleaning GC/MS	100/pk	5080-5400
	Injection port cleaning kit		480-0003
	Septum tool, knurled handle		450-1000



Purged packed inlet assembly

7890/6890/6850 Purged Packed Inlet Supplies

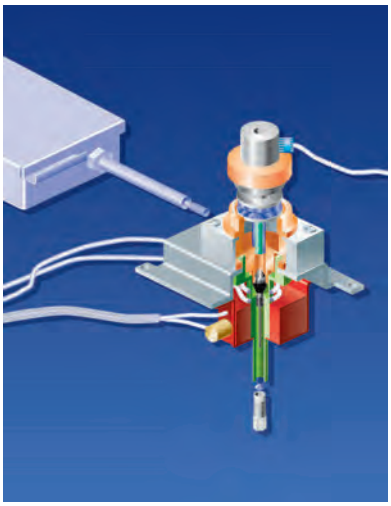
Description	Unit	Part No.
QuickPick purged packed inlet PM kit Includes 5 non-stick BTO septa, 1 O-ring, 1 ferrule, and 1 disposable glass liner		5188-6498
Merlin Microseal		5182-3444
Merlin Microseal high pressure nut		5182-3445
Septum nut, purged inlets		18740-60835
Non-stick bleed and temperature optimized (BTO) septa, 11 mm	50/pk	5183-4757
Packed port insert weldment		19243-80570
O-ring, Viton	12/pk	5080-8898
Disposable glass liner, 170 µL internal volume	25/pk	5080-8732
Disposable glass insert, deactivated, 170 µL internal volume	5/pk	5181-3382
Polyimide ferrule, 1/4 in	10/pk	5080-8774
1/4 in nut, brass	10/pk	5180-4105
530 µm column adapter for use with glass liners		19244-80540
1/8 in column adapter for use with glass liners		19243-80530
1/4 in column adapter for use with glass liners		19243-80540
Nut warmer cup with insulation		19234-60720
Universal column nut	2/pk	5181-8830
Self Tightening column nut, for inlet/detector		5190-6194



How to install glass liner on Purged Packed Inlet

Nuts and Ferrules for 1/8 in Packed Columns

Description	Unit	Part No.
1/8 in stainless steel nut and ferrule set	20/pk	5080-8751
1/8 in brass nut and ferrule set	20/pk	5080-8750
Polyimide/graphite ferrule, 1/8 in	10/pk	0100-1332



Detector Systems

Flame Ionization Detector (FID)

The FID requires routine maintenance to ensure optimum performance. Maintenance requirements are application dependent, but Agilent recommends periodically cleaning or replacing the following items:

FID Routine Maintenance

Item	Comments
FID Jet	A plugged jet results in longer retention times as the column exit/detector pressure increases. Once the jet becomes completely plugged, it is difficult to light or sustain a flame.
Ignitor Glow-Plug	Replace if corroded or burned out.
FID Collector/Insulators	Contamination can contribute to detector noise or loss of sensitivity.
Column Adapter/Seals For Adaptable FID only	Leaks at column fittings can result in difficulty lighting the FID or sustaining a flame after injection.

Typical FID Problems

Condensation

Since the FID combustion process results in water formation, the detector temperature must be kept above 300 °C to prevent condensation. At detector block temperatures below 300 °C, the castle assembly drops below 100 °C, resulting in condensation and possible rusting. Such condensation, especially when combined with chlorinated or fluorinated solvents or samples, causes corrosion, with resulting increase in detector noise and loss of sensitivity.

Flame Ignition

If the flame goes out or will not light:

- Measure the hydrogen/air and makeup flow rates – Low H_2 or makeup flows indicate a plugged jet, or a leak at the column fitting. Measure each gas flow independently.
- Confirm that the ignitor is glowing during the FID ignition sequence.
- Check for partially or completely plugged jet – Formation of silica or carbon deposits at the tip of the jet can cause plugging. Incorrect capillary column installation can also cause plugging.

It is best to replace a plugged jet, rather than try to clean it.

- Check that the capillary column is not installed all the way to the jet tip (withdraw 1-2 mm).
- Check that the correct type of jet is installed for the column you are using.
- Check for leaking column or adapter fitting at the base of the FID.
- Check the lit offset value to make sure it is not too low or too high. Adjust the value (normally set to 2.0 pA).

Injecting large volumes of aromatic solvent or water can cause the flame to go out. Switch to a non-aromatic solvent or reduce injection volume.

FID collector assembly

Increased FID Noise or Loss in Sensitivity

FID noise is affected by:

- The cleanliness of the GC gases and gas delivery system – Ensure that the carrier/H_2 and air purity is ≥99.9995%. Check traps and filters in the gas supply lines. The FID background signal should be ≤20 pA when the flame is lit and stablized.
- Dirty collector/PTFE insulators – Clean or replace.
- Dirty jet – An incorrect flame pattern can increase noise or affect sensitivity.

TIPS & TOOLS

For optimal sensitivity, use Agilent gas purifiers to ensure cleanliness of your GC gases. **Turn to page 164.**

Installing a Capillary Column in the FID

WHAT YOU NEED:

- Column
- Ferrule(s)
- Column nut
- Column cutter
- 1/4 in open end wrench
- Septum
- Isopropanol
- Lab tissue
- Lint-free gloves
- Column ferrule installation tool (p/n 19251-80680)

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. If using the adaptable detector, verify that the adapter is installed.
4. Place a septum, capillary column nut, and ferrule on the column.
5. Score the column using a glass scribing tool. The score must be square to ensure a clean break.
6. Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.
7. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
8. Install the capillary column.

   If the column id is greater than 0.1 mm:

   a. Gently insert the column into the detector until it bottoms; do not attempt to force it further.

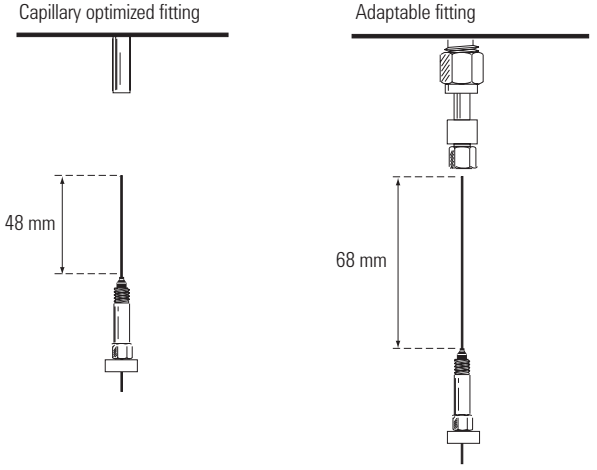
   b. Finger tighten the column nut, then withdraw the column about 1 mm. Tighten the nut an additional 1/4 turn with a wrench.

   If the column id is 0.1 mm or less, position the column so it extends above the ferrule by 48 mm (capillary optimized fitting) or 68 mm (adaptable fitting). Slide the septum up to hold the column nut and ferrule at this fixed position.

   c. Insert the column into the detector. Slide the nut and ferrule up the column to the detector base. Finger tighten the column nut until it grips the column.

   d. Adjust the column (not the septum) position so that the septum is even with the bottom of the column nut. Tighten the nut an additional 1/4 turn with a wrench.

Positioning the column



FID Jet Identification and Selection

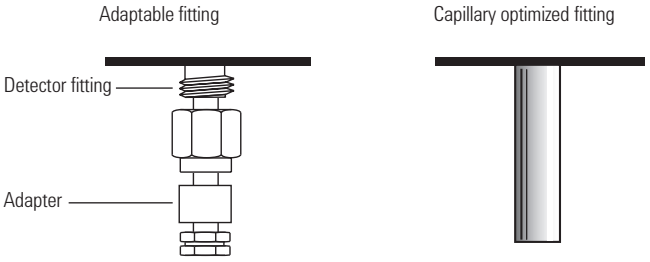
Adaptable FID Jet, 19244-80560

Before ordering parts for FID maintenance, determine which type of FID is installed on your GC. The FID is available in two versions:

- Dedicated, Capillary Optimized: for capillary columns only
- Adaptable: for packed or capillary columns

To determine the type of FID installed on your GC, open the oven door and examine the fitting at the base of the detector. Compare to the following diagram.

Hint: Adaptable jets are longer than dedicated capillary jets.



FID Jets

Item	Description	Part No.
1	Jet, 0.011 in/0.29 mm id tip, capillary dedicated	G1531-80560
2	Jet, 0.018 in/0.47 mm id tip, capillary optimized	G1531-80620
3	Jet, capillary adaptable, 0.011 in id tip	19244-80560
4	Jet, packed, high temperature, 0.018 in id tip	19244-80620
5	Jet, packed standard, 0.018 in id tip	18710-20119
6	Jet, packed wide-bore, 0.030 in id tip (for high-bleed applications)	18789-80070

Jet Cleaning Procedure

Use Agilent FID Cleaning Kit, p/n 9301-0985

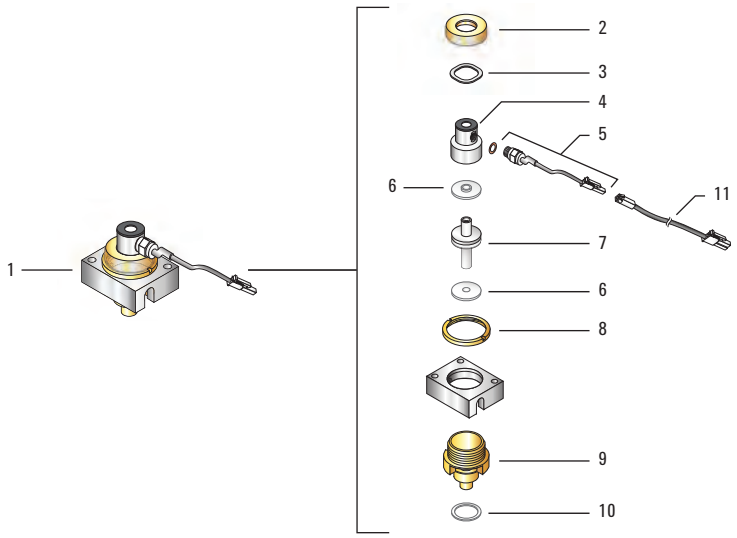
1. Run a cleaning wire through the top of the jet. Run it back and forth a few times until it runs smoothly. Be careful not to scratch the jet. (Do not force too large a wire or probe into the jet opening or the opening will become distorted. A loss of sensitivity, poor peak shape, and/or lighting difficulties may result if the opening is deformed.)
2. Fill an ultrasonic cleaning bath with aqueous detergent, and place the jet in the bath. Sonicate for five minutes.
3. Use a jet reamer to clean the inside of the jet.
4. Sonicate again for five min.

   Note: from this point on, handle the parts only with forceps!
5. Remove the jet from the bath and rinse it thoroughly, first with hot tap water and then with a small amount of GC-grade methanol.
6. Blow the jet dry with a burst of compressed air or nitrogen, and then place the jet on a paper towel and allow to air dry.

FID cleaning kit, 9301-0985

7890/6890/6850 Flame Ionization Detector (FID) Supplies

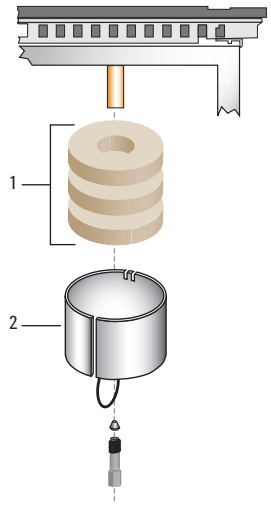
Item	Description	Unit	Part No.
1	FID collector assembly		G1531-60690
2	Collector nut		19231-20940
3	Washer, spring, wavey, 19.0 to 19.81 mm id, 24.5 mm od		3050-1246
4	Hastelloy ignitor castle (optional)		19231-21060
	Ignitor castle		19231-20910
5	Ignitor glow plug assembly		19231-60680
6	Collector insulator		G1531-20700
7	Hastelloy collector body		G1531-21090
	Collector body		G1531-20690
8	Nut, collector spanner		19231-20980
9	Collector housing		G1531-20740
10	Silicone gaskets, 0.890 in od/0.709 in id	12/pk	5180-4165
11	FID ignitor cable, 7890A only		G3431-60680



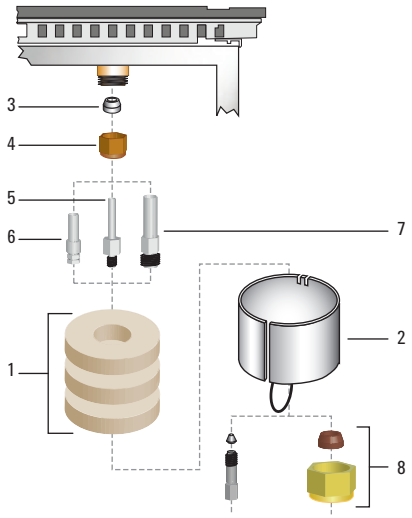
Flame Ionization Detector (FID) assembly

FID base assembly

Item	Description	Unit	Part No.
1	Nut warmer insulation		19234-60715
2	Nut warmer cup assembly		19234-60700
3	Polyimide ferrule, 1/4 in	10/pk	5080-8774
4	1/4 in nut, brass	10/pk	5180-4105
5	FID/NPD 1/8 in packed column		19231-80520
6	FID/NPD adapter for capillary column		19244-80610
7	FID/NPD 1/4 in packed column		19231-80530
8	1/8 in stainless steel nut and ferrule set	20/pk	5080-8751
	1/8 in brass nut and ferrule set	20/pk	5080-8750
	Polyimide/graphite ferrule, 1/8 in	10/pk	0100-1332
	1/8 in nut, brass	10/pk	5180-4103
	Universal column nut	2/pk	5181-8830
	For complete offering of column ferrules, **see page 37**.		



Capillary-optimized FID parts



Adaptable FID parts

FID base assembly

Electron Capture Detector (ECD)

The Agilent micro ECD is the most sensitive on the market, with a detection zone volume 10 times smaller than any other ECD. The replaceable liner serves as a physical stop for the column, ensuring reproducible column installation and decreasing column contamination of the cell.

Liner Selection

The only assembly that requires routine maintenance is the glass liner in the makeup gas assembly, especially for the µECD. All sample passes through the indent in the mixing liner of the µECD. The mixing liner should be replaced if there is a significant loss of sensitivity or any time the column is removed/reinstalled in the detector.

- Gigabore Liner (p/n 19233-20625): for original ECD design (5890 and 6890), brown, polyimide coating
- Mixing Liner (p/n G2397-20540): for µECD, clear glass with indent

Makeup Gas Adapter Maintenance/Installation Procedure

1. Remove the Makeup Gas Adapter from the ECD fitting with a 9/16 in wrench. Be careful not to stress the 1/16 in stainless steel gas supply tube.
2. Unscrew the end cap of the Makeup Gas Adapter and ultrasonically clean in solvent.
3. Remove the old liner.
4. Clean the Makeup Gas Adapter body with solvent in a Nalgene squeeze bottle.
5. Wipe the Makeup Gas Adapter with a clean laboratory wipe.
6. Install the replacement liner.
7. Reinstall the tip of the Makeup Gas Adapter and tighten securely.
8. Reinstall the Makeup Gas Adapter. Make sure it is fully inserted into the detector.
9. Reinstall the column.
10. Reinstall the insulation cup.

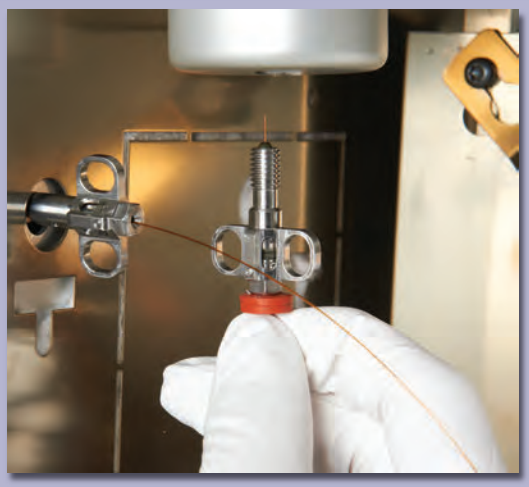
TIPS & TOOLS

Agilent's Self Tightening column nut eliminates the need for retightening once and for all

This unique, self tightening stainless steel GC column nut delivers a tight connection – without expensive upgrades or adapters – and gives you the advantages of:

- Reliable performance
- Less wasted time
- Ease of use
- Faster maintenance

Learn how to install a column using the Self Tightening column nut, visit **www.agilent.com/chem/STnut**



Thermal Cleaning

If your baseline is noisy or the output value is abnormally high (>1000 Hz), and you have determined that these problems are not being caused by leaks in the GC system, you may have contamination in the detector from column bleed and sample residues. To remove contamination, you should perform a thermal cleaning (bake out) of the detector. Bake out the detector at 20 to 30 degrees higher than normal operating temperature (375 °C max), with 50 to 100 mL/min of makeup gas flow.

WARNINGS & CAUTION

Detector disassembly and/or cleaning procedures other than thermal should be performed only by personnel trained and licensed appropriately to handle radioactive materials. Trace amounts of radioactive ^{63}Ni may be removed during other procedures, causing possible hazardous exposure to β and X-radiation.

Radioactivity Leak Test

Electron capture detectors must be tested for radioactive leakage at least every six months. Records of tests and results must be maintained for possible inspection by the Nuclear Regulatory Commission and/or responsible local agency. More frequent tests may be conducted when necessary.

The procedure used is a "wipe test". A Wipe Test Kit is supplied with each new detector. Refer to the information card supplied in the kit for instructions on performing the test.

Gas Purity

For successful EC detection, it's important that the carrier and purge gases are very clean and dry (99.9995% minimum purity). Moisture, oxygen, or other contaminants can result in higher detector response, but usually at the expense of both sensitivity and linear range. Always precondition the column before connection to the detector.

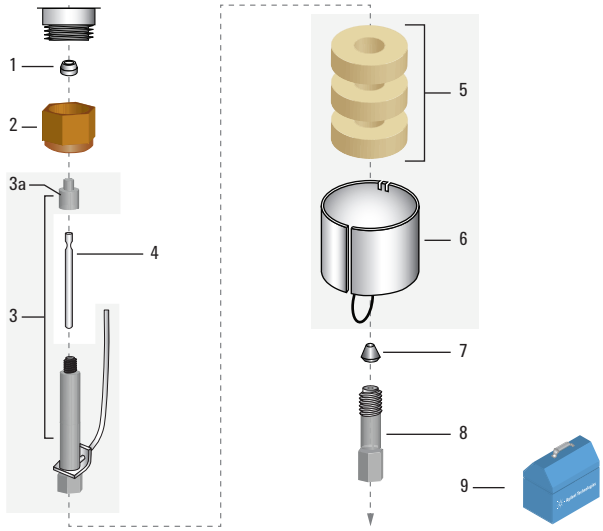
ECD Wipe Test

The Wipe Test Kit (p/n 18713-60050) included with each new ECD includes an information card with instructions for performing the test. Records of tests and results must be maintained for possible inspection by the Nuclear Regulatory Commission (NRC) and/or responsible state agency.

Electron Capture Detector (ECD) Supplies

Item	Description	Unit	Part No.
1	Polyimide ferrule, 1/4 in	10/pk	5080-8774
2	1/4 in nut, brass	10/pk	5180-4105
3	Micro ECD makeup gas adapter, 7890		G3433-63000
	Micro ECD makeup gas adapter, 6890		G2397-80520
3a	ECD adapter end cap		19233-20755*
4	Fused silica liner for micro ECD makeup gas adapter		G2397-20540*
5	Nut warmer insulation		19234-60715
6	Nut warmer cup assembly		19234-60700
7	For complete offering of column ferrules, **see page 37**.		
8	For complete offering of column nuts, **see page 40**.		
9	GC electron capture detector standard in isooctane	3 x 0.5 mL ampoules	18713-60040
	Micro ECD wipe test kit		18713-60050

*Items 3a and 4 are supplied with item 3



Electron Capture Detector (ECD) assembly

ECD WARNINGS

Although beta particles at this energy level have little penetrating power – the surface layer of the skin or a few sheets of paper will stop most of them – they may be hazardous if the isotope is ingested or inhaled. For this reason the cell must be handled with care. Radioactive leak tests must be performed at the required intervals, the inlet and outlet fittings must be capped when the detector is not in use, corrosive chemicals must not be introduced into the detector, and the effluent from the detector must be vented outside the laboratory environment.

Thermal Conductivity Detector (TCD)

The TCD compares the thermal conductivities of two gas flows – pure carrier gas (also called the reference gas) and carrier gas plus sample components (also called column effluent).

Filament Maintenance

The primary maintenance for a TCD involves the filament. Most procedures involve improving filament life or keeping the filament from becoming damaged or contaminated. To avoid filament damage and contamination:

- Check for leaks
- Use gas purifiers to remove oxygen
- Avoid chemically-active sample components, such as acids and halogenated compounds
- Turn off the filament when not in use

Increasing Filament Lifetime

Use the following startup process to increase filament lifetime:

Purge the detector with carrier and makeup gas for 10-15 min before turning on the filaments. This prevents oxidation of the filaments due to the presence of oxygen that has diffused into the cell under no flow conditions.

Cell Contamination

Cell contamination is a problem when a lower detector temperature is used to improve sensitivity. If the cell becomes contaminated, a solvent flush of the detector may help to remove the condensed material.

Thermal Cleaning

The TCD can become contaminated with deposits from such things as column bleed or dirty samples. A wandering baseline, increased noise level, or changes in response on a checkout chromatogram all indicate contamination. Thermal cleaning, or bakeout (heating the detector block to evaporate the contaminant), should be performed only after you have confirmed that the carrier gas and the flow system components are leak-free and contaminant-free.

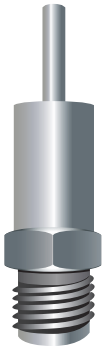
Watch out for decreased sensitivity caused by samples that react with the filament, originating from oxygen-contaminated carrier gas, leaks in plumbing, or column bleeding. Samples with active components, such as acids and halogenated compounds can chemically attack the filament as well. Also, sample condensation will contaminate the detector cell if the temperature is too low.

Some types of contaminants can be removed by temperature bake out.

7890/6890/6850 Thermal Conductivity Detector (TCD) Supplies

Description	Unit	Part No.
For 1/8 in SS Packed Column Installation		
Polyimide/graphite ferrule, 1/8 in	10/pk	0100-1332
1/8 in nut, brass	10/pk	5180-4103
For 1/4 in SS Packed Column Installation		
Polyimide/graphite ferrule, 1/8 in	10/pk	0100-1332
1/8 in nut, brass	10/pk	5180-4103
1/4 in packed column adapter		G1532-20710
Polyimide ferrule, 1/4 in	10/pk	5080-8774
1/4 in nut, brass	10/pk	5180-4105
For Capillary Column Installation (Standard)		
TCD capillary column adapter		G1532-80540
Polyimide/graphite ferrule, 1/8 in	10/pk	0100-1332
1/8 in nut, brass	10/pk	5180-4103
Universal column nut	2/pk	5181-8830
6850 column nut	2/pk	5183-4732
530 µm, 1.0 mm id graphite ferrule	10/pk	5080-8773
320 µm, 0.5 mm id graphite ferrule	10/pk	5080-8853
TCD sample Solution of 0.33% C_{14}, C_{15}, and C_{16} normal alkanes in hexane (w/w).	3 x 0.5 mL ampoules	18711-60060
FID and TCD sample This sample is used for the HP 5880, 5890 and 6890 with a FID or TCD. Solution of 0.033% C_{14}, C_{15}, and C_{16} normal alkanes in hexane.	3 x 0.5 mL ampoules	18710-60170

1/8 in stainless steel packed column



1/4 in packed column adapter, G1532-20710

Standard design

Installing a Capillary Column in the TCD

WHAT YOU NEED:

- Front ferrule
- Back ferrule
- Column nut
- Column cutter
- 7/16 in wrench
- Lab tissue
- Lint-free gloves

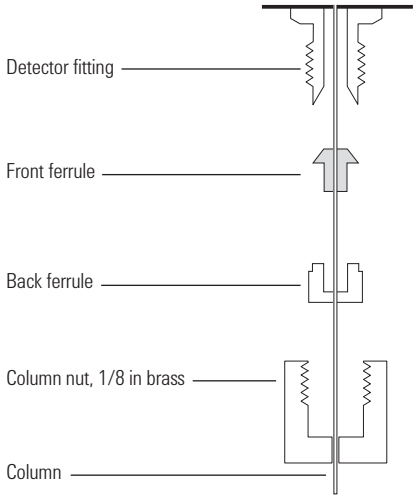
1. Gather the required supplies and tools.
2. Assemble the ferrules and 1/8 in brass Swagelok nut on the column.
3. Score the column using a glass scribing tool. The score must be square to ensure a clean break.
4. Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain that there are no burrs or jagged edges.
5. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
6. Insert the column into the detector until it bottoms.
7. Slide the column nut and ferrules up the column to the detector and finger tighten the nut.
8. Pull out 1 mm of column. Tighten the nut an additional 1/4 turn with a wrench or until the column does not move.

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

TCD Ferrules

Column ID (mm)	Back Ferrules, 10/pk	Front Ferrules, 10/pk
0.53	5182-3477	5182-9673
0.32	5182-3477	5182-9676
0.25/0.2/0.1	5182-3477	5182-9677
No hole	5182-3477	5182-9679
1/8 in nut, brass	5180-4103	



Determining the TCD Electronic Pressure Control (EPC)

If you have a 6890A or 6890A Plus GC, you may have an older design EPC flow manifold for the TCD. The older design requires removal of sheet metal panels to attach the TCD reference flow gas supply inside the GC. The new "Minifold" design allows TCD reference gas to be connected directly to the back of the GC. Replacement TCD filament block assemblies have different part numbers depending on the EPC design type.

Once you have determined the type of EPC module, consider ordering a passivated filament block assembly, which is recommended for fatty acid analysis or reactive/acidic samples.

TCD Filament Block Assemblies

Instrument	Passivated	Applications	Specifications	EPC Design	Part No.
7890A	Yes	Standard TCD Analysis Gases/Hydrocarbons	Complete Detector Assembly Includes detector palette and heater/sensor assembly	Original	G3432-60220
7890A	Yes	Standard TCD Analysis Gases/Hydrocarbons	Complete Detector Assembly Includes detector palette and heater/sensor assembly Third detector, side mounted	Original	G3432-60221
6890	No	Standard TCD Analysis Gases/Hydrocarbons	Filament Block Only Must reuse heater/sensor	Original	G1532-60675
6890	No	Standard TCD Analysis Gases/Hydrocarbons	Filament Block Only Must reuse heater/sensor	Minifold	G1532-60685
6890	Yes	Recommended for Fatty Acid Analysis	Filament Block Only Must reuse heater/sensor	Original	G1532-60690
6890/6850	Yes	Recommended for Fatty Acid Analysis	Filament Block Only Must reuse heater/sensor	Minifold	G1532-60695
6890/6850	No		Complete Detector Assembly Includes detector palette and heater/sensor assembly	Minifold	G2630-61230

Flame Photometric Detector (FPD)

In 2005, Agilent released an improved FPD with minimum detectable levels (MDL) of 3.6 pg/s for sulfur and 60 fg/s for phosphorus. This is more than a 5 times improvement for sulfur. The updated design is based on a one-piece deactivated transfer line jet assembly and improved optics. Upgrade kits are available.

Operation

The FPD uses three gases: air and hydrogen to support the flame, and nitrogen makeup for capillary columns. The flow rates are critical for optimizing performance. Using nitrogen as a makeup gas is essential to obtaining low MDLs. Do not use helium for the makeup gas.

Recommended Gas Flows

Detector Gas Flows	Phosphorus Mode	Sulfur Mode
Air	100 mL/min	60 mL/min
Hydrogen	75 mL/min	50 mL/min
Nitrogen makeup	60 mL/min	60 mL/min

Maintenance

Managing gas purity; contamination from column bleed, sample residue, and corrosion; and air leaks can help keep your FPD at peak performance.

Glow plug, 0854-0141

Gas Purity

Sulfur contamination is a common problem and causes noise and/or a higher baseline offset in the FPD. To minimize sulfur contamination and achieve the lowest MDLs, use at least 99.9995% pure gases, clean tubing, and regulators with metal diagrams. To protect your FPD over its lifetime, Agilent recommends gas generators or supply gas filters designed to remove sulfur.

For more information on Gas Clean Filters, turn to page 164.

Contamination

The FPD is susceptible to buildup of residue on the surfaces of the ignitor coil, jet, combustion chamber, and chamber window. The residue increases detector offset and reduces the signal-to-noise ratio. The sample or column bleed usually cause the residue. After a period of time, you may need to rebuild the detector and replace the transfer line. Do not clean the transfer line, jet, or other parts with brushes or solvents.

To increase the time between servicing, remove the column, cap off the detector, and run it at 250 °C with the flame to bake off some of the residue. Replacing the ignitor may reduce baseline output. If these tactics are not effective, rebuild the detector.

If your solvent or sample is corrosive, it can erode the aluminum vent tube. Agilent recommends using alternative stainless steel vent tubes for these applications.

Air Leaks

The original FPD design has three more internal seals than the new design. Temperature cycling of the detector causes the ferrules to shrink and leaks to occur. The most common leaks are around the fused silica transfer line. To eliminate these leaks, remove the detector from the GC and tighten the transfer line fittings.

For both the original and new FPD, leaks can develop at the column nut or capillary column adapter, the gang fitting at the EPC module, around the vent tube, or around the ignitor glow plug. If you are replacing fittings or O-rings, always use conditioned, graphitized-polyimide ferrules and Agilent's low sulfur O-rings. Make sure ferrules are the correct size for your column.

Flame Ignition Problems

You can tell if your FPD is lit by checking the detector "Output" and "Flame" on the display. The detector senses that the flame is on by comparing the output with the offset. An optimized FPD normally runs with an output in the range of 30 to 80 with the offset point at 2.0. If the flame is out and the electrometer is on, the output usually displays less than 1.

Most FPD ignition problems are caused by incorrect gas flows, incorrect column installation, or a dirty or defective ignitor. To troubleshoot:

1. Make sure the FPD is at operating temperature before trying to light.
2. Remove the rubber drip tube while lighting the FPD.
3. Increase air supply pressure by 10-20 psi.
4. Check the detector gas flows to see if they match the Recommended Gas Flows table.
5. Check the detector output when you turn the flame on. The photomultiplier will see the glow of the ignitor and jump to about 68000 pA.
6. Remove the column and check the tip for residue or burnt polyimide coating. If it appears damaged, cut off the damaged portion and reinstall to the proper height.
7. Remove the ignitor glow plug. If dirty or damaged, replace it.

Less common problems include leaks, quenching, and condensation:

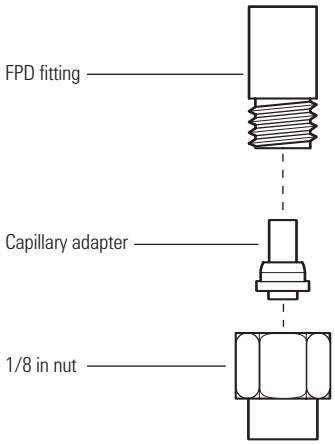
- Large air leaks at the inlet or detector can reduce the percentage of the hydrogen-air mixture at the detector and cause ignition problems.
- Large injections of certain samples can cause flameouts or quenching that cause the detector to attempt to relight, interrupting your analysis.
- Condensation is a by-product of the burning of your sample. For many analyses, the liquid is collected from the vent tube. If the liquid drips back into the detector, it will extinguish the flame. Agilent recommends that you wait to light the flame until the detector is at temperature and equilibrated.
- Light leaks at the vent tube can cause a higher baseline offset. Make sure the vent tube ferrule seals tightly against the emission block. Keep the lid closed over the detector.

TIPS & TOOLS

Helium is not a good makeup gas for the FPD. You will not be able to light or keep the detector lit in the sulfur mode with helium.

Installing a Capillary Column Adapter to the FPD

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. Insert the capillary adapter into the 1/8 in nut as shown, then thread the nut onto the detector fitting.
4. Finger tighten the nut, then tighten an additional 1/8 turn with a wrench.



WHAT YOU NEED:

- FPD capillary column adapter
- Column cutter
- 1/4 in and 9/16 in wrenches
- Metric ruler
- 1/8 in nut
- Lint-free gloves

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

WHAT YOU NEED:

- Column measuring tool, p/n 19256-80640
- Column cutter
- 1/4 in and 7/16 in wrenches
- Column nut
- Ferrule
- Capillary column
- Lint-free gloves

Attaching a Capillary Column to the FPD

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. Assemble a septum, column nut, and ferrule on the end of the column.
4. Insert the end of the column through the column measuring tool so that the end protrudes beyond the tool.
5. Tighten the column nut until it grips the column. Tighten the nut an additional 1/8 to 1/4 turn with a pair of wrenches. Snug the septum against the base of the column nut.
6. Use a wafer cutter at 45° to score the column.
7. Snap off the column end. The column may protrude about 1 mm beyond the end of the tool. Inspect the end with a magnifying loupe to make certain that there are no burrs or jagged edges.
8. Remove the column, nut, and swaged ferrule from the tool.
9. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
10. Verify that a capillary adapter is installed in the detector fitting.
11. Carefully thread the swaged column up into the adapter. Finger tighten the column nut, then use a wrench to tighten an additional 1/8 turn.

If you are using a capillary column, the tip of the column must be at least 1 mm below the surface of the jet. When you install the column, measure the distance from the sealing surface of the ferrule to the tip of the column. This measurement is 153 mm for the original FPD and 145 mm for the new FPD. For the new design, Agilent recommends using the column measuring tool, p/n 19256-80640.