

The Essential Chromatography and Spectroscopy Catalog

Your comprehensive reference guide
for columns and supplies

2007-2008 Edition



Agilent Technologies



Dear Valued Customer,

At Agilent, the most important part of our business is doing whatever it takes to help you get the results you need for your business.

With that in mind, I'm pleased to present you with the 2007-2008 edition of Agilent's *Essential Chromatography and Spectroscopy Catalog*.

Inside, you'll find everything you need to ensure maximum instrument performance and reproducible results – including compatibility charts, application notes, maintenance schedules, and much more. You can also access the most current maintenance videos, e-seminars, on-site seminar details, and special offers – as well as our on-line store – at www.agilent.com/chem.

And remember, when you buy columns and supplies from Agilent, you're buying more than just products. You also get over four decades of Agilent GC, LC, MS and ICP/MS expertise. On the web, by phone or in person, Agilent helps you solve the problems that can slow you down and get in the way of your results.

I invite you to engage us, and let us work with you to solve your technical challenges. If you prefer to speak with our experts directly, or if you have additional questions, you can contact your local Agilent office or authorized distributor using the information on pages 22-27 of your catalog.

As always, thank you for the opportunity to become your partner in chromatography. Please don't hesitate to contact me with suggestions on how we can better serve your needs. I'd be delighted to hear from you.

Sincerely,



Helen Stimson

Vice President and General Manager
Columns and Supplies Division
helen_stimson@agilent.com
302-633-8437

P.S. Our customers tell us that their budget challenges have never been greater. So we've made it easy to find valuable discounts on Agilent supplies, accessories, and more. For details, visit www.agilent.com/chem/specialoffers.

TABLE OF CONTENTS

Featured Products	2-18
Sales, Services and Support	19-27
Services and Support.....19-21	Agilent Offices and Distributors Worldwide.....22-27
General Chromatography	28-127
Vials, Caps and Septa30-54	Fittings and Tools105-114
Syringes55-62	Chemical Standards.....115-122
CTC Analytics Autosampler Supplies63-68	Integrators, Integrator Supplies, and Cables.....123-127
Gas Management.....69-104	
Sample Preparation	128-149
Solid Phase Extraction (SPE).....130-143	Sample Filtration.....144-149
GC and GC/MS	150-443
Maintenance Schedule.....153	GC and GC/MS Columns228-328
GC General Supplies.....154-181	GC Troubleshooting and Maintenance.....329-345
GC Instrument Parts and Supplies.....182-211	GC and GC/MS Applications.....355-443
GC/MS Parts and Supplies.....212-227	
LC and LC/MS	444-671
General LC Supplies.....446-460	LC and LCMS Columns505-619
1100/1200 Series	LC and LC/MS Troubleshooting620-623
Instrument Parts and Supplies.....461-499	LC and LC/MS Applications.....624-671
1090 Series Instrument Parts and Supplies.....500-504	
CE and CE/MS	672-689
CE Solution Kits674-677	CE Instrument Parts and Supplies.....683-689
CE Capillaries677-682	
ICP-MS	690-709
ICP-MS Supplies.....692-707	ICP-MS Standards.....708-709
UV-Vis	710-720
Cells and Cell Accessories.....712-716	Dissolution Testing Supplies.....719
Tubing and Fittings.....716	Standards and Reagents.....720
Instrument Parts and Supplies.....717-718	
Indices	721-771
Part Number721-750	Alphabetical.....763-770
Compound.....751-762	
Ordering Information	772-784
Easy Ordering Terms and Conditions.....771-773	Order Forms775-784
Easy Ways to Order774	

Information in this document is subject to change without notice. Agilent Technologies reserves the right to correct any printing or typographical errors in this catalog. Any prices in this catalog are for reference only and are subject to change without notice. Application information in this catalog is for investigational use only and is not intended to be a complete laboratory diagnostic procedure or method. The performance characteristics of the procedures have not been fully established. The choice of methodology and procedures remains the responsibility of the user and not of Agilent Technologies.

Featured Products



Introducing the new Agilent 1200 Series LC platform

Whatever your priority, speed, resolution or sensitivity, the flexible, modular design of the 1200 Series LC platform ensures configurations ideally suited to meet your application requirements.

The new Agilent 1200 Series represents the next generation of HPLC, designed for even greater robustness and reliability, together with enhanced performance.

Scalable Solutions

The new 1200 Series offers the broadest LC portfolio available:

Manual Isocratic LC System

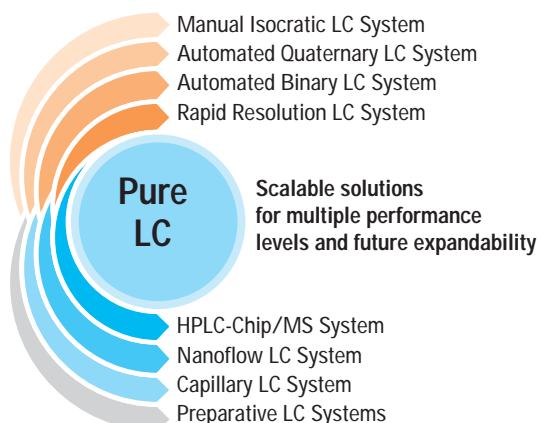
Workhorse for demanding QA/QC applications

- Entry-level system for world-class LC technology
- Easy and fast maintenance
- Flow rates up to 10 ml/min for a wide range of column dimensions and applications
- Upgrade options from isocratic up to automated quaternary LC system

Automated Quaternary LC System

For routine method development and high throughput gradient applications

- Greatest flexibility for multi-solvent gradients by accessing up to 4 solvents
- Flow rates up to 10 ml/min support narrow bore, standard and semi-preparative applications
- Wide selection of autosamplers for full flexibility in injection volumes and sample containers





Rapid Resolution LC System

Highest speed and resolution with uncompromised data quality

- Up to 60% more resolution and up to 20 times faster compared to conventional LC
- Flow rates up to 5 ml/min provide universal applicability
- Full, uncompromised compatibility with existing methods
- Ideally suited for use with ZORBAX Rapid Resolution HT 1.8 μm columns
- Throughput of 2000 samples per day



Automated Binary LC System

For research, high-throughput and fast applications

- High pressure gradient mixing for superior gradient performance even at lower flow rates
- Optimized delay volumes for fast chromatography
- Flow rates from 0.05 to 5 ml/min provides ideal support for narrow and standard bore applications



Capillary LC System

Enter the world of low flow applications

- Up to 500 times more sensitive compared to conventional LC
- Typical flow rates 1-100 $\mu\text{l}/\text{min}$, extendable up to 2.5 ml/min
- Advanced diode array detection from 190-950 nm

Featured Products



Nanoflow LC System

Unsurpassed nanoflow performance and stability

- Up to 3500 time more sensitive compared to conventional LC
- Typical flow rates 0.1-1 $\mu\text{l}/\text{min}$, extendable up to 2.5 ml/min
- Compatibility with third-party MS platforms

HPLC-Chip/MS System

For reliable high sensitivity nanospray LC/MS

- Up to 3500 times more sensitive compared to conventional LC
- No peak dispersion for uncompromised chromatographic performance
- Sample preparation and separation columns, connection capillaries, fittings, and nanospray emitter integrated directly on the polymer chip



Featured Products

Preparative LC Systems

Preparative LC is the technique of choice for isolation and purification. For lowest peak dispersion, Agilent has developed dedicated preparative solutions for a range of sample quantities and flow rates, optimized for highest recovery and purity, throughput and productivity.



Featured Products



Purification Systems

- Analytical scale covering flow rates up to 10 mL/min
- Preparative scale covering flow rates up to 100 mL/min
- Automated delay volume calibration
- Integrated safety features
- Software solutions for different user needs
- Smart fraction collection based on time, peak and mass, or both



Micro Collection/Spotting System

Allows the collection of micro fractions in different well-plate formats and also provides users the advantage of combining chromatography with the power of MALDI MS by direct spotting on MALDI targets.

- Active flow control for exceptional flow stability
- Flexibility of collection in well-plates, Eppendorf tubes and MALDI targets
- Liquid control for highest reproducible collection of small volumes
- Fraction cooling prevent evaporation and thermal decomposition



Extensive LC Column and Supplies Portfolio

Maximize your performance by combining the new Agilent 1200 Series system with Agilent ZORBAX LC columns and LC supplies. Designed with the same attention to detail, quality and superior performance you have come to expect from Agilent instruments, you can count on Agilent columns and supplies to deliver the high quality results you need. See the LC and LC/MS chapter for new 1200 parts, supplies, and columns.

Featured Products



The new Agilent 6000 Series— An Expanded Commitment to LC/MS

The new Agilent 6000 Series family of LC/MS systems represents a major commitment by Agilent to LC/MS users; a commitment to create LC/MS systems that provide not only exceptional analytical performance, but also exceptional reliability and ease of use.

The 6000 Series includes new triple quadrupole and Q-TOF instruments, and improved versions of Agilent's proven ion trap, TOF, and single quadrupole instruments.

Featured Products



6510 Quadrupole Time-of-Flight LC/MS

Delivers unsurpassed Q-TOF sensitivity, and the confidence of very accurate mass measurements, in a compact, bench-top design.



6410 Triple Quadrupole LC/MS

Establishes a new standard for value in a triple quadrupole mass spectrometer; delivering outstanding sensitivity, great ease of use, and legendary Agilent reliability at a very attractive price.

Featured Products



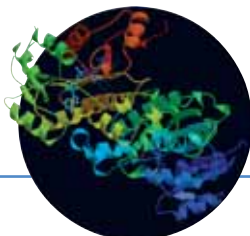
6300 Series Ion Trap LC/MS systems

A family of ultrasensitive and very reliable ion traps, with innovations like the electron transfer dissociation (ETD) for improved analysis of proteins with post-translational modifications.



6210 Time-of-Flight LC/MS

Unrivaled TOF mass accuracy, mass resolution, and dynamic range, with conveniences like automated tuning and automated, continuous introduction of a reference mass standard



Sharing proven technologies and innovations

The 6000 Series gains strength from its sharing of both proven components and groundbreaking innovations. The new 6510 Q-TOF gets its outstanding mass accuracy, resolution, and dynamic range from the high-performance TOF components proven on the 6210 TOF. The 6410 Triple Quad and 6510 Q-TOF share Agilent's innovative new high pressure, linear acceleration collision cell, which optimizes MS/MS fragmentation while eliminating cross-talk. Agilent ion sources are easily interchangeable between Agilent 6000 Series instruments.

Sources for every application

Complementing the 6000 Series LC/MS systems, Agilent offers an expansive selection of LC/MS ion sources to meet the widest range of applications and analytical requirements. Agilent ion sources use orthogonal nebulization and high-temperature, counter-flow drying gas to maximize performance, reliability, and ease of use. Recent innovations include Agilent's revolutionary multimode source that simultaneously generates ions by both electrospray and APCI—without the loss of sensitivity experienced by competing sources that have to switch between the two ionization modes.

Featured Products

Agilent Bioseparations— Lead with the experts in separations

The Agilent Bioseparations portfolio represents the leading edge in proteomic separations, including high-abundance protein fractionation with the Multiple Affinity Removal family and unprecedented protein-level separation with the mRP-C18 column and the Agilent 3100 OFFGEL Fractionator. Combine multiple techniques for the most compatible workflows and the most powerful multidimensional separations with unprecedented recovery and reproducibility.



Multiple Affinity Removal LC Columns and Spin Cartridges

The industry leader in high-abundance protein fractionation provides the Multiple Affinity Removal systems, including the Human 7 (Hu-7), High Capacity Human 6 (Hu6-HC) and the original Human 6 (Hu-6) systems, as well as the Mouse 3 (Ms-3) system.



- Detect lower-abundance proteins and peptides from biological samples such as plasma, serum and CSF
- Process large amounts of plasma with columns and spin cartridges that last for over 200 injections
- Minimize sample loss with our rapid, single-step protocols
- Shorten processing time by using high-capacity injections
- Remove albumin, IgG, IgA, transferrin, haptoglobin, antitrypsin and fibrinogen with the Hu-7 system
- Expand the dynamic range of current LC/MS and electrophoretic analytical methods

Featured Products



mRP-C18 High-Recovery Protein Fractionation Column

The mRP-C18 column provides extremely high protein recoveries, separation efficiency, loadability, and reproducibility.

- Recover >98% of proteins and peptides spanning a wide molecular weight range
- Fractionate membrane proteins with >95-98% recovery
- Achieve highly resolved, sharp peaks
- Use simple, efficient and reproducible protocols to reduce sample complexity
- Applicable to a wide variety of sample types including cell lysates, lipid rafts and membrane protein preparations



3100 OFFGEL Fractionator

The 3100 OFFGEL Fractionator provides increased sensitivity and resolving power for proteins and peptides. In addition, the fractionator promotes increased recovery and the discovery of post-translational modifications.

- Achieve high recovery & enrichment of peptides and proteins in solution
- Obtain additive-free samples with easy-to-use fractionation
- Fractionate analytical or preparative quantities of proteins or peptides
- Identify more peptides and proteins with high sensitivity & resolving power
- Acquire reproducible performance from run to run



PROTEOMICS METABOLOMICS GENOMICS INFORMATICS
GLYILEVALCYSGLUGLNALASERLEUASPARGL
CYSVALLYSPROLYSPHETRYRTHRLEUHIISLYS

Featured Products

Introducing the Agilent 7890A Series GC

Enhanced capabilities. Expanded possibilities.

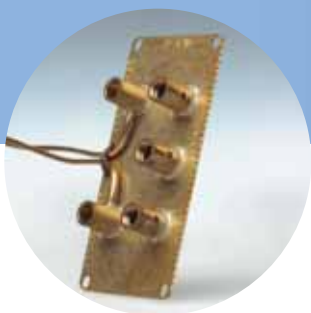
Running more samples, faster. Lowering costs by keeping columns and detectors cleaner. Generating reliable, more precise data. The Agilent 7890A Series GC platform can help you achieve all these goals and more.



With its full range of inlets, detectors, and data systems, and Agilent's reputation for performance and reliability, Agilent's 7890A Series GC represents the next generation of gas chromatography. Features include...

- Agilent gas-phase microfluidics, combined with enhanced user-friendly interfaces, makes a range of new chromatographic capabilities easier to set-up and operate.
- Faster cool-down, along with shorter post-run times with backflush, promote higher sample throughput. Faster oven ramps are available for GC/MS users.
- Real-time monitoring and diagnostics—tell you when maintenance is needed—before something goes wrong. And when you choose our scalable software option, you can monitor multiple GC systems across your entire laboratory.
- Fast and easy split/splitless inlet maintenance—minimizes your downtime.
- Electronic pneumatics controls (EPC) feature a micro-machined injection-molded design for greater reliability. Also, additional EPC channels are available to facilitate complex analyses.
- Digital electronics deliver more measurement precision.

And of course, the Agilent 7890A Series GC is backed by over 40 years of Agilent innovation, leadership, and chromatography expertise.



Agilent 7890A Series GC System

Highlights and productivity-boosting enhancements

Agilent gas-phase microfluidics devices

All devices can be used for backflush applications to shorten cycle times, reduce column maintenance, and improve data quality.

- Deans Switch (heart cutting) provides higher chromatographic resolution.
- Purged column effluent splitters allow simultaneous operation among GC detectors—including MSD.
- QuickSwap for GC/MS lets you remove columns quickly without cooling or venting.



Customized instrument control and data handling software platforms

Real-time monitoring/diagnostics software is designed to work alongside Agilent software platforms and features a range of interfaces, including maintenance videos, pop-up screen messages, e-mail status notifications, and more.

- GC Multi-Technique ChemStation increases your R&D/method development flexibility.
- GC EZChrom Elite combines ease-of-use with lab-wide QA/QC scalability.
- GC Agilent OL combines ease-of-use with Enterprise Content Management
- GC/MS ChemStation boosts your qualitative and quantitative analysis capabilities.



Agilent's industry-leading 7683B Automatic Liquid Sampler

Delivers unsurpassed injection flexibility, reproducibility, and ease-of-use.



CTC PAL sample injectors

Automate sample preparation and increase your productivity.

- Choose our versatile CombiPAL sample injector for liquid injection, headspace, and solid-phase microextraction techniques.
- Choose our economical GC PAL platform (liquid injections only) for large-volume injections, multiple vial sizes, and extended vial capacity.



G1888 Headspace Sampler with inert sample pathway

Lets you automatically introduce volatile compounds from virtually any sample matrix directly into a GC or GC/MS—without analyte degradation or loss.

Featured Products



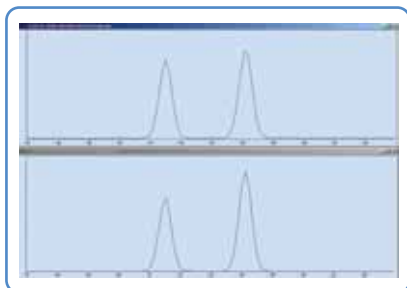
The Agilent 5975B Series MSD delivers all the performance, all the time.

30 years of innovation and leadership have led to a total GC/MS solution for your lab. The 5975B Series MSD offers fast synchronous SIM/Scan, advanced quantitative and qualitative analysis software tools and a wide range of hardware options designed to deliver optimum productivity for your lab:

- Inert ion source—superior performance for active compounds
- True hyperbolic quadrupole—maximum transmission and resolution
- Thermally stable quartz quadrupole—the proprietary quadrupole can be heated up to 200°C for long-term mass axis stability
- Quick replace electron multiplier horn—off-axis high-energy dynode (HED) detector ensures long life and ultimate sensitivity
- 0.10 u mass axis stability over 48 hours—ensures longer lasting tune and calibration stability
- Auto CI—automatic EPC reagent gas adjustment and CI tuning
- Fast scanning capability—scan rates up to 10,000 amu/sec
- Electron impact (EI) ionization with standard CI ion source—obtain EI and CI spectra from the same source
- Fast SIM—dwell time as short as 1 ms
- 1050 u mass range—extends application space for high mass compounds
- Ammonia specification for PCI/NCI—unique to the industry
- SemiQuant capability—easy and fast estimation of amount of unknown compounds



Featured Products



High-performance electronics enable fast GC/MS in full scan.

Agilent's 5975B Series MSD includes Performance Electronics to maximize signal transmission for faster GC/MS in full scan, Selected Ion Monitoring (SIM) and Synchronous SIM/Scan modes.

- Scan rates up to 10,000 u/sec—compatible with Fast GC/MS
- More efficient electronics—run Synchronous SIM/Scan without compromising performance
- More data points—for better peak integration



The Agilent 5975B Series MSD is the most highly automated Agilent MSD to date, and was designed for exceptional performance, ease of use and simplified maintenance.

QuickSwap microfluidic switch increases the flexibility of your MSD system.

- Fast column removal or replacement without the need to cool and vent the MSD
- Risk-free inlet and column maintenance by preventing air from entering the MSD
- Short analysis times and increased sample throughput by removal of high molecular weight compounds using backflushing mode



Oil-free pumps run clean and maintenance-free.

Agilent was the first GC/MS manufacturer to use the oil-free pumping technology with its rough pumps, which offers virtually maintenance-free care and the safety associated with dry pumping. There's no risk of oil leaking and of possible oil contaminations of your samples.



Updated MSD Productivity ChemStation software extends your qualitative and quantitative analysis capabilities.

- SemiQuant capability—estimate the concentration of compounds not calibrated but of importance to you or your customers
- Enhanced Data Analysis Plus—select from a set of qualitative analysis tools
- Synchronous SIM/Scan and AutoSIM—automatically convert any full scan method to a high sensitivity method
- CTC PAL Autosamplers—integrated control for increased productivity



Maximize your performance by combining the new Agilent 5975B Series MSD with Agilent columns and supplies, including new QuickSwap parts. Designed with the same attention to detail, quality and superior performance you have come to expect from Agilent instruments, you can count on Agilent columns and supplies to deliver the high quality results you deserve.

Featured Products

Make the Change to ICP-MS with Agilent

ICP-MS is widely acknowledged as the premier technique for trace metals analysis. Agilent's 7500 Series delivers the highest levels of performance, while retaining ease of use, flexibility, and reliability through automation and excellence in design. With second generation Octopole reaction System (ORS) technology and the widest range of sampling accessories, backed by the finest applications and service support, the 7500 Series leads in the way in ICP-MS. The 7500 Series is comprised of three different models to suit different application requirements.



Agilent 7500a—The Flexible Workhorse

The 7500a is a full-featured, high-performance ICP-MS with excellent matrix tolerance, high levels of automation, and exceptional ease of use. The 7500a is easily upgradeable to ORS technology, on site. The 7500a features:

- Full automation with excellent performance in routine use
- Unique nine orders dynamic range with high speed simultaneous detector
- Sample introduction system and interface designed to handle high matrix sample types including environmental, food, biomedical, petrochemical, and geological



Agilent 7500ce—Reaction Cell ICP-MS Made Routine

ORS technology makes the 7500ce the most powerful ICP-MS available. The instrument of choice for easy, ppt-level quantification in the most challenging sample matrices.

- Unique He collision mode for reliable, predictable removal of unknown matrix interferences
- Novel, off-axis ion optics and a high transmission ORS cell offer excellent sensitivity and low-ppt level quantification, even in complex matrices
- Sample introduction system and interface designed to handle high matrix sample types such as wastewater, soils, food, biomedical, petrochemical, and geological

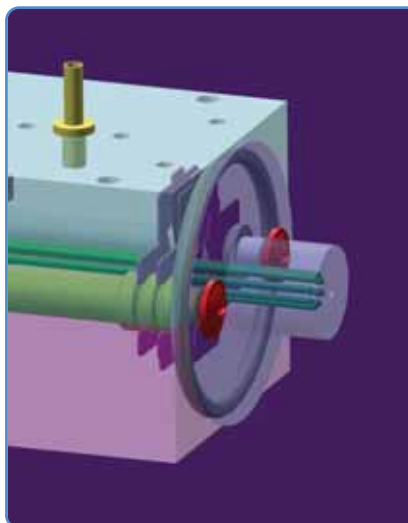
Featured Products



Agilent 7500cs—The Ultimate Semiconductor Analyzer

ORS technology extends the scope of ICP-MS for semiconductor applications.

- Ultra high sensitivity for the ultimate in detection power, featuring the ORS for removal of matrix interferences in the toughest semiconductor sample types
- Unmatched cool plasma performance with Agilent's ShieldTorch interface ensures complete flexibility for all applications
- Sample introduction system and interface designed for semiconductor use; special shipping prep and full exhaust duct for cleanroom use



Extensive ICP-MS Supplies Portfolio

Maximize your performance by combining the new Agilent 7500 Series system with Agilent ICP-MS parts and supplies. Designed with the same attention to detail, quality and superior performance you have come to expect from Agilent instruments, you can count on Agilent supplies to deliver the high quality results you need. See the ICP-MS chapter for 7500 parts and supplies.



Featured Products



Eclipse Plus

New Eclipse Plus columns provide the ultimate in performance for silica-based columns. Peak shape is excellent for the most challenging basic compounds. Because of their high level of performance, Eclipse Plus columns are the ideal first choice for method development of all samples. Available in 1.8, 3.5, and 5 μm particle sizes.

Turn to page 533.



RRHT 1.8 μm Columns

ZORBAX Rapid Resolution High Throughput Columns for ultimate speed and performance at any pressure.

Turn to page 568.



Quiet Cover

Agilent's Quiet Cover addresses the noise and inconvenience of rough pumps of Single Quad and Trap LCMS systems. The Agilent Quiet Cover was designed to house the BOC E1M18 rough pump to provide noticeable reduction in pump noise, ergonomic design, and easier routine maintenance.

Turn to page 499.



CTC Autosampler Supplies

Analysts who select CTC Analytics' autosamplers for sample preparation flexibility or high throughput now have the convenience of buying CTC's recommended consumables along with your Agilent chromatography columns and supplies. Agilent offers a portfolio of consumables recommended by CTC for the HTS PAL sample injector, GC PAL, and the popular CombiPAL GC-GC/MS sample injector to meet your application needs.

Turn to page 65.



Gold Seal

Agilent has revolutionized production of the inlet gold seal using a patent pending metal injection molding process. Unlike traditional machined inlet seals, the new format Agilent gold inlet seal has a very reproducible smooth surface, eliminating traces of machining grooves that can be the source of minute leaks reducing system sensitivity and column lifetime.

Turn to page 170.



Micro Fluidic Gas Phase Products

Increase the flexibility and productivity of your GC systems with our new Microfluidic based accessories, including the QuickSwap MSD interface for vent-free removal of columns, the Purged Effluent Splitter for inert, leak-free column effluent splitting at high temperatures, and the Deans Switch device for the analysis of complex samples by heart cutting.

Turn to page 179.

Featured Products



New 5975 Parts & Supplies

Expanded and reformatted listing of all the parts necessary to keep your 5973 or new 5975 MSD in peak operating condition.

Turn to page 216.



Non-Stick GC Inlet Liner O-rings

Only Agilent's new non-stick premium inlet liner o-rings are pre-cleaned and conditioned to eliminate out gassing contamination; plasma treated for a non-stick, contaminant-free surface; and packaged for convenience and cleanliness.

Turn to page 169.



Non-Stick Septa

Never again will you have to scrape bits of septum out of the GC inlet. Only Agilent's Premium Inlet septa have a proprietary plasma treated surface to assure a non-stick septum every time—without compromising the cleanliness and integrity of your GC system!

Turn to pages 157-158.

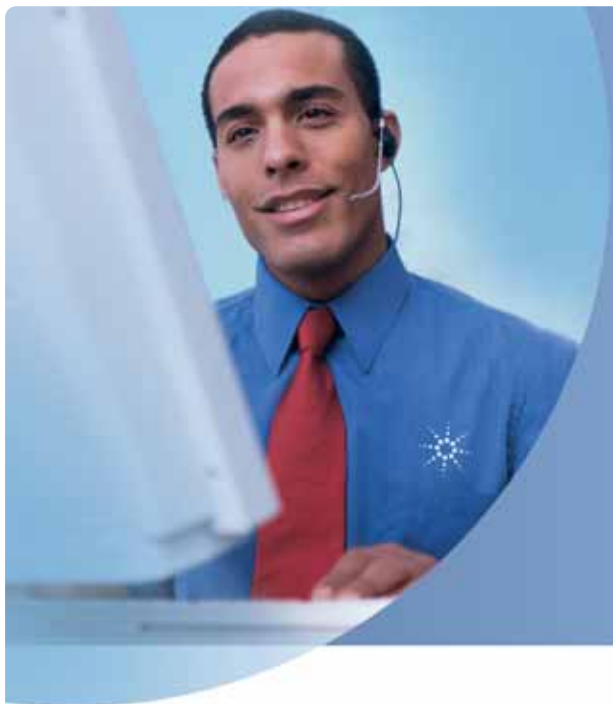


Ultimate Union

Tired of the arts and crafts required with press-fit column connectors and polyimide glue? Frustrated by leaks with metal unions once you start your temperature programmed sequences? Try our Ultimate Union for an inert easy-to-use, leak-free, high-temperature column connection.

Turn to page 175.

Agilent Service and Support



Focus on what you do best, and leave the rest to Agilent Service and Support

Every hour of every work day you have something important to do. You need to know you can count on the reliability of your instruments to keep your lab competitive and successful. Agilent Technologies' experienced service and support team is ready to help with a wide array of programs designed to maximize the performance of your instruments, minimize downtime and optimize productivity.

Preventive maintenance maximizes uptime

By regularly servicing your instruments, we can lower your instrument failure rate and raise your productivity. Agilent offers a variety of repair contract options, so you're sure to find one that fits your needs and budget.

On-Site Services

- Preventive Maintenance
- MS Ion source cleaning
- At-Your-Site Instrument Repair
- At-Your Site Instrument Repair plus Consumables
- On-Demand Repair Service (time & materials)
- Asset Maximization for instruments at end of support
- Laboratory moves and instrument relocation

Service Center Repair Services

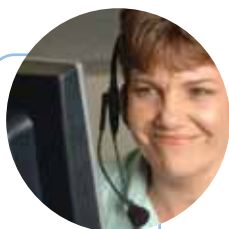
- Return-to-Agilent repair
- Return-to-Agilent with instrument loaner
- Instrument Exchange

Remote Services

- Technical phone support
- Instrument monitoring and diagnostics (See Intelligent Services)



Agilent Service and Support



Agilent service doesn't end with your instrument

Agilent also offers comprehensive options for Software and Data System Services, Laboratory Optimization Services, Consulting and Education Opportunities. Whether you need services for a few Agilent instruments, or seek a laboratory-wide solution that addresses both Agilent and non-Agilent instruments, we can provide just what you need.

- Software and Data System Services
- Lab Resource Management
- Consulting Services
- Education and Training
- Industry-focused bundles
 - Petrochemical Service Bundle
 - Pharmaceutical Service Bundle
 - Life Sciences Service Bundle



Agilent Compliance Services provide equipment qualification for every lab

Agilent has a wide range of compliance offerings that have been accepted by regulators and quality control boards for more than a decade. Whether you need Classic compliance products, designed to help automate and streamline your compliance procedures in a flexible, scalable program—or the latest in Enterprise services which streamline compliance protocols across your entire laboratory or enterprise, even covering other manufacturers' instruments—Agilent can create a program that's right for you.

- Classic Edition: The proven, safe and most convenient choice for Agilent equipment qualification
- Software Edition: Fast, accurate and comprehensive qualification for Agilent software
- Network Edition: Metrology-based qualification of your lab network infrastructure
- Enterprise Edition: The most cost-effective and flexible qualification program for your entire laboratory and enterprise
- Partner Edition: Enterprise Edition managed by you



Maximize your Agilent instruments with real-time remote monitoring and assistance

Intelligent Services are configured within Agilent's latest generation technology:

- With Push for Help, simply click on a Help button on your PC screen and an Agilent Service Professional immediately receives all the information needed over a secure internet connection to start solving your problem
- With Real-Time Collaboration, Agilent experts can diagnose and solve problems for you remotely
- With Asset Report you can view a report that gives you a real-time assessment of your instrument so that you can really understand just how effectively your resources are being used

Give your lab the freedom to focus. Trust Agilent to provide you with the service and support you need to keep your lab running at peak performance.



Technical Support at Work for You

Have a hardware, software, application, 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, call your local Agilent sales office or **1-800-227-9770** in the U.S. or Canada. You can also visit www.agilent.com/chem/techsupport for a wealth of knowledge, tips, and insight.

The Technical Support Web site features:

- Frequently Asked Questions
- Downloads and Utilities
- Installation and Maintenance Videos
- Interactive Troubleshooter
- Warranty Information
- Technical Support Contact Information



Instrument Repair Parts Questions

Instrument repair parts are not, for the most part, listed in this catalog. If you have questions about instrument repair, call **1-800-227-9770** in the U.S. and Canada. For repair parts outside the U.S., contact your local Agilent office or your authorized Agilent distributor.

Agilent Offices Worldwide

Agilent Offices Worldwide

Australia

Agilent Technologies
Australia Pty Ltd
347 Burwood Highway
Forest Hill
Victoria 3131, Australia
1-800-802-402
61-3-9210-5474

Austria

Agilent Technologies
Osterreich GmbH
Chemische Analysentechnik
Mooslackengasse 17
A-1190 Wien
01/25 125-6800
01/25 125-7365
customercare_austria@agilent.com
www.agilent.com/chem/dehome

Belgium

Agilent Technologies Belgium
S.A./N.V.
Pegasus Park
De Kleetlaan 12a Bus 12
1831 Diegem
32 (0)2 4049222
32 (0)2 6264630
customercare_belgium@agilent.com

Brazil

Agilent Technologies Brazil Ltda.
Alameda Araguaia, 1142
Barueri
Sao Paulo, SP 06455-940
0800-781405
chem_vendas@agilent.com

Canada

Agilent Technologies Canada Inc.
Life Sciences and Chemical
Analysis Group
2660 Matheson Blvd. E.
Mississauga, ON L4W5M2
514-693-3155
514-693-3170
agilent_inquiries@agilent.com

China

Agilent Technologies Co., Ltd
Room 0908-0912,
Tian Fu Lv Zhou Mansion
No 2, XiaNanDa Street
Chengdu 610012, P. R. C.
86-28-8616-5500
86-28-8616-5501

Agilent Technologies Co., Ltd
Unit 08, 66/F Citic Plaza
233 Tian He Bei Road
Guangzhou 510613, P.R.C.
86-20-8668-5500
86-20-8669-5861

Agilent Technologies Co., Ltd
12F, Hua Xin International Building;
219 Qingnian Street
Shenyang 110015
Liaoning Province, P.R.C.
86-24-23-961455
86-24-23-961460

Agilent Technologies Co., Ltd
77F Office Tower, Raffles City,
No. 268 Xi Zang Zhong Road
Shanghai 200001, P.R.C.
86-21 2301 7688
86-10 6340 3162

Agilent Technologies Co., Ltd
(China)
16F, The Exchange-Beijing,
No.118 Jian Guo Lu Yi
Chao Yang District
Beijing, 100022, P.R.C.
86-10-6564-7888
86-10-6566-9220

Denmark

Agilent Technologies Denmark A/S
Naerum Hovedgade 8
2850 Naerum
45 7013 0020
45 8 233 2865
customercare_denmark@agilent.com

Finland

Agilent Technologies Finland Oy
Linnoitustie 2B
02600 Espoo
010 855 2460
010 855 2667
customercare_finland@agilent.com

France

Agilent Technologies France S.A.S
1 Rue Galvani
91745 Massy Cedex
0810 446 446
33 (0)1 49939068
customercare_france@agilent.com

Germany

Agilent Technologies Sales &
Services GmbH & Co. KG
Hewlett-Packard-Str. 8
76337 Waldbronn
49 (0)7243 602 602
49 (0) 69 953 07 919
customercare_germany@agilent.com

Hong Kong

Agilent Technologies
Hong Kong Limited
Suites 2405-16 Cityplaza
One 1111 King's Road
Taikoo Shing, Hong Kong
852-3197-7777
852-2506-9275

India

Agilent Technologies India Pvt. Ltd
RMZ Infinity, 8th Floor
Tower B, No.3
Old Madras Road
Benaganahalli Village
Krishnarajapuram Hobli
Bangalore - 560016, India
91 80 40148700
91 80 41665120

Agilent Technologies India Pvt. Ltd
G01, Prime Corporate Park, 230/231
Next to ITC Grand Maratha Hotel
Sahar Road, Andheri (E)
Mumbai 4000099, India
91 22 30648200 / 201
91 22 30648250

Agilent Technologies India Pvt. Ltd
Plot No. 94 Gandhi Road
Parvathi Nagar, Old Perungalathur
Chennai - 600063, India
91-44-2276 1721

Agilent Technologies India Pvt. Ltd
Uma Aishwarya House, 1st Floor
No.8-2-502/1/AG, Road No.7
Banjara Hills, Hyderabad - 500
034, India
91 40 66560410
91 40 23358762

Agilent Technologies India Pvt. Ltd
Chandiwala Estate
Maa Anandmai Marg
Kalkaji, New Delhi 110 019, India
91 11 4149 6666
91 11 2682 6421

Ireland

Agilent Technologies Ireland Ltd
Silverstone House
Ballymoss Road
Dublin 18
01 605 8324
1890 924026
Customercare_ireland@agilent.com

Italy

Agilent Technologies Italia S.p.A.
Via P. Gobetti, 2/C
I-20063 Cernusco sul Naviglio MI
39 02 9260 8473
Toll free: 800 012 575
39 02 3859 1126
customercare_italy@agilent.com

Japan

Agilent Technologies Japan
Yokogawa Analytical Systems, Inc
9-1, Takakura-Cho, Hachioji-shi
Tokyo, 192-0033 Japan
81 426 609910
81 426 608676

Korea

Agilent Technologies Korea Ltd
25-12, Yoido-dong
Youngdeungpo-gu
Seoul 150-010, Korea
822-1588-5522
822-2004-5089

Agilent Technologies Korea Ltd
7F Sae-Young Bldg.
#1038-2 Ingye-dong, Paldal-gu
Suwon-Si, Kyunggi-Do,
442-834, Korea
82-31-230-2653
82-31-230-2633

Malaysia

Agilent Technologies Sales
(Malaysia) Sdn Bhd
Unit No 201, Level 2, Uptown 2;
2 Jalan SS 21/37
Damansara Uptown; 47400
Petaling Jaya
Selangor Darul Ehsan, Malaysia
(603) 7727-8808 or
1-800-88-0805
(603) 7727-1239

Mexico

Agilent Technologies Mexico
Blvd. Adolfo Lopez Mateos
2009-#202
Los Alpes
Mexico, D.F. 01010
52(55)-9171-5500
01-800-506-4800
Isca-lar@agilent.com

Agilent Offices Worldwide/Agilent Distributors Worldwide

Netherlands

Agilent Technologies
Netherlands B.V.
Startbaan 16
1187 XR Amstelveen
31 (0)20 547 2600
31 (0)20 6545748
customercare_netherlands
@agilent.com

Russia

Agilent Technologies
Kosmodamianskaya Naberezhnaya
52
Building 1
113054 Moscow

Singapore

Agilent Technologies Singapore
(Sales) Pte Ltd
1 Yishun Avenue 7
Singapore 768923
65-6377-1688
65-6822-8247

Spain

Agilent Technologies Spain S.L.
Ctra. N-VI Km 18,200
28230 Las Rozas, Madrid
901 11 68 90
901 900 559
customercare_spain@agilent.com

Sweden

Agilent Technologies Sweden AB
Kronborgsgrand 23
S-164 94 Kista
08 506 489 50
08 5199 2243
customercare_sweden@agilent.com

Switzerland

Agilent Technologies Intl. Sarl
International Sales
Rue de la Gare 29
CH – 1110 MORGES
41 21 811 3811
41 21 811 3899
myriam_novelli@agilent.com

Agilent Technologies Europe,
International Sales
39, rue de Veyrot
CH-1217 Meyrin 1
Geneva

Agilent Technologies (Schweiz) AG
Lautengartenstrasse 6
4052 Basel
0848/803560
061/2865522
customercare_switzerland
@agilent.com

Taiwan

Agilent Technologies Taiwan Ltd
25F. No. 6 Sih-Wei 3rd Rd.
Kaohsiung 802, Taiwan
886-7-535-5035
886-7-536-1329

Agilent Technologies Taiwan Ltd
8th Floor, No. 2, Sec. 1
Fushing South Road
Taipei 104, Taiwan, R.O.C.
886-2-8772-5888
886-2-8773-9003

Thailand

Agilent Technologies (Thailand) Ltd
U Chu Liang Building, 22/F Unit A, D
968 Rama 4 Road
Silom, Bangrak, Bangkok 10500,
Thailand
66-2-632-4388
66-2-632-4334

Agilent Technologies (Thailand) Ltd
267/42 Sukhumvit Road
Tambol Map Ta Phut;
Amphur Muang
Rayong 21150, Thailand
66-2-38-607708
66-2-38-607709
66-2-38-607710

UK

Agilent Technologies UK Limited
Lakeside,
Cheadle Royal Business Park
Stockport
Cheshire SK8 3GR
0845 712 5292
0845 600 8356
Customercare_uk@agilent.com

USA

Agilent Technologies,
Life Sciences and Chemical
Analysis Group
North American Sales,
Customer Contact Center
2850 Centerville Road
Wilmington, Delaware 19808
800-227-9770
302-633-8901
cag_sales-na@agilent.com

Agilent Distributors Worldwide

Argentina

Analytical Technologies
Av. Córdoba 1131 - 4° Piso.
Capital Federal
C1055AAB, Buenos Aires
(54)-11-4814-4445
(54)-11-4814-4447
info@analytical-tech.com

Omnilab
Virrey Arredondo 2850
C1426EAB, Buenos Aires
(54)-11-4553-1100
(54)-11-4555-1584
info@omnilab.com.ar

Australia

Biolab (Aust) Pty Ltd
2 Clayton Road
Clayton, VIC 3167
1300-735-297
61-3-9562-9840
analytical@aus.biolabgroup.com
www.biolabgroup.com.au/
auanalytical

Austria

Wagner & Munz Ges.m.b.H.
Mariahilferstraße 123/3
A-1060 Wien
(01) 5999 9480
(01) 5999 9489
office@wagnermunz.com
www.wagnermunz.com

Belarus

ODO Selentehnologija
Sharangovicha str. 19 -352
Minsk, 220018
375 172 59 07 77
375 172 59 09 78
selen@mail.bn.by

Belgium

VWR INTERNATIONAL bvba/sprl
Haasrode Researchpark Zone 3
Geldenaaksebaan 464
B-3001 LEUVEN
32(0)16 38 52 84
info@be.vwr.com

Bolivia

Sistemas Analíticos
Calle Barachavi 138
Santa Cruz de la Sierra
5913 351 6298
5913 311 9209
info@sistemasanaliticos.com.bo
www.sistemasanaliticos.com.bo

Bosnia & Herzegovina

Dan-Jar d.o.o. Sarajevo
Podgaj 8
Sarajevo, BiH-71000
387 33 666 412
387 33 667 242
danjar@dan-jar.hr

Brazil

Hexis Científica
Jundiaí, SP
(11) 4589-2682/2600
(11) 4589-2626
venda@hexis.com.br
www.hexis.com.br

Sovereign
São Paulo, SP
(11) 3838.2499
(11) 3838.2498
vendas@sovnet.com
www.sovnet.com

Bulgaria

Team Ltd.
71-73 Totleben blvd, 7th floor
Sofia, 1606
359-2-951-6883
359 2 954 9212
team_cag@team-cag.com

Canada

Chromatographic Specialties Inc.
P.O. Box 1150,
300 Laurier Blvd.
Brockville, Ontario K6V 5W1
(613) 342-4678
sales@chromspec.com
www.chromspec.com

VWR International
2360 Argentinia Road
Mississauga, ON L5N 5Z7
(908) 788 5550
solutions@vwr.com
www.vwrsp.com

Agilent Distributors Worldwide

Chile

Analitica Weisser
Marathon N° 2849, Macul
CP 413 - Correo 11
Santiago
(562)-237 3100
(562)-237 3404
analitica@analitica.cl

China

Beijing Bafang Century
Technologies Ltd
Room 1106, Bldg 7
#68 Wan Quan He Road,
Haidian District
Beijing 100086
86-10-82656500
86-10-8265-6517

Beijing Haidian Chaosheng
Technology Development Co
B1906, CaiZhi International Tower
#18 Zhongguancun East Road,
Haidian
Beijing 100083
86-10-82600156
86-10-8260-0160

Guangzhou Dexiang Technology Ltd
Unit 2003, Goldlion Tower
138 Ti-yu Road East
Guangzhou 510520
86-20-38781378
86-20-38781383

LWL-AGI (Beijing) Co Ltd
Room 1008-1009 South Building
New World Centre,
Chongwenmenwai Da Jie
Beijing 100062
86-10-67081764
86-10-67081768

Shanghai Joy-Way Trade &
Development Co Ltd
8/F, Bo Ai Building
758 Nan Jing Road(W)
Shanghai 200041
86-21-62170333
86-21-62178800
joywaychem@vip.sina.com

Shenyang Yuanzhu Teaching
Instruments Co Ltd
Room 1103,
Dong Bei Guo Shi Building
No. 71 Chong Shan East Street,
Huang Gu District
Shenyang, Liaoning Province
110032, P.R.C.
86-24-86274115
86-24-86274115

Colombia

Khymós LTDA
Carrera 20 No. 86A-35
Oficina 201
Bogotá D.C.
(571) 691 3111
(571) 617 0403
info@khymos.com

Costa Rica & Honduras

Orgoma S.A.
Barrio El Carmen de Paso Ancho
el Buen Precio 175m al este
CP177-2350 San José
(506) 226 0962
(506) 226 0408
Ogonzalez@orgoma.com

Croatia

Dan-Jar d.o.o.
Pazinska 31
Zagreb, 10110
385 1 550 22 00
385 1 550 22 99
danijel.jeric@dan-jar.hr

Czech Republic

HPST, s.r.o
Pisnicka 372/20
Praha 4, 14200
420 244 001 231
420 244 001 235
info@hpst.cz

Ecuador

Fielquimec Cia Ltd.
Pablo Casals, Pasaje 2 # E2-35
Ciudadela El Labrador
Quito
(5932) 240-2601
(5932) 240-1647
fielquim@interactive.net.ec

Egypt

AGITECH Arabian Group for
Integrated Technologies
54 Abd El-Monem Riyad St.
Mohandseen, Giza - Cairo 12411
202 345 0353
202 345 4408
info@agitech.com.eg

El Salvador

Servicios Técnicos de Ingeniería
S.A. de C.V.
79 Ave. Norte y 7a.
Calle Pte. # 4051
Col. Escalón, San Salvador
503-2264-4713
503-2263-3734
aguerra@setisa.com.sv

Estonia

Quantum Latvia Ltd
Balta str 3/9
Riga 1055
371 74 72 926
371 74 72 939
quantum@quantum.lv

Finland

Tamro Medlab Oy
P.O. Box 11
Rajatorpantie 41 B FIN-01641
Vantaa
358 20 445 3802
medlab.asiakaspalvelu@tamro.com

France

CHROMOPTIC SAS
La maison des Services
Avenue des 2 Lacs
F-91971 COURTABOEUF Cédex
01 69 31 41 65
01 60 14 46 92
chromoptic@wanadoo.fr

INTERCHIM
213 avenue Kennedy
BP 1140
F-92110 CLICHY
01 41 32 34 40
04 70 03 82 60
interchim.paris@interchim.com

Georgia

Progresi XXI
Chavchavdze Ave 3, room 103
Tbilisi, 0128
995 32 913369
bchankvetadze@yahoo.com

Germany

Duratec Analysentechnik GmbH
Rheinauer Str. 4
D-68766 Hockenheim
+49 (0)6205 9450-0
+49 (0)6205 9450-33
info@duratec.de
www.DURATEC.de

GGA GmbH
Glaswaren, Geräte- und
Analysentechnik GmbH
Carl-Zeiss-Strasse 49
47445 Moers
+49 (0)2841 9871-300
+49 (0)2841 9871-333
gga@gga.de
www.gga.de

Omnilab-Laborzentrum
GmbH & Co. KG
Abt. OCS
Robert-Hooke-Str. 8
28359 Bremen
+49 (0)421 17599 - 351
+49 (0)421 17599 - 350
info@omnilab.de
www.omnilab.de

Wagner & Munz GmbH
In der Rosenau 4
81829 München
+49 (0)89 451023-0/18
+49 (0)89 451023-33
office@wagnermunz.com
www.wagnermunz.com

Greece

Hellamco S.A.
7, Marathonos Str.
Chalandri
Athens, 152.33
30-210-689-52-60
30-210-680-16-72
info@hellamco.gr

Guatemala

IPESA
9a Calle 15-45 Zona 13
Edificio Plaza Trafalgar
Guatemala 01013
(502) 2384-8181
(502) 2384-8111
marvin_velasquez@ipesa.com

Hong Kong

Tegent Technology Ltd
Rm 2103-2105 Westin Centre
26 Hung To Road
Kwun Tong
852-27592182
852-27583830
tegent@netvigator.com

Hungary

Kromat Kft.
Siraly u. 3.
Budapest, 1124
36-1-248-2110
36 1 319-8547
gabor.komar@kromat.hu

India

LCGC Chromatography Solutions
Pvt Ltd
LCGC Towers,
161/166 Paigah Colony
Off S.P. Road,
behind Anand Theater
Hyderabad 500 003
91-40-55315242
91-40-55329000

Agilent Distributors Worldwide

Indonesia

PT Berca Niaga Medika
Gedung Berca 1st Floor
JI Abdul Muis No. 62
Jakarta 10160
62-21-351-8826
62-21-351-8832

Ireland

Carl Stuart Ltd.
Tallaght Business Park
Whitstown
Dublin, 24
01 452 3432
01 452 3967
agilent@carlstuart.com
www.carlstuart.com

Israel

Eldan Electronic Instruments Ltd.
6 Hashiloach street
Petach Tikva, 49170
972-3-902-1330/209
972-3-9030-631
bensl@eldan.biz

Italy

Analitica S.a.s.
Via Putignano km. 1,450
C.P. 130
I-70023 Gioia del Colle BA
0039 080 3481248
0039 080 3431334
info@analiticaweb.it
www.analiticaweb.it

C.P.S. Analitica S.r.l.
Via Neera 8/A
I-20141 Milano MI
0039 02 8954201
0039 02 89542022
cps@cps.it
www.cps.it

D.T.O. Servizi S.r.l.
Viale Viareggio 34/E
I-30038 Spinea VE
0039 041 997234
0039 041 991727
info@dtoservizi.it
www.dtoservizi.it

Stepbio S.r.l.
Via Paolo Nanni Costa 12/3 e-f
I-40133 Bologna BO
0039 051 634 3340
0039 051 634 3332
stepbio@stepbio.it
www.stepbio.it

Japan

Asahi Denki Co., Ltd.
3-7-10, Oimatsu-cho
Kurashiki-shi, Okayama, 710-0826
086-422-5711
086-426-9332
kanribu@asahi-mie.co.jp
www.asahi-mie.co.jp

GL Sciences, Inc.
22-1 Nishishinjuku 6-chome
Sinjuku-Ku, Tokyo, 163-1130
03-5323-6620
03-5323-6621
world@glsc.co.jp
www.glsc.co.jp

Kinryo Electric Co., Ltd.
3-3-11, Niitaka
Yodogawa-ku
Osaka-shi, Osaka, 532-0033
06-6394-1161
06-6394-5250
www.kinryo-electric.co.jp

Kyoritsu Electric Corporation
61-1, Nakatahon-cho
Shizuoka-shi, Shizuoka, 422-8686
054-285-4400
054-285-1105
webmaster@mail.kdwan.co.jp
www.kdwan.co.jp

Miwa Electric Industrial Corporation
14, Oonoda aza motofukuro
Taihaku-ku
Sendai-shi, Miyagi, 982-0014
022-249-8104
022-248-1282
www.miwadenko.co.jp

Nishikawa Keisoku Co., Ltd.
Mita43MT Building
3-13-16, Mita
Minato-ku, Tokyo, 108-8321
03-3453-1331
03-3453-3994
webmaster@nskw.co.jp
www.nskw.co.jp

SHIMADZU GLC Ltd.
2-7-1 Taito
Taito-ku, Tokyo, 110-0016
03-5812-3821
03-5812-3827
https://solutions.shimadzu.co.jp/glc/

Shinkawa Electric Co., Ltd.
8-6, Takeya-cho
Naka-ku
Hiroshima-shi,
Hiroshima, 730-0048
082-247-6447
082-247-4851
www.shinkawa.co.jp

Taiyo Corporation
2074, Ooaza uenomuro
Tsukuba-shi, Ibaraki, 305-0023
029-857-2452
029-857-4629
bunseki@taiyo.co.jp
www.taiyo.co.jp

Tokyo Denki Sangyo Co., Ltd.
1211, Murata-cho
Nakamura-ku
Chiba-shi, Chiba, 260-0825
043-300-8618
043-208-5803
webmaster@tokyo-densan.co.jp
www.tokyo-densan.co.jp

Yokogawa & Co., Ltd.
7-336, Kasumori-cho
Nakamura-ku
Nagoya-shi, Aichi, 453-0855
052-471-7124
052-461-0279
webadmin@ycl.yokogawa.co.jp
www.yokogawa.co.jp/YCL/

Yokogawa Denyo Corporation
17-38, Okui-cho
Toyama-shi, Toyama, 930-0846
0764-41-1831
0764-41-1983
webinfo@ydy.co.jp
www.yokogawa.co.jp/YDY/

Jordan

AGITECH Arabian Group
for Integrated Technologies
54 Abd El-Monem Riyad St.
Mohandseen, Giza – Cairo 12411
202 345 0353
202 345 4408
info@agitech.com.eg

Kazakhstan

Dicosta Technologies
111, Kabanbai-Batyr Street
Almaty, 480012
7-3272-58-20-20
7-3272-58-35-05
alexander_serazetdinov@cs.kz

Korea

Young In Scientific Ltd
Young Hwa Bldg
547 Shinsa-Dong, Kangnam-Ku
Seoul 135 120
82-2-519-7300
82-2-5197400

Young Wha Scientific Co Ltd
5F Gu-Jung Bldg
577-7, Shinsa-dong, Gangnam-Gu
Seoul 135 891
82-2-2140-5400
82-2-2140-5405

Latvia

Quantum Latvia Ltd
Balta str 3/9
Riga, 1055
371-74-72-926
371-74-72-939
quantum@quantum.lv

Lebanon

Technoline Sal
SAR Building, 6th & 10th Floors
Fouad Chehab Str., Sin-EI-Fil
Beirut
961-1-50-27-77
961-1-48-17-77
technoline@lynx.net.lb

Lithuania

Lokmis JSC
Naugarduko 68B
Vilnius, 03203
370-5-215-1895
office@lockmis.lt

Macedonia

DSP Chromatography
Bulevar AVNOJ-a 166/1
11070 Belgrade, Serbia
381 11 260 70 20
381 11 260 70 20
darko@dsp-c.co.yu

Malaysia

IT Tech Research (M) Sdn Bhd
17A, Jalan USJ 16/2F
UEP Subang Jaya
Selangor D.E.
6-03-8025-9161
6-03-8025-9163
sales@ittech.com.my
www.ittech.com.sg

Mexico

ABC Instrumentacion Analitica
Tigre 33
Col. Actipan del Valle Mexico D.F.
52 55 5524-2208
52 55 5534-4107
carlos_fragoso@abcia.com.mx

Analitek
Lomas de los Pinos 5505^a
Col. Estanzuela, Monterrey N.L.
52-81-81040267
andres.ferrara@analitek.com

Agilent Distributors Worldwide

Moldova

Laco Alfatec SRL
23, 63 M.Kogalniceanu str. Off.23
Chisinau, MD-2014
373-22-77 25 75
373-22-76 37 11
laco@cni.md

Morocco

Sobovat Sarl
185 rue Oussama Ibnou-Zaid
Maarif
Casablanca
212-22-23-01-85/98
212-22-98-18-80
sobovat@menara.ma

Netherlands

VWR International B.V.
Postbus 8198
1005 AD AMSTERDAM
(31) 020 480 84 00
(31) 020 480 84 80
info@nl.vwr.com

New Zealand

Biolab Ltd
244 Bush Road
Albany, Auckland
64-9-980-6700
64-9-980-6788
peter.hermans@nzl.biolabgroup.com

Nigeria

MIS Co Ltd
3, Gerrard Road
Ikoyi
Lagos
234-1-269-3421/23/24
234-1-269-3419/2755
taiwo_elegbede@misnigeria.com

Norway

Matriks AS
Forskningsparken
Gautstadalleen 21
Oslo, 0349
47-815-32-560
47-2295-8560
post@matriks.no

Pakistan

H A Shah and Sons
Office No. 11, 3rd Floor
109-W, Sardar Begum Plaza
Jinnah Avenue,
Blue Area, Islamabad
92-51-227-3557
92-51-227-2743
wb@hashah.com

Panamá

Prodima S.A.
San Miguelito
Calle 1a. Monte Oscuro (Final)
Panamá 4, P.O Box 0815-00038
507) 2-210-566
(507) 2-243-819
grupo-analitica@prodima.com.pa

Paraguay & Uruguay

ASM
Av. Brasil 2815 Apto. 603
11300 Montevideo Uruguay
(598 2) 709-6955
(598 2) 709-6955
info@asm.com.uy

Peru

Grupo Tecnológico del Peru
Av. Paseo de la República
6188-Miraflores
Lima 18 - Peru
(511)-2420-111
(511)-4473-756
lrobles@gtp.com.pe

Philippines

Edward Keller (Philippines) Inc
Carmelray Industrial Park 1
Canlubang, Calamba
4028 Laguna
63-2-864-1600
63-2-8641696

Poland

Perlan Technologies Polska Sp.Z.o.o.
Pulawska 303
Warsaw, 02-761
48 22 5491 400
48 22 5491 401
klient@perlan.com.pl

Portugal

Soquimica
Rua Coronel Santos Pedroso, 15
Lisboa, 1500
35 121 716 51 60
35 121 716 51 69
informacoes@soquimica.pt
www.soquimica.pt

Romania

Agilrom Scientific S.R.L.
Aleea St.O. Iosif nr. 4
Bl. M54, Sc.1 Et 7, Ap 79, Sector 3
Bucaresti, 031034
40-21-327 36 48
40-21-327-36-88
office@agilrom.ro

Russian Federation

Interlab Inc.
1 Vadkovsky per.
Moscow, 127055
7-495- 788-0983
7-495-755-7761
interlab@interlab.ru

Serbia & Monte Negro

DSP Chromatography d.o.o.
Bulevar AVNOJ-a 166/1
Belgrade, 11070
381 11 260 70 20
381 11 260 70 20
darko@dsp-c.co.yu

Singapore

IT Technologies Pte Ltd
10 Bukit Batok Crescent
#08-01/02 The Spire
Singapore 658079
65-6897-0626
65-6897-0627
vimala@ittech.com.sg
www.ittech.com.sg

Slovakia

Hermes LabSystems s.r.o.
Puchovska 12
Bratislava, 83106
421-2-4920 6938
421-2-4488 8546
hermes.plus@hermes-plus.sk

Slovenia

CHEMASS d.o.o.
Baznikova 40
Ljubljana, 1000
386-1-427-7560
386-1-427-7560
miran.zalec@chemass.si

South Africa

Chemetrix (Pty) Ltd
400 16th Road
Block J, Central Park; Midrand
Johannesburg, 1685
27-11-541-98-01
27-11-541-9802
brucef@chemetrix.co.za

Spain

Andaluza de Instrumentación, S.L.
Pol. Industrial Oeste
Parcela 21/1
30169 San Ginés, Murcia
34 968 80 91 62
34 968 89 13 22
pqm@proquimur.com
www.andaluza.com

Anorsa
Ctra. del Mig 99-101, 1ºB
08907 L
34 933 00 60 50
34 933 00 60 12
anorsa@anorsa.com
www.anorsa.com

Proquinorte, S.A.
Alameda de Urquijo, 87
48013 Bilbao
34 944 42 33 50
34 944 41 68 73
proquinorte@proquinorte.com

Serviquimia, SA
Pol. Ind. de Constantí
Dinamarca (lado del mar)
43120 Constantí, Tarragona
34 902 201 002
34 977 524 478
serviquimia@serviquimia.com
www.serviquimia.com

Suministros Generales para
Laboratorio S.L. (SGL)
Sancho de Ávila, 89 - Bajos B
08018 Barcelona
34 93 356 81 71
34 93 356 81 70
sglab@sglab.net
www.sglab.net

Sri Lanka

Techno Instruments Private Limited
No. 25 Rajawatte Terrace
Siebel Avenue
Colombo 00500, Sri Lanka
94 11 2820194
94 11 4300445
techno_2@diamond.lanka.net

Sweden

Dalco ChromTech AB
Box 174
Besöksadress Tingsvägen 19
191 24 Sollentuna
08 5949 6969
08 5949 6968
info@dalcochromtech.se
www.dalcochromtech.se

Scantec Lab AB
Box 238
433 63 Sävedalen
031 - 336 90 00
031 - 336 90 36
scantec.info@scanteclab.se
www.scanteclab.se

Agilent Distributors Worldwide

Switzerland

Milian S.A.
11, Rue Emma-Kamacher
Box 377
CH-1217 Geneva-Meyrin 1
41 (0) 22 884 16 00
41 (0) 22 884 16 16
milian@milian.com
www.milian.com

Taiwan

Great Engineering
Technology Corp
14F, No. 392, Yucheng Road
Zuoying District
Kaoshiung City 813, Taiwan
886-7-5507380
886-7-5507480
www.getech.com.tw

Thailand

Worldco Co. Ltd
63/3 Arun-Amarin Road
Arun-Amarin, Bangkoknoi
Bangkok 10700
66-2434-0130
66-2433-8692
worldco@truemail.co.th

Trinidad & Tobago and Caribbean Islands

Analogic Solutions Ltd
Suite 1B, Stanmore Court
21 Stanmore Avenue
Port of Spain, Trinidad
(868)-627-1900
(868)-627-1901
analogic@tstt.net.tt
www.analogicsolutions.com

Tunisia

Precision Electronique
Centre Urbain Nord
Immeuble A16
Tunis, 1003
216-7-1-750-850
216-7-1-230-700
ajmi.haouala@tunelec.com.tn

Turkey

Sem Laboratuar Cihazlari Paz. San.
ve Tic. A.S.
Kozyatagi Mahallesi, Saniye
Ermutlu sokak
S.as,maz Plaza. No : 4 Kat : 2
Kadikoy - Istanbul, 34742
90 216 571 02 00
90 216 571 02 02
mehmet.balci@semmlab.com.tr

UK

Crawford Scientific Ltd
Holm Street, Strathaven
Lanarkshire, ML10 6NB
44 (0)1357 522961
44 (0)1357 522168
enquiries@crawfordscientific.com
www.crawfordscientific.com

HiChrom Ltd.
1 The Markham Centre
Station Road Theale
Reading Berkshire, RG7 4PE
44 (0)118 930 3660
44 (0)118 932 3484
sales@hichrom.co.uk
www.hichrom.co.uk

Metlab Supplies Ltd.
Unit 7, Glendale Ave
Sandycroft, Deeside
FLINTSHIRE, CH5 2QP
44 (0)1244 526 300
44 (0)1244 526 301
sales@metlabsupplies.co.uk
www.metlab.co.uk

Ukraine

NPVF "ALSI"
Str. Shovkunenko 8/20, ap.51
Kiev, 03049
380-44-246-10-40
380-44-246-10-40
andrey_esaulenko@alsi.kiev.ua

United Arab Emirates

Gulf Bio Analytical Corp.
Near Caterpillar Round About
Al Gussais, Industrial Area III
Dubai
971 4 26 71 888
971 4 26 70 990
sales@gulfbioanalytical.com

USA

CCS Inc.
452 Alverio Street Roosevelt
Extension
Hato Rey, P.R. 00918
787-633-5142

Chrom Tech Inc.
5995 149th St., Suite 104
Apple Valley, MN 55124
(952) 431-6000
sales@chromtech.com
www.chromtech.com

Drachrom
1905 Gracewood Drive
Greensboro, NC 27408
(336) 282-5836
info@drachrom.com
www.drachrom.com

Fox Scientific
8221 EFM 917
Alvarado, Texas 76009
800-369-5524
www.foxscientific.com

Government Scientific
Source, Inc., (GSS)
12351 Sun Valley Drive
Reston, VA 20191
(800) 248-8030
sales@govsci.com
www.govsci.com

Krackeler Scientific
P.O. Box 1849
Albany, NY 12201
800-334-7725
518-462-6011
office@krackeler.com
www.krackeler.com

Neta Scientific
704 East Main Street
Suite H
Moorestown, NJ 08057
877-415-5658
winfred@jas-usa.com

P.J. Cobert Associates, Inc.
2302 Weldon Parkway
St.Louis, MO 63146
800-972-4766 or (314) 993-2390
cobert@cobertassoc.com
www.cobertassoc.com

Resolution Systems
590 East 32nd Street
Holland, MI 49423-5376
800-572-6653
info@resolutionsys.com
www.resolutionsys.com

Thomas Scientific
1654 High Hill Road
Swedesboro, NJ 08085
800-345-2100
www.thomassci.com

VWR International
1310 Goshen Parkway
West Chester, PA 19380
(800) 932-5000
solutions@vwr.com
www.vwr.com

Uzbekistan

Fortek
28, Katartal str. Floor 7
Tashkent, 700135
998 71 173 93 01
998 71 173 93 02
Rustam@fortek.uz

Venezuela

GRUPO PROD&KHYM, S.A.
3ra. Transversal
de Los Ruices Norte
Edificio Segre: Piso 3; Ala Sur
Caracas Venezuela 1071
58 212-237.36.22
58 212-237.80.36
ventas.gpk@prodkhym.com

Vietnam

Tramat Co Ltd
12 Hang Duong Street
Hanoi
84-4-828-1631
84-4-825-1746
tramat@hn.vnn.vn

General Chromatography

Vials, Caps and Septa.....	30-54
<i>General Information</i>	30-32
<i>Screw Top Vials, Caps, Septa and Kits</i>	32-36
<i>Crimp Top Vials, Caps and Kits</i>	37-41
<i>Snap Top Vials, Caps and Kits</i>	40-42
<i>Microvolume Inserts for Wide Opening Vials</i>	43
<i>8-425 Screw Top Vials, Caps, Septa and Inserts</i>	44-45
<i>Microvolume Inserts for 2 ml, 8-425 Screw Top Vials</i>	46
<i>LC Vials, Caps and Septa</i>	47
<i>4 ml Screw Top Vials, Caps and Septa</i>	48
<i>Headspace Crimp Top Vials, Caps, Septa and Kits</i>	49-51
<i>General Purpose Sample and Storage Vials</i>	52
<i>Crimping and Decapping Tools, Racks</i>	53-54
Syringes.....	55-62
<i>Autosampler Syringes</i>	56-58
<i>Manual Syringes</i>	59-62
CTC Analytics Autosampler Supplies.....	63-68
<i>CTC Autosampler Supplies for GC and GC/MS</i>	63-64
<i>CTC Autosampler Supplies for LC and LC/MS</i>	65-67
<i>CTC Autosampler General Supplies</i>	68
Gas Management.....	69-104
<i>Introduction</i>	69-71
<i>Moisture Traps</i>	72-75
<i>Oxygen Traps</i>	76-77
<i>Hydrocarbon Traps</i>	78-80
<i>Combination Traps</i>	81-84
<i>Gas Purification Systems</i>	85-92
<i>Gas Purifier Accessories</i>	93
<i>GC Installation Kits</i>	94-95
<i>Flowmeters</i>	96-102
<i>Regulators, Tubing and Accessories</i>	103-104
Fittings and Tools.....	105-114
<i>Fittings</i>	105-108
<i>Tools</i>	109-114
Chemical Standards.....	115-122
<i>LC and LC/MS Standards</i>	115-116
<i>CE and UV-Vis Standards</i>	117-118
<i>GC Column Test Standards</i>	119
<i>GC and GC/MS Standards</i>	120-122
Integrators, Integrator Supplies, and Cables.....	123-127



General Supplies

Making your chromatography lab more productive, day after day

With Agilent supplies and accessories, the difference is in the details. All our products have been engineered or selected by our instrument design teams, manufactured to our demanding specifications, and tested under a variety of conditions. This painstaking care—registered to ISO 900—ensures that every part will perform at optimal levels.

On the following pages, you will find the staples—including manual and autosampler syringes, hardware, caps, and vials. All reflect over four decades of Agilent chromatography, application, and standards knowledge. You will also find gas-management supplies, such as purifiers, regulators, flow meters, and leak detectors.



Vials, Caps and Septa



Vials, Caps and Septa

Prevent unexpected sequence problems with Agilent certified vials, caps and septa

Don't let the least expensive part of the sequence become the biggest cause of failed analysis. Agilent's certified vials are manufactured with the same high-quality design, technical expertise, and exacting specifications that go into every Agilent instrument.

Agilent certified vials are manufactured to exacting specifications. Every order of certified vials, caps, and septa comes with a test certificate confirming product specifications.

The following Agilent products are certified:

- Screw Top Vials, Caps, Septa and Kits
- Crimp Top Vials, Caps, Septa and Kits
- Snap Top Vials
- Headspace Crimp Top Vials

Statements on the Certified Vial Certificate

- Compatible with Agilent autosamplers
- Made from first hydrolytical class, borosilicate glass type 1
- Manufactured in a ISO 9001 certified environment
- 100% automated computerized video imaging to test critical dimensions, including vial finish, outer diameter, body OD, and length
- Packed in a clean environment and with packaging especially designed to reduce contamination
- Compliant with requirements of U.S. and European Pharmacopoeia

Certified Caps and Septa

- Designed and fabricated for proper sealing and trouble-free operation with Agilent instruments
- Manufacturing SOPs monitored stringently for consistent quality and full traceability
- Chromatographic test on silicone septa for purity to eliminate outliers and sample errors

The following Agilent products will be certified in the future:

- Snap Top Caps
- Standard Opening Screw Top Vials (8-425)
- 4 mL Screw Top Vials, Caps and Septa
- 6 mL Vials, Caps and Septa
- General Purpose Sample and Storage Vials
- Microvolume Inserts

Vials, Caps and Septa

Type of closure

- Crimp top vials, screw top vials or snap top vials
- While crimp tops are the least expensive, they need a crimping tool and the caps are not reusable. Screw top vials are the perfect alternative for reusability and low evaporation.

Type of glass or polypropylene

- Clear or amber glass, polypropylene vials
- If your sample is light sensitive, you may choose amber glass
- For most applications, standard clear glass is sufficient
- For samples that may stick to glass or chemically react with glass, use polypropylene

Deactivated/non-deactivated

- For samples that interact with the highly polar silanol groups on the glass surface, a deactivation procedure is performed on the vials.

Need for inserts

- Flat or conical with polyspring
- If you only have a small amount of sample, you may choose to place a limited volume insert inside the vial or choose micro sampling vials like High Recovery
- Polyspring at the bottom of the conical insert keeps it aligned for proper injection

For the up-to-date information on Agilent Certified Vials, Caps and Septa, visit www.agilent.com/chem/vials.

Autosampler Compatibility Chart

Autosampler	Model
Agilent Technologies	All Models except CE, that cannot be pressurized
Beckman	501, 507
Dynatech	42 Vial Tray, LC 2000
Finnigan	A200S
Fisons	AS 800
Gilson	231-401, 232-402, 201/202, 221/222, Aspec
Hewlett-Packard	All Models except CE
Hitachi	AS-2000, AS-4000
L.E.A.P.	A200S, CTC PAL
LDC	Marathon, Promis
Perkin-Elmer	4900, Integral 4000, Autosystem GC, ISS 100/ISS 200, LC 600 42-Tray
Spark	Marathon/Promis, SPH 125
Spectra-Physics	SpectraSystem, 8875/8880
Varian	8100/8200, 8035/9095, 8000, Marathon, Vista
Waters	2690, Alliance Systems

Vials

Screw Top Vials

Septum Selection Guide

Septum Material	Compatible with	Incompatible with	Resealability	Max. Temperature
Rubber (Natural or Butyl)	ACN, acetone, DMF, alcohols, diethylamine, DMSO, phenols	Chlorinated solvents, aromatics, hydrocarbons, carbon disulfide	Excellent	< 100°C
PTFE/Natural or Butyl Rubber	PTFE resistance until punctured, then septa or liner will have compatibility of rubber		Good	< 100°C
Silicone/Silicone Rubber	Alcohol, acetone, ether, DMF, DMSO	ACN, THF, benzene chloroform, pyridine, toluene, hexane, heptane	Excellent	< 200°C
PTFE/Silicone, PTFE/Silicone/PTFE	PTFE resistance until punctured, then septa will have compatibility of silicone		Average	< 200°C
VITON	Chlorinated solvents, benzene, toluene, alcohols, hexane, heptane	DMF, DMSO, ACN, THF, pyridine, dioxane, methanol, acetone	Good	<260°C



Screw Top Vials, Caps, Septa and Kits

Combine the excellent autosampler handling of a crimp cap profile with the ease of a screw cap. The screw caps and precision fit septa give a secure seal with the microvolume inserts.

- 2 ml, 12 x 32 mm
- 40% larger opening than standard narrow opening vials
- Unique thread design for consistently secure seal (9 x 425)
- Precision-formed neck for optimal robotic arm handling
- Rigorous quality assurance for dimensional consistency from lot to lot
- Uniformly flat bottom ensures compatibility with inserts
- Optional ceramic write-on spot with fill marks
- Select from several compatible micro-volume inserts



5182-0714, 5182-0715, 5182-0716

2 ml Wide Opening Screw Top Glass Vials

Versatile 2 ml, 12 x 32 mm wide opening vials for autosamplers with rotating or robotic arm trays.

Description	Unit	Part No.
Clear	100/pk	5182-0714
Clear, write-on spot	100/pk	5182-0715
Amber, write-on spot	100/pk	5182-0716
Clear	1000/cs*	5183-2067
Clear, write-on spot	1000/cs*	5183-2068
Amber, write-on spot	1000/cs*	5183-2069

*Case includes 10 packs of 100 vials

Vials

Screw Top Vials, Caps and Septa



5183-2070, 5183-2071, 5183-2072

2 ml Deactivated Wide Opening Screw Top Glass Vials

These wide opening 2 mL, 12 x 32 mm vials are created using a deactivation process to eliminate sample interactions. Ready-to-use for the analysis of polar compounds such as phenols, proteins, antibodies, amines, metabolites, herbicides and pesticides.

Description	Unit	Part No.
Clear, silanized	100/pk	5183-2070
Clear, write-on spot, silanized	100/pk	5183-2071
Amber, write-on spot, silanized	100/pk	5183-2072

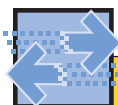


5183-2030, 5183-2073

1.5 ml Wide Opening Screw Top High Recovery Glass Vials

Wide opening, 1.5 mL vials with 30 μ L reservoir. For sample concentration and injection without transferring to microvolume inserts.

Description	Unit	Part No.
Clear	100/pk	5183-2030
Amber, write-on spot	100/pk	5183-2073



Product Finder

To view our diverse line of microvolume inserts, turn to page 43.

Vials

Screw Top Vials



5182-0717, 5182-0718, 5182-0719

Polypropylene Screw Caps with Integrated Septa

These precision-fit septa provide an evaporation proof seal. (See the Septum Selection Guide to choose the septum best suited for your application.)

Description	Unit	Part No.
Blue, PTFE/red silicone rubber septa*	100/pk	5182-0717
Green, PTFE/red silicone rubber septa*	100/pk	5182-0718
Red, PTFE/red silicone rubber septa*	100/pk	5182-0719
Black, PTFE/red silicone rubber septa*	100/pk	5185-5838
Blue, PTFE/silicone septa	100/pk	5182-0720
Green, PTFE/silicone septa	100/pk	5182-0721
Red, PTFE/silicone septa	100/pk	5182-0722
Blue, PTFE/silicone/PTFE septa	100/pk	5182-0723
Blue, Pre-slit PTFE/silicone septa	100/pk	5183-2076
Green, Pre-slit PTFE/silicone septa	100/pk	5183-2077
Red, Pre-slit PTFE/silicone septa	100/pk	5183-2078
Green, PTFE/silicone/PTFE septa	100/pk	5182-0724
Red, PTFE/silicone/PTFE septa	100/pk	5182-0725
Blue polypropylene cap, Bonded PTFE/silicone septa	100/pk	5185-5823
Blue polypropylene cap, Bonded pre-slit PTFE/silicone septa	100/pk	5185-5824
Blue, PTFE/red silicone septa	500/pk	5185-5820
Green, PTFE/red rubber septa	500/pk	5185-5829
Blue, PTFE/silicone/PTFE septa	500/pk	5185-5862
Green, PTFE/silicone/PTFE septa	500/pk	5185-5861
Blue, PTFE/silicone septa	500/pk	5185-5863
Green, PTFE/silicone septa	500/pk	5185-5864
Blue, Pre-slit PTFE/silicone septa	500/pk	5185-5865

*Commonly referred to as "red rubber"

Polypropylene Screw Caps with Bonded Septa

Bonded caps combine innovation with time saving convenience. This chemically inert patented process produces a true bond at the molecular level of the septa and plastic cap, eliminating excess evaporation and providing proper seal with the vial. Septa are completely secure and will not fall into the vial during injection. These caps are made with PTFE/Silicone septa for excellent chemical resistance and multiple injections.



5185-5823

Description	Unit	Part No.
Blue polypropylene cap, Bonded PTFE/silicone septa	100/pk	5185-5823
Blue polypropylene cap, Bonded pre-slit PTFE/silicone septa	100/pk	5185-5824

Polypropylene Screw Caps (no septa)

An economical choice. Use caps and replace septa when needed. Choose from three cap colors for separating assays, lots, standards, etc.



5182-0728, 5182-0727, 5182-0726

Description	Unit	Part No.
Blue, Open top	100/pk	5182-0728
Green, Open top	100/pk	5182-0727
Red, Open top	100/pk	5182-0726
Blue PTFE-lined solid top (for storage)	100/pk	5183-2075

Vials

Screw Top Vial Kits



Assortment of septa for wide opening screw caps

Septa for Wide Opening Screw Caps

Description	Unit	Part No.
Ivory, PTFE/red rubber*	100/pk	5182-0731
Red, PTFE/white silicone/red PTFE	100/pk	5182-0729
Blue, Pre-slit PTFE/white silicone	100/pk	5183-2074
Red, PTFE/white silicone	100/pk	5182-0730

*Commonly referred to as "red rubber"



Screw top vial kit

Non-Assembled, 2 ml Wide Opening Screw Top Glass Vial Convenience Packs

Screw Top Convenience Packs are an easy way to get 500 of each component using one catalog number. Packed in our six drawer reusable blue plastic cabinet, 500 screw top vials and screw caps with septa installed are kept handy and dust-free.

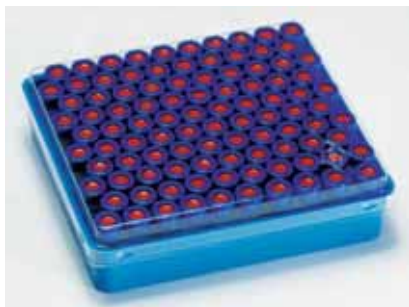
Note: Review the Septum Selection Guide to choose the septum best suited for your application.

Description	Unit	Part No.
Clear vials, blue screw caps, PTFE/red silicone rubber septa*	500/pk	5182-0732
Clear vials with write-on spot, blue screw caps, PTFE/red silicone rubber septa	500/pk	5182-0867
Amber vials with write-on spot, green screw caps, PTFE/red silicone rubber septa	500/pk	5182-0733
Clear vials, blue screw caps, PTFE/silicone/PTFE septa	500/pk	5182-0736
Clear vials with write-on spot, blue screw caps, PTFE/silicone/PTFE septa	500/pk	5182-0869
Amber vials with write-on spot, green screw caps, PTFE/silicone/PTFE septa	500/pk	5182-0737
Clear vials, blue screw caps, PTFE/silicone septa	500/pk	5182-0734
Clear vials with write-on spot, blue screw caps, PTFE/silicone septa	500/pk	5182-0868
Amber vials with write-on spot, green screw caps, PTFE/silicone septa	500/pk	5182-0735
Clear vials, blue screw caps, pre-slit blue PTFE silicone septa	500/pk	5183-2079
Clear vials with write-on spot, blue screw caps, pre-slit blue PTFE silicone septa	500/pk	5183-2080
Amber vials with write-on spot, green screw caps, pre-slit blue PTFE silicone septa	500/pk	5183-2081

*Commonly referred to as "red rubber"

Vials

Screw Top Vial Kits



Preassembled vial pack

Pre-Assembled, 2 ml Wide Opening Screw Top Glass Vial Convenience Packs

Screw Top Vial Pre-assembled Packs come ready to use with cap and septum of your choice attached to the vial. A time/labor-saving product for use on your Agilent Autosampler or any rotating tray automatic sampler.

Note: Review the Septum Selection Guide to choose the septum best suited for your application.

Description	Unit	Part No.
Clear vials, blue screw caps, PTFE/red silicone rubber septa*	100/pk	5182-0553
Clear vials with write-on spot, blue screw caps, PTFE/red silicone rubber septa	100/pk	5182-0864
Amber vials with write-on spot, green screw caps, PTFE/red silicone rubber septa	100/pk	5182-0554
Clear vials, blue screw caps, PTFE/silicone/PTFE septa	100/pk	5182-0555
Clear vials with write-on spot, blue screw caps, PTFE/silicone/PTFE septa	100/pk	5182-0866
Amber vials with write-on spot, green screw caps, PTFE/silicone/PTFE septa	100/pk	5182-0556
Clear vials, blue screw caps, PTFE/silicone septa	100/pk	5182-0557
Clear vials with write-on spot, blue screw caps, PTFE/silicone septa	100/pk	5182-0865
Amber vials with write-on spot, green screw caps, PTFE/silicone septa	100/pk	5182-0558
Clear vials, blue screw caps, pre-slit blue PTFE silicone septa	100/pk	5183-2082
Clear vials with write-on spot, blue screw caps, pre-slit blue PTFE silicone septa	100/pk	5183-2083

*Commonly referred to as "red rubber"

Vials

Crimp Top Vials



Crimp Top Vials, Caps and Kits

The wide opening crimp cap provides a larger target area for improved autosampler needle accuracy. Select from four cap colors and a variety of septa. Whatever your crimp top vial needs, Agilent has what you are looking for.

- 2 mL, 12 x 32 mm
- Tightly controlled crown for improved crimping
- Precision-formed neck for improved autosampler handling
- 40% larger opening than standard narrow opening vials
- Rigorous quality assurance provides dimensional consistency from lot to lot
- Uniformly flat bottom ensures compatibility with inserts
- Optional ceramic write-on spot with fill marks



5181-3375, 5182-0543, 5181-3376

2 ml Wide Opening Crimp Top Glass Vials

Wide opening 2 mL, 12 x 32 mm vials. The outer diameter of the crimp head is 11 mm.

Description	Unit	Part No.
Clear	100/pk	5181-3375
Clear, write-on spot	100/pk	5182-0543
Amber, write-on spot	100/pk	5181-3376
Clear	1000/cs*	5183-4491
Clear, write-on spot	1000/cs*	5183-4492
Amber, write-on spot	1000/cs*	5183-4493

*Case includes 10 packs of 100 vials

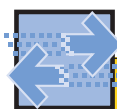


5183-4494, 5183-4495, 5183-4496

2 ml Deactivated Wide Opening Crimp Top Glass Vials

Include the addition of a deactivation process to eliminate sample interactions. Ready-to-use for polar compound analysis such as phenols, proteins, antibodies, amines, metabolites, herbicides and pesticides.

Description	Unit	Part No.
Clear	100/pk	5183-4494
Clear, write-on spot, silanized	100/pk	5183-4495
Amber, write-on spot, silanized	100/pk	5183-4496



Product Finder

Wrist pain or tired hands? Try our electronic crimpers/decappers. Turn to page 53.

Vials

Crimp Top Vials



5182-3454

1.5 ml Wide Opening Crimp Top High Recovery Glass Vials

Wide opening, 1.5 ml vials with 30 μ l reservoir. For sample concentration and injection without transferring to microvolume inserts.

Description	Unit	Part No.
Clear	100/pk	5182-3454
Clear, silanized	100/pk	5183-4497

Crimp Top Vials with Fixed Inserts

Description	Unit	Part No.
Crimp top micro vial with fixed insert	100/pk	9301-1388



5185-5821

Crimp Top Extreme Recovery Vials

- Patented design with stable base for GC autosamplers
- Uniform internal surface without any ridges to hold back sample
- It has wider neck opening for easy pipetting
- Increased sample volume capacity versus standard inserts
- Low residual volume for smaller volume injections without using the inserts
- Safe to use with Vortex for sample concentration

Description	Unit	Part No.
Clear, 1.5 ml Extreme Recovery	100/pk	5185-5821



5182-0567, 9301-0978

Wide Opening Polypropylene Crimp/Snap Top Vials

Wide opening 12 x 32 mm vials manufactured from virgin polypropylene, meeting the requirements of 21 CFR 177.1520. Polypropylene is chemically resistant and the material of choice for pH sensitive samples, sodium or heavy metals analysis. Polypropylene is translucent and able to withstand temperatures to 135°C. Use with crimp or snap caps.

Description	Unit	Part No.
1 ml	100/pk	5182-0567
300 μ l	1000/pk	9301-0978
300 μ l	100/pk	5188-2788
300 μ l	1000/pk	5184-3557

Recommended for CE applications

Vials

Crimp Top Vials, Caps and Vial Kits



9301-0977

Wide Opening Glass/Plastic Crimp/Snap Top Vials

Most popular 12 x 32 mm wide opening vials for economical and effective microsampling. Polypropylene body with a glass flanged insert molded to the inside. Sample comes in contact only with the 100 µL high quality glass insert and the septum. Use with crimp or snap caps.

Description	Unit	Part No.
100 µl	100/pk	9301-0977



Crimp Caps with 11 mm Septa

Crimp Caps with 11 mm Septa

Description	Unit	Part No.
Silver aluminum, Clear PTFE/red rubber septa	100/pk	5181-1210
Blue aluminum, Clear PTFE/red rubber septa	100/pk	5181-1215
Green aluminum, Clear PTFE/red rubber septa	100/pk	5181-1216
Red aluminum, Clear PTFE/red rubber septa	100/pk	5181-1217
Silver aluminum, PTFE/silicone/PTFE septa	100/pk	5181-1211
Silver aluminum, PTFE/silicone septa	100/pk	5182-0552
Silver aluminum, Black Viton septa	100/pk	5181-1212
Silver aluminum, PTFE/butyl rubber septa	500/pk	5061-3370
Silver aluminum, Clear PTFE/red rubber septa	1000/pk	5183-4498
Silver aluminum, PTFE/silicone/PTFE septa	1000/pk	5183-4499
Silver aluminum, PTFE/silicone septa	1000/pk	5183-4500
Silver aluminum, Thin Teflon septa	100/pk	5182-0871
Magnetic crimp caps for CTC Autosampler	100/pk	5188-5386



Crimp Vial Kit

Non-Assembled, 2 ml Wide Opening Crimp Top Glass Vial Convenience Packs

Crimp Top Vial Convenience Packs are an easy way to get 500 of each vial component using one catalog number. Packed in our six drawer reusable blue plastic cabinet, all items are kept handy and dust-free.

Description	Unit	Part No.
Vial kit, crimp top vials, caps and septa	500/pk	5181-3400
Vial kit, crimp top vials, caps and septa	500/pk	5181-8801

Vials

Snap Top Vials



Snap Top Vials, Caps and Kits

The simple, efficient way to a secure seal without crimping. It's as easy as push-on, pull-off. A consistently secure seal outperforms the loose fit of other snap caps. A variety of snap caps with septa are available. Crimp caps can also be used with wide opening snap top vials. Snap cap vials cannot be pressurized. For microsampling, see microvolume inserts for wide opening vials.

- 2 mL, 12 x 32 mm
- Use with any 11 mm snap or crimp cap
- Provides a total seal around the entire circumference of the vial crown
- 40% larger opening than standard narrow opening vials
- Precision-formed neck improves autosampler handling
- Optional ceramic write-on spot
- Uniformly flat bottom ensures compatibility with inserts



5182-0544, 5182-0546, 5182-0545

2 ml Wide Opening Snap Top Glass Vials

Wide opening 2 mL, 12 x 32 mm vials. Use with snap or crimp caps.

Description	Unit	Part No.
Clear	100/pk	5182-0544
Clear, write-on spot	100/pk	5182-0546
Amber, write-on spot	100/pk	5182-0545
Clear	1000/cs*	5183-4504
Clear, write-on spot	1000/cs*	5183-4505
Amber, write-on spot	1000/cs*	5183-4506

*Case includes 10 packs of 100 vials



5183-4507, 5183-4508, 5183-4509

2 ml Deactivated Wide Opening Snap Top Glass Vials

The 2 mL vials undergo a deactivation process to eliminate sample interactions. Ready-to-use for the analysis of polar compounds such as phenols, proteins, antibodies, amines, metabolites, herbicides and pesticides.

Description	Unit	Part No.
Clear, silanized	100/pk	5183-4507
Clear, write-on spot, silanized	100/pk	5183-4508
Amber, write-on spot, silanized	100/pk	5183-4509

Vials

Snap Top Vials, Caps and Vial Kits



5182-0567, 9301-0978

Wide Opening Polypropylene Crimp/Snap Top Vials

Wide opening 12 x 32 mm vials manufactured from virgin polypropylene, meeting the requirements of 21 CFR 177.1520. Polypropylene is chemically resistant and the material of choice for pH sensitive samples, sodium or heavy metals analysis. Polypropylene is translucent and able to withstand temperatures to 135°C. Use with crimp or snap caps.

Description	Unit	Part No.
1 ml	100/pk	5182-0567
300 µl	1000/pk	9301-0978
300 µl	100/pk	5188-2788
300 µl	1000/pk	5184-3557

Recommended for CE applications



5183-4510

1.5 ml Wide Opening Snap Top High Recovery Glass Vials

Wide opening, 1.5 mL vials with 30 µL reservoir. For sample concentration and injection without transferring to microvolume inserts. Use with snap or crimp caps.

Description	Unit	Part No.
Clear	100/pk	5183-4510

Vials

Wide Opening Inserts



5182-0542, 5182-0550, 5182-3458, 5182-3457,
5182-3459

Snap Caps with 11 mm Septa

Description	Unit	Part No.
Clear polyethylene cap, solid polyethylene membrane septa	100/pk	5182-0542
Clear polyethylene cap, clear PTFE/red silicone rubber septa*	100/pk	5182-0550
Blue polyethylene cap, clear PTFE/red silicone rubber septa*	100/pk	5182-3458
Green polyethylene cap, clear PTFE/red silicone rubber septa*	100/pk	5182-3457
Red polyethylene cap, clear PTFE/red silicone rubber septa*	100/pk	5182-3459
Clear polyethylene cap, PTFE septa	100/pk	5182-0540
Clear polyethylene cap, PTFE/silicone/PTFE septa	100/pk	5182-0566
Blue polyethylene cap, PTFE/silicone septa	100/pk	5182-0541
Clear polyethylene cap, pre-slit PTFE/silicone septa	100/pk	5183-4511
Polyethylene cap, clear PTFE/red silicone rubber septa	500/pk	5182-0564
Snap cap, PTFE/red silicone rubber	500/pk	5185-5916

*Commonly referred to as "red rubber"



Snap Top Vial Kit

Non-Assembled, 2 ml Wide Opening Snap Top Glass Vial Convenience Packs

Snap top convenience packs are an easy way to get 500 of each vial component using one catalog number. Packed in our six drawer reusable blue plastic cabinet, snap top vials and snap caps with septa are kept handy and dust-free.

Description	Unit	Part No.
Clear snap top vials, clear polypropylene snap caps, PTFE/red silicone septa	500/pk	5182-0547
Amber snap top vials with write-on spot, clear polypropylene snap caps, PTFE/red rubber septa	500/pk	5182-0548

Vials

Wide Opening Inserts



Microvolume Inserts for Wide Opening Vials

To meet your microsampling needs, Agilent has a variety of microvolume inserts with capacities and designs that can transform our vials from full-capacity to limited volume with one simple step.

These inserts are compatible with our wide opening screw top, crimp top and snap top vials.



5181-1270

Conical Inserts with Polymer Feet

With the correct default setting on an autosampler, these inserts have practically no dead volume. The syringe needle can strike the bottom of the insert without being damaged. The polymer feet act as a shock absorber. This allows all of the sample to be withdrawn. These inserts are self-aligning and stand straight.

Description	Unit	Part No.
100 µL glass inserts with polymer feet and mandrel interior	100/pk	5181-1270
100 µL deactivated glass inserts with polymer feet and mandrel interior	100/pk	5181-8872
100 µL polypropylene inserts with polymer feet	100/pk	5182-0549



5183-2085

Conical Glass Inserts

Conical inserts require no springs and are ready to drop into the vial for injections. The most economical choice for microvolume sampling.

Description	Unit	Part No.
100 µL pulled-point glass inserts	100/pk	5183-2085



5181-3377

Flat Bottom Inserts

An economical limited-volume alternative. Manufactured with tight tolerances for a custom fit.

Description	Unit	Part No.
250 µL glass flat bottom inserts	500/pk	5181-3377
250 µL deactivated glass flat bottom inserts	500/pk	5183-2086
250 µL polypropylene flat bottom inserts	500/pk	5183-2087

Narrow neck inserts

Description	Unit	Part No.
Narrow neck inserts	500/pk	9301-1387

Vials

8-425 Screw Top Vials



8-425 Screw Top Vials, Caps, Septa and Inserts

The original, smaller opening vial with an 8-425 thread size screw cap. Available with black caps and a variety of septa to meet the needs of your application.

- 8-425 thread design
- The original, narrow neck size
- Uniformly flat bottom ensures compatibility with inserts



5183-4428, 5183-4429

2 ml 8-425 Screw Top Glass Vials

These 2 mL, 12 x 32 mm 8-425 vials accommodate a variety of autosamplers originally designed for narrow neck vials. Use with 8-425 screw caps.

Description	Unit	Part No.
Clear	100/pk	5183-4428
Amber	100/pk	5183-4429
Clear, PTFE-lined storage cap	100/pk	5183-4518



5183-4432, 5183-4433

2 ml Deactivated 8-425 Screw Top Glass Vials

The same vials as described previously with the addition of a deactivation process to eliminate sample interactions. Ready-to-use for polar compound analysis such as phenols, proteins, antibodies, amines, metabolites, herbicides and pesticides. Use with 8-425 screw caps.

Description	Unit	Part No.
Clear, Silanized	100/pk	5183-4432
Amber, Silanized	100/pk	5183-4433

Vials

8-425 Screw Caps and Septa



5183-4438, 5183-4442

8-425 Screw Caps with Septa

Open top screw caps with the 8 mm septa installed.

Description	Unit	Part No.
Black, Red PTFE/white silicone septa	100/pk	5183-4442

8-425 Screw Caps (no septa)

Open top polypropylene screw caps without septa. Recommended instead of phenolic caps. Phenolic is a sulfur-based product that can flake and contaminate samples when syringe needle pushes through septum.

Description	Unit	Part No.
Black	100/pk	5183-4438



Septa for 8-425 Screw Caps

Septa for 8-425 Screw Caps

Description	Unit	Part No.
Red PTFE/white silicone/red PTFE, 8 mm	100/pk	5183-4436
Red PTFE/white silicone, 8 mm	100/pk	5183-4437
PTFE coated Butyl rubber septa	500/pk	9301-1130

Vials

Inserts for 8-425 Vials



Microvolume Inserts for 2 ml, 8-425 Screw Top Vials

To meet your microsampling needs, Agilent has a variety of microvolume inserts with capacities and designs that can transform our vials from full-capacity to limited volume with one simple step. The inserts featured here are compatible with 8-425 screw top vials. (Not for use with wide opening vials.)



5183-2088

Conical Inserts with Polymer Feet

Polymer feet act as the inserts' shock absorber to allow the syringe needle to strike the bottom without being damaged. This insert is self-aligning and stands straight.

Description	Unit	Part No.
100 μ l glass inserts with polymer feet	100/pk	5183-2088



5183-2089

Conical Glass Inserts

Ready-to-use and require no springs. The most economical for microvolume sampling.

Description	Unit	Part No.
100 μ l pulled-point interior glass inserts	100/pk	5183-2089



5183-2090

Flat Bottom Inserts

An economical limited-volume alternative. Manufactured with tight tolerances for a custom fit.

Description	Unit	Part No.
100 μ L glass flat bottom inserts	100/pk	5183-2090



LC Vials, Caps, and Septa

Agilent Technologies offers a variety of vials for Agilent's LC instruments. Choose from small volume vials, 2 mL, and 6 mL vials.

Agilent minivials are designed to allow for reproducible injections of minute quantities, making your limited sample applications more effective and more accurate. Our microvials provide limited volumes for microsampling and the 6 mL capacity vial allows for larger sample injections.

6 ml Vials, Caps, and Septa for 1100/1200 Series Autosampler

Description	Unit	Part No.
Clear screw vial, 16 mm cap size	100/pk	9301-1377
Screw caps, 16 mm	100/pk	9301-1379
PTFE/silicone septa, 16 mm	100/pk	9301-1378
Clear crimp vial, 20 mm cap size	100/pk	9301-1419
Crimp caps, PTFE/silicone septa, 20 mm	100/pk	9301-1425
Clear screw extreme high recovery vials, 16mm cap size	30/pk	5188-2757
PTFE/silicone septa, pre-slit, 16mm	100/pk	5188-2758
5 ml high recovery screw cap vials	30/pk	5188-5369

Vials

4 ml Vials

4 ml Screw Top Vials, Caps and Septa

4 ml, 15 x 45 mm screw top glass vials are a custom fit to Agilent 6850 autosampler tray (G2880A) for use as sample as well as wash vials. Vials with fill marks are also appropriate for use as wash vials and waste vials in 7673 and 7683 autosamplers. These vials can also be used in Perkin-Elmer Autosystem GC, Waters 48 position tray autosampler, Shimadzu AOC-14/1400, LC-10A and the SIL-2AS. Use the 13 x 425 caps with septa for use as sample vials and with diffusion caps for wash vials. These vials can also be used as storage vials.



5183-4448, 5183-4450

- 4 mL, 15 x 45 mm
- Precision formed screw threads (13 x 425) for consistently secure seal
- Custom fit for 7673, 7683 and 6850 autosamplers
- Can be used as wash, waste or storage vials

4 ml Screw Top Vials

Description	Unit	Part No.
Clear	100/pk	5183-4448
Amber	100/pk	5183-4450

Caps and Septa for 4 ml Screw Top Vials



5183-4464, 07673-40180 with 5183-4461, 5183-4460

Description	Unit	Part No.
Black 13 x 425 caps, PTFE/silicone septa	100/pk	5183-4464
Black 13-425 open top screw caps	100/pk	5183-4461
Diffusion inserts used with black open top screw caps	12/pk	07673-40180
PTFE/natural rubber septa	144/pk	9301-1031
Red PTFE/white silicone	100/pk	5183-4460
White virgin PTFE septa	1000/pk	5183-4459



9301-0723, 5182-0551

4 ml Screw Top Vials, Caps, and Septa Kits

Description	Unit	Part No.
Clear screw top wash vials with screw caps (no septa)	144/pk	9301-0723
4 ml wash vials with fill markings and caps	25/pk	5182-0551

Vials

Headspace Vials



Headspace Vials, Caps, Septa and Kits

These beveled neck 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. You can save when you purchase a “pack” quantity—with vial, cap and septa packaged together in a single container.

- 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



5182-0837, 5182-0838

Flat Bottom Headspace Crimp Top Glass Vials

20 mm beveled crimp top creates a much tighter seal than flat crimp surface. The slightly longer neck is custom fit for Agilent Technologies and Carlo Erba. Manufactured to exacting tolerances. Use with 20 mm crimp caps.

Description	Unit	Part No.
20 ml, 23 x 75 mm	100/pk	5182-0837
10 ml, 23 x 46 mm	100/pk	5182-0838

Vials

Headspace Vials and Caps



5183-4474, 5183-4475

Rounded Bottom Headspace Crimp Top Glass Vials

20 mm beveled crimp top creates a much tighter seal than flat crimp surface. Use with Headspace and CTC Headspace. Heat annealed to 530°C. Use with 20 mm crimp caps.

Description	Unit	Part No.
20 ml, 23 x 75 mm	100/pk	5183-4474
10 ml, 23 x 46 mm	100/pk	5183-4475



Headspace Vials for G1888A Autosampler

Description	Unit	Part No.
Headspace screw top, 20 ml, clear, 23 x 75 mm	100/pk	5188-2753
HeadSpace screw top, 10 mL, clear, 23 x 46 mm	100/pk	5188-5392
UltraClean 18 mm screw caps with septa for headspace vials	100/pk	5188-2759



9301-0721, 9301-0718

20 mm Headspace Crimp Caps (no septa)

For use with all Headspace crimp top vials. Caps with safety feature release pressure at approximately 45 psi.

Description	Unit	Part No.
Silver aluminum, one piece	100/pk	9301-0721
Silver aluminum, one piece, safety feature	100/pk	9301-0718



5183-4477, 5183-4479

20 mm Headspace Crimp Caps with Septa

Pre-assembled 20 mm crimp caps with septa. Ready-to-use with any Headspace crimp top vials.

Description	Specifications	Unit	Part No.
Silver aluminum, PTFE/silicone septa	-60°C to 180°C	100/pk	5183-4477
Silver aluminum, Safety feature, PTFE/silicone septa	-60°C to 180°C	100/pk	5183-4478
Silver aluminum, Molded PTFE/butyl septa	-40°C to 125°C	100/pk	5183-4479
Silver aluminum, Safety feature, Molded PTFE/butyl septa	-40°C to 125°C	100/pk	5183-4480

Vials Headspace Caps, Septa & Vial Kits

Ultra Clean 18 mm Screw Top Caps with Septa

Description	Specifications	Unit	Part No.
Silver, 1.5mm PTFE/silicone septa (top white)	to 100 °C	100/pk	5188-2759



5183-4476, 9301-0719, 9301-0976

20 mm Headspace Septa

Description	Specifications	Unit	Part No.
Gray butyl stopper	-40°C to 120°C	100/pk	5183-4476
Gray PTFE/black butyl molded	-40°C to 125°C	100/pk	9301-0976
Tan PTFE/white silicone	-60°C to 180°C	100/pk	9301-0719



Headspace Vial Convenience Kits

Description	Specifications	Unit	Part No.
20 mL flat bottom Headspace crimp top vials, silver aluminum one-piece crimp caps with safety feature, molded PTFE/Silicone Septa	< 125°C	100/pk	5182-0839
20 ml flat bottom Headspace crimp top vials, silver aluminum one-piece crimp caps with safety feature, molded PTFE/Butyl Septa	< 180°C	100/pk	5182-0840

Vials

Storage Vials

General Purpose Sample and Storage Vials

With four vial capacities available in clear or amber glass, Agilent vials are ideal for sampling or storage. Our Teflon-lined storage caps offer broad chemical resistance—the ultimate in glass closures. The polypropylene screw caps with Teflon/silicone septa are extra clean to eliminate sample contamination.



Clear Glass Sample Vials with Teflon-Lined Storage Caps

Packaged as 100 or 200 pack of shrink-wrapped clear glass sample vials, with Teflon-lined solid-top storage caps in resealable plastic bags—all in our handy container to keep items dust-free.

Description	Unit	Part No.
4 ml, 15 x 45-vials with 13-425 caps	100/pk	5183-4519
12 ml, 19 x 65-vials with 15-425 caps	200/pk	5183-4521
22 ml, 23 x 85-vials with 20-400 caps	200/pk	5183-4523
40 mL, 28 x 95-vials with 24-400 caps	100/pk	5183-4524



Amber Glass Sample Vials with Teflon-Lined Storage Caps

Packaged as 100 or 200 pack of shrink-wrapped amber glass sample vials, with Teflon-lined solid top storage caps in resealable plastic bags all in our handy container to keep items dust-free.

Description	Unit	Part No.
4 ml, 15 x 45-vials with 13-425 caps	100/pk	5183-4526
12 ml, 19 x 65-vials with 15-425 caps	200/pk	5183-4528
40 ml, 28 x 95-vials with 24-400 caps	100/pk	5183-4530



Clear Glass Sample Vials with Caps and Septa

Vial packs are shrink-wrapped in quantities of 100 or 200. Natural colored Teflon/clear silicone septa and polypropylene open top caps are each in resealable plastic bags. All items are packed in our handy container to keep items dust-free.

Description	Unit	Part No.
4 ml, 15 x 45-vials with 13-425 caps	100/pk	5183-4532
12 ml, 19 x 65-vials with 15-425 caps	200/pk	5183-4534
22 ml, 23 x 85 vials with 20-400 caps	200/pk	5183-4536
40 ml, 28 x 95-vials with 24-400 caps	100/pk	5183-4537



Electronic Crimper, 5183-4763, 5184-3572



Electronic Decapper, 5184-3567, 5184-3573



Black & Decker Rechargeable Battery, 5183-4799

Crimping and Decapping Tools

Electronic Crimpers and Decappers

Is your hand getting tired from crimping or decapping too many vials? Should your crimp seals be more consistent vial to vial? Try the new Electronic Crimpers and Decappers from Agilent Technologies. They crimp or decap vials easily and consistently with the push of a button. These devices, with battery-powered motors, will make crimping and decapping vials a breeze and even fun.

The units use standard power tool batteries and allow you to crimp and decap hundreds of vials before you have to recharge the battery. You can adjust the crimp or decap force to your specifications.

Description	Part No.
Electronic Crimper: 11 mm, complete with one VersaPak Gold rechargeable battery and charger. Recommended for 2 ml, 12 x 32 mm crimp top autosampler vials.	5183-4763
Electronic Decapper: 11 mm, complete with one VersaPak Gold rechargeable battery and charger. Recommended for 2 ml, 12 x 32 mm crimp top autosampler vials.	5184-3567
Electronic Crimper: 20 mm, complete with one VersaPak Gold rechargeable battery and charger. Recommended for 20 mm headspace or serum vials.	5184-3572
Electronic Decapper: 20 mm, complete with one VersaPak Gold rechargeable battery and charger. Recommended for 20 mm headspace or serum vials.	5184-3573
Black and Decker VersaPak Gold NiMH rechargeable battery	5183-4799

Vials

Electronic Crimpers and Decappers/Vial Racks



Manual Crimper and Decapper

Manual Crimpers and Decappers

Use with all 8, 11 and 20 mm crimp top vials and crimp caps.

Manual Crimpers and Decappers

Description	Part No.
Manual crimper, 8 mm	8710-1643
Manual decapper, 8 mm	5181-8827
Manual crimper, 11 mm	8710-0979
Manual decapper, 11 mm	5181-1213
Manual crimper, 20mm	9301-0720
Manual decapper, 20mm	5181-1214



Crimping System and Heads

Description	Part No.
Holder without crimp head, to be mounted	5062-2495
Crimp head, 11 mm	5001-3755
Crimp head, 20 mm	5001-3756
Decapper head, 11 mm	5001-3758
Decapper head, 20 mm	5001-3759



Vial rack, 9301-0722

Vial Racks

Description	Part No.
Rack for 8 mm, 100 and 300 µl minivials, solid plexiglass	5061-3349
Rack for 12 mm, 2 mL vials, 5/pk	9301-0722



Micro vial tray, 5061-3349



Syringes

With a broad selection of syringes for manual and auto injectors, Agilent has what you need for accurate and effective sampling.

Typical Needle Gauge Dimensions

Gauge	OD		ID	
	mm	inches	mm	inches
22	0.71	0.028	0.41	0.016
23s	0.635	0.025	0.11	0.0045
25	0.5	0.02	0.2	0.008
26s	0.47	0.0184	0.11	0.0045

Needle and Point Styles

Needle gauge, length, and point styles are referenced in syringe listings as gauge/length in mm/point style (e.g., 26s/42/HP).

Needle Styles

Fixed Needle Syringe: The epoxy-cemented, stainless steel needle is centered in the syringe barrel at the depth of the zero graduation mark. Do not heat above 50°C.

Removable Needle Syringe: Removable needle allows use of various point styles. The threaded hub connection and Teflon sealing ferrule can be tightened to compensate for wear.

Point Styles

HP Point Style: This proprietary design yields optimal performance and reliability and reduces coring by parting, not cutting, the septum.

Point Style 2: A standard, general purpose point style. Needle has a 20° bevel.

Point Style 3: For manual LC injectors. The needle has a 90° bevel, ideal for a volume displacement syringe.

Side Hole Point Style 5: Syringe needle has a side hole for sample filling and dispensing.

AS Point Style: For use in autosamplers; also referred to as Cone Style.



HP Point Style



Point Style 2



Point Style 3



Point Style 5/Side Hole



AS Point Style

Syringes

Autosampler Syringes



Autosampler Syringes

With a broad selection of syringes for auto injection, Agilent has what you need for accurate and effective sampling. Agilent delivers even more value in every autosampler syringe with the introduction of many new features in our line of Gold Standard GC Autosampler Syringes.

- Lot numbers printed directly on the barrel with a corresponding Certificate of Conformance ensuring certified performance to all specifications.
- Gold protective cap on the fused needle, preventing the glass syringe barrel from chipping as it is pressed against the inlet.
- Black ink and gold illuminating backing strip, for effortless viewing of the volume scale, which is easily discernible from imitators.
- Environmentally friendly packaging, an improved design that reduces waste.
- Individually sealed packaging, for contaminant-free use right out of the box.

Tapered Needle, 23-26s Gauge Autosampler Syringes

Use one needle and get the benefits of two. The upper portion of the tapered needle offers the strength of a 23 gauge, while the lower portion at 26s gauge allows for use with split/splitless or on-column injections with 0.53 mm id columns. All standard plungers are stainless steel.

Volume (µl)	Description	Unit	Needle	Part No.
5	Tapered, fixed		23-26s/42/HP	5181-1273
	Tapered, fixed	6/pk	23-26s/42/HP	5181-8810
	Tapered, removable		23-26s/42/HP	5182-0835
	Replacement needle for 5 µl syringe	3/pk	23-26s/42/HP	5182-0832
10	Tapered, fixed		23-26s/42/HP	5181-1267
	Tapered, fixed	6/pk	23-26s/42/HP	5181-3360
	Tapered, removable		23-26s/42/HP	5181-3321
	Replacement needle for 10 µl syringe	3/pk	23-26s/42/HP	5181-3319
	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5181-3354
	Tapered, fixed, PTFE-tipped plunger	6/pk	23-26s/42/HP	5181-3361
	Replacement plunger with PTFE tip for fixed needle 10 µl syringe			5181-3365
Tapered, removable		23-26s/42/HP	5181-3356	
	Replacement plunger with PTFE tip for removable needle 10 µl syringe			5181-3358
50	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5183-0314
100	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5183-2042

Syringes

Autosampler Syringes

Straight Needle, 23 and 26s Gauge Autosampler Syringes

Volume (µl)	Description	Unit	Needle	Part No.
0.5	Cone-tipped, 23 gauge		23/42/HP	5188-5246
1	Cone-tipped, 23 gauge		23/42/HP	5188-5247
5	Straight, fixed, 26 gauge		26s/42/HP	9301-0891
	Straight, fixed, 26 gauge	6/pk	26s/42/HP	5183-4728
	Straight, fixed, 23 gauge		23/42/HP	9301-0892
	Straight, fixed, 23 gauge	6/pk	23/42/HP	5182-0875
	Straight, removable, 23 gauge		23/42/HP	5182-0834
	Replacement needle for 5 µl syringe	3/pk	23/42/HP	5182-0830
10	Straight, fixed, 26 gauge		26s/42/HP	9301-0714
	Straight, fixed, 26 gauge	6/pk	26s/42/HP	5183-4729
	Straight, fixed, 23 gauge		23/42/HP	9301-0713
	Straight, fixed, 23 gauge	6/pk	23/42/HP	9301-0725
	Straight, fixed, PTFE-tipped plunger		23/42/HP	5181-8809
	Straight, fixed, PTFE-tipped plunger	6/pk	23/42/HP	5183-4730
	Replacement plunger for 10 µl fixed needle syringe			5181-8808
	Straight, removable, 23 gauge		23/42/HP	5181-8806
	Straight, removable, PTFE-tipped plunger		23/42/HP	5181-8813
	Replacement needle for 10 µl syringe	3/pk	23/42/HP	5181-8811
Replacement plunger with PTFE tip for removable needle 10 µl syringe			5181-3358	
25	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-0316
50	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-0318
100	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-2058

Syringes

Autosampler Syringes

7673/7683 On-Column Autosampler Syringes

Agilent Technologies 7673/7683 on-column syringes with needle diameters for columns ranging from 0.25 mm to 0.53 mm. Specifically designed for the 7673/7683 Autosampler.

Volume (µl)	Description	Unit	Part No.
5	Removable needle, barrel only		5182-0836
	Stainless steel needle for 0.53 mm column	3/pk	5182-0832
	Stainless steel needle for 0.32 mm column	3/pk	5182-0831
	Stainless steel needle for 0.25 mm column	3/pk	5182-0833
	Plunger button	10/pk	5181-8866



Removable needle

HP 7670/71/72 Autosampler Syringes

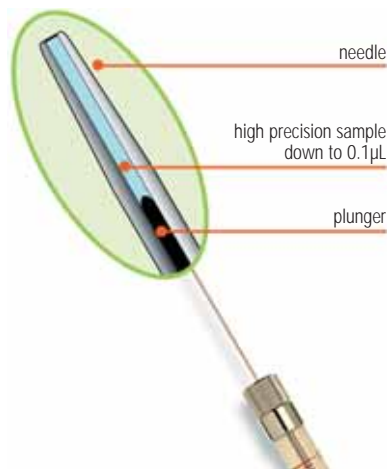
This syringe has a long needle and regular plunger button for compatibility with HP 7670/71/72 autosamplers. Available with a fixed or removable needle.

Volume (µl)	Description	Needle	Part No.
1	Straight, removable	23/56/2	5182-9622
10	Straight, fixed	23/50/HP	5182-9734
	Straight, removable	23/50/HP	5182-9626
	Straight, fixed, PTFE-tipped plunger	23/50/HP	5182-9799

Manual Syringes

Manual, Low Volume, Plunger-in-Needle Syringes

Removable needle syringes with capacities from 0.5 μl to 5.0 μl . The plunger is in the needle and the sample is contained within the needle.



Volume (μl)	Description	Needle	Part No.
0.5	Removable	23/70/HP	5182-9651
1	Removable	26/70/HP	5182-9605
	Replacement needle/plunger for 1.0 μl syringe	26/70/HP	5182-9635
	Removable	23/70/HP	5182-9627
	Replacement needle/plunger for 1.0 μl syringe	23/70/HP	5182-9712
5	Removable	23/70/HP	5182-9623
	Replacement needle/plunger for 5 μl syringe	23/70/HP	5182-9683



Manual, Regular Plunger Syringes

Volume (μl)	Description	Needle	Part No.
10	Fixed, with plunger protection	26/50/2	5182-3499
	Fixed, 10/pk	26/50/2	5182-3428
25	Fixed	25/50/2	5182-9625
50	Fixed	25/50/2	5182-9636
100	Fixed	25/50/2	5182-9615
250	Fixed	25/50/2	5182-9640
500	Fixed	25/50/2	5182-9641

Syringes

Manual Syringes



Fixed needle

Manual Syringes with PTFE-Tipped Plungers (Gas-Tight)

Available with a fixed needle, these syringes are for general purpose injections. With gas-tight construction, they are ideal for sampling gases and volatile materials.

Volume	Description	Needle	Part No.
10 µl	Fixed, PTFE-tipped plunger	26/50/2	5182-9606
	Replacement plunger with PTFE tip for 10 µl syringe		5182-9621
25 µl	Fixed, PTFE-tipped plunger	25/50/2	5182-9629
50 µl	Fixed, PTFE-tipped plunger	25/50/2	5182-9612
100 µl	Fixed, PTFE-tipped plunger	25/50/2	5182-9610
250 µl	Fixed, PTFE-tipped plunger	25/50/2	5182-9608
500 µl	Fixed, PTFE-tipped plunger	25/50/2	5182-9609
1 ml	Fixed, PTFE-tipped plunger	23/50/2	5182-9604
	Replacement plunger with PTFE tip for 1.0 ml syringe		5182-9661
2.5 ml	Fixed, PTFE-tipped plunger	23/50/2	5182-9642
	Replacement plunger with PTFE tip for 2.5 ml syringe		5182-9671
5 ml	Fixed, PTFE-tipped plunger	23/50/2	5182-9638
10 ml	Fixed, PTFE-tipped plunger	23/50/2	5182-9643
	Replacement plunger with PTFE tip for 10 ml syringe		5182-9709



Superflex Syringe

Manual SuperfleX Plunger Syringes (not available in Japan)

The super elastic alloy plunger, together with the plunger protection guide and button reinforcement, ensure precise and smooth injections. The plunger is flexible and returns to its original shape after injection.

Volume (µl)	Description	Needle	Part No.
5	Removable, SuperfleX syringe	26s/50/2	5182-3498
10	Fixed, SuperfleX syringe, 6/pk	26s/50/2	5182-3495
	Fixed, SuperfleX syringe	26s/50/2	5182-3496

Syringes

Manual Syringes



On-column syringe

Manual On-Column Syringes

Ideal for manual on-column injections. Depending on column diameter, choose either fused silica or durable stainless steel.

Volume (µl)	Description	Unit	Needle	Part No.
10	Removable, stainless steel		0.23 mm/10 cm	5182-9633
	Replacement needle for 10 µl syringe	3/pk	0.23 mm/10 cm	5182-9645
	Removable, fused silica (barrel only)			9301-0658
	Fused silica needle for 10 µl syringe	6/pk	0.18 mm/11.5 cm	19091-63000
	Replacement PTFE ferrule for P/N 9301-0658			0100-1389



Teflon luer lock



Push button

Gas-Tight Syringes with Luer Lock Valve Fitting

Offer pressure tight sample containment up to 100 psi for liquid and gas samples.

Volume (ml)	Description	Part No.
1	Gas-tight syringe, push-pull luer lock valve	5183-4549
2.5	Gas-tight syringe, push-pull luer lock valve	5183-4550
5	Gas-tight syringe, push-button luer lock valve	5183-4551
10	Gas-tight syringe, push-button luer lock valve	5183-4552
25	Gas-tight syringe, push-button luer lock valve	5183-4553
50	Gas-tight syringe, push-button luer lock valve	5183-4554

Gas-Tight Syringes with Luer Lock Fitting

With the Teflon luer lock syringe your sample comes in contact with glass and Teflon reducing the risk of contamination. Use with syringe filters and for pump priming in LC applications.



Push pull

Volume (ml)	Description	Part No.
1	Gas-tight syringe, Teflon luer lock	5182-9710
	Replacement plunger with PTFE tip for 1.0 ml syringe	5182-9661
2.5	Gas-tight syringe, Teflon luer lock	5182-9711
	Replacement plunger with PTFE tip for 2.5 ml syringe	5182-9671
5	Gas-tight syringe, Teflon luer lock	5182-9630
10	Gas-tight syringe, Teflon luer lock	5182-9620
	Replacement plunger with PTFE tip for 10 ml syringe	5182-9709
25	Gas-tight syringe, Teflon luer lock	5182-9639

Syringes

Manual Syringes



Luer lock needle

Luer Lock Needles

Description	Unit	Needle	Part No.
Needle, luer lock	5/pk	23/50/2	5183-4606
Needle, luer lock	2/pk	23/50/5	5183-4613
Needle, luer lock	2/pk	23/51/3	5183-4614

Syringes for Manual Injection Valves

Use with a variety of liquid chromatographs including the Rheodyne, Altex, and Valco sampling valves. The blunt-tip point style (3) prevents tearing of the LC injector valve needle seats.



Fixed needle

Volume (µl)	Description	Needle	Part No.
10	Fixed	22/51/3	5182-9644
25	Fixed	22/51/3	5182-9628
50	Fixed	22/51/3	5182-9619
100	Fixed	22/51/3	5182-9613
250	Fixed	22/51/3	5182-9624
500	Fixed	22/51/3	5182-9658
500	Removable	22/50/3	5183-4547
25-500	Replacement needles for 500 µl removable needle syringe	22/50/3	5183-4548

Autosampler Supplies

Liquid Injection Vials and Caps

CTC Analytics PAL Autosampler Supplies

To better serve Agilent instrument users who choose CTC Analytics' autosamplers for high throughput and flexible sample introduction, Agilent has partnered with CTC to provide a fully integrated system, including CTC approved consumables.

Agilent's portfolio includes a variety of vials, caps, syringes, and well plates compatible with the CTC Analytics HTC PAL, GC PAL, and Combi PAL systems.



Combi PAL and GC PAL Liquid Injection Vials and Caps

Agilent provides a wide variety of micro and 2 ml vials and caps compatible with the Combi Pal and GC Pal listed in the Vials and Caps section. Below are the most popular vials and caps.

Description	Unit	Part No.
Crimp cap, 11mm magnetic	100/pk	5188-5386
Crimp top, 2 mL, wide opening clear vial	100/pk	5181-3375
7mm Crimp top vial, 0.8ml, Amber flat	1000/pk	5183-4487
8 mm crimp caps with PTFE/silicone septa	500/pk	5180-0842
Screw top vial, 2mL, Clear, wide opening	100/pk	5182-0714
Screw cap, PTFE/silicone septa	100/pk	5182-0720
Crimp/snap top vial, 2mL, Clear	100/pk	5182-0544
Blue polyethylene cap, PTFE/silicone septa, PTFE/silicone septa	100/pk	5182-0541

Autosampler Supplies

Liquid Injection and Headspace Syringes



Combi PAL and GC PAL Liquid Injection Syringes

A key feature of CTC's GC PAL and Combi PAL is the ability to inject a wide range of sample volumes, up to 500 µl for LVI applications. The following fixed needle, 26 gauge needles are recommended by CTC to sustain high reproducibility and accuracy.

Volume (µl)	Description	Unit	Needle	Part No.
1.2	Fixed needle		26/51/AS	G6500-80113
5	Fixed needle		26/51/AS	G6500-80114
10	Fixed needle		26/51/2	G6500-80115
			26/51/AS	G6500-80116
	Replacement plunger	10/pk		G4200-80105
25	Fixed needle		26/51/AS	G6500-80117
			Replacement plunger	10/pk
100	Fixed needle		26/51/AS	G6500-80118
250	Fixed needle		26/51/AS	G6500-80119
			Replacement plunger	10/pk
500	Fixed needle		26/51/AS	G6500-80120
			Replacement plunger	



Combi PAL Headspace Consumables

CTC's static headspace sampler uses fixed needle syringes with a sideport needle for gas flushing. CTC recommends screw vials and caps for best sealing and most reproducible results. These vials and caps are also used in SPME applications.

Description	Part No.
Syringe, CTC Headspace, 1.0 ml, 23 g	G6500-80107
Plunger, replacement CTC 1.0 mL	G4200-80101
Syringe, CTC Headspace, 2.5 ml, 23 g	G6500-80109
Plunger, replacement CTC 2.5 mL	G4200-80107
Syringe, CTC Headspace, 5.0 ml, 23 g	G6500-80111
Plunger, replacement CTC 5.0 mL	G4200-80108
10 mL Screw top clear vial, 100/pk	5188-5392
20 mL Screw top clear vial, 100/pk	5188-2753
UltraClean 18mm magnetic screwcap with silicone/PTFE septa 100pk	5188-2759

Autosampler Supplies

Liquid Injection Vials, Caps and Syringes



HTC PAL Liquid Injection Vials and Caps

Agilent provides a wide variety of vials and cap compatible with the HTC LC Injector listed in the Vials and Caps section. CTC recommends using Silicone/PTFE and PTFE/Silicone/PTFE septa for purity and penetration properties. Below are featured the most popular vials and caps used with the HTC.

Description	Unit	Part No.
Screw top vial, 2mL, Clear	100/pk	5182-0714
Screw top vial, 2 ml polypropylene, with 0.2 mL integrated glass insert	100/pk	5188-5390
Screw cap, PTFE/silicone septa	100/pk	5182-0720
Screw cap, Pre-slit PTFE/silicone septa	100/pk	5183-2076
Crimp top vial, 2ml, Clear	100/pk	5181-3375
Crimp cap, Silver aluminum, PTFE/silicone septa	100/pk	5182-0552
7mm Crimp top vial, 0.8ml	1000/pk	5183-4487
8 mm crimp caps with PTFE/silicone septa	500/pk	5180-0842
Blue polyethylene cap, PTFE/silicone septa, PTFE/silicone septa	100/pk	5182-0541
Crimp/snap top vial, 2ml, Clear	100/pk	5182-0546

Autosampler Supplies

Liquid Injection Vials, Caps and Syringes



HTC PAL Liquid Injection Syringes

To accommodate various applications, the HTC PAL is compatible with a range of fixed needle, 22 gauge, Pointstyle 3 syringes. CTC has designed and recommends special inert X-type syringes which feature zero carry-over and a long-lasting plunger for the applications that demand precision.

Volume (µl)	Description	Unit	Needle	Part No.
25	X-type Fixed Needle		22S/51/3	G4200-80117
100	X-type Fixed Needle, low dead volume		22/51/3	G4200-80118
	X-type Fixed Needle, fast aspiration and eject		22S/51/3	G4200-80119
10	Fixed Needle		22S/51/3	G4200-80113
25	Fixed Needle		22S/51/3	G4200-80114
100	Fixed Needle		22/51/3	G4200-80115
	Fixed Needle		22S/51/3	G4200-80116
250	Fixed Needle		22/51/3	G6500-80102
500	Fixed Needle		22/51/3	G6500-80103
1000	Fixed Needle		22/51/3	G6500-80104
2500	Fixed Needle		22/51/3	G6500-80105
5000	Fixed Needle		22/51/3	G6500-80106
25 mL	Replacement plungers for X-type syringe	3/pk		G4200-80112
100	Replacement plunger for X-type syringe	3/pk		G4200-80111
10	Replacement plunger	10/pk		G4200-80103
25	Replacement plunger	10/pk		G4200-80104
10	Replacement plunger	10/pk		G4200-80105
250	Replacement plunger	10/pk		G4200-80102
500	Replacement plunger			G4200-80106
1000	Replacement plunger			G4200-80101
2500	Replacement plunger			G4200-80107
5000	Replacement plunger			G4200-80108

Autosampler Supplies

Liquid Injection Valve Supplies

HTC PAL Liquid Injection Valve Supplies

Whether your HTC PAL autosampler has the new Rheodyne 7996 High Pressure 600 bar valve or Valco Cheminert injection valves, Agilent offers a wide selection of sample loops to meet your application needs.

- Loops for the Rheodyne 7996 valve are supplied with Swagelok fittings required for high pressure
- Cheminert metal loops include two 1/16 in. stainless steel nuts and two stainless steel ferrules
- Cheminert PEEK loops include two PEEK nuts and two PEEK ferrules

Description	Part No.
Valco Valve Loops and Needle Seals	
Loop, PEEK 2µl, Cheminert Inject Valve	5188-6469
Loop, PEEK 5µl, Cheminert Inject Valve	5188-6470
Loop, PEEK 10µl, Cheminert Inject Valve	5188-6467
Loop, PEEK 20µl, Cheminert Inject Valve	5188-6468
Loop, 2µl, Cheminert Injection Valve	5188-6457
Loop, 10µl, Cheminert Injection Valve	5188-6458
Loop, 50µl, Cheminert Injection Valve	5188-6460
Loop, 100µl, Cheminert Injection Valve	5188-6461
Loop, 250µl, Cheminert Injection Valve	5188-6462
Loop, 500µl, Cheminert Injection Valve	5188-6463
Loop, 1000µl, Cheminert Injection Valve	5188-6464
Loop, 2000µl, Cheminert Injection Valve	5188-6465
Loop, 5000µl, Cheminert Injection Valve	5188-6466
PEEK Needle Seal, Valco, 22 gauge, 10/pk	5188-6476
Teflon Needle Seal, Valco, 22 gauge, 10/pk	5188-6477
Rheodyne 7996 Valve Loops and Needle Seals	
Loop, 5 uL, SS, Rheodyne 7996	5188-6486
Loop, 10 uL, SS, Rheodyne 7996	5188-6487
Loop, 20 uL, SS, Rheodyne 7996	5188-6488
Loop, 50 uL, SS, Rheodyne 7996	5188-6489
Loop, 100 uL, SS, Rheodyne 7996	5188-6490
Stator, Rheodyne Series 7996	5188-6491
RheBuild Kit, 7996 Series, includes Rotor Seal and 3/32 hex wrench	5188-6492
Needle Seals, Rheodyne valve PD 7996 10/pk	5188-6478

Autosampler Supplies

Accessories

CTC Autosampler General Supplies

For your convenience, Agilent offers a selection of replacement sampling trays, well plates and sampling accessories for CTC autosamplers.

Description	Part No.
Sample tray, 200 vials, 0.7 or 1mL	G6500-80100
Sample tray, 98 2ml or 78 1 mL vials	G6500-80101
Sample tray, 32 10 or 20 mL vials	G6500-80121
Sample tray, for PAL stack	G6500-80122
96 Well plates, 0.5 ml, polypropylene	5042-1386
96 Deep well plates, 1 ml, polypropylene	5042-6454
384 Well plates, 90 μ L, polypropylene	5042-1388
Closing mats for 96 well plates, silicone	5042-1389
Well plate foil cutter, max 22 gauge needle	5188-6479



Gas Purification

Agilent Technologies brings the highest performance and largest variety of gas purifiers to gas chromatographers. We manufacture purifiers in an astonishing variety of sizes and configurations, to remove oxygen, moisture, and hydrocarbons. Our product line contains in-line gas purifiers including refillable, indicating, S-shaped, and metal body types. In line gas purifiers are made to remove specific contaminants. We also carry gas purification systems with removable cartridges. These systems provide the ability to design the right combination of filters needed for your application. Please refer to the following Gas Purifier Selection Guide to determine which gas purifiers you should use.

Gas Management

Gas purifiers

Gas Purifier Selection Guide

In Line Purifiers

Contaminant	Description	Series	Unique Features	Refillable	Page No.
Moisture (H ₂ O)	Economy Indicating Moisture Traps	MT, MT-D, MT-S	Economical plastic "Lexan" body for durability	Yes	72
	Glass Indicating Moisture Traps	GMT, LGMT	Glass body for no moisture diffusion	Yes	74
	S-Traps		Can be reconditioned in GC oven	No	75
	Big Moisture Traps	BMT	Ultra-high capacity for moisture	Yes	75
	Refills for Moisture Traps	MT, MT-D, MT-S GMT, LGMT, BMT	Makes gas purification more economical		72–75
Oxygen (O ₂)	Indicating Oxygen Traps	IOT, LIOT	Glass construction with plastic safety shield	No	76
	Oxygen Traps	OT1	Economical non-indicating oxygen trap	No	76
	Big Oxygen Traps	BOT	Ultra-high capacity for oxygen	No	77
Hydrocarbons (HCs)	Hydrocarbon Traps	HT	Economical trap for hydrocarbons	Yes	78
	Big Hydrocarbon Traps	BHT	Ultra-high capacity for hydrocarbons	Yes	78
	S-Traps		Can be reconditioned in GC oven	No	79
	Capillary Grade Hydrocarbon Traps	HT3	High surface area adsorbent, purged with high purity helium	Yes	79
	Refills for Hydrocarbon Traps	HT, BHT, HT3	Makes gas purification more economical		78–80
Combination Traps	Oxygen/Moisture Trap	OT3	Bi-functional trap, leak-free one-piece design	No	81–82
	Hydrocarbon/Moisture Trap	HMT	Bi-functional trap, leak-free one-piece design	Yes	82
	Big Universal Trap	RMS	Gas-specific (for purifying He, N ₂ , or H ₂), ultra-high capacity, removes H ₂ O, O ₂ , HCs, CO, and CO ₂ , recommended for GC and GC/MS gas supplies	No	83–84
	Refill for Hydrocarbon/Moisture Trap	HMT	Makes gas purification more economical		82
Purification Systems					
Multiple	High Capacity Gas Purification System		1 or 3 position cartridge system with ultra-high capacity and rugged, all-welded stainless steel construction for optimal purity, available with triple combination trap	No	86
	Quick Change + Point of Operation Panel		1, 2, 3, or 4 position cartridge system with quick change (QC) connections and unique valves to change cartridges without interrupting gas flow to the instrument	No	90
	Super-Clean Gas Filter System		1, 2, 3, or 4 position modular, quick-connect cartridge system with visible indicators	No	91
Other Purifiers					
Organics	Split Vent Trap	RDT	Cartridge design with durable cartridge holder and replacement cartridges	No	93
Accessories					
	Mounting Clips	MC, UMC	Designed to hold In Line Purifiers		93
	Trap Mounting Panel	UMP	Designed to hold In Line Purifiers		93

Gas Management

Oxygen and Moisture Capacities

Oxygen Removal

Type of Trap	Removal Capacity (mg)	Performance (ppb)
OT3 series	600.0	15
IOT series	30.0	2
LIOT series	100.0	1
OT3 + IOT	630.0	2
GC-1	396.0	5
GC-4	40.0	2
RBC series	436.0	2
RQC series	436.0	2
BOT series	3400.0	1

Moisture Removal

Type of Trap	Removal Capacity (g)	Performance (ppb)
MT120 series	21.6	20
MT120-D series	21.6	22
MT120-S series	31.5	40,000
MT200 series	36.0	18
MT200-D series	36.0	20
MT200-S series	52.5	39,000
MT400 series	72.0	14
MT400-D series	72.0	16
MT400-S series	105.0	39,000

Performance numbers are the lowest levels observed using N₂ @ 1 L/min.

Gas Management

Moisture Traps



Refillable moisture trap MT120

Moisture Traps

Economy Indicating Refillable Moisture Traps

Agilent Indicating Moisture Traps are designed to remove water, oil, and organics from gases employed in, but not limited to, gas chromatography. Refillable moisture traps are constructed from Lexan brand polycarbonate tubing. Lightweight, chemically resistant and of superior strength when compared to traps manufactured from acrylic. Agilent Indicating Moisture Traps have become the chromatographer's choice for water adsorption from GC gases.

- Available in three refillable sizes and three different packings
- Both inlet and outlet connectors are equipped with stainless steel frits to prevent particulates from entering the gas stream
- Mixed packing bed makes improper installation impossible
- Easily refillable
- Tested to 125 psi (helium)

Molecular Sieve 13X and Indicating 4A (MT Series)

The preferred adsorbent for GC gas drying. Blue indicating sieve turns buff at 20% relative humidity.

Description	Size (cc)	Fitting (in.)	Removal Capacity (g)	Max. Effluent H ₂ O Concentration (ppb)	Part No.
Refillable Moisture Trap	120	1/8	21.6	20	MT120-2
Refillable Moisture Trap	120	1/4	21.6	20	MT120-4
Refillable Moisture Trap	200	1/8	36.0	18	MT200-2
Refillable Moisture Trap	200	1/4	36.0	18	MT200-4
Refillable Moisture Trap	400	1/8	72.0	14	MT400-2
Refillable Moisture Trap	400	1/4	72.0	14	MT400-4

Refills and Mounting Clips

Description	Part No.
Adsorbent refill (1 pint) for MT series	MSR-1
Mounting clip for 120 and 200 cc traps	MC-1
Universal mounting clip for 400 cc traps	UMC-4

Gas Management

Moisture Traps

Molecular Sieve 5A and Indicating Drierite (MT-D Series)

High moisture capacity and simultaneously removes hydrogen sulfide and oil. Indicating Drierite changes dramatically from bright blue to pink as the gas stream approaches 40% relative humidity.

Description	Size (cc)	Fitting (in.)	Removal Capacity (g)	Max. Effluent H ₂ O Concentration (ppb)	Part No.
Refillable Moisture Trap	120	1/8	21.6	22	MT120-2-D
Refillable Moisture Trap	120	1/4	21.6	22	MT120-4-D
Refillable Moisture Trap	200	1/8	36.0	20	MT200-2-D
Refillable Moisture Trap	200	1/4	36.0	20	MT200-4-D
Refillable Moisture Trap	400	1/8	72.0	16	MT400-2-D
Refillable Moisture Trap	400	1/4	72.0	16	MT400-4-D

Refills and Mounting Clips

Description	Part No.
Adsorbent Refill (1 pint) for MT-D Series	MSR-2
Mounting clip for 120 and 200 cc traps	MC-1
Universal mounting clip for 400 cc traps	UMC-4



Refillable Moisture trap MT400

Silica Gel, Grade 40, and Indicating Silica Gel, Grade 42 (MT-S Series)

Highest moisture capacity adsorbent. Adsorbs as much as 40% of its weight in water. High affinity for hydrocarbons. Blue indicating gel turns from a deep blue to pale pink at 40% relative humidity.

Description	Size (cc)	Fitting (in.)	Removal Capacity (g)	Max. Effluent H ₂ O Concentration (ppb)	Part No.
Refillable Moisture Trap	120	1/8	31.5	40	MT120-2-S
Refillable Moisture Trap	120	1/4	31.5	40	MT120-4-S
Refillable Moisture Trap	200	1/8	52.5	39	MT200-2-S
Refillable Moisture Trap	200	1/4	52.5	39	MT200-4-S
Refillable Moisture Trap	400	1/8	105.0	39	MT400-2-S
Refillable Moisture Trap	400	1/4	105.0	39	MT400-4-S

Refills and Mounting Clips

Description	Part No.
Adsorbent Refill (1 pint) for MT-S series	SGR
Mounting clip for 120 and 200 cc traps	MC-1
Universal mounting clip for 400 cc traps	UMC-4

Gas Management

Moisture Traps



Glass Indicating Moisture Traps (GMT and LGMT Series)

Ideal for GC/MS Systems, Electron Capture Detectors, and Electrolytic Conductivity Detectors

- Molecular Sieve 13X and a band of Indicating Molecular Sieve 4Å
- Available in 70 cc, 100 cc and 250 cc sizes
- Heavy wall borosilicate glass tube — no moisture diffusion
- Refillable

The 100 cc unit will treat 10 standard "A" cylinders with up to 30 ppm water or 16.3 grams to less than 10 ppb. Molecular sieves differ from all other commercially available adsorbents, as they have an extremely high adsorption capacity for water and polar compounds even at relatively low concentrations. The color change takes place in the middle of the trap bed, giving ample warning. In addition to the inherent qualities of the sieve material, we treat the bed material under high vacuum and heat to ensure maximum scrubbing efficiency and capacity.



Refillable glass moisture trap

Description	Size (cc)	Fitting (in.)	Removal Capacity (g)	Max. Effluent H ₂ O Concentration (ppb)	Part No.
Glass Indicating Moisture Trap	70	1/8	11.4	7	GMT-2GC-HP
Glass Indicating Moisture Trap	70	1/4	11.4	7	GMT-4GC-HP
Glass Indicating Moisture Trap	100	1/8	16.3	6	GMT-2-HP
Glass Indicating Moisture Trap	100	1/4	16.3	6	GMT-4-HP
Glass Indicating Moisture Trap	250	1/8	40.09	6	LGMT-2-HP
Glass Indicating Moisture Trap	250	1/4	40.09	6	LGMT-4-HP

Refills and Mounting Clips

Description	Part No.
Molecular Sieve Refill for GMT and LGMT series	GMSR
Mounting clip for 70 and 100 cc traps	UMC-3
Universal mounting clip for 400 cc traps	UMC-4



Moisture S-trap

Moisture Removal S-Traps

- Contains Molecular Sieve 5Å, 45/60 mesh
- Can be reconditioned

Description	Part No.
Moisture S-trap, preconditioned, 1/8 in. fittings*	5060-9084
Moisture S-trap, unconditioned, 1/8 in. fittings	5060-9077

*Traps can be reconditioned by heating at a minimum of 350°C, with flow for 6 hours

Big Moisture Traps (BMT Series)

- Capacity: 130 grams H₂O
- Pressure: Up to 250 psig
- Efficiency: reduction of H₂O to less than 5 ppb
- 750 cubic centimeter gas purifiers
- Ideal for bulk purification applications or where several instruments are plumbed from a single gas source
- One piece of heavy-walled aluminum tube. This one-piece design eliminates potential leaks.
- Equipped with sintered stainless steel frits to prevent particulate contamination
- Refillable



Big moisture trap

Description	Size (cc)	Fitting (in.)	Part No.
Big Moisture Trap	750	1/8	BMT-2
Big Moisture Trap	750	1/4	BMT-4

Refills and Mounting Clips

Description	Part No.
Refill for Big Moisture Trap (enough for 2 refills)	BMSR-1
Big Mounting Clip, 2/pk	UMC-5-2

Gas Management

Oxygen Traps

Oxygen Traps

Indicating Oxygen Traps

- Reduces oxygen to less than 1 ppb
- Environmentally safe
- Available in two sizes, standard and large—three times the capacity

This trap actually removes the oxygen rather than converting it to another form of contamination.

Oxygen and a wide range of oxides react with the activated bed material to form a manganese oxide. This reaction results in a progressive and dramatic color change, from light green in the adsorbent's active state to deep brown as oxygen saturation occurs. The Indicating Oxygen Trap is designed to be used in conjunction with any of our high capacity, non-indicating oxygen traps. When properly installed downstream from the non-indicating trap, the Indicating Oxygen Trap provides a visual indication of oxygen breakthrough BEFORE contamination reaches sensitive system components.

Unlike adsorbent materials utilized in competitive products, our indicating media can be exposed to air and water in virtually any quantity without resulting in an exothermic reaction. The spent product is nontoxic, nonhazardous, nonflammable, and nonreactive. The high impact Lexan shield prevents "lab catastrophes" if the trap is exposed to pressure beyond its stated pressure limit. Safe for land-fill refuse.

Indicating Oxygen Traps (IOT and LIOT Series)

Description	Size (cc)	Fitting (in.)	Part No.
Indicating Oxygen Trap	30	1/8 in.	IOT-2-HP
Indicating Oxygen Trap	30	1/4	IOT-4-HP
Large Indicating Oxygen Trap	150	1/8	LIOT-2
Large Indicating Oxygen Trap	150	1/4	LIOT-4
Mounting Clip for IOT traps			UMC-2
Mounting clip for LIOT traps			UMC-3

Economy Non-Indicating Oxygen Traps (OT1 Series)

Description	Size (cc)	Fitting (in.)	Part No.
Oxygen Trap	70	1/8	OT1-2
Oxygen Trap	70	1/4	OT1-4
Mounting clip for OT1 traps			MC-1



Economy non-indicating oxygen trap

Gas Management Oxygen Traps



Big oxygen trap

Big Oxygen Traps (BOT Series)

- Capacity: 3 liters O₂ or 3,200 mg
- Pressure: Up to 250 psig
- Efficiency: reduction of O₂ to less than 1 ppb
- 750 cubic centimeter gas purifiers
- Ideal for bulk purification applications or where several instruments are plumbed from a single gas source
- One piece of heavy-walled aluminum tube. This one-piece design eliminates potential leaks
- Equipped with sintered stainless steel frits to prevent particulate contamination

Description	Size (cc)	Fitting (in.)	Part No.
Big Oxygen Trap	750	1/8 in.	BOT-2
Big Oxygen Trap	750	1/4	BOT-4
Big Mounting Clip, 2/pk			UMC-5-2

Gas Management

Hydrocarbon Traps

Hydrocarbon Traps

Hydrocarbon Traps (HT Series)

Our Hydrocarbon Traps offer you flexibility: refill your trap and remove extremely low levels of hydrocarbons.

- Remove organics from carrier gases, air and hydrogen
- High capacity—200 cc of filtering media
- Impregnated carbon filter media
- Mounting Panel
- Refillable

Description	Size (cc)	Fitting (in.)	Part No.
Hydrocarbon Trap	200	1/8	HT200-2
Hydrocarbon Trap	200	1/4	HT200-4
Mounting clip for HT200 Series			MC-1
Adsorbent Refill (1 pint), 2 Recharges for Hydrocarbon Trap			ACR



Big hydrocarbon trap

Big Hydrocarbon Traps (BHT Series)

- Capacity: 80 grams of medium to heavy molecular weight hydrocarbons
- Pressure: Up to 250 psig
- Efficiency: reduction of C4 hydrocarbons to less than 15 ppb
- 750 cubic centimeter gas purifiers
- Ideal for bulk purification applications or where several instruments are plumbed from a single gas source
- One piece of heavy-walled aluminum tube. This one-piece design eliminates potential leaks.
- Equipped with sintered stainless steel frits to prevent particulate contamination
- Refillable

Description	Size (cc)	Fitting (in.)	Part No.
Big Hydrocarbon Trap	750	1/8	BHT-2
Big hydrocarbon trap	750	1/4	BHT-4
Refill for Big Hydrocarbon Trap (enough for two refills)			BACR
Big Mounting Clip, 2/pk			UMC-5-2



Hydrocarbon S-trap

Hydrocarbon Removal S-Traps

- Filled with 40/60 mesh activated charcoal
- Can be reconditioned

Description	Part No.
Hydrocarbon S-Trap, 1/8 in. fittings, used for trapping organics from gases*	5060-9096

*This trap can be reconditioned by heating at a minimum of 350°C, with flow for 6 hours

Capillary Grade Hydrocarbon Traps (HT3 Series)

- Extremely high surface area, coconut shell-based, activated carbon
- 100 cc of filtering media
- Purged with ultra-high purity helium
- Refillable

Description	Size (cc)	Fitting (in.)	Part No.
Capillary Grade Hydrocarbon Trap	100	1/8	HT3-2
Capillary Grade Hydrocarbon Trap	100	1/4	HT3-4
Mounting clip for HT3 Series			MC-1
Adsorbent Refill (1 pint), 3 Recharges for Capillary Grade Hydrocarbon Trap			ACR

Gas Management

Hydrocarbon Traps

Ability of Activated Carbon to Remove Substances from Gases Using Hydrocarbon Traps

Compound	Efficiency
acetone	excellent
hypochlorous acid	excellent
alcohol	excellent
amines	very good
inorganic acids	none
ammonia	poor
iodine	excellent
amyl acetate	excellent
isopropyl acetate	excellent
amyl alcohol	excellent
isopropyl alcohol	excellent
benzene	excellent
ketones	excellent
butyl acetate	excellent
butyl alcohol	excellent
lactic acids	excellent
by-products-organic	very good
lysol	excellent
calcium hypochlorite	excellent
mercaptans	excellent
carbon dioxide	none
methyl acetate	excellent
chlorobenzene	excellent
methyl alcohol	excellent
chlorine	excellent
methyl bromide	excellent
chlorophenol	excellent
methyl chloride	excellent
chlorophyl	excellent
methyl ethyl ketone	excellent
cresol	excellent

Compound	Efficiency
dissolved oils	excellent
nitrobenzenes	excellent
nitrotoluene	excellent
ethyl acetate	excellent
ethyl alcohol	excellent
organic acids	excellent
ethyl chloride	excellent
oxalic acid	excellent
ethyl ether	excellent
ozone	excellent
fluoride	poor
phenol	excellent
formaldehyde	poor
potassium permanganate	excellent
propyl acetate	excellent
glycol	excellent
propyl alcohol	excellent
propyl chloride	excellent
hydrogen bromide	satisfactory
hydrogen chloride	poor
sodium hypochlorite	excellent
hydrogen fluoride	none
solvents	excellent
hydrogen iodide	satisfactory
sulfuric acid	satisfactory
hydrogen selenide	satisfactory
hydrogen sulfide	satisfactory
toluene	excellent
trichloroethylene	excellent
xylene	excellent

Combination Traps

Oxygen/Moisture Traps

Oxygen/moisture adsorbents team up to give you two functionalities in the same trap. Unlike some oxygen/moisture traps, these traps are disposable.

Consider the safety, performance, and cost advantages of the Agilent capillary grade oxygen/moisture traps (OT3) when comparing to heated, catalytic traps.

- Optimized for maximum surface area and capacity
- Leak-free, one-piece design—(tested to 2000 psi)
- Bed material treated with ultra-high purity helium
- Filter design: prevents channeling, promotes efficient scrubbing

We recommend this trap for these applications:

- Electron Capture Detectors

Recommended by Agilent for electron capture detectors, oxygen/water removal effectively prevents detector degradation from oxygen and water contamination. The all-metal housing of the Agilent OT3 trap virtually eliminates contamination and resultant signal noise.

- GC/MS

GC/MS Evaluation of the Agilent OT3 Trap

Mass spectral data was acquired to determine background.

The trap was installed between the gas cylinder and the GC and data was acquired.

Experimental Conditions

High purity helium

80-100 scans of mass spectral data were acquired. Helium admitted to MS during scans 25-45. Ten scans were summed and scans 10-20 were used to correct for inherent instrument background.

Agilent trap was installed and experiment was repeated.

After additional use, the experiment was repeated.

The data shows about a twentyfold reduction in the M/Z 18 ratio (water) and about a fortyfold reduction in the M/Z 32 ratio (oxygen).

M/Z Ratio*	18/28	32/28	32/40
Without Agilent OT3 Trap	0.098	0.266	11.08
With Agilent OT3 Trap	0.005	0.0118	0.247

*Contribution of inherent instrument background removed. Analysis by California Analytica Laboratories, Inc. Sacramento, California

In addition to inert gases (nitrogen, helium, argon and krypton), the Agilent OT3 Trap treats streams of hydrogen, alkanes, alkenes, aliphatic hydrocarbon gases, low boiling aromatics, carbon dioxide, carbon monoxide, and argon-methane.

Gas Management Combination Traps

Why use Oxygen Traps?

Traces of oxygen in your carrier gas system can destroy a GC column, especially polar phases.

How does it work?

The Agilent OT3 Trap contains a highly active, metal-containing, scrubbing material in an inert, aluminum body. This material removes 500 mL oxygen from a gas stream to less than 15 ppb. Additionally, up to 2 grams of moisture can be removed by this trap without affecting the oxygen capacity.



Agilent OT3 trap

Oxygen/Moisture Traps (OT3 Series)

Description	Size (cc)	Fitting (in.)	Part No.
OT3 Trap	100	1/8	OT3-2
OT3 Trap	100	1/4	OT3-4
Mounting clip			MC-1

Hydrocarbon/Moisture Traps

Our hydrocarbon/moisture traps offer you flexibility: refill your trap and remove extremely low levels of both moisture and hydrocarbons.

- Replace most mixed bed traps supplied by GC manufacturers
- Mounting panel
- Refillable



Hydrocarbon Moisture trap

Hydrocarbon/Moisture Traps (HMT Series)

Description	Size (cc)	Fitting (in.)	Part No.
Hydrocarbon/Moisture Trap	200	1/8	HMT200-2
Hydrocarbon/Moisture Trap	200	1/4	HMT200-4
Mounting clip for HMT Series			MC-1
Adsorbant Refill (1 pint), 2 Recharges for Hydrocarbon/Moisture Trap			HCRMS

Combination Traps for Chemical Ionization MS

Description	Fitting (in.)	Part No.
Chemical Ionization for MS*	1/8	G1999-80410

*Isobutane or methane applications only

Gas Management Combination Traps



Big universal traps have nearly three times the capacity of the competitor's purifier

Big Universal Traps

Big Universal Traps utilize a layered, multi-adsorbent bed packing of the most effective, highest capacity adsorbent materials available today for the removal of oxygen, moisture, hydrocarbons, carbon dioxide and carbon monoxide from helium gas streams. The volume of the various adsorbent materials in the Big Universal Trap was developed through rigorous testing and evaluation in order to assure that breakthrough of the five major contaminant groups occurs as simultaneously as possible as each material achieves complete saturation.

One Big Universal Trap unit will easily purify the contents of thirteen "K" size cylinders of 99.997% purity helium to a cumulative level of 100 parts per billion of O₂, H₂O, CO₂, CO and hydrocarbons at a flow rate of up to 8 liters/minute. All tube fittings are Swagelok brand stainless steel, fitted with 40 micron stainless steel frits for particulate control. Maximum pressure is 500 psi.

Big Universal Traps are more economical than other purifiers. They cost only slightly more than competitive products, but offer nearly three times the capacity.

Big Universal Traps are ideal for any GC or GC/MS application where helium is employed and assurance of purity is essential. Combining the contents of three individual in-line traps into a single unit reduces the number of potential leaks and the possibility of aspirating contaminants into the gas stream. A single purifier also simplifies installation and replacement.

Gas Management Combination Traps

Capacity Data

High Purity Helium-99.997%		Removal Capacity
O ₂	< 5 ppm	1.07 L
THC*	< 1 ppm	20 g
H ₂ O	< 5 ppm	46 g

*Total Hydrocarbons, analysis limited to three contaminate groups

Effluent Concentration

Research Grade Helium-99.9999%	
Impurities	< 1 ppm
N ₂	< 0.5 ppm
O ₂	< 0.5 ppm
THC*	< 0.1 ppm
CO+CO ₂	< 0.1 ppm
H ₂ O	< 0.2 ppm
H ₂	< 0.2 ppm
Ar	< 0.1 ppm
Ne	< 0.5 ppm

*Total Hydrocarbons, analysis limited to three contaminate groups

Big Universal Traps (RMS Series)

Gas Type	Fitting (in.)	Part No.
Hydrogen	1/8	RMSHY-2
Hydrogen	1/4	RMSHY-4
Helium (Ar/Me)	1/8	RMSH-2
Helium (Ar/Me)	1/4	RMSH-4
Nitrogen	1/8	RMSN-2
Nitrogen	1/4	RMSN-4
Big Mounting Clip, 2/pk		UMC-5-2

Gas Management

Gas Purification Systems

High Capacity Gas Purification System

Three Cartridge System



Three cartridge high capacity gas purification system

- Agilent's highest capacity and most economical gas purification system.
- Provides low-cost gas contaminant removal for up to 18 cylinders of carrier gas.
- Includes a manifold with cartridge mounts and three replaceable cartridges: one moisture/hydrocarbon cartridge; one oxygen cartridge; and one oxygen indicating cartridge.
- Designed to minimize column damage from impurities such as oxygen and to maximize performance by reducing sulfur compounds, moisture and organics to very low levels.
- First cartridge removes moisture and organics.
- Second cartridge provides the capacity to remove at least 1000 cc of pure oxygen
- Third cartridge (indicating oxygen) changes color to warn of system saturation.
- Consists of a permanent all-welded stainless steel manifold to minimize the potential for leaks.
- Suitable for bench or wall mounting.

Single Cartridge System

- Contains a triple-combination cartridge that offers the same highly efficient contaminant removal properties from eight cylinders of carrier gas but without the visual indicator.
- Other cartridges are also available for detector gas supplies and as individual filters for specialized requirements.

Specifications: Three Cartridge High Capacity GPS

Max. Pressure	200 psi
Capacity	1000 ml of oxygen, 18 tanks of 99.997% purity gas
	15 g H ₂ O (inlet at saturation)
	0.7 g H ₂ O (inlet moisture 10 ppm)
	12 g hydrocarbon (as n-butane)
Dimensions	25 cm x 30 cm x 8 cm
Weight	4.8 kg
Purity Level	< 0.2 ppm oxygen; > 99.8% removal of moisture and hydrocarbons

Specifications: Single Cartridge GPS

Max. Pressure	200 psi
Capacity	450 ml of oxygen, 8 tanks of 99.997% purity gas
	6.0 g H ₂ O (inlet at saturation)
	0.3 g H ₂ O (inlet moisture 10 ppm)
	5.2 g hydrocarbon (as n-butane)
Dimensions	12 cm x 30 cm x 8 cm
Weight	1.6 kg
Purity Level	< 0.2 ppm oxygen; > 99.8% removal of moisture and hydrocarbons

Gas Management

Gas Purification Systems



Single cartridge gas purification system

High Capacity Gas Purification System

Description	Part No.
Three Cartridge System: Includes manifold for wall or bench mount and 3 cartridges (H₂O/hydrocarbon, oxygen, and indicating O₂)	
1/8 in. fittings	5183-1907
1/4 in. fittings	5182-9776
Replacement Cartridge Kit	5182-9780
Single Cartridge System: Includes single cartridge manifold brackets for wall or bench mount, and a triple combination cartridge (H₂O/hydrocarbon and O₂)	
1/8 in. fittings	5183-4598
1/4 in. fittings	5183-4599
Detector-Specific Purifiers	
FID Purifier, 1/8 in. fittings Includes two hydrocarbon/moisture cartridges with separate connections for air and hydrogen lines	5182-9793
ECD Purifier, 1/8 in. fittings Includes moisture cartridges and high capacity oxygen cartridge in series	5182-9795
Individual Cartridge Filters and Replacement Cartridges	
Moisture/Hydrocarbon Replacement Cartridge	5182-9777
Oxygen Replacement Cartridge	5182-9778
Indicating Oxygen Replacement Cartridge	5182-9779
Moisture Only Replacement Cartridge	5182-9792
Hydrocarbon Only Replacement Cartridge	5182-9791
Triple combination replacement cartridge for single cartridge system	5183-4600
Single cartridge manifold, 1/8 in. fittings	5183-4607
Single cartridge manifold, 1/4 in. fittings	5183-4608

Gas Management

Gas Purification Systems

QC+ Point of Operation Panels

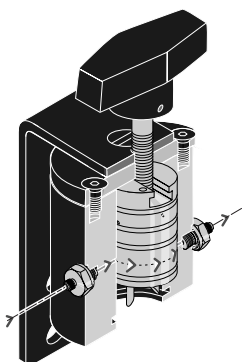
The QC+ Point of Operation Panel contains purifier cartridges that can be quickly changed (that's the QC). The cartridges are removed from the panel without interruption of gas flow to the system (that's the +), drastically minimizing costly instrument downtime (and that's a real +).

Filter cartridges are of all metal or glass construction, eliminating infusion and resultant signal noise associated with filters constructed from plastics. Cartridges are quickly installed via a simple knurled retaining nut. No wrenches are needed! As many as four cartridges can be replaced in a matter of seconds, and because there is low dead volume, a minimal amount of gas system purge is required after installation.

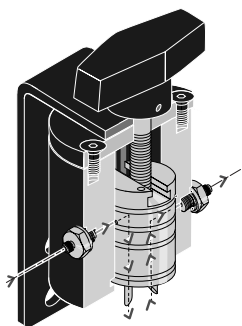
Each QC+ filter head is equipped with an internal flow valve. This valve serves two functions. In the "down" position, gas is passed through adsorbent filter cartridges for purification (Figure 1b). In the "up" position, the gas is diverted through the filter head. With the valve up (Figure 1a), the filter cartridge can then be easily replaced with a fresh cartridge. But, because the gas continues to flow through the bypass valve, the need to shut down instruments is eliminated while the filter cartridges are removed. QC+ is the only GC purification system with this revolutionary "flow through/bypass" feature.

The QC+ system has a unique D-shaped cartridge top that is self-aligning into the matching slotted filter head, assuring trouble-free installations. As many as four cartridges can be replaced in a matter of seconds without exposing downstream plumbing to atmospheric contaminants.

QC+ systems are available in single-head kits or 2-, 3- and 4-head panel configurations, available exclusively with 1/8 in. Swagelok fittings. QC+ panels can be wall mounted or used "freestanding." Oxygen, water, hydrocarbons and other organics are reduced to low part per billion levels.



a



b

(Figures a and b. The "plus" valve (a) features a closed gas path when changing cartridges. When placed in the down position (b), the "plus" valve shifts gas through the cartridge)

Gas Management

Gas Purification Systems

Replacement Cartridges

High Capacity Oxygen

The GC-1 oxygen cartridge is an all metal assembly that contains a highly active metal catalyst, supported on an alumina silicate substrate. Oxygen removal efficiency to less than 15 ppb. P/N: GC-1;
Capacity: 396 mg

High Capacity Moisture

The GC-2 moisture cartridge is an all metal assembly that contains 13X molecular sieve, 16-20 mesh sphere size. Water removal efficiency to less than 9 ppb. P/N: GC-2;
Capacity: 15 g

Indicating Moisture

The GC-2-1 indicating moisture cartridge is a glass assembly that contains a combination of 5Å molecular sieve and indicating Drierite. This cartridge provides a visual indicator of adsorbent saturation. Water removal efficiency to less than 9 ppb. P/N: GC-2-1;
Capacity: 7 g

Hydrocarbon

The GC-3 hydrocarbon cartridge is an all metal assembly that contains a high surface area and coconut shell-based, activated carbon medium. Efficiencies to low ppb levels for C2 and heavier compounds. Hydrocarbon removal efficiency to less than 30 ppb. P/N: GC-3;
Capacity: 8 g

Indicating Oxygen

The GC-4 indicating oxygen cartridge is constructed from glass. It contains a manganese oxide adsorbent that experiences a dramatic and progressive color change during adsorption. Oxygen removal efficiency to less than 2 ppb. P/N: GC-4;
Capacity: 40 mg

Gas Management

Gas Purification Systems

2-, 3- and 4-Head Panels

2-Head GC Carrier Gas

QC+ System RBC-P

Two-head carrier gas purification system is strongly recommended when employing columns with bonded phases or any capillary column. Consists of high capacity oxygen/moisture adsorber and indicating trap that signals breakthrough of high capacity, non-indicating cartridge. Flow at Pressure: 13 LPM at 50 psi helium

2-Head Detector Gas Supply for FID

QC+ System RBC-D-P

Two-head air/hydrogen system is strongly recommended for both hydrogen and air supply to Flame Ionization Detectors (FIDs). Includes high capacity moisture and hydrocarbon cartridges. Flow at Pressure: 14 LPM at 50 psi helium

3-Head GCs with Selective Detectors and Carrier Gas

QC+ System RTC-P

Three-head cartridge system with high capacity oxygen, moisture, and hydrocarbon cartridges. The perfect compliment to any system that employs nitrogen, helium, or argon/methane mixtures. Flow at Pressure: 7 LPM at 50 psi helium

3-Head Electron Capture and ELCD Detectors

QC+ System RTC-I-P

Three-head cartridge panel that includes high capacity oxygen, moisture, and indicating oxygen cartridges. Flow at Pressure: 7 LPM at 50 psi helium

4-Head GC/MS and any Critical GC Application

QC+ System RQC-P

Consists of high capacity oxygen, moisture, and hydrocarbon removing filters, plus an indicating oxygen cartridge to signal oxygen breakthrough of upstream unit. The ultimate in gas purification for any GC application. Flow at Pressure: 6 LPM at 50 psi helium

Gas Management

Gas Purification Systems



RBC-P

QC+ Point of Operation Panels

Description	Fitting (in.)	Part No.
1-Head		
Indicating oxygen	1/8	R2D2-I-P
2-Head		
Moisture, hydrocarbon	1/8	RBC-D-P
Moisture and indicating moisture	1/8	RBCDP-GC2/I
3-Head		
Oxygen, moisture, hydrocarbon	1/8	RTC-P
Moisture, oxygen, indicating oxygen	1/8	RTC-I-P
4-Head		
Oxygen, indicating oxygen, hydrocarbon, moisture	1/8	ROC-P



RTC-I-P

Replacement Cartridges

Description	Part No.
High capacity oxygen	GC-1
High capacity moisture	GC-2
Indicating moisture	GC-2-I
Hydrocarbon	GC-3
Indicating oxygen	GC-4
Replacement O-ring set	R2D2-ORINGS



ROC-P

Super Clean Gas Purification Systems

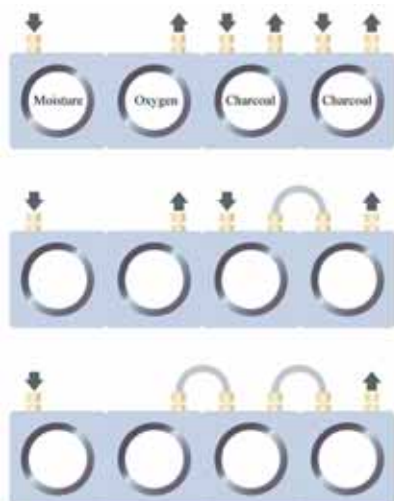
Super-Clean gas filter systems are designed to provide the utmost in convenience and contamination reduction. The system is tested for leak-tightness and the glass and metal construction of the cartridges eliminates diffusion of contaminants into the gas stream. During cartridge replacement, check valves close off the system to the atmosphere, further minimizing the entry of contaminants.

Filter systems are available in several configurations, including 3 and 4 cartridge systems for GCs equipped with Flame Ionization Detectors (FIDs). Additionally, baseplates are available for 2, 3, or 4 filters, allowing the user to design a gas filter system for any application. Unit is ready to connect with 1/8 in. tubing. Maximum pressure is 150 psi (11 bar).

- Triple filter cartridge for carrier gas purification with a single cartridge.
- Fuel gas filter for removal of hydrocarbons and moisture from FID fuel gases.
- The filter's gas flow path is made from high quality glass and stainless steel.
- Filters can be changed easily, without tools.
- Base plate design allows customization for your gas filtration needs (see figure).
- Indicating action tells when to replace cartridges.

Gas Management

Gas Purification Systems



Gas filter base plate design



Specifications

Max pressure	150 psi (11 bar)
Capacity	Triple Filter—1.8 g H ₂ O, 0.5 L O ₂
	Fuel gas filter—3.6 g H ₂ O
	Moisture filter—7.2 g H ₂ O
	Oxygen—1000 mL of O ₂
Dimensions	33 cm x 31 cm x 11 cm—4 filter system
Weight	8 kg
Purity Level	< 0.1 ppm at max flow rate of 2 L/min (max pressure 10 bar)

Super Clean Gas Purification Systems

Description	Part No.
FID Gas Purification System: Dedicated three position system for purifying all gases used in an FID-equipped GC. Includes the triple filter cartridge for carrier gas, and two fuel gas filter cartridges for both hydrogen and zero air.	5182-9703
Carrier Gas Purification System: Single position system for GC/MS, ECD and NPD detectors. Includes the triple filter cartridge.	5182-9704
Super Clean Gas Purification System: Includes four position baseplate manifold with four filter cartridges: oxygen, moisture (both with indicator), and two hydrocarbon cartridges.	5182-0816
FID Fuel Gas Purification System: Two position system dedicated to purifying the incoming hydrogen and zero grade air directly at your FID-equipped GC.	5183-4774
GC/MS assembly for He (gas specific), 1 filter/base plate, Triple cartridge (O ₂ /Moisture/Charcoal)	5188-6475
Wall mount bracket for Super Clean Gas Purification System	5182-0821
O-ring kit 8/pk, 4 each of 2 sizes	5182-3423

Gas Management

Gas Purification Systems

Super Clean Replacement Filter Cartridges

Description	Part No.
Triple Filter Cartridge: A single carrier gas filter now with hydrocarbon, moisture, and oxygen trapping capability. Includes moisture and oxygen indicator so you know exactly when to replace the cartridge.	5182-9705
Fuel Gas Filter Cartridge: Combination hydrocarbon and moisture trap with moisture indicator. Insures the highest quality hydrogen and zero air for your FID.	5183-4771
Moisture filter cartridge with indicator	5182-0817
Oxygen filter cartridge with indicator	5182-0818
Hydrocarbon filter cartridge	5182-0820
Filter cartridge bundle of 4: Oxygen, moisture, and 2 hydrocarbon	5183-4770
FID Filter Cartridge Bundle: Includes one Triple Filter Cartridge and two Fuel Gas Filter Cartridges	5183-4769
GC-Filter, Triple, gas specific for He (O ₂ /Moisture/Charcoal) for GC/MS	5188-6474

Super Clean Baseplates

Design your own gas purification system—use Agilent's Super Clean Baseplates and filter cartridges to design a customized gas solution specific to your application needs.

Description	Part No.
Single position baseplate/manifold	5182-0815
2 position baseplate/manifold	5182-9706
3 position baseplate/manifold	5182-9707
4 position baseplate/manifold	5182-9713



Tips & Tools

Built-in check valves automatically stop gas flow to allow for fast filter changes without the introduction of ambient air into the system.



RDT-1020

Gas Purifier Accessories

Universal/External Split Vent Trap

Split vent trap stops environmental pollution. The split vent trap was designed to protect the lab environment from the contaminants released by split injection systems, which can vent up to 500 times the amount of sample reaching the detector into the laboratory's air. A replaceable, impregnated carbon filter media traps and eliminates a broad range of contaminants. The traps are also easy to change and come with three packs of replacement cartridges each. Replace approximately every six months.

Universal/External Split Vent Trap

Description	Part No.
Universal/external split vent trap with 3 cartridges, 1/8 in. Swagelok fitting	RDT-1020
Replacement cartridges, 3/pk	RDT-1023

Chemical Filters/Traps for 5890

These filters are packed with molecular sieve 5Å, 60/80 mesh, and can be reconditioned by heating in the GC oven. (Recommended replacement for P/N 5060-8299)

Chemical Filters/Traps for 5890

Description	Part No.
Chemical filter for 5890	05890-61260
Detector trap replacement kit	19231-60790
Replacement detector stainless steel trap	19231-80590
Replacement O-rings, 12/pk	5180-4181
Plastic fitting, 10/pk	5181-3394
Split vent trap 5890 GC (internal)	19251C

Trap Mounting Clips

Trap Size (OD)	Use With	Part No.
7/8 to 1 in.	MT120, MT200, OT1, OT3, MT3, HT200, HMT	MC-1
1-1/8 to 1-3/8 in.	IOT	UMC-2
1-3/8 to 1-5/8 in.	GMT, LIOT	UMC-3
1-5/8 to 1-7/8 in.	MT400, LGMT	UMC-4
2 to 2-1/2 in.	Big Traps	UMC-5
2 to 2-1/2 in.	Big Traps	UMC-5-2

Gas Management

GC Installation Kits

GC Installation Kits

Agilent Installation Kits for GC are designed to provide you with the essential items necessary for a successful installation while providing a substantial cost savings over individual purchases.

Description	Unit	Part No.
GC Installation Kit with Tools (no gas purifiers)		19199M
Snoop, 8 oz (236 ml) bottle		9300-0311
1/8 in. brass nut and ferrule set	20/pk	5080-8750
Copper tubing, 1/8 in., 50 ft, precleaned		5180-4196
1/8 in. tee, brass	2/pk	5180-4160
Tube cutter, 1/8 to 5/8 in. od tubing		8710-1709
1/8 in. cap, brass	6/pk	5180-4121
Nut driver, 7 mm		8710-1217
Screwdriver, Torx T10		5182-3466
Screwdriver, Torx T 20		5182-3465
Open end wrench, 1/4 and 5/16 in.		8710-0510
Open end wrench, 7/16 and 9/16 in.		8710-0803
Open end wrench, 7/16 and 3/8 in.		8710-0972
Wrench, 1/2 and 7/16 in.		8710-0806

Description	Unit	Part No.
GC Installation Kit with Gas Purifiers (no tools)		19199N
Snoop, 8 oz (236 ml) bottle		9300-0311
1/8 in. brass nut and ferrule set	20/pk	5080-8750
Copper tubing, 1/8 in., 50 ft		5180-4196
1/8 in. tee, brass	2/pk	5180-4160
Tube cutter, 1/8 to 5/8 in. od tubing		8710-1709
1/8 in. cap, brass	6/pk	5180-4121
Indicating Oxygen Trap, 1/8 in.		IOT-2-HP
Big Oxygen Trap, 1/8 in.		BOT-2
Glass Indicating Moisture Trap, 1/8		GMT-2-HP
Hydrocarbon S-Trap, 1/8 in. fittings		5060-9096
Universal/external split vent trap with 3 cartridges		RDT-1020

Gas Management

GC Installation Kits

GC Basic Installation Kit

Description	Part No.
GC Basic Installation Kit Includes copper tubing, column nuts, two moisture traps, and five wrenches	5182-3453



Fittings kit, 5180-4161

Miscellaneous

Description	Part No.
Teflon tape, industrial roll	0460-1266
Copper tubing, 1/8 in., 50 ft	5180-4196
Tube cutter, 1/8 to 5/8 in. od tubing	8710-1709
Fittings Kit	5180-4161

Gas Management Flowmeters



Flowmeters

Agilent manufactures the largest selection of flowmeters for chromatography. We have developed flowmeters for measuring capillary column flows, calibrating air pumps and flow controllers, and verifying instrument gas flows.

Setting and maintaining GC flow rates greatly affect the instrument accuracy and sensitivity. Choosing a flowmeter for your application depends upon measurement speed, ease of use, accuracy and flow rate range.

Measurement Speed

Agilent offers two types of volumetric flowmeters—bubble (Optiflow) and thermal conductivity based flowmeter (ADM and FlowTracker series)—and one mass flowmeter (Veri-Flow 500). Volumetric measurements rely upon the volume of gas passing through the flow meter but not the composition. Additionally, volumetric flowmeters accurately measure from a mixed or multi-component gas stream. Mass flowmeters are calibrated to specific gas compositions and determine the flow rate for those calibrated gases. Mass measurements are independent of temperature and pressure.

With volumetric flowmeters, no adjustments are needed when switching from one gas stream to a different composition stream. An analyst can immediately change from measuring nitrogen from a GC detector to helium split rate from an injection port, to methane from an anaerobic digestion vessel. If a mass flowmeter is used, the analyst must change instrument settings and purge the flowmeter of the initial gas before accurate readings can be taken.

Ease of Use

When setting gas flows with many flowmeters, the analyst often needs more than two hands to hold and start the flowmeter. With continuous flow readings, the analyst does not have to start or stop the flowmeter with each measurement. The FlowTracker, Veri-Flow 500, and ADM flowmeters read flow values continuously.

Flow Rate Range

Low flow rates? No problem (down to 0.1 ml/min). Very high flow rates? No problem (up to 5 L/min). A wide range of flow rates? No problem (0.5-1000 ml/min using a single flowmeter).

Flowmeter Selection Guide

Description	Low Flow (mL/min)	High Flow (mL/min)	Accuracy	Flow through design	Gases measured (non-corrosive)	Volumetric ¹ or mass ² flowmeter	RS-232 Capability	Unique Features	Power Supply	Page No.
Digital Flowmeters: For those who prefer data acquisition and logging with completely electronic, multifunction devices. For noncorrosive gas streams.										
FlowTracker 2000 plus Leak Detector	0 ³	500	± 2% of reading ± 0.2 mL/min*	Yes	N ₂ , H ₂ , He, Air, CO ₂ , CH ₄ , 95% Ar/CH ₄	Both	Output	Multifunction digital volumetric flowmeter, with leak detection and pressure, temperature, and calculated mass flow measurements	6 AA batteries or 110V/220V AC	98
FlowTracker 1000	0 ³	500	± 2% of reading ± 0.2 mL/min*	Yes	N ₂ , H ₂ , He, Air, CO ₂ , CH ₄ , 95% Ar/CH ₄	Both	Output	Multifunction digital volumetric flowmeter, with pressure, temperature, and calculated mass flow measurement	6 AA batteries or 110V/220V AC	98
ADM 2000	0.5	1000	± 3%	No	All	Both	Output	Easy-to-use digital volumetric flowmeter, with calculated mass flow measurement and RS232 output	9V battery or 110V/220V AC	98
ADM 1000	0.5	1000	± 3%	No	All	Volumetric	None	Economical digital volumetric flowmeter for most chromatographic flow measurements	9V battery	98
Veri-Flow 500	20	500	± 3%	Yes	N ₂ , H ₂ , He, Air, 95% Ar/CH ₄	Mass	Output and Input	True mass flow measurement with RS232 input and output capability	Rechargeable battery or 110V/220V AC	98
Bubble Flowmeters: For those who prefer classic bubblemeter technology combined with digital readout. Durable, for all gases, including mildly corrosive and humid gas streams.										
Optiflow Model 420	0.1	50	± 3%	No	All	Volumetric	None	Low flow range for measuring flows of capillary columns	9V battery	102
Optiflow Model 570	0.5	700	± 3%	No	All	Volumetric	None	Medium flow range for general chromatography applications, also available in a field portable case	9V battery	102
Optiflow Model 650	5	5000	± 2%	No	All	Volumetric	None	High flow range for demanding flow measurements, including negative (vacuum) flows, also available in a field portable case	9V battery	102

¹Volumetric measurements are accurate and are independent of the gas that is being measured, thus allowing measurements of mixed gases commonly found in chromatography.
²Mass flow measurements are very accurate for specific gases and are not affected by temperature and pressure fluctuations.
³± 2% mL/min of reading ± 0.2 mL/min this is additive (± 5% from 0-5 mL/min)

Gas Management Flowmeters

FlowTracker Flowmeters

Agilent's FlowTracker Flowmeters are the ultimate gas flowmeters for chromatography applications. These handheld flowmeters incorporate industry leading performance and features in a highly accurate and reliable package. The inherent stability of the rugged, solid state components allows us to provide the longest calibration interval on the market, all traceable to NIST standards.

There are two models available:



Flow Tracker 1000, 5183-4779

FlowTracker 1000

- Highly accurate and reliable measurement of common carrier and fuel gases used in GC including: nitrogen, air, carbon dioxide, hydrogen, helium, and argon/methane
- 15-month guaranteed calibration period traceable to NIST standards
- Measures flow (5-500 mL/min.) based on gas viscosity properties with an accuracy of +/-2% of reading +/-0.2mL/min this is additive (+/-5% from 0-5 mL/min.)
- Flow rate range from 5-500 mL/min (no conversion necessary from SCCM) eliminates the need for two separate meters to measure capillary and standard flows
- Displays mass flow, volumetric flow, temperature, and pressure readings simultaneously
- Screen displays for flow, linear velocity, and split ratio modes



FlowTracker 2000, 5183-4780

FlowTracker 2000

- Combination Flowmeter/Leak Detector: the ultimate GC troubleshooting tool!
- All the features of the FlowTracker 1000 plus an economical Thermal Conductivity Leak Detector in a single handheld design (leak detection at 10-3 cc/s vs. 10-5 cc/s for most dedicated leak detectors)
- "First of its kind" product to hit the market
- Industry-leading flowmeter performance with leak detection for less than the price of a typical leak detector
- Visual and audible detection signals
- Cost effective alternative to purchasing two separate instruments to measure GC flows and detect gross leaks in your GC and GC/MS systems

FlowTracker Flowmeters

Description	Part No.
FlowTracker 1000 Flowmeter	5183-4779
FlowTracker 2000 Flowmeter and Leak Detector	5183-4780
Flow Tracker AC Power Supply	5183-4781

ADM Flowmeters

Want to use the simplest flowmeter for gas chromatographic analysis? ADM flowmeters allow most gas measurements with the touch of only one button—turn it on, and the instrument provides continuous, hands-free flow readings. You can measure column, detector, and carrier gas flows without any adjustments. ADM flowmeters are ideal for measuring gas streams with a changing gas composition. For example, if you measure the gas flow from a digestion system, concentration changes in methane, carbon dioxide, and oxygen will not affect accuracy.

All ADM flowmeters are battery powered and field portable. Agilent calibrates each instrument to 5-point, NIST-traceable standards to ensure the highest available accuracy. The ADM family measures flow volumetrically, so you don't have to make any adjustments when changing from one gas to another.

If you need rapid, real-time measurements of a gas stream, ADM Flowmeters are perfect for you. These flowmeters are designed for basic gas chromatography laboratories.



ADM 1000

ADM 1000

- Accuracy $\pm 3\%$
- Operating temperature range—0 to 45°C for the instrument, -70 to 135°C for the tubing.
- Calibration—traceable to NIST primary standards
- Real time, split ratio measurement
- CE mark certified
- Measures flow rates from 0.5 to 1000 mL/min
- Split ratios—compare the ratio from one gas measurements to another (i.e., injection port split ratios)



ADM 2000

ADM 2000

In addition to the features of the ADM 1000, the ADM 2000 includes:

- Mass flow measurements—measure flow rate, independent of atmospheric pressure and temperature (calculated)
- Data output through RS-232 port
- 9V battery and AC power adapter (120 or 220 VAC)

ADM Flowmeters

Description	Flow Rate (ml/min)		Gases Measured*	Accuracy (%)	Power Supply	RS-232 Data Output	Part No.
	Low	High					
ADM1000**	0.5	1000	All	± 3	9V Battery	None	220-1170
ADM2000	0.5	1000	All	± 3	Battery or 120V AC	Yes	220-1171-U
ADM2000E	0.5	1000	All	± 3	Battery or 220V AC	Yes	220-1171-E
Carrying Case for ADM							907-0056

* $\pm 3\%$ or ± 0.2 ml/min, whichever is greater with a flow rate of 0.5 - 1,000 ml/min

**Non-corrosive gases only

Gas Management Flowmeters



Veri-Flow 500 Flowmeters

Need the ultimate in versatility? The Veri-Flow 500 packs an incredible amount of features into a highly accurate flowmeter. The solid state gas sensor used in the Veri-Flow 500 measures mass flow rates of the 5 common GC laboratory gases from 5 to 500 mL/min. Above all, the Veri-Flow 500 has big features for a small, small price.

What Does it Measure?

- 5 gases—H₂, He, N₂, Air, Argon/Methane
- In-line flow
- Injection port split flows
- Carrier gas linear velocity

What Else?

- Two-way data communication through serial port
- Rechargeable battery pack
- ± 3% accuracy
- CE mark certified

Veri-Flow Flowmeter

Description	Flow Rate (ml/min)		Gases Measured	Accuracy (%)	Power Supply	RS-232 Data Output	Part No.
	Low	High					
Veri-Flow 500, 110-240V	20	500	He, H ₂ , Ar/CH ₄ , N ₂ , Air	± 3	Rechargeable Battery or 110V/220V AC	Yes	HVF-500

Gas Management Flowmeters



Optiflow 420

Digital Bubble Flowmeters

Agilent Digital Bubble Flowmeters have been making flow measurement easy for years. Today, they are still widely used to measure GC flows, calibrate air sampling pumps, and verify various gas flows. The Optiflow series offers the widest range of flow rates and allows you to visually ensure gas flows. This tried and true flowmeter measures volumetrically and therefore can measure any gas composition with the push of one button and the squeeze of a bulb.

- Wide flow range from 0.1 to 50 mL/min (Optiflow 420) up to 5 to 5000 mL/min (OptiFlow 650)
- 9V Long-lifetime battery
- Available with hard field case (Models 570 and 650 only)



Optiflow 570

Optiflow 420

The Optiflow 420 is the best bubble flowmeter for measuring low gas flow rates—especially GC columns.

- Flow range—0.1 to 50 mL/min
- +/- 3% accuracy



HFM-570-FC

Optiflow 570

Want a bubble flowmeter for measuring carrier, makeup, injection port, and detector gases? The Optiflow 570 handles most of your GC needs. We also manufacture Optiflow 570 in a hard metal case, which makes it portable and field ready.

- Flow range—0.5 to 700 mL/min for the Optiflow 570
- Available in hard field case (Optiflow 570 only)
- Split ratio measurement
- +/- 3% accuracy



Optiflow 650

Optiflow 650

If you calibrate air sampling equipment, verify mass flow controller settings, or monitor higher gas flow rates, these Optiflow flowmeters are simple and efficient.

- Flow range—5.0 to 5000 mL/min for the Optiflow 650
- +/- 2% accuracy
- Available in hard field case
- Measures both positive and negative (vacuum) flow sources

Gas Management Flowmeters

Optiflow Flowmeters

Description	Field Case	Flow Rate (ml/min)		Gases Measured*	Accuracy (%)	Power Supply	RS-232 Data Output	Part No.
		Low	High					
Gas Flowmeters								
Optiflow 420	No	0.1	50	All	± 3	9V Battery	None	HFM-420
Optiflow 570	No	0.5	700	All	± 3	9V Battery	None	HFM-570
Field-Cal 570	Yes	0.5	700	All	± 3	9V Battery	None	HFM-570-FC
Optiflow 650	No	5.0	5000	All	± 2	9V Battery	None	HFM-650
Field-Cal 650	Yes	5.0	5000	All	± 2	9V Battery	None	HFM-650-FC

*Noncorrosive and mildly corrosive gases only

Economy Glass Bubble Flowmeters



Glass Bubble Flowmeters

Description	Part No.
10 ml glass bubble flowmeter	0101-0030
100 ml glass bubble flowmeter	0101-0113

Bubble Flowmeter Accessories and Replacement Parts

Description	Part No.
Replacement bulbs for Optiflow and Glass Bubble Flowmeters	HFM-BULB
Snoop, 8 oz (236 ml) bottle	9300-0311
Adapter flow meter - fused silica capillary	325-0506
Bubblemeter Glassware Repair Kit, HFM-420	HFM-420-B
Bubblemeter Glassware Repair Kit, HFM-570	HFM-570-B
Bubblemeter Glass Repair Kit, HFM-570-FC	HFM-570FC-B
Bubblemeter Glassware Repair Kit, HFM-650	HFM-650-B
Bubblemeter Glass Repair Kit, HFM-650-FC	HFM-650FC-B
Replacement Flow Trap Tube Kit, HFM-650	HFM-650-FT

Gas Management Regulators and Accessories



Brass body regulator

Gas Cylinder Regulators, U.S. Only

To plumb your system properly, select one of Agilent's economical brass regulators and the proper gas purification devices from our newly expanded product offering. These regulators and our broad spectrum of in-line filters, combination traps, and gas purification systems are an excellent combination to plumb your systems. Our new gas purification selection guide and diagrams will help you determine which products can be used with the regulators below.

Brass Body, Dual Stainless Steel Diaphragms

Specifications

Max inlet pressure	3000 psig
Operating temperature range	-40°F to 165°F
Inlet-outlet port	1/4 in., MNPT
Outlet valve	1/4 in., MNPT 1/2 in. dual scale gauges CGA-346, 350, 340, 580, 590 Internal self-reseating relief valve
Delivery pressures	1 to 125 psig
Weight	5.6 lbs

Materials of Construction

Body	Brass
Bonnet	Brass
Diaphragms	Stainless steel
Seat material	PTFE
Seat assemblies	Encapsulated
Gauges	Brass
Adjusting knob	A.B.S. plastic
Outlet needle valve	Brass

Brass Body, Dual Stainless Steel Diaphragms, 1/8 in., U.S. Only*

Description	Part No.
CGA 346, 125 psig max (8.6 bar), Air	5183-4641
CGA 350, 125 psig max (8.6 bar), H ₂ , Ar/Me	5183-4642
CGA 540, 125 psig max (8.6 bar), O ₂	5183-4643
CGA 580, 125 psig max (8.6 bar), He, Ar, N ₂	5183-4644
CGA 590, 125 psig max (8.6 bar), Air	5183-4645

*For 1/4 in. tubing, purchase a 1/4 in. adapter, U.S. only

Gas Management

Regulators and Accessories

Connectors (Swagelok to Female NPT)

Description	Unit	Part No.
1/8 in. (A) x 1/4 in. (B) connector, brass (included with brass regulators)	1/ea	0100-0118
1/4 in. (A) x 1/4 in. (B) connector, brass*	1/ea	0100-0119

*Required for plumbing 1/4 in. tubing to regulators

Tubing - Precleaned

Description	Part No.
Copper tubing, 1/8 in., 50 ft	5180-4196
Copper tubing, 1/8 in., 12 ft	5021-7107



Spectra-link tubing connecting system on a two stage regulator

Spectra-Link Flexible Tubing

- Stainless steel: no outgassing or permeation through polymeric materials
- Quick Connection: prevents air from entering gas lines during tank changeover
- Tested: each system has leak rates lower than 1×10^{-5} cc/sec

Description	Part No.
Spectra-Link with 1/8 in. fittings and 36 in. line	SL-8
Spectra-Link with 1/4 in. fittings and 36 in. line	SL-4



Cylinder wall bracket, 5183-1941

Cylinder wall bracket

Description	Part No.
Cylinder wall bracket with strap & chain (cylinder size up to 14 in., 35 cm)	5183-1941



Tips & Tools

For optimum performance always depressurize a regulator before closing the adjusting knob and removing the regulator from the cylinder.

Fittings



Nut, Front and Back Ferrule Sets

Nuts, Front and Back Ferrule Sets

Description	Unit	Part No.
1/16 in. stainless steel nut and ferrule set	10/pk	5180-4149
1/8 in. brass nut and ferrule set	20/pk	5080-8750
1/8 in. stainless steel nut and ferrule set	20/pk	5080-8751
1/4 in. brass nut and ferrule set	20/pk	5080-8752
1/4 in. stainless steel nut and ferrule set	20/pk	5080-8753

Nuts



Nut

Description	Unit	Part No.
1/16 in. nut, stainless steel	10/pk	5180-4102
1/8 in. nut, brass	10/pk	5180-4103
1/4 in. nut, brass	10/pk	5180-4105

Front Ferrules



Front Ferrules

Description	Unit	Part No.
1/16 in. front ferrule, stainless steel	10/pk	5180-4108
1/16 in. front ferrule, stainless steel, Valco one piece	10/pk	5181-1292
1/8 in. front ferrule, brass	10/pk	5180-4109
1/4 in. front ferrule, brass	10/pk	5180-4111

Back Ferrules



Back Ferrules

Description	Unit	Part No.
1/16 in. back ferrule, stainless steel	10/pk	5180-4114
1/8 in. back ferrule, brass	10/pk	5180-4115
1/4 in. back ferrule, brass	10/pk	5180-4117

Caps



Cap

Description	Unit	Part No.
1/8 in. cap, brass	6/pk	5180-4121
1/4 in. cap, brass	6/pk	5180-4120

Plugs



Plug

Description	Unit	Part No.
1/8 in. plug, brass	6/pk	5180-4124
1/4 in. plug, brass	6/pk	5180-4125

Hardware

Fittings



Blanking Nut – Adapters – Hose Connector

Blanking Nut, Adapter, Hose Connector

Description	Unit	Part No.
1/16 in. blanking nut, stainless steel		01080-83202
1/8 in. x 1/8 in. adapter, brass	1/ea	0100-0420
1/16 in. hose connector, brass	10/pk	5180-4148



Tee



Low Dead Volume Tee

Tees

Description	Unit	Part No.
1/16 in. tee, stainless steel	1/ea	0100-0782
1/8 in. tee, brass	2/pk	5180-4160
1/8 in. tee, stainless steel	1/ea	0100-0542
1/4 in. tee, brass	2/pk	5180-4129
1/6 in. tee, low dead volume, stainless steel	1/ea	0100-0969



Cross



Elbow

Crosses

Description	Unit	Part No.
1/8 in. cross, brass	1/ea	0100-0161
1/4 in. cross, brass	1/ea	0100-0985

Elbows

Description	Unit	Part No.
1/8 in. elbow, brass	1/ea	0100-0091



Union

Unions

Description	Unit	Part No.
1/16 in. union, stainless steel	1/ea	0100-0124
1/16 in. union, brass	1/ea	0100-1316
1/8 in. union, brass	2/pk	5180-4127
1/8 in. union, stainless steel	1/ea	0100-0126
1/4 in. union, brass	2/pk	5180-4128
1/4 in. union, stainless steel	1/ea	0100-0128



Zero Dead Volume Union

Zero Dead Volume Unions

Description	Unit	Part No.
1/16 in. union, zero dead volume, stainless steel	1/ea	0100-0900



Bulkhead Union

Bulkhead Unions

Description	Unit	Part No.
1/8 in. bulkhead union, stainless steel	1/ea	0100-0132
1/8 in. bulkhead union, brass	1/ea	0100-0133



Connector
(Swagelok-style to Male NPT)

Connectors (Swagelok to Male NPT)

Description	Unit	Part No.
1/8 in. (A) x 1/4 in. (B) connector, brass	2/pk	5180-4143
1/4 in. (A) x 1/4 in. (B) connector, brass	2/pk	5180-4145



Connector
(Swagelok-style to Female NPT)

Connectors (Swagelok to Female NPT)

Description	Unit	Part No.
1/8 in. (A) x 1/4 in. (B) connector, brass	1/ea	0100-0118
1/4 in. (A) x 1/4 in. (B) connector, brass*	1/ea	0100-0119

*Required for plumbing 1/4 in. tubing to regulators

Hardware

Fittings



Reducing Union

Reducing Unions

Description	Unit	Part No.
1/16 x 1/8 in. reducing union, brass	2/pk	5180-4130
1/16 x 1/8 in. reducing union, stainless steel	1/ea	0100-0241
1/8 x 1/4 in. reducing union, brass	2/pk	5180-4131
1/8 x 1/4 in. reducing union, stainless steel	1/ea	0100-0121



Reducer

Reducers

Description	Unit	Part No.
1/8 in. (A) x 1/4 in. (B) reducer, brass	2/pk	5180-4135
1/4 in. (A) x 1/8 in. (B) reducer, brass	2/pk	5180-4134

Fittings Kit

Description	Unit	Part No.
Fittings Kit: Includes items below		5180-4161
1/8 in. nut, brass	10/pk	5180-4103
1/4 in. nut, brass	10/pk	5180-4105
1/8 in. front ferrule, brass	10/pk	5180-4109
1/4 in. front ferrule, brass	10/pk	5180-4111
1/8 in. back ferrule, brass	10/pk	5180-4115
1/4 in. back ferrule, brass	10/pk	5180-4117
1/4 in. cap, brass	6/pk	5180-4120
1/8 in. cap, brass	6/pk	5180-4121
1/8 in. plug, brass	6/pk	5180-4124
1/4 in. plug, brass	6/pk	5180-4125
1/8 in. union, brass	2/pk	5180-4127
1/4 in. union, brass	2/pk	5180-4128
1/8 in. tee, brass	2/pk	5180-4160
1/4 in. tee, brass	2/pk	5180-4129
1/8 x 1/4 in. reducing union, brass	2/pk	5180-4131
1/4 in. (A) x 1/8 in. (B) reducer, brass	2/pk	5180-4134
1/8 in. (A) x 1/4 in. (B) reducer, brass	2/pk	5180-4135



Tools

General laboratory tool kit

The General Laboratory Tool Kit includes the following items

- Toolbox
- Flashlight
- 8 in. bastard file
- 6 in. adjustable wrench
- 12 in. adjustable wrench for use with regulator
- No. 1 pt, 3 in. Pozidriv shaft, fits no. 2-4 screws
- No. 2 pt, 4 in. Pozidriv shaft, fits no. 5-10 screws
- Flathead screwdriver, 2 in. steel shaft, 1/8 in. blade
- Flathead screwdriver, 4 in. steel shaft, 1/4 in. blade
- Hex key set, 1.5, 2, 2.5, 3, 4, 5, and 6 mm keys
- 6 in. long jaw needle nose pliers with side cutters
- Three open-end wrenches (1/4 in. x 5/16 in., 1/2 in. x 9/16 in., 7/16 in. x 3/8 in.)
- Snoop-liquid leak detector
- Teflon tape

Description	Part No.
General laboratory tool kit	5180-4162

Wrenches

Description	Part No.
Open end wrench, 1/4 and 5/16 in.	8710-0510
Wrench, 1/2 and 7/16 in.	8710-0806
Open end wrench, 7/16 and 9/16 in.	8710-0803
Open end wrench, 7/16 and 3/8 in.	8710-0972
Adjustable wrench, 12 in., for use with regulators	8710-1712
Open end wrench, 9/16 and 5/8 in.	8720-0010
Open end wrench, 1/2 and 9/16 in.	8720-0025
Open end wrench, 14 mm	8710-1924
Open end wrench, 12/12 mm, 116 mm long	8710-1841
Open end wrench, 4 mm	8710-1534

Hardware Tools

Screwdrivers

Description	Part No.
Screwdriver, 3 in. Pozidriv Shaft No. 1 pt	8710-0899
Screwdriver, 4 in. Pozidriv shaft No. 2 pt	8710-0900
Screwdriver, Torx T10	5182-3466
Screwdriver, Torx T 20	5182-3465

Pliers and Tweezers

Description	Part No.
Needle nose pliers, pointed serrated jaws	8710-0004
Tweezers, 4 3/4 in. long	8710-0007
Truarc pliers	8710-0018

Tube Cutters and Replacement Blades

Description	Unit	Part No.
Hi-duty tube cutter, 1/8 - 1 1/8 in. od tubing		8710-1707
Hi-duty tube cutter blades	5/pk	8710-1708
Tube cutter, 1/8 to 5/8 in. od tubing		8710-1709
Tube cutter blades	5/pk	8710-1710
Plastic tubing cutter		8710-1930
Blades for plastic tubing cutter	5/pk	8710-1931



Hex Keys, 5064-8211

Hex Keys

Description	Part No.
Hex key set: 1.5, 2, 2.5, 3, 4, and 5 mm keys, 1090A (5880/90A)	8710-0641
Hex key, 4 mm, 15 cm long T-handle	8710-2392
Hex key, 3 mm, 12 cm long straight handle	8710-2411
Hex key, 2.5 mm, 15 cm long straight handle	8710-2412
Hex key, 1.5 mm, 10 cm long straight handle	8710-2393
Hex key, 9/64 in., 15 cm long T-handle	8710-2394
Hex key, 4.0 mm, 10 cm long straight handle	5965-0027
Hex key, 2.5 mm, 10 cm long straight handle	5965-0028
Tool Kit Hex Keys, Rheotool*	5064-8211
Includes 3 hex keys, 4 mm, 1.5 mm, and 9/64 in., with straight or T-handle plus Rheotool.	

*The tools are recommended for easier repair and maintenance for the LC modules.



Column installation kit, 430-2000

GC Column Accessories

Capillary Column Installation Kit

The Capillary Column Installation Kit contains:

- Diamond-tipped pencil
- 20x magnifier
- Ferrule removal tool
- Septum removal tool
- Refillable 2 oz. bottle of Snoop

Description	Part No.
Capillary Column Installation Kit with diamond-tipped cutting pencil	430-2000



Column rinse kit, 430-3000

Capillary Column Rinse Kit

This kit makes solvent rinsing easy! Solvent rinsing removes many contaminants that accumulate in columns. The contaminants are removed by passing solvents through the column. Only bonded and cross-linked phase columns should be rinsed, or permanent damage to the column will result.

Description	Part No.
Capillary Column Rinse Kit	430-3000



Fused silica tubing cutters

Fused Silica Tubing Cutters

We offer a conveniently designed, pencil-shaped tool and a ceramic wafer that allow you to make clean and easy cuts in fused silica, glass and aluminum-clad capillary columns.

Description	Part No.
Diamond-tipped column cutting pencil	420-1000
Ceramic wafer column cutter, 4/pk	5181-8836
Column cutter with rotating diamond blade	5183-4620
Replacement diamond blade (for 5183-4620)	5183-4621



Column cutting tool, 5183-4620

Column Baskets and Hangers

Description	Part No.
13 cm, 5 in. basket for 6850 capillary columns	19091-80060
Column hanger for 5 in. basket	G2630-80800
Column hanger clip kit for 7 in. basket	G1530-61580
Column hanger for 6890, 5890, 5880A	1460-1914

Hardware Tools



Capillary and Megabore ferrule tools



Liner tool



Column ferrule installation tool, 19251-80680

Miscellaneous Tools

Ferrule Tools

Remove ferrules stuck inside fittings. Screw the stainless steel ferrule tool into the ferrule and pull it out. Use the smaller capillary ferrule tool for capillary column ferrules (0.32 mm id column and smaller). The megabore ferrule tool is used for megabore ferrules. The liner tool can be used to remove polyimide and tubing from inside a megabore liner. The column ferrule installation tool positions a ferrule onto a capillary column for proper installation.

Description	Part No.
Capillary ferrule tool	RFT-2500
Megabore ferrule tool	RFT-5300
Column ferrule installation tool	19251-80680
MS Interface Column Installation Tool	G1099-20030



Magnifier, mirror, microprobes

20x Magnifier

Examine column ends for proper cuts. Jagged, rough, or nonperpendicular cuts negatively affect chromatographic performance.

Description	Part No.
20x Magnifier	430-1020

Microprobes

Hardened stainless steel probes remove septum and ferrule pieces stuck in fittings. Five different styles give you all of the angles necessary for getting into those hard-to-reach places.

Description	Part No.
Microprobes	RMP-5005

Mirror

Inspect injection ports, the inside of fittings, and other hard-to-reach places.

Description	Part No.
Mirror	707-0027



Snoop

Snoop

Leak test most pressurized gas systems. We recommend that leak detecting solutions be used with care where there is any possibility of the fluid being aspirated into gas flow streams supplying the column or detector. This squeezable bottle comes with a "Snooper Tube" extendable up to 12 inches (30 cm). Electronic leak detectors are preferred. In their absence, a volatile nonreactive solvent like isopropanol may be used. Use caution to avoid aspiration of materials such as Snoop into the column.

Description	Part No.
Snoop, 8 oz (236 ml) bottle	9300-0311
Snoop, 1 gallon bottle	460-1002

Hardware Tools



Injection port cleaning kit, 480-0003

Injection Port Cleaning Kit

If changing the liner and trimming the column does not remove contamination from your injection port, you probably need to clean and flush your injection port. Three stainless steel brushes and a scraper are the ideal tools for removing sample residue and septum particles. The stainless steel brushes have diameters of 5 mm, 1/4 in. and 3/8 in.

Description	Part No.
Injection Port Cleaning Kit	480-0003



FID cleaning kit, 9301-0985

FID cleaning kit

This easy-to-use maintenance kit improves sensitivity, reduces noise, and decreases detector spiking.

Description	Part No.
FID cleaning kit	9301-0985

12-Piece File Set

This file set scores glass, removes burrs from metal tubing, and cleans threads. This 12-piece file set covers all the laboratory filing needs. The files are 5 1/2 in. long.

Description	Part No.
12-Piece File Set	RSF-1200



GC Buddy Junior, 5183-4789

Combination GC Tools

Description	Part No.
GC Buddy multi-purpose lab tool	5182-9765
GC Buddy Junior multi-purpose lab tool	5183-4789



Septum tool with knurled handle, 450-1000

Miscellaneous Injection Port Tools

Description	Part No.
Septum tool, knurled handle	450-1000
Ferrule removal tool	440-1000
Capillary inlet cleaning wires, 5/pk	5180-4153
Cotton swabs, 100/pk	5080-5400



Capillary inlet cleaning wires, 5180-4153

Chemical Standards

When performing chemical analyses, you can't afford to settle for anything less than the highest standards. That is why Agilent Technologies standards are the perfect solution for you. Every Agilent standard must meet the uncompromising parameters of our ISO-9001 registered quality system. Our quality system means the strictest quality control of incoming raw materials, the meticulous validation of analyte concentrations, homogeneity and stability.

So, when it's uncompromising quality you're after, whether it's analytical standards, columns or instrumentation, you can purchase them all from the same reliable source—Agilent Technologies.

LC and LC/MS Standards & Reagents

GPC-SEC Calibration Standards

Three different polystyrene standard kits are available for organic GPC column calibration. Each kit contains individual monodisperse polymers that cover low, medium and high molecular weight ranges. Each standard lot is characterized using low-angle laser light scattering, membrane osmometry and GPC. Typical dispersity values for Agilent's polystyrene standards are 1.05 to 1.07.

GPC-SEC Calibration Standards*

Description	Part No.
Low molecular weight (mol wt) range, 10 standards; 162-20 K (0.5 g/ea)	79911-60500
Medium mol wt range, 10 standards; 580-3 M (0.5 g/ea)	79911-60501
High mol wt range, 10 standards; 300 K-15 M (0.5 g/ea)	79911-60502

*The exact molecular weights of these standards vary from batch to batch, but each batch is individually certified.
The nominal molecular weights of standards are as follows:
Low mol wt: 162, 580, 900, 1.4 K, 2.2 K, 3.4 K, 5.1 K, 8.1 K, 12.8 K, 20 K
Medium mol wt: 580, 1.5 K, 4 K, 10 K, 27 K, 66 K, 180 K, 460 K, 1.2 M, 3 M
High mol wt: 300 K, 460 K, 700 K, 1.1 M, 1.7 M, 2.6 M, 4 M, 6.2 M, 9.5 M, 15 M

GFC Calibration Standards

Description	Part No.
Polysaccharides: 10 0.2 g standards in mol wt range 180-788 K*	1535-4546
PEG Standards: 10 individual 0.5 g standards in mol wt range 100-23 K	1535-4545

*Polysaccharides 10 individual standards 0.2 g ea. mw: 180, 738, 5900, 11800, 22800, 47300, 112000, 212000, 404000, 788000
Polyethylene glycol 10 individual standards, 0.5 g ea. mw: 106, 194, 400, 600, 1000, 2100, 4120, 7100, 11.84 K, 22.8 K

Chemical Standards

LC and LC/MS Standards

LC and LC/MS Standards

Description	Part No.
Caffeine Standards Kit for LC/MS OQ/PV Includes 5 ampoules, 5 ml each: 0.5, 1.0, 5.0, 25.0, and 50.0 µg/ml in water	8500-6917
Caffeine Standards Kit for LC OQ/PV Includes one 10 mL ampoule: 125.0 µg/ml; four 5 mL ampoules: 5.0, 25.0, 250.0 and 500.0 µg/ml caffeine in water	8500-6762
Caffeine Standards Kit for Capillary OQ/PV Includes 5 ampoules, 5 ml: 2.0, 4.0, 20.0, 100.0, 200.0 µg/ml caffeine in water	5065-4420
Fluorescence Detector Calibration Sample, 1 g glycogen	5063-6597
Caffeine Standards Kit for LC/MS-Trap OQ/PV Includes 5 ampoules, 5 ml each: 0.1, 0.5, 1.0, 5.0, 10.0, µg/ml caffeine in water	5065-9908
ESI+APCI LC Demo Sample Contains 5 x 1 ml ampoules with 033 ng/ul Crystal violet, 77ng/ul Carbazole, 300ng/ul 9-Phenanthrol, 1ng/ul 1-Hexanesulfonic acid sodium salt in Water/Methanol 60:40	G1978-85000
ES-TOF Biopolymer reference standard kit Contains 7 x 2 ml ampoules with 5mM Purine 1 M Ammonium forate, 0.5 mM HP-0285, 0.1 mM HP-0321,0.2mM HP-1221, 0.2 mM HP-1821,0.5 mM HP-2421	G1969-85003

Qualitative LC Standards

Description	Part No.
Isocratic and Gradient Standards Contains 0.15% diethylphthalate, 0.01% biphenyl, and 0.03% terphenyl in MeOH (w/w). The gradient standard includes 0.32% dioctyl phthalate as well. Two 0.5 ml ampoules of each.	01080-68702
Isocratic Standard, 0.5 ml ampoule	01080-68704
RI Detector OQ/PV Test Sample	5064-8220

Chemical Standards

CE/UV-Vis Standards

CE Standards & Reagents

Description	Part No.
CE OQ/PV Chemicals Only Kit	5063-6520
CE Installation Qualification (IQ) Kit	5063-6514

UV-Vis Standards & Reagents

In recent years, quality requirements as outlined by ISO 9000, GLP, GMP and NAMAS have assumed increasing importance. As a consequence, the recommendations of pharmacopoeias have become more influential in the pharmaceutical industry. Formal performance verification of UV-Visible spectrophotometers is now essential, but because of the non-availability of appropriate and/or easy-to-use standards, it has been done in ways which do not fully meet regulatory requirements or it has been very time consuming.

Agilent Technologies has made performance verification of the Agilent 8453 spectrophotometer much easier by making available sets of liquid standards in snap-open ampoules.

The standards can be used with standard open-topped cuvettes, but to reduce the time required and to minimize errors due to cross-contamination from standard to standard, Agilent recommends the use of flow cells for the verification. A hardware kit is available which includes all the items necessary. For reasons of safety in shipment the standards are packaged in two kits.

Standards Kit-I

Standard	Purpose
60.06 mg/L potassium dichromate 0.01 N sulphuric acid	Photometric accuracy at 235, 257, 313 and 350 nm
0.01 N sulphuric acid	Blank for photometric accuracy test
12 g/L potassium chloride in water	Stray light at 200 nm
10 g/L sodium iodide in water	Stray light at 220 nm
50 g/L sodium nitrite in water	Stray light at 340 nm
0.02% v/v toluene in hexane	Resolution (ratio of the absorbance maximum at 269 nm to the absorbance minimum at 266 nm)
Hexane	Blank for resolution test

Note: HPLC grade water is recommended as blank for the stray light tests.

Standards Kit-II

Standard	Purpose
40 g/L holmium oxide in 10% v/v perchloric acid	Wavelength accuracy in UV and visible ranges
10% v/v perchloric acid	Blank for wavelength accuracy

Chemical Standards

Calibration Standards and Accessory Kits

Certified Calibration Standards and Accessory Kits

Description	Part No.
OO/PV Chemical Standards Kit I (for photometric accuracy, stray light and resolution measurements)	5063-6503
OO/PV Chemical Standards Kit II (for wavelength accuracy)	5063-6521
OO/PV Hardware Kit	5063-6523
Multicell transport adjustment tool	89075-23800
Hoya 056 filter, used for performance verification of 8425A	08450-60300
Test sample for UV-Vis (Caffeine solution, 10 µg/mL in water)	5063-6524
Caffeine OO/PV sample for dissolution test, 150 mg/L caffeine in water, 500 mL	5042-6476

*Checkout Samples**

Description	Part No.
Holmium oxide glass filter	08450-60117
Test sample for UV-Vis (Caffeine solution, 10 µg/mL in water)	5063-6524

*These are checkout samples only (not certified)

Chemical Standards

GC Column Test Standards

J&W GC Column Test Standards

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

J&W GC Column Test Standards

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

Agilent GC Column Test Standards

Our line of Column Test Standards validate the performance of your Agilent columns by checking such components as polarity and inertness. These standards help insure the quality of your chromatograms.

Agilent GC Column Test Standards

Description	Quality Control Specifications	Part No.
Megabore Test Sample, 530 μm HP-1, HP-5 columns (0.35-1.0 mg/ml)	1 x 1 ml	8500-6812
1-Dodecanol 1.00 mg/ml, Acenaphthylene 0.88 mg/ml, n-Pentadecane 1.16 mg/ml, n-Tridecane 0.52 mg/ml, 4-Chlorophenol 0.84 mg/ml, 1-Decylamine 0.84 mg/ml, n-Tetradecane 1.00 mg/ml, n-Undecane 0.32 mg/ml		
Ultra Test Mix Sample, 200 μm, 250 μm and 320 μm HP-1 and HP-5 columns (0.35-1.0 mg/ml)	1 x 1 ml	5080-8858
1-Dodecanol 0.94 mg/ml, 1-Decylamine 0.80 mg/ml, n-Pentadecane 1.02 mg/ml, n-Tridecane 0.52 mg/ml, 4-Chlorophenol 0.80 mg/ml, Methyl caprate (Methyl decanoate) 0.32 mg/ml, n-Tetradecane 0.94 mg/ml, n-Undecane 0.32 mg/ml, Acenaphthylene 0.88 mg/ml, n-Pentane 0.63 mg/ml		
FFAP Column Test Sample, used for all Free Fatty Acid Phase columns (0.5-1.8 mg/ml)	1 x 1 ml	8500-6813
Acetophenone 1.24 mg/ml, n-Heptadecane 1.55 mg/ml, 1-Octanol 0.99 mg/ml, n-Pentane 0.63 mg/ml, Butyric acid 1.74 mg/ml, n-Hexadecane 0.93 mg/ml, n-Pentadecane 0.69 mg/ml, n-Tetradecane 0.46 mg/ml		

Chemical Standards

GC and GC/MS Instrument Standards

GC and GC/MS Standards

Qualitative GC and GC/MS Instrument Evaluation Standards

Description	Part No.
Capillary Inlet Evaluation Sample (Split Mode) Solution of 1.0% (w/w) C ₉ , C ₁₆ in C ₁₄ . Three 0.5 ml ampoules.	8500-4789
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. Three 0.5 ml ampoules.	18710-60170
Nitrogen-Phosphorus Detector Sample This sample is used for the HP 5880, 5890 and 6890 with a NPD. Solution of 0.65 ppm azobenzene, 1,000 ppm octadecane, and 1.00 ppm malathion in isooctane (w/v). Three 0.5 ml ampoules.	18789-60060
Thermal Conductivity Detector Sample Solution of 0.33% C ₁₄ , C ₁₅ , and C ₁₆ normal alkanes in hexane (w/w). Three 0.5 ml ampoules.	18711-60060
Electron Capture Detector Sample This sample is used for the HP 5880, 5890 and 6890 with an ECD. Solution of 33 pg/mL (0.033 ppm) (w/v) each of lindane and aldrin in isooctane. Three 0.5 ml ampoules.	18713-60040
ECD Test Sample Lindane, 0.033 ppm in iso-octane, 3 ampoules	5183-0379
Flame Photometric Detector (FPD) Check Out Sample 3 x 1 ml ampoules, Methyl Parathion in Isooctane 2.5 mg/L	5188-5953
Flame Photometric Detector (FPD) Sample This sample is used for the HP 5880, 5890 and 6890 with an FPD. Solution of 20 ng/μl (20 ppm) dodecanethiol and tributylphosphate in isooctane. Three 0.5 ml ampoules.	19305-60580
Flame Photometric Detector (FPD) Sample Contains 3 x 1 ml ampoules: 1%(vol)Dodecane, 2.0 mg/mL 1-dodecanethiol,2.0 mg/ML Tributyl phosphate, 1.0 mg/mL Tert-Butylsulfide in Iso-octane	5188-5245
Atomic Emission Detector Sample Sample 1: Contains (w/w) 0.07% nitrobenzene, 0.43% n-tridecane, 0.07% 4-fluoroanisole, 0.05% tert-butylsulfide, 0.08% 1,2,4-trichlorobenzene, 0.05% tetraethyl orthosilicate, 0.05% n-decane (perdeuterated), 4.3% n-dodecane, 0.13% n-tetradecane, 0.07% 1-bromohexane, 4.04% n-octane in isooctane. Sample 2: Contains the same components as Sample 1 plus 0.06% triethylphosphate. Six 0.5 ml ampoules. Three of each sample.	8500-5067
PFHT-High Mass Checkout Sample 3x1 ml ampoules 5% PFHT (Tris(perfluoro- heptyl)-s-triazine) in Hexane	5188-5357
OO/PV Headspace Sample Contains 0.2-0.3% t-butyl disulfide, 1,2-dichlorobenzene, and nitrobenzene in ethanol	5182-9733
Headspace Sample Contains 0.2-10.0% t-butyl disulfide, 1,2-dichlorobenzene, nitrobenzene, and n-nonane in n-dodecane	8500-4328
Response Linearity Standard Contains 3 x 1 ml ampoules with n-heptadecane (1.5), n-octadecane(10),n-nonadecane(2),n-elcos ane(100), n-docosane(1000), n-tetracosane(10,000ug/mL)	5188-5244

Miscellaneous Qualitative Standards

Description	Part No.
Nickel Catalyst Test Sample Mixture of 10±5 ppm each of methane, carbon monoxide, and carbon dioxide in helium. One pressurized aerosol-type container (370 ml at 25 psig).	19354-60510
Nickel catalyst refill	5080-8761
MIDI System Calibration Standard Quantitative calibration standard for the Microbial ID System. Fatty acid methyl esters w/v%. 0.01% n-C9:0, 0.02% n-C10:0, 0.01% n-C11:0, 0.02% C12:0, 0.01% C13:0, 0.02% C14:0, 0.01% n-C15:0, 0.02% n-C16:0, 0.01% n-C17:0, 0.02% n-C18:0, 0.01% n-C19:0, 0.02% n-C20:0, 0.005% C10:0 2OH, 0.0025% C10:0 3OH, 0.005% C14:0 2OH, 0.0025% C14:0 3OH and 0.005% C16:0 2OH. Four 2 ml ampoules.	19298-60500

Chemical Standards

GC and GC/MS Instrument Standards

Qualitative Simulated Distillation Standards

Description	Part No.
Boiling Point Calibration Sample No. 1 Mixture of the following normal hydrocarbons, approximate concentrations % weight/weight: 8.3% n-pentane, 4.4% n-hexane, 4.6% n-heptane, 4.7% octane, 4.8% nonane, 9.7% decane, 4.9% n-undecane, 19.9% n-dodecane, 10.2% n-tetradecane, 5.1% n-pentadecane, 10.3% n-hexadecane, 5.3% n-heptadecane, 2.2% n-octadecane, 1.3% n-eicosane, 1.3% n-tetracosane, 0.9% n-octacosane, 0.9% n-dotriacontane, 0.9% n-hexatricontane, 0.9% n-tetracontane. For use with ASTM method D 2887. Six 1 ml ampoules.	5080-8716
Low Boiling Point Calibration Sample No. 220 Mixture of the following normal hydrocarbons, approximate concentrations % weight/weight: 8.8% n-pentane, 4.7% n-hexane, 4.8% n-heptane, 4.9% n-octane, 5.1% n-nonane, 10.3% n-decane, 5.2% n-undecane, 21.1% n-dodecane, 10.8% n-tetradecane, 5.4% n-pentadecane, 10.9% n-hexadecane, 5.5% n-heptadecane, 2.4% n-octadecane. Six 1 ml ampoules.	5080-8768
Boiling Point Calibration Sample No. 320 Mixture of the following components, approximate concentrations % weight/weight: 6.9% n-pentane, 4.8% 2-methyl pentane, 3.6% n-hexane, 3.7% 2,4-dimethyl pentane, 3.8% n-heptane, 4.8% toluene, 3.9% n-octane, 4.8% p-xylene, 4.8% n-propyl benzene, 8.1% n-decane, 4.7% n-butyl benzene, 16.5% n-dodecane, 4.3% n-tridecane, 8.4% n-tetradecane, 4.2% n-pentadecane, 8.5% n-hexadecane, 4.3% n-heptadecane. Six 1 ml ampoules.	5080-8769
PolyWax 500, 1 gram, neat	5188-5316
PolyWax 655, 1 gram, neat	5188-5317

Qualitative Petrochemical Standards

Description	Part No.
Alcohol in Gasoline Sample Test mixture containing approximately 1% each of ethanol, isopropanol, n-propanol, sec-butanol, isobutyl alcohol, tert-amyl alcohol, and n-butanol; 2% each of methanol and tert-butyl alcohol; and 3% MTBE in gasoline. Three sealed 0.5 ml ampoules.	18900-60640
Natural Gas Sample Approximate concentrations % volume/volume: 69% methane, 6% nitrogen, 1% carbon dioxide, 0.5% oxygen, 9% ethane, 1% n-pentane, 6% propane, 3% isobutane, 3% n-butane, 1% iso-pentane and 0.5% hexanes. One pressurized aerosol-type container (370 ml at 25 psig).	5080-8756
Transformer Gas Sample Approximate composition: 0.1% each of carbon dioxide, propylene, hydrogen, carbon monoxide, propane, ethane, methane, ethylene, acetylene, butene-1, and 99% nitrogen. One pressurized aerosol-type container (16 oz/473 mL at 120 psig).	5080-8759
Refinery Gas Sample Approximate concentrations % volume/volume: 15% hydrogen, 5% propane, 1% propylene, 10% iso-butane, 2% iso-pentane, 1% n-pentane, 15% nitrogen, 5% methane, 5% n-butane, 10% 1-butene, 5% trans-2-butene, 5% cis-2-butene, 5% carbon dioxide, 5% carbon monoxide, 1% ethylene, and 10% ethane. One pressurized aerosol-type container (370 ml at 25 psig).	5080-8755
Reference Gas Oil No. 1 Batch 2 Multiple component mixture of hydrocarbons from petroleum fractions. Used for performance verification of the Agilent simulated distillation analyzer, Option 840. The analyzer performs analysis of petroleum fractions according to ASTM Method D 2887. Three 1 ml ampoules.	5060-9086

Chemical Standards

GC and GC/MS Instrument Standards

Gas Analyzer Standards and Accessories

Accessories

Description	Part No.
Regulator for Calib Mix Cylinders, 1 ea Regulator type: Single stage, with swivel connector, Fittings: 1/4 in. female NPT swivel to cylinder, 1/16 in. SS compression fitting to GC, Pressure gauge range: 0 to 400 psi, Flow range: Dedicated 20 ml/min \pm 5%	5184-3539
Gas Sampling Tubing, 1/16 in. Stainless Steel with Fittings Specifications: 1/16 in. Stainless Steel tubing, 610 mm long, 0.038 in. id with two 1/16 in. Stainless Steel Swagelok nuts, front ferrules, and back ferrules	5185-5817

Gas Analyzer Standard Cylinders*

Description	Part No.
Universal Calib Mix Cylinders, Box of 2 0.10% Helium, 0.05% Neon, 0.10% Hydrogen, 0.05% Oxygen, 0.10% Nitrogen, Balance – 99.05% Methane, 0.05% Ethane, 0.05% Ethylene, 0.05% Carbon Dioxide, 0.10% Carbon Monoxide, 0.05% Acetylene, 0.05% Propane, 0.05% Methyl Acetylene, 0.05% n-Butane, 0.05% n-Hexane, 0.05% n-Heptane	5184-3541
NGA (Natural Gas Analyzer) Calib Mix Cylinders, Box of 2 5.17% Nitrogen, Balance – 72.24% Methane, 8.997% Ethane, 1.495% Carbon Dioxide, 6.001% Propane, 2.999% Isobutane, 2.000% n-Butane, 0.50% Isopentane, 0.50% n-Pentane, 0.10% n-Hexane	5184-3542
RGA (Refinery Gas Analyzer) Calib Mix Cylinders, Box of 2	5184-3543
Universal/NGA Calib Mix Cylinder Combo Box**	5184-3544
Universal/RGA Calib Mix Cylinder Combo Box**	5184-3545

*Cylinder specifications: Pressure (when full): 240 psi, Volume: 8.5 liters, Temperature range: 0°F to 450°F, Diameter: 2.75 in., Height (w/valve): 7.25 in., Tank material: Carbon steel, Concentrations: \pm 5% accuracy, w/w.

**Combo boxes contain one box of 2 calibration mix cylinders, containing one cylinder of Universal mix, and the other is either an NGA or RGA cylinder.

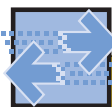


Regulator, carry case and mix cylinders

Gas Analyzer Standard Kits*

Description	Part No.
Universal Calibration Kit, 1 ea With two Universal mix cylinders	5184-3546
NGA Calibration Kit, 1 ea With one Universal and one NGA mix cylinder	5184-3547
RGA Calibration Kit, 1 ea With one Universal and one RGA mix cylinder	5184-3548

*Calibration kits contain one box of 2 calibration mix cylinders, 2 regulators, 2 pieces of stainless steel 1/16 in. gas sampling tubing, and 1 carry case, all packaged separately.



Product Finder

For a complete selection of single and multi-element reference standards for ICP-MS, turn to page 708.

Integrators and Integrator Supplies

Ink cartridges/Thermal Paper



Integrators, Integrator Supplies and Cables

At Agilent Technologies, our goal is to provide high quality columns and supplies for your instrumentation. In between our rigorous designing, manufacturing and testing, we have also taken the time to listen. We understand that your laboratory needs encompass far more than simply columns and consumables. Which is why we offer our established line of integrators, data handling supplies and cables.

Information generation and its presentation has never been more important. Agilent understands that data handling supplies are indeed also laboratory supplies. So it is essential that you never run out of them at a crucial moment. We provide a means to purchase ink cartridges and integrator supplies just as conveniently as you can order our other laboratory products.

Integrator Cartridges and Printheads

Description	Part No.
Ink cartridge, Agilent 3397A, 3396 Series III, 3396A and B, 3395, 3394	5181-1220
Printhead for 3388A and 5880A	19350-60540

Integrator Paper and Supplies

Paper and Supplies for the Agilent 3397A, 3396 Series II, and 3396A/B/95/94

Description	Unit	Part No.
Z-fold paper, sequentially numbered, 8.5 x 11 in., 500 sheets/pk, Inkjet	5/pk	5062-3561
Perforated paper, 8.5 x 11 in. rolls, Inkjet	4/pk	5181-1219
Perforated paper, sequentially numbered, 8.5 x 11 in. rolls, Inkjet	4/pk	5183-2009
Perforated paper, A4 size rolls, Inkjet	4/pk	5181-1255
Replacement paper roll rod		03394-20500
Replacement paper roll brackets	2/pk	03396-40050

Thermal Paper for the Agilent 3390/92/93

Description	Unit	Part No.
Thermal printing paper, blue print, 4.5 in. wide	4 rolls/pk	5080-8800

Thermal Paper for the Agilent 338X/5830/3370

Description	Unit	Part No.
Z-fold paper, black print, 8.5 in. wide	8 pk/box	9270-0658

Integrators and Integrator Supplies

Integrators and Accessories

Integrators and Accessories

3396 Series III Integrator with BASIC programming

- BASIC programming
- Reintegration/replot
- Negative peak integration
- Industry standard RS-232 communications port
- Offers 256 kb RAM
- Multiple-level calibration
- Instrument Control (INET)

3395 Series III Integrator with 128 kb of RAM, general purpose signal, and remote cables

- Stores multiple data files in RAM
- Reintegration/replot
- 100% memory backup for power failure protection
- Multiple-level calibrations for up to 63 levels
- Offers 128 kb RAM storing up to 20 hrs of chromatographic data at 4 Hz.

Description	Part No.
3396 Series III Integrator with BASIC programming	3396C
3395 Series III Integrator with 128 kb of RAM, general purpose signal, and remote cables	3395B
GC Dual-channel Appak-Series III, 5890 and 6890 GC control software for the 3396 Series III Integrator*	G2101A
Integrator Starter Kit Includes 8.0 MB data storage card, Z-fold paper stand, Z-fold paper (500 sheets), and three ink cartridges	G2100A
Integrator Data Storage card, 16 MB	G2105A

*Requires Agilent 5890 GC communications board, option 552 or accessory 19242B

Integrators and Integrator Supplies

Cables

Cables

3396 Series III Cable Sets

Description	Part No.
Series III Integrator General Purpose cables, signal/remote cable pair includes 35900-60630 and 03396-61031	G2108A
INET interface for integrators, provides INET communications and dual-channel output, includes 1 INET cable	G1553A

Cables to Connect 3397A or 3396/95 Series III Integrator

Instrument	Cable Type		
	Analog	Remote	Sample
6890 Series GC (non-INET)	G1530-60570		
			03396-61010
5890 GC (non-INET)	35900-60610		
			03394-60560
1100 Series LC	35900-60750		
			03396-61010
1090 Series LC	35900-60600		03396-60560
			03396-60650
1050 Series LC	35900-60750		03396-60560
			03396-61010
1040 diode array detector	35900-60600		03396-60560
			03396-60650
1046A fluorescence detector	35900-60750		
			03394-60600
7673 automatic sampler (non-INET)			03396-60550
			03396-60560
General Purpose	35900-60630		
			03394-60540

Integrators and Integrator Supplies

Cables

Cables to Connect 3394/95A and 3396A/B Integrator

Instrument	Cable Type		
	Analog	Remote	Sample
6890 Series GC	G1530-60570		
		03396-61020	03396-61010
5890 GC	35900-60610		
			03394-60560
1090 Series LC	35900-60600		
		35900-60710	
		03396-60650	03396-60560
1050 Series LC	35900-60750		
		01046-60210	
			03396-60560
1040 diode array detector	35900-60610		
		03396-60650	
1046A fluorescence detector	35900-60750		
		01046-60210	
7673 automatic sampler (non-INET)			03396-60560
General Purpose	35900-60630		
		35900-60920	
	35900-60900		03394-60540

Integrators and Integrator Supplies

Cables

HPIB and GPIB Cables

Description	Part No.
PCI GPIB Card for Win95/98/NT (82350A/B)	G1680-63715
HPIB Cable 2m (10833B)	10833B-2310
General Purpose Cable GPIO-Open End	G1103-61611
HPIB Cable, 8 meter (10833G)	10833G-2310
Cable, 6890 to PC 9F/9F RS232	G1530-60600
Crossover Ethertwist Cable, 10 ft	5183-4649
Adapter, extends GPIB connector (10834A)	10834A-2310

Instrument Interface Cables

Description	Part No.
Signal cable, general purpose analog output cable assembly, spade lugs/6 pins	G1530-60560
External event control, cable, 8 pins/spade lugs	G1530-60590
Remote start cable for general use with lug	35900-60670
6890 to PC via RS 232-C, 9 female/25 male user card cable	G1530-60610
General purpose binary-coded decimals cable with spade lugs	G1530-60630
Automatic liquid sampler; remote start/stop cable, 2 m 9 male/9 female	G1530-60930
HPIL cable, 5 m	82167-60003
Remote Y Cable, G1512/5890A to 3396C	G1512-60530
Remote Cable to 5890	35900-60700

Sample Preparation

Solid Phase Extraction (SPE)	130-143
AccuBOND [®] SPE Products	130-140
Evidex [®] SPE Products.....	141
Manifolds and Accessories.....	142-143
Sample Filtration.....	144-149
Syringe Filters.....	144-149



Sample Preparation

Helping you overcome your most challenging sample preparation obstacles

Effective sample preparation can make the difference between a definitive measurement and a record of impurity-driven interferences. If samples are taken incorrectly—or if your protocols do not provide good recovery or interference removal—then all subsequent steps could be negated.

That is why Agilent's sample preparation products are manufactured under an ISO-9000 certified program to make sure they meet the consistency standards that will help you achieve reproducible results.

Remember, too, that when you choose Agilent, you also get 40 years of chromatography expertise that can help your lab avoid problems and overcome separation challenges.



Sample Preparation

SPE

AccuBOND[®] SPE Products



Solid-Phase Extraction

Solid-Phase Extraction (SPE) is a technique for the cleanup and concentration of analytes from various matrices. SPE improves and simplifies separations, increases chromatography column lifetime, and improves detection limits.

AccuBOND[®] SPE Cartridges— A Versatile Sample Preparation Family

The AccuBOND[®] name on SPE cartridges indicates high quality in a wide selection of phases for use in routine analyses that call for consistent results with higher sample volumes. Based on high purity, irregularly shaped silica packing, AccuBOND[®] cartridges bring you these valuable characteristics:

- High quality, low extractables for dependable separations
- Solvent pre-washed packings, frits and cartridge bodies
- Wide variety of phases
- Larger mass cartridges for extraction of environmental samples
- Suitable for general SPE method development
- Specific phases for routine extractions of drugs of abuse from biological fluids
- Attractive pricing for routine, high volume laboratory use

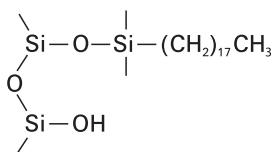


Free Newsletter

Receive a free subscription to *Separation Times* or *Agilent in Pharmaceutical Analysis*! Go to www.agilent.com/chem/subnews to register for the electronic newsletter that provides the science, solutions and special offers you need to ensure your lab achieves maximum productivity.

AccuBOND[®] Reversed Phase (Non-Polar)

Reversed phase sorbents are non-polar and used to retain (extract) non-polar analytes from less polar matrices. For reversed phase sorbents, elution solvent strength increases as the solvent becomes more non-polar.



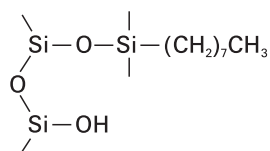
Structure of octadecylsilane (C18, ODS) covalently bonded to the surface of silica particle

Octadecylsilane (ODS) (C18)

AccuBOND[®] C18 products are based on bonded, reversed phase (octadecylsilane), irregular silica gel (silica) particles. This non-polar, non-encapped sorbent provides additional polar interactions associated with surface silanol groups. It also enhances retention of basic compounds compared with the corresponding encapped sorbent. It is recommended as a general purpose SPE phase for both polar and non-polar analytes.

Octadecylsilane (ODS) (C18)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-1310
200 mg, 3 ml	50/pk	188-1320
500 mg, 3 ml	50/pk	188-1350
500 mg, 6 ml	30/pk	188-1356
1000 mg, 6 ml	30/pk	188-1360



Structure of octyl (C8) silane, covalently bonded to the surface of a silica particle

Octyl (C8)

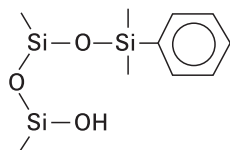
AccuBOND[®] C8 products are based on bonded, reversed phase (octylsilane), irregular silica gel (silica) particles. This non-polar, non-encapped sorbent is recommended as a general purpose SPE phase for non-polar analytes. It is slightly less retentive than AccuBOND[®] C18 products. For basic analytes, octyl sorbents often can increase the extraction efficiency and enhance their purity.

Octyl (C8)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-0310
200 mg, 3 ml	50/pk	188-0320
500 mg, 3 ml	50/pk	188-0350
500 mg, 6 ml	30/pk	188-0356
1000 mg, 6 ml	30/pk	188-0360

SPE

AccuBOND[®] SPE Products



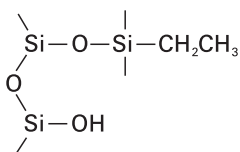
Structure of phenyl silane, covalently bonded to the surface of a silica particle

Phenyl

AccuBOND[®] Phenyl SPE products are based on bonded, reversed phase (phenyl), irregular silica gel (silica) particles. This phase exhibits additional polar secondary interactions, which can enhance retention of basic compounds. It exhibits a different selectivity compared with the octadecyl and octyl phases when both aromatic and nonaromatic compounds are being extracted.

Phenyl

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-0510
200 mg, 3 ml	50/pk	188-0520
500 mg, 3ml	50/pk	188-0550
500 mg, 6 ml	30/pk	188-0556
1000 mg, 6 ml	30/pk	188-0560



Structure of ethyl (C2) silane, covalently bonded to the surface of a silica particle

Ethyl (C2)

AccuBOND[®] Ethyl (C2) SPE products are manufactured using a trifunctional silane bonded to irregular silica gel (silica) particles. They are not endcapped, allowing additional polar interactions with surface silanol groups. The short chain ethyl group provides less retention than the longer C8 and C18 chains, where retention is primarily based on non-polar interactions. The stronger interactions of this phase with basic and polar analytes can provide additional extraction selectivity.

Ethyl (C2)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	5185-5811
200 mg, 3ml	50/pk	5185-5812
500 mg, 3ml	50/pk	5185-5813
500 mg, 6 ml	30/pk	5185-5814
1000 mg, 6 ml	30/pk	5185-5815

ENV PS-DVB

AccuBOND[®] ENV PS-DVB is a highly cross-linked polystyrene-divinylbenzene (PS-DVB) copolymer. With its high surface area (600 m²/g) and high capacity, it is ideal for the extraction of polar analytes that are not adequately retained on a C18 or C8 sorbent. The nonselective characteristic of this sorbent is useful for screening applications where a broad range of analytes is to be extracted.

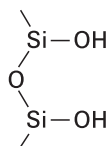
The particle size (75-150 μm) makes it ideal for the rapid flow of a large volume of aqueous environmental sample. The cartridge design has been optimized for phenol, which typically has low and irreproducible recoveries.

ENV PS-DVB

Description	Unit	Part No.
1000 mg, 6 ml	30/pk	188-3060
500 mg, 6 ml	30/pk	5188-5295

AccuBOND[®] Normal Phase (Polar)

Normal phase sorbents are polar and used to retain (extract) polar analytes. For normal phase sorbents, solvent strength increases as the solvent becomes more polar.



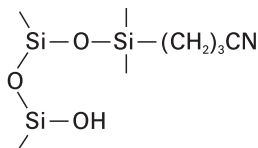
Structure of silanol groups on the surface of a silica particle

Silica

AccuBOND[®] Silica SPE products are based on unbonded, activated irregular silica gel (silica) particles. The primary interaction available is polar (e.g., hydrogen bonding). The silanol groups are ionizable, so it can be used as a weak cation exchanger at intermediate pH values.

Silica

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-0110
200 mg, 3ml	50/pk	188-0120
500 mg, 3ml	50/pk	188-0150
500 mg, 6ml	30/pk	188-0156
1000 mg, 6 ml	30/pk	188-0160



Structure of cyanopropylsilane (CN), covalently bonded to the surface of a silica particle

Cyano (CN)

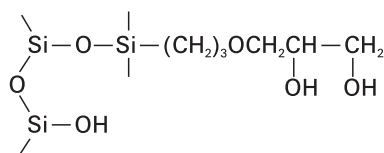
AccuBOND[®] Cyano (CN) SPE products are based on irregular silica gel (silica) particles. This polar, bonded sorbent can exhibit both polar and non-polar interactions. It can be used as a non-polar sorbent for extraction of both polar and non-polar molecules from aqueous samples, and for extraction of polar molecules from relatively non-polar solvents.

Cyano (CN)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-0610
200 mg, 3 ml	50/pk	188-0620
500 mg, 3 ml	50/pk	188-0650
500 mg, 6 ml	30/pk	188-0656
1000 mg, 6 ml	30/pk	188-0660

SPE

AccuBOND[®] SPE Products



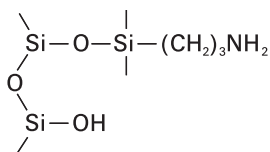
Structure of diol silane, covalently bonded to the surface of a silica particle

Diol (OH)

AccuBOND[®] Diol SPE products are based on irregular silica gel (silica) particles. This polar, bonded sorbent can exhibit both polar and weak non-polar interactions, depending on the cartridge preparation and sample matrix. While, with appropriate cartridge conditioning, it can be used as a non-polar sorbent to extract relatively non-polar molecules from aqueous samples, it is more frequently used to extract polar molecules from relatively non-polar solvents using hydrogen-bonding interactions.

Diol (OH)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-0710
200 mg, 3 ml	50/pk	188-0720
500 mg, 3 ml	50/pk	188-0750
500 mg, 6 ml	30/pk	188-0756
1000 mg, 6 ml	30/pk	188-0760



Structure of aminopropyl (NH₂) silane, covalently bonded to the surface of a silica particle

Amino (NH₂)

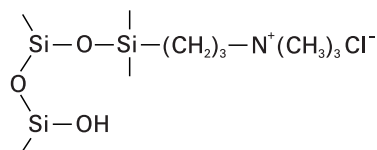
AccuBOND[®] Amino (NH₂) SPE products are based on irregular silica gel (silica) particles. This dual purpose sorbent can act either as a polar phase or weak anion exchanger. When conditioned with a non-polar solvent, e.g., hexane, it can hydrogen bond with any molecule containing -OH, -NH, or -SH functional groups. In an aqueous environment with pH 7.8 or less, it can function as a weak anion exchanger.

Amino (NH₂)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-1010
200 mg, 3ml	50/pk	188-1020
500 mg, 3 ml	50/pk	188-1050
500 mg, 6 ml	30/pk	188-1056
1000 mg, 6 ml	30/pk	188-1060

AccuBOND[®] Ion Exchange

Ion exchange phases are more dependent on pH, ionic strength, and counter-ion strength than on solvent strength. These phases depend on ionic interactions as the primary retention mechanism.



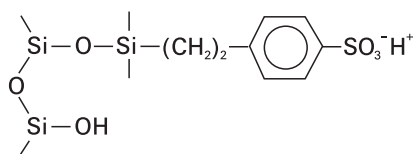
Structure of SAX silane, covalently bonded to the surface of a silica particle

Strong Anion Exchange (SAX)

AccuBOND[®] SAX SPE products are based on irregular silica gel (silica) particles. This strong anion exchanger is used to extract compounds capable of carrying a negative charge from both aqueous and non-aqueous solutions. They are ideally suited to extraction of weak acids. Nominal capacity 0.6 meq/g.

Strong Anion Exchange (SAX)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-1610
200 mg, 3 ml	50/pk	188-1620
500 mg, 3 ml	50/pk	188-1650
500 mg, 6 ml	30/pk	188-1656
1000 mg, 6 ml	30/pk	188-1660



Structure of SCX silane, covalently bonded to the surface of a silica particle

Strong Cation Exchange (SCX)

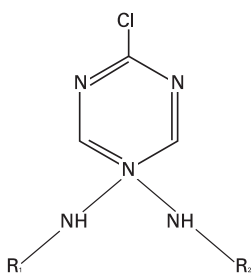
AccuBOND[®] SCX SPE products are based on irregular silica gel (silica) particles. These strong cation exchange sorbents are used to extract positively charged basic compounds. This benzenesulphonic acid-based sorbet has significant non-polar secondary interactions, with nominal capacity 0.3 meq/g.

Strong Cation Exchange (SCX)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-1510
200 mg, 3 ml	50/pk	188-1520
500 mg, 3 ml	50/pk	188-1550
500 mg, 6 ml	30/pk	188-1556
1000 mg, 6 ml	30/pk	188-1560

SPE

AccuBOND[®] SPE Products

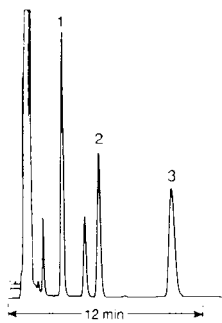


General Structure of Triazine Herbicides

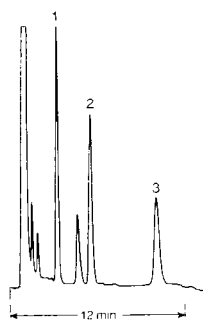
Comparative Herbicide Extractions Using SPE Products

Application Example

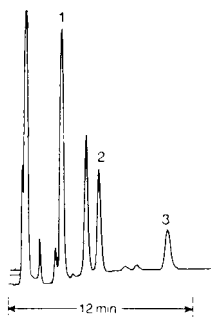
Detection of triazine herbicides can be critical to food safety. Analysis of these persistent chemicals in various matrices is simplified by the use of AccuBOND[®] SPE sample preparation. Examples for soil (containing a large number of charged species), for muscle tissue (with large amounts of relatively non-polar components such as lipids), and for corn oil (with glycerides and fatty acids that are non-polar compared to the triazines) all show effective separation of the three prominent triazine species. Refer to the chromatograms to see the chromatographic results.



Soil



Muscle tissue



Corn oil

Analysis of Triazines in a Variety of Samples: Preparation with AccuBOND[®] SPE Cartridges

The following examples demonstrate effective isolation of prominent triazine compounds for

- soil—containing a large number of charged species,
- muscle tissue—with large amounts of relatively non-polar components such as lipids, and
- corn oil—with glycerides and fatty acids.

Solid Phase Extraction Method

Results in Chromatogram

	Soil	Muscle tissue	Corn oil
CARTRIDGE	SCX	ODS (C18)	Diol
EXTRACTION	Shaken in acetonitrile	Homogenized in methanol	None
PRE-TREAT	Acetic acid	Methanol	Methanol, hexane
LOAD	Diluted with acetic acid	Diluted with water	Diluted with hexane
WASH	Acetic acid, acetonitrile, water, 0.1 M K ₂ HPO ₄	Water	Hexane
ELUTE	Acetonitrile/K ₂ HPO ₄	Methanol	Methanol

Key to Chromatograms

Peak		R1	R2
1	Simazine	—CH ₂ CH ₃	—CH ₂ CH ₃
2	Atrazine	—CH ₂ CH ₃	—CH(CH ₃) ₂
3	Propazine	—CH(CH ₃) ₂	—CH(CH ₃) ₂

AccuBOND[®] Non-Silica

Non-silica-based phases have varying degrees of polarity and surface acidity or basicity. They are primarily used to retain polar analytes. For these phases, solvent strength generally increases as the solvent becomes more polar.

Alumina A (Acidic)

AccuBOND[®] Alumina A sorbents, with 50-200 μm particle size, can adsorb molecules by interaction with the aluminum metal center, hydrogen bonding with the surface hydroxyl groups, or ion exchange if the surface carries a charge. Acid washing results in a surface with decreased capacity for basic compounds.

Alumina A (Acidic)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-2110
200 mg, 3 ml	50/pk	188-2120
500 mg, 3 ml	50/pk	188-2150
500 mg, 6 ml	30/pk	188-2156
1000 mg, 6 ml	30/pk	188-2160

Alumina B (Basic)

AccuBOND[®] Alumina B sorbents, with 50-200 μm particle size, can adsorb molecules by interaction with the aluminum metal center, hydrogen bonding with the surface hydroxyl groups, or ion exchange if the surface carries a charge. Washing with a basic solution results in a net negative charge, allowing retention of certain compounds as cations on the surface or by specific interaction with the center.

Alumina B (Basic)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-2210
200 mg, 3 ml	50/pk	188-2220
500 mg, 3 ml	50/pk	188-2250
500 mg, 6 ml	30/pk	188-2256
1000 mg, 6 ml	30/pk	188-2260

SPE

AccuBOND[®] SPE Products

Alumina N (Neutral)

AccuBOND[®] Alumina N sorbents, with 50-200 μm particle size, can adsorb molecules by interaction with the aluminum metal center, hydrogen bonding with the surface hydroxyl groups. The neutralized surface allows interaction with compounds whose heteroatoms are electronegative (e.g., N, O, P, S) or with an electron-rich, highly aromatic structure.

Alumina N (Neutral)

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-2310
200 mg, 3 ml	50/pk	188-2320
500 mg, 3 ml	50/pk	188-2350
500 mg, 6 ml	30/pk	188-2356
1000 mg, 6 ml	30/pk	188-2360

Florisil

AccuBOND[®] Florisil is a selective synthetic magnesia-silica adsorbent, specially processed to give consistent results when used for column cleanup and separation of chlorinated pesticide residues prior to identification and measurement of the pesticide by gas, thin layer, or paper chromatography.

Florisil

Description	Unit	Part No.
100 mg, 1 ml	100/pk	188-2410
200 mg, 3 ml	50/pk	188-2420
500 mg, 3 ml	50/pk	188-2450
500 mg, 6 ml	30/pk	188-2456
1000 mg, 6 ml	30/pk	188-2460



Library

More information is a click away. We have a variety of educational primers, application notes, maintenance guides, and literature available from Agilent for free. To learn more, call your local sales office or an authorized distributor or visit our website at www.agilent.com/chem/OnlineLibrary.



AccuBOND[®] Bulk SPE Sorbents

AccuBOND[®] Cartridge Starter Kits and Bulk SPE Sorbents

AccuBOND[®] cartridge starter kits are available for reversed phase, normal phase, and ion-exchange in economical 100 mg, 1 mL configurations for easier method development and selectivity screening.

AccuBOND[®] sorbents are available in bulk, along with a selection of reservoirs and frits, for those who wish to pack their own SPE cartridges or to perform "flash" chromatography.

SPE Starter Kits

10 each in 100 mg, 1 ml configuration

Description	Part No.
Reversed Phase C2, C8, C18, CN, and Phenyl Phases	009-4003
Normal Phase Silica, Amino, Diol, and CN Phases	009-4004
Ion-Exchange Phase SCX, SAX, and Amino Phases	009-4005

Bulk SPE Sorbents

Description	Unit	Part No.
ODS (C18)	25 g	189-1302
Octyl (C8)	25 g	189-0302
Ethyl (C2)	25 g	5185-5816
PSA *	25 g	5188-5364
Phenyl	25 g	189-0502
Silica	25 g	189-0102
Diol	25 g	189-0702
Cyano (CN)	25 g	189-0602
Amino (NH ₂)	25 g	189-1002
SAX	25 g	189-1602
SCX	25 g	189-1502
Alumina A	25 g	189-2102
Alumina N	25 g	189-2302
Florisil	25 g	189-2402

*PSA (polar strong anion exchange) is an ion exchange material with two amino groups, offering higher ionic capacity than the Amino sorbent. The PSA functional group (ethylene diamine n-propyl) is a good bidentate ligand, ideally suited for chelation.

SPE

AccuBOND[®] SPE Products



AccuBOND[®] Empty Reservoirs and Frits

Empty reservoirs and separate or integrated frits are available if you would like to prepare your own solid phase extraction cartridges. By purchasing bulk SPE sorbents, you can pack larger or different weights of sorbent, mixed phases or any combination that you desire. The larger volume reservoirs can be used for low pressure or flash chromatography.

Description	Unit	Part No.
Empty reservoirs Luer fitting on bottom, 1.5 ml	50/pk	700-4004
Empty reservoirs Luer fitting on bottom, 3 ml	50/pk	700-4005
Empty reservoirs Luer fitting on bottom, 6 ml	50/pk	700-4006
Empty reservoirs Luer fitting on bottom, 25 ml	50/pk	700-4007
Empty reservoirs Luer fitting on bottom, 70 ml	50/pk	700-4008
Reservoirs with frits, 1.5 ml	50/pk	700-4014
Reservoirs with frits 2 x 20 μ m, 3 ml*	50/pk	700-4015
Reservoirs with frits 2 x 20 μ m, 6 ml**	50/pk	700-4016
SPE frits, 20 μ m, 1.5 ml, Polyethylene	50/pk	700-4034
SPE frits, 20 μ m, 3 ml, Polyethylene	50/pk	700-4035
SPE frits, 20 μ m, 6 ml, Polyethylene	100/pk	700-4036

*Use two frits in each tube.
**Used with high-suspended-solids samples.

Evidex^{II} SPE Products

Evidex^{II} SPE Cartridges

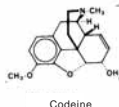
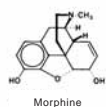
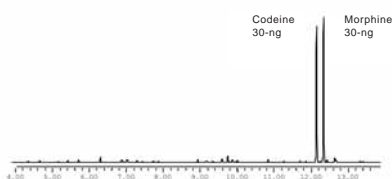
Effective sample preparation is an important step in building compelling evidence in drugs-of-abuse cases. The Evidex^{II} SPE cartridge—suitable for all necessary methods—supports the kind of reliable, accurate separation that you need with characteristics like:

- Cartridge designed for SAMSHA (Substance Abuse and Mental Health Services Administration) drug classes: Amphetamine/Methamphetamine, PCP (angel dust), Benzoylcegonine (cocaine), Codeine/Morphine, THC-COOH (marijuana)
- Step-by-step instructions included, for testing consistency
- Accurate, reproducible results (<5% RSD)
- Forgiving of minor errors of volumes and concentrations of reagents
- Tested with actual drugs of abuse to ensure lot-to-lot reproducibility, high recovery, and clean extracts with low background
- Proprietary bonding chemistry (mixed phase)
- Specific GC Evidex capillary columns for optimized separations of drug classes

Opiates in Urine by GC/MS

Column: DB-EVDX
128-8522
25 m x 0.20 mm, 0.33 μm

Carrier: Helium at 40 cm/sec
Oven: 65°C for 1 min
65-325°C at 20°/min
Injection: Splitless, 250°C
Detector: MSD, 300°C transfer line



Description	Unit	Part No.
200 mg, 3 ml	50/pk	188-2920
400 mg, 6 ml	30/pk	188-2946

Drugs of Abuse Gas Chromatography Columns

DB-EVDX

- Specially configured and tested for drugs-of-abuse confirmation
- DB-5ms EVDX: Equivalent to (5%-Phenyl)-methylpolysiloxane
- Consistent retention and peak shape
- Text mix includes caffeine, glutethimides, lidocaine, phenobarbital, EDDP, Methaqualone, methadone, cocaine, desipramine, carbamazepine
- Low bleed for GC/MS analysis
- Bonded and cross-linked
- Solvent rinsable

Description	ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
DB-5ms EVDX	0.20	25	0.33	-60 to 325/350	128-8522

SPE Manifolds and Accessories



Vacuum Manifold Processing Station, 5185-5754

Manifolds and Accessories

Agilent manifolds and accessories complement the quality of AccuBOND® sorbents. Flexible configurations and availability as complete assemblies or individual components mean that the user has the necessary capability at any stage from method development to high throughput operation.

Vacuum manifold processing stations for individual cartridges are suitable for use from method development to lower volume production. Shown here is a 10-port manifold assembly, (P/N 5185-5754) with all inputs plugged. Your capability is enhanced with features like:

- Manifolds available for either 10 or 20 positions
- Tank constructed of chemically resistant, vacuum-safe glass
- Ultra high molecular weight polyethylene lid ensures excellent solvent resistance
- Vacuum gauge with coarse and fine control valves for monitoring and adjustment of vacuum levels, plus a safety release valve
- Choice of height-adjustable racks to accommodate a variety of collection vessels (rack options to fit 10, 12 and 16 mm tube diameters); standard rack for 16 mm tubes
- Compatible with standard Luer-tipped SPE and filtration columns
- Individually controlled PTFE stopcocks, permitting flow control at each port position (optional)
- Clearly marked ports and racks to ensure correct positioning of collection vessels

10-Port Cartridge Manifold

Description	Part No.
Vacuum manifold assembly, 10 port with 16 mm rack (adjustable)	5185-5754
Rack, optional, 10 x 10 mm, adjustable height	5185-5755
Rack, optional, 10 x 12 mm, adjustable height	5185-5756
Rack, optional, 10 x 16 mm, adjustable height	5185-5757
Lid, 10 position for 10-port vacuum manifold	5185-5760
Lid gasket for 10-port vacuum manifold	5185-5761
Glass tank for 10-port vacuum manifold	5185-5762

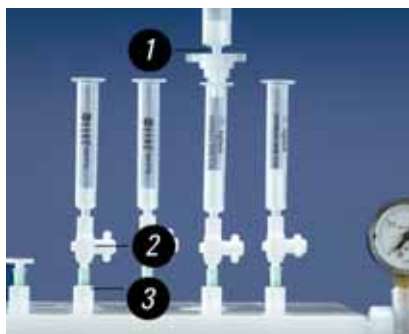
20-Port Cartridge Manifold

Description	Part No.
Vacuum manifold assembly, 20 port, with 16 mm rack (adjustable)	5185-5765
Rack, optional, 20 x 10 mm, adjustable height	5185-5766
Rack, optional, 20 x 12 mm, adjustable height	5185-5767
Rack, optional, 20 x 16 mm, adjustable height	5185-5768
Lid, 20 position for 20-port vacuum manifold	5185-5771
Lid gasket for 20-port vacuum manifold	5185-5772
Glass tank for 20-port vacuum manifold	5185-5773



The 20-port manifold assembly, 5185-5765, is shown with all three sizes of SPE cartridge, illustrating its adaptability

SPE Manifolds and Accessories



Multi-stage preparations are straightforward, with use of the accessories shown. 1. Stacking Adapter (5185-5794) 2. Stopcock Valve (5185-5758) 3. Needle Retainer (5185-5764)



Cartridge contents are retained and protected on top by use of the appropriately sized cap (available for 1 mL, 3 mL, and 6 mL cartridges) and on the bottom by a Luer Cap, 5185-5795)

Parts and Disposables for Cartridge Manifolds

Description	Unit	Part No.
Stopcock valve for vacuum manifold	10/pk*	5185-5758
Stainless steel needles for vacuum manifold	10/pk*	5185-5759
Port seal plugs for vacuum manifold	10/pk*	5185-5763
Needle retainer for vacuum manifold	10/pk*	5185-5764
Caps for 1 ml SPE cartridges	100/pk	5185-5791
Caps for 3 ml SPE Cartridges	100/pk	5185-5792
Caps for 6 ml SPE Cartridges	100/pk	5185-5793
Adapters, stacking for 1, 3 or 6 ml cartridges	10/pk	5185-5794
Luer caps (fit all cartridge sizes)	100/pk	5185-5795

*For a 20 port manifold, order 2 packs of 10



Quick Buy

It's easy to order catalog items online. Simply enter desired quantities and part numbers, and then click "Add to Cart."

Sample Filtration

Syringe Filters



Sample Filtration

Membrane sample filters are used to clarify any samples that need further analysis or where particulate matter may cause a problem. They are most often used for the filtration of HPLC samples to prevent damage to the injection valve or plugging of the HPLC column inlet. Agilent provides a range of standard and economy syringe filters conveniently housed in inert polymeric housings for easy use and disposal.

Syringe Filters

Membrane syringe filters are used most often to clarify small-volume sample solutions prior to HPLC and ion chromatography. The membrane filters are contained in an inert polymeric housing. No glue or binders are used in their construction to ensure that no extractables are present. The housing is designed to spread the sample solution over the entire surface of the membrane so that maximum membrane capacity is used. Syringe filters are ready-to-use and are quite convenient. You merely attach the Luer-tipped syringe filled with the sample solution to the housing and push the sample through the pre-cleaned filters.

Why Filter Your Samples for HPLC?

- Protects your column, particularly the newer sub-five micron microparticulate columns, capillary columns and column inlet frits, against plugging (blockage) from sample particulate matter. Extends column lifetime.
- Protects your injection valve components from possible damage, scratching and increased wear by sample particulate matter. Minimizes instrument downtime.

Why Purchase Agilent Syringe Filters?

- We offer the most popular sizes, porosities and membrane types at attractive pricing
- Both Luer and the lowest volume mini-tips available
- Low extractables for high sensitivity work
- High protein recovery for biological samples
- Regenerated cellulose filters are batch-tested under HPLC conditions
- New Econofilters are attractively priced in larger quantity packages

How to Select the Right Membrane Syringe Filter

- Choose the size of filter based on the volume of sample that must be filtered.
- Choose the porosity of the filter based on the size of potential particulates that may be present in your sample. Remember, the finer the porosity the more pressure it will take to pass sample through the filter. If you have a great deal of particulate matter, you may want to use a glass fiber filter, place a glass fiber pre-filter in front of your membrane filter to prevent rapid plugging or use a 2-in-1 filter that has a built-in prefilter in a single housing.
- Choose the membrane type based on the solvent that you want to filter.

Sample Filtration

Syringe Filters



Filter Types

All filter inlets are female Luer-compatible, have inert polypropylene or polycarbonate housings and come in four diameters:

30 mm filters are designed for larger sample volumes or for solvent filtration. The wide cross sectional area (5.1 cm²) offers an increased filtration speed over the smaller diameter filters. The holdup volume is less than 50 µL.

25 mm Econofilters are designed for high throughput laboratories that require an economical filter packaged in larger quantities at a substantial cost savings. The filters have a moderately wide cross sectional area (4.2 cm²) with a holdup volume of less than 50 µL.

13 mm filters are ideal for most applications. They offer the best compromise between holdup volume and sample volume and are our most popular size. Sample volumes are typically in the 1-10 mL range and the holdup volume is less than 10 µL.

Two porosities are available: 0.45 micron pores and 0.20 micron pores. Use the 0.45 micron version to remove particles that are detrimental to most columns; the 0.20 micron filters are used to remove the smallest particles.

Pre-filters have a 100% borosilicate glass fiber membrane that is chemically inert and resistant to most solvents. The high surface area of the rigid fiber structure provides outstanding particle retention capacity while maintaining low flow resistance. The GF53 will retain coarse particles down to approximately 3 µm in diameter and the GF92 down to approximately 2 µm in diameter. They can be used standalone or in series with a membrane filter.

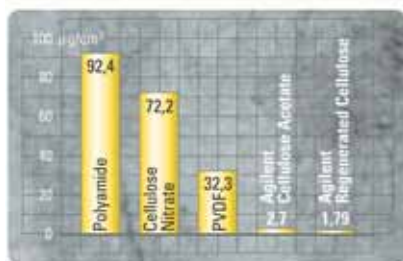
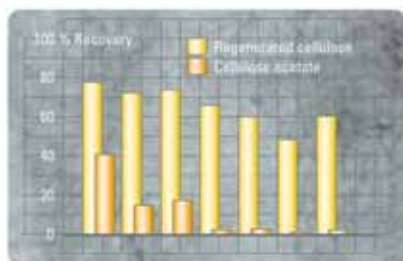


2-in-1 Filter

2-in-1 filters are a two-layered filter in a single housing with a built-in glass fiber pre-filter on the top layer and a membrane filter on the bottom layer. The coarse pre-filter removes the larger particulates that would plug the membrane filter. This type of filter is recommended for difficult-to-filter samples. Because the pre-filter retains coarse particles, it requires less force to push liquid sample through the filter, thereby providing higher throughput. The combination costs less than two individual filters and saves time, sample and money.

Sample Filtration

Syringe Filters



Recovery of Polynuclear aromatic hydrocarbons

Membrane Types

Agilent Technologies provides the most popular types of membranes to cover a very wide range of applications. The main selection criteria are solvent compatibility and porosity. To assist you in making sure that the former criterion is met, the chemical resistance table lists the most popular solvents used in HPLC along with the compatible membrane types. As you can see, the regenerated cellulose and PTFE membranes have the widest range of solvent compatibility and are the preferred membranes for HPLC use. Our most popular membrane type, the regenerated cellulose membrane is priced slightly lower than the PTFE.

- Regenerated cellulose membranes are recommended for general HPLC sample preparation as well as filtration of aqueous biological samples and organic solvents. The regenerated cellulose filter is close to a universal filter for HPLC. In addition to its wide range of solvent compatibility, low protein binding, and attractive pricing, it offers extremely low extractables. Extractables with UV absorbance can be particularly troublesome to liquid chromatographers. Thus, all regenerated cellulose filters are batch-certified for water, acetonitrile and methanol extractables as determined under stringent HPLC test conditions (wavelengths of 214 and 254 nm) on an Agilent Technologies Series 1100/1200 HPLC System. A "Certificate of Analysis" (C of A) is available for each batch of regenerated cellulose filters. In addition, we have changed the packaging and provide the regenerated cellulose in a reusable, easy-opening plastic box.
- PTFE membranes are compatible with almost all solvents, acids and bases.
- Cellulose nitrate is primarily used for pre-filters and is compatible with many but not all aqueous or non-aqueous solvents (see Chemical Resistance Table).
- Cellulose acetate membranes are not compatible with organic solvents. They are well suited for aqueous solutions and are specially recommended for proteins and protein-related samples.

Recovery

Sample recovery is an important performance criterion for membrane filters. Nobody wants to spend time collecting and preparing their precious sample only to find that in the filtration step, the sample is irreversibly "sorbed," affecting the analytical results or reducing the amount of sample analyte for subsequent steps in the sample preparation or method process.

Sample Filtration

Syringe Filters

Chemical Resistance Table for Membrane Filters

Substances	Membrane filters				
	Cellulose nitrate	Cellulose acetate	Regenerated cellulose	Nylon 66	PTFE
1-Hexanol	+	+	+	+	+
1,4-Dioxane	-	-	+	N/A	0
Acetic acid, 10% & 25%	+	0	+	-	+
Acetone	-	-	+	+	+
Acetonitrile	-	-	+	+	-
Aliphatic hydrocarbons	+	+	+	+	+
Ammonia, 1 M	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	N/A	+
Benzene	+	+	+	+	+
Boric acid	+	+	+	0	+
Carbon tetrachloride	+	0	+	-	+
Carboxylic acid	+	+	+	-	+
Chloroacetic acid	-	-	0	-	+
Chloroform	+	-	+	+	0
Cyclohexane	0	0	+	+	+
Cyclohexanol	+	+	+	+	+
Diethylether	0	0	+	+	0
Dimethyl formamide	-	-	0	+	+
Dimethyl sulfoxide	-	-	0	N/A	+

Code for Table: + = Resistance, 0 = Limited resistance, - = Not resistant, N/A = Not available

Sample Filtration

Syringe Filters

Chemical Resistance Table for Membrane Filters

Substances	Membrane filters				
	Cellulose nitrate	Cellulose acetate	Regenerated cellulose	Nylon 66	PTFE
Ethanol=<98%	-	+	+	+	+
Ethyl acetate	-	-	+	+	+
Ethylene chloride	0	0	+	+	+
Ethylene glycol	0	+	+	+	+
Formic acid, 25%	+	0	+	-	+
Hexane	+	+	+	+	+
Hydrochloric acid, 25%	+	-	+	-	+
i-Propanol	+	+	+	+	+
Methanol	-	+	+	0	+
Nitric acid, 25%	0	0	+	-	+
Pentane	+	+	+	+	+
Phosphoric acid, 25%	+	+	+	0	+
Phosphoric acid, 45%	0	0	0	0	+
Potassium hydroxide, 1 M	-	-	0	-	+
Salt solutions, aqueous	+	+	+	+	+
Sodium hydroxide, 1 M	-	0	-	-	+
Tetrachloroethane	+	0	+	0	+
Tetrahydrofuran	-	-	+	+	0
Toluene	+	+	+	+	+
Trichloroacetic acid, 10%	+	-	-	0	+
Trichloroethane	+	0	+	0	+
Trichloroethylene	+	0	+	0	+
Xylene	+	+	+	+	+

Code for Table: + = Resistance, 0 = Limited resistance, - = Not resistant, N/A = Not available

Sample Filtration

Syringe Filters

Pre-Filters (Stand alone), 100/pk

Description	Part No.
Glass fiber (GF-53)*	5042-1393
Glass fiber (GF-92)*	5042-1370

*Pre-filters have a 100% borosilicate glass fiber membrane that is chemically inert and resistant to most solvents. The high surface area of the rigid fiber structure provides outstanding particle retention capacity while maintaining low flow resistance. The GF53 will retain coarse particles down to approximately 3 μm in diameter and the GF92 down to approximately 2 μm in diameter. They can be used standalone or in series with a membrane filter.

Membrane Filters, 100/pk

Description	Diameter (mm)	Pore Size (μm)	Part No.
PTFE with Luer tip	30	0.2	3150-0753
PTFE with Luer tip	30	0.45	3150-0754
PTFE with Luer tip	13	0.45	5185-5836
PTFE with mini tip	13	0.45	5185-5837
Cellulose Acetate with Luer tip	30	0.45	5061-3363



Regenerate Cellulose Filters, 5061-3364

Regenerated Cellulose Membrane Filters, 100/pk

Description	Diameter (mm)	Pore Size (μm)	Part No.
Luer tip	30	0.2	5061-3354
Luer tip	30	0.45	5061-3364
Luer tip	13	0.2	5064-8222
Luer tip	13	0.45	5064-8221
Mini tip	13	0.2	5061-3366
Luer tip	13	0.45	5061-3365

2-in-1 Filters, 100/pk

Description	Diameter (mm)	Pore Size (μm)	Part No.
Glass Fiber/Cellulose Nitrate	30	0.45	5042-1391
Glass Fiber/Regenerated Cellulose	30	0.45	5042-1392



Syringe Econofilters, 5185-5830

Membrane Econofilters, 200/pk

Description	Diameter (mm)	Pore Size (μm)	Part No.
Regenerated Cellulose	25	0.2	5185-5830
Regenerated Cellulose	25	0.45	5185-5831
Nylon	25	0.2	5185-5832
Nylon	25	0.45	5185-5833
PTFE	25	0.2	5185-5834
PTFE	25	0.45	5185-5835

Syringes for Sample Filters, 10/pk

Description	Part No.
Disposable syringes, 20 ml	5062-8534

GC and GC/MS

Maintenance Schedule.....	153	GC and GC/MS Columns.....	228-328
GC General Supplies.....	154-181	GC Columns.....	228-231
Septa.....	154-160	Columns for GC/MS.....	232-233
Liners.....	161-169	Polysiloxane Polymers.....	234-269
Inlet Seals.....	170	PEG Columns.....	270-277
Column Ferrules and Nuts.....	171-174	Chiral Columns.....	278-280
Column Connectors/Splitters.....	175-178	Foods and Flavors.....	280
MicroFluidic Products.....	179	High Temperature Columns.....	281-282
Valves and Loops.....	180-181	Life Sciences.....	283-284
GC Instrument Parts and Supplies.....	182-211	Pesticides.....	285-286
Purge and Trap Supplies.....	182-185	Petroleum.....	287-289
Automatic Liquid Sampler Supplies.....	186-188	Semivolatiles.....	290-291
Headspace Supplies.....	187-188	Volatiles.....	292-295
7890/6890/6850 Inlet Supplies.....	189-195	PLOT.....	296-303
7890/6890/6850 Detector Supplies.....	196-203	Metal.....	304
5890 Inlet Supplies.....	204-206	Non-Bonded.....	305-308
5890 Detector Supplies.....	207-210	Custom Columns.....	309
Gas Flow Supplies.....	211	6850 GC Columns.....	310-313
Miscellaneous Instrument Parts and Supplies.....	211	Quality Control Specifications.....	314-317
GC/MS Parts and Supplies.....	212-227	Fused Silica Tubing.....	318-319
MSD Maintenance and Contamination.....	212-217	Method/Column Selection Guides.....	320-328
MSD Ion Source.....	219	GC Troubleshooting and Maintenance.....	329-345
MSD Filaments.....	220	GC and GC/MS Applications.....	355-443
MSD Vacuum Systems and Pumps.....	221-223	Environmental-Hydrocarbons.....	355-356
Electron Multiplier Parts and Supplies.....	224	Environmental-Pesticides and Herbicides.....	357-367
5973A/N Extended Linearity Semi-Volatiles		Environmental-Semivolatiles.....	368-378
Application Kit.....	225	Environmental-Volatiles.....	379-384
MS Engine Supplies.....	226	Environmental-Air Analysis.....	385-388
MS Test and Performance Samples.....	227	Food, Flavors and Fragrances.....	389-401
		Industrial Chemicals.....	402-443
		Life Sciences.....	421-429
		Petroleum.....	430-443



GC and GC/MS

Setting the standard for reliable, long-term performance.

In this section, you will find specifications and essential facts about Agilent's GC and GC/MS consumables portfolio. Backed by four decades of chromatography innovation, Agilent consumables deliver long life and lot-to-lot consistency, which can help lower your ownership costs and maintain optimal system performance. With over 1000 J&W DB- and HP-GC columns, you are certain to find one that fits your separation needs.

Of course, choosing the right column is just the first step in building and maintaining robust analytical methods. That is why we have added suggestions for precisely engineered Agilent supplies—plus innovative new products, such as our Ultimate Union and Non-stick O-rings.



GC and GC/MS

Maintenance Schedule

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. Replace indicating traps when indicating material is spent.
Split vent trap	Every 6 months*	Replace
Flowmeter calibration	Every 1 to 2 years	Re-calibrate electronic flowmeters—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*	Check for scratched corrosion, or build-up of non-volatile sample components and replace if dirty.
Columns		
Front-end maintenance	Weekly-monthly*	Remove 1/2 to 1 meter from the front of the column when experiencing chromatographic problems (peak tailing, decreased sensitivity, retention time changes, etc.). Replace inlet liner, 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 return chromatographic performance.
Ferrules	As needed	Replace when changing columns and inlet/detector parts.

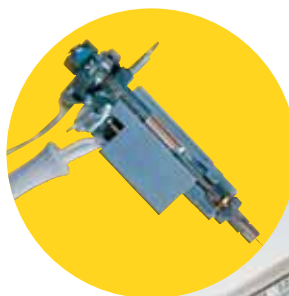
*Schedule is an approximation of average usage requirements. Frequency may vary widely based upon application and sample type.



GC and GC/MS Maintenance Schedule

Item	Typical Schedule	Actions/Comments
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 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 As needed	Measure hydrogen, air, and makeup gas flows. Clean/replace FPD windows and seals when detector sensitivity is reduced.
Mass Selective Detectors		
Tune MSD	As needed	Keep plenty of PFTBS (part number 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 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.



GC and GC/MS

Septa



Inlet Septa

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

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, however, they can leak or decompose. This causes sample losses, lower column flow, decreased column life and ghosting.

What is the Function

The septum isolates the sample flow path from the outside world. It must provide a barrier that is readily penetrated by the injector needle while maintaining internal pressure without contaminating the analysis.

Septa are generally made of special high temperature, low-bleed silicone rubber formulations.

Why Replace

Septa should be replaced regularly to avoid

- leaks
- decomposition
- sample loss
- reduced column or split vent flow
- ghost peaks
- column degradation

How to Minimize Problems

Avoid problems by

- using with the recommended temperature range
- changing regularly
- installing the retainer nut “finger tight”
- using septum purge when available
- using autoinjectors
- using sharp syringe needles

Your 50th Septum is as Clean as Your 1st!

The primary benefit behind the new packaging is that each septum is individually packaged for the ultimate cleanliness. Each septum is easily dispensed one at a time by pushing it through the back foil, as is commonly done with pharmaceutical capsules and tablets. No longer do you need to reach into a jar and wonder how clean the septa are or if you are contaminating other septa.

In addition, the new packaging delivers the following features and added value:

- No more clumping or sticking: Septa don't stick to each other or the jar
- Easy to see exactly how many are left: Know exactly when to reorder
- Compact storage size: Fits easily into drawers
- Convenient quantities: All septa are packaged in either 50 or 100 packs
- High quality PET packaging: Tested by GC-FID, GC/MS, and GC-ECD to ensure the absence of interfering background peaks



Tips & Tools

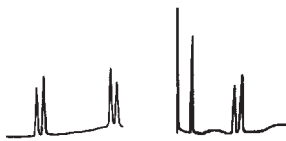
Bleed can come from many sources in the GC and GC/MS system, and the source is sometimes hard to isolate. If you are trying to minimize bleed contributions throughout the system be sure to use Agilent's low bleed septa and one of Agilent's low bleed columns for GC/MS.

GC and GC/MS

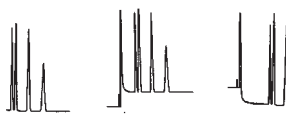
Septa

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.
---------------------------	--	--



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 Long Life	◆	◆◆◆	to 350°C
Non-Stick Advanced Green	◆◆	◆◆	to 350°C

◆◆◆ = best ◆◆ = very good ◆ = good

Premium Non-Stick 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
- Blister package keeps each septum clean and ready for use
- Center point guides the needle for easy penetration, less coring, longer life
- Precision molding assures accurate fit in the inlet
- Each batch is tested on an Agilent 6890 GC-FID for bleed
- Premium formulations selected for sealing and chromatographic cleanliness
- No need to bake septa before using

Bleed and Temperature Optimized Septa (BTO)

- Extended temperature range, lowest bleed
- Maximum injection port temperature 400°C
- Plasma coating 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



5183-4757

Description	Unit	Part No.
11 mm septa	50/pk	5183-4757
11 mm septa	100/pk	5183-4757-100
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4758



Library

Download Agilent's Comparison of Centerguide Usage. It's from from Agilent's website and illustrates how Agilent's center guide septa greatly reduce septa coring. Go to www.agilent.com/chem/OnlineLibrary and download publication number 5988-7353.

GC and GC/MS Premium Septa

Long-Life Septa

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



5183-4761

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

Advanced Green Septa

- True long-life, high temperature green septum
- More injections per septum
- Plasma coating 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



5183-4759

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

GC and GC/MS General Purpose Septa



General Purpose Septa

Agilent's General Purpose Septa are made from an enhanced injection-molded silicone rubber material. The septa material, dark red or gray in color, is specified to withstand over 200 automatic injections at an injection port temperature of 350°C. You can have confidence in your chromatographic results knowing that each lot of septa is placed through a demanding QC test to ensure that only the highest quality product is delivered to your laboratory.

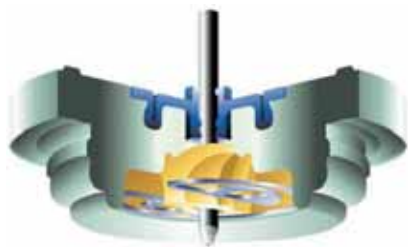
- Low bleed for reduced instrument maintenance downtime and increased laboratory productivity
- Less frequent replacement for long life time and the ability to withstand more than 200 injections at elevated injection port temperatures
- Easy penetration and the durability to remain resistant to coring and leaking from multiple injections
- Blister packaging for cleanliness and convenience

Description	Unit	Part No.
Gray Septa		
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
Red Septa		
11 mm solid septa	50/pk	5181-1263-50
11 mm solid septa	100/pk	5181-1263-100
11 mm septa with partial through hole	50/pk	5181-3383-50
11 mm septa with partial through hole	100/pk	5181-3383-100
9.5 mm (3/8 in.) septa*	50/pk	5181-1283-50
9.5 mm (3/8 in.) septa*	100/pk	5181-1283-100
5 mm septa through hole 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

GC and GC/MS

Merlin Microseal



Merlin Microseal

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

Description	Part No.
High Pressure Merlin Microseal	
High pressure Merlin Microseal starter kit: Includes microseal septum and nut	5182-3442
Microseal high pressure septum	5182-3444
Microseal high pressure nut	5182-3445
High sample volume septum kit: Contains Merlin high pressure Microseal, six 23-gauge syringes, 500 vials and caps	5181-8839
Merlin Microseal Standard Pressure	
Merlin Microseal kit, original low pressure system: Includes nut and septum	5181-8816
Merlin Microseal kit, original low pressure system: Includes nut and 2 septa	5181-8833
Microseal septum, stainless steel, rubber (30 psi)	5181-8815
Microseal PTFE nut liners, 2/pk	5182-0853
Merlin MicroSeal manual syringe, 5 µl, 23 gauge	5182-3438
Merlin MicroSeal manual syringe, 10 µl, 23 gauge	5182-3439
Syringe, 5 µl, 23 gauge	9301-0892
Syringe, standard plunger, 10 µl, 23 gauge	9301-0713

Inlet Liners

Agilent offers a complete selection of GC split and splitless inlet liners that deliver consistent quality so you can get consistent results.

And unlike other manufacturer's liners, Agilent liners are built to Agilent's precise inlet tolerances which helps ensure optimal dimensional accuracy and inertness toward demanding compounds. In addition, silk screened part numbers and lot number on liners make identification and re-ordering easier for you.

Choosing the proper liner for a specific application can be a difficult and challenging task. The three liner characteristics that must be considered for each application are:

- Liner volume
- Liner treatments or deactivation
- Any liner design features that might affect carrier gas flow through the inlet or sample vaporization

What is the Function

Liners are the centerpiece of the inlet system in which the sample is evaporated and brought into the gas phase.

Why Replace

These problems will occur if the liner is not changed on a regular basis or if the correct liner is not used:

- peak shape degradation
- solute discrimination
- poor reproducibility
- sample decomposition
- ghost peaks
- reduced column life

How to Minimize Problems

Change liners on a regular basis determined by:

- previous use pattern
- sample cleanliness
- chromatographic abnormalities such as:
 - peak shape changes
 - peak discrimination
 - poor reproducibility
 - sample pyrolysis
 - active analyte response loss or decomposition

GC and GC/MS Inlet Liners



Discussion of Liner Characteristics

Liner Volume

The purpose of the injection port is to allow the introduction of a sample into the gas chromatograph in an accurate, reproducible manner. The vaporized sample should be a true representation of the liquid sample and, unless specifically desired, should be injected without chemical change. The elevated temperatures used in the inlet vaporize the liquid sample to a gas for transfer to the head of the column. This phase transition is accompanied by a very significant volume change. The volume of the resulting vapor must be small enough to fit within the volume of the liner. If the volume is too great for the liner, it could result in backflash, or sample loss caused by expansion into the septum purge or split vent lines. Both can compromise reproducibility and sensitivity. Backflash also frequently results in sample carryover.

Larger volume liners ($> 800 \mu\text{l}$) are characterized by larger inside diameters (ID) and are typically used with injection sizes of $1 \mu\text{l}$ or more. The small volume liners have a smaller ID and are usually used with small injection sizes ($< 1 \mu\text{l}$), fast $100 \mu\text{m}$ ID columns, gas samples, or when using external sampling devices like headspace and purge and trap.

Liner Deactivation

Active sites on inlet liners can adsorb sample components and cause peak tailing, and potential loss of sensitivity and reproducibility. Deactivation agents are used to cover or react with active sites on the glass surface of the liner. Agilent liners are deactivated using deactivation procedures that produce reproducible and inert liners, with long lifetimes. For splitless applications or when even slightly polar compounds must be analyzed, a deactivated liner should be used.

With use, even deactivated liners can begin to exhibit activity. When this occurs, the liner should be replaced. Liners can be cleaned to remove particulate material or solvent rinsed to remove less volatile components. However, choosing the proper liner cleaning procedure can be difficult. Some solvents may remove the deactivation layer, and tools might scratch the glass surface of the liner, resulting in the generation of unwanted active sites. A new liner almost always outperforms a cleaned and re-deactivated one – especially for trace analysis.

Liner Design Features

Dimensions

- The outside diameter (OD) of the liner determines if the liner is more effectively used in split or splitless mode
- Larger OD liners improve analyte recovery by retaining more sample inside the liner
- Agilent splitless liners are all designed with exacting dimensional tolerances to fit tightly in the inlet and minimize sample contact with metal surfaces
- Smaller OD liners are designed for split injection because they produce less resistance to carrier and split flow through the inlet
- Large volume liners are used for split injections with enforced dimensional stability for a wide range of split ratios

Tapers

Tapering or narrowing the liner internal diameter (ID) is done for a number of purposes:

- Bottom taper focuses sample onto the head of the column
- Bottom taper minimizes contact with metal parts of the inlet
- Center taper positions glass wool correctly
- Top taper minimizes sample backflash

To operate properly, the column must be installed correctly in the injection port with the tip of the column ideally located about halfway into the taper, or about 4-6 mm from the column tip to the top of the ferrule. Some applications will work better with different column installation depths. Therefore, you should check the instrument manual for proper installation distances and determine which distance is appropriate for your application. Reproducible positioning is important for repeatable quantitative results.



Library

Download the Free Software Tool, Vapor Volume Calculator. You can use it to determine the vapor volume of an extended list of common solvents for any user-chosen set of inlet temperatures and pressures for a given Agilent inlet liner. Go to www.agilent.com/chem/FlowCalculator.

GC and GC/MS Inlet Liners

Packing

Glass Wool

Many liner designs use deactivated glass wool packing. The glass wool is positioned or held in place near the center of the liner to:

- Provide additional surface area for complete volatilization of the sample to minimize thermal discrimination
- Trap non-volatile components and septum particles before they reach the column
- Wipe any sample from the syringe needle, thereby increasing reproducibility and preventing sample residue build-up at the septum

Glass wool liners that have glass wool near the center of the liner, such as Agilent Part Nos. 5183-4647 and 5183-4711, are recommended for automatic injections.






If glass wool is positioned at the bottom of the liner, its main purpose is simply to trap non-volatile components. Glass wool is generally not recommended for the following analytes:

- phenols
- organic acids
- pesticides
- amines
- drugs of abuse
- reactive polar compounds
- thermally labile compounds

Glass Cups

Another design feature used to help volatilize the sample and provide good mixing is the incorporation of a glass cup inside the liner. Glass cup liners are also available with additional glass wool and inert packing to increase reproducibility and limit sample discrimination. Not recommended for use with Electronic Pressure Control Inlets on 6890 or 6850 GCs.

Liner Troubleshooting

Symptom	Possible Cause	Remedy	
Tailing Peaks 	Sample components adsorbed by column, inlet liner or contaminated gold inlet seal Needle hitting and breaking packing in inlet liner	Use new, deactivated liner or clean old liner and replace glass wool. Partially remove packing from liner or use without packing.	
	Column end poorly cut (sample absorption)	Remove column. Make a clean, square cut using a reliable capillary fused silica cutting tool (such as a ceramic wafer or the Agilent Column Cutter), then reinstall column.	
	Broken or chipped inlet liner	Make sure total flow in inlet is above 40 ml/min.	
Leading Peaks 	Sample decomposing	Remove inlet liner and check cleanliness. Use new, deactivated liner or replace glass wool and packing.	
		Sample decomposing	Remove inlet liner and check cleanliness. Use new, deactivated liner or replace glass wool and packing.
		Column and inlet liner misaligned	Check installation of column end and inlet liner; adjust if necessary.
		Column or inlet liner contaminated or column deteriorating	Use a guard column to prolong column life. Remove inlet liner and check cleanliness. Use new, deactivated liner or replace glass wool and packing. Trim the front end of the column a minimum of 6 inches.

GC and GC/MS Inlet Liners



Agilent Choice Liners

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

Split Inlet Liners

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

Splitless Inlet Liners

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

Direct Inlet Liners

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






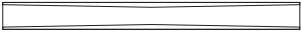








Tips & Tools

Agilent offers a variety of e-seminars, on-site training, and on-demand eLearning to help you learn how to be a more effective chromatographer. For more information, visit www.agilent.com/chem/Education.

GC and GC/MS Inlet Liners

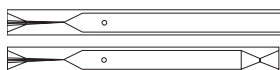
Agilent Choice Liners

	Description	Volume (µl)	ID (mm)	Unit	Part No.
Splitless Inlet Liners					
	Single taper, deactivated	900	4	1/pk	5181-3316
				5/pk	5183-4695
				25/pk	5183-4696
	Single taper, inert	900	4	1/pk	5181-3316i
				5/pk	5062-3587
				25/pk	5183-4693
	Double taper, deactivated	800	4	1/pk	5181-3315
				5/pk	5183-4705
				25/pk	5183-4706
	Straight, deactivated, quartz	250	2	1/pk	5181-8818
				5/pk	5183-4703
				25/pk	5183-4704
	Straight, non-deactivated, quartz	250	2	1/pk	18740-80220
				5/pk	5183-4707
				25/pk	5183-4708
	Straight, non-deactivated	990	4	1/pk	210-3003
				5/pk	210-3003-5
Split Inlet Liners					
	Single taper, glass wool, deactivated (general purpose)	870	4	1/pk	5183-4711
				5/pk	5183-4712
				25/pk	5183-4713
	Single taper, glass wool, deactivated, low pressure drop	870	4	1/pk	5183-4647
				5/pk	5183-4701
				25/pk	5183-4702
	Straight, deactivated glass wool	990	4	1/pk	19251-60540
				5/pk	5183-4691
				25/pk	5183-4692
	Straight, with cup (for manual injections)	800	4	1/pk	18740-80190
				5/pk	5183-4699
				25/pk	5183-4700
	Straight, with cup, glass wool and packing (for manual injections, not recommended for use with EPC)	800	4	1/pk	18740-60840
				5/pk	5183-4697
				25/pk	5183-4698
Direct Inlet Liners					
	Straight, non-deactivated (for gas samples, headspace, or purge & trap)	140	1.5	1/pk	18740-80200
				5/pk	5183-4709
				25/pk	5183-4710

GC and GC/MS Inlet Liners

Direct Connect Liners

- Press fit connection to the column
- No sample exposure to the inlet
- Deactivated liners included in 8270 EPA application kit (G2860A)
- Inert Deactivated liner recommended for trace analysis of acids and bases
- Optimized hole size and placement



Direct Connect Liners

Description	Part No.
Single Taper, Splitless, 4 mm ID, Deactivated	G1544-80730
Dual Taper, Splitless, 4 mm ID, Deactivated	G1544-80700
Single Taper, Splitless, 4 mm ID, Deactivated, Inert	G1544-80731

Focus Liners

- Improved reproducibility
- Precise amount of glass wool in the ideal position traps non-volatile sample residue
- Glass wool provides extra surface area for vaporization, traps nonvolatile sample residue, and wipes any residual sample from the needle

Focus Liners

Description	Unit	Part No.
Deactivated with glass wool, 4 mm ID, 6.3 mm x 78.5 mm	5/pk	210-4004-5
Tapered, deactivated with glass wool, 4 mm ID, 6.3 mm x 78.5 mm	5/pk	210-4022-5



Programmable Temperature Vaporizing (PTV) Liners

Programmable Temperature Vaporizing (PTV) Liners

Description	ID (mm)	Volume (µl)	Part No.
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	1.5	150	5183-2037
PTV Liner, Fritted Glass, Deactivated	1	80	5183-2041
Quartz liner for high temperature PTV	3.4	713	5188-5313
PTV liner, high temperature, borosilicate	3.4	668	5188-5356



Liner O-Rings

- 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, 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 creating un-necessary inlet maintenance
- Packaged for convenience and cleanliness in a novel dial package that delivers 1 clean O-ring, ready for use

Liner O-Rings

Description	Unit	Part No.
Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
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
High Temp PTV inlet Liner Fluorocarbon O-ring	10/pk	5188-5311

GC and GC/MS Inlet Liners



Patent Pending Metal Injection Molded Gold Inlet Seal

Split/Splitless Inlet Seals

To ensure that you have a consistent and inert surface to properly seal the inlet and prevent sample degradation, Agilent has revolutionized production of the inlet gold seal. Unlike traditional machined seals, the new format Agilent gold inlet seal has a very reproducible smooth surface, eliminating traces of machining grooves that can be the source of minute leaks. With Agilent's proprietary metal injection molding (MIM) manufacturing process, every gold inlet seal provides a high quality, leak free seal so critical for reproducible results.

Our new package keeps the gold seal clean and scratch free. For your added convenience, an inlet washer is provided with each inlet seal.



Gold plated seal kit, 5188-5367

Split/Splitless Inlet Seals

Description	Part No.
Stainless steel seal	18740-20880
Gold plated seal kit, includes washer Replacement for 18740-20885	5188-5367
Gold-plated seal with cross*	5182-9652

*Use with total flow rates of greater than 200 ml/min



Special Offers

Don't forget, we have special offers throughout the year. To view them, turn to the inside back cover of this catalog, then go to www.agilent.com/chem/specialoffers.

Ferrules



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.



Capillary Column Ferrules in Dial Package

At Agilent, we offer a comprehensive selection of ferrules made of different materials and configurations for a leak-free connection between the column and injector. Our popular ferrules are in novel dial packs to conveniently dispense one clean ferrule at a time.

Three main types of ferrules are used with capillary GC columns: graphite, Vespel and Vespel-graphite composites. Graphite ferrules can withstand temperatures as high as 450°C, and Vespel and Vespel-graphite ferrules are rated to 280°C and 350°C, respectively.

What is the Function

Ferrules seal the connection of the column or liner to the system. The ideal ferrule provides a leak-free seal, accommodates various column outer diameters, seals with minimum torque, will not stick to the column or fittings, and will tolerate temperature cycling.

Why Replace

Signals that a ferrule is damaged include:

- background noise from oxygen diffusing into the system
- column bleed catalyzed by oxygen
- sample degradation
- loss of sample
- increase in detector signal/noise
- poor retention time reproducibility

How to Minimize Problems

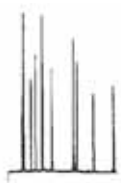
General technique for installing ferrules:

- don't overtighten – fingertighten column nut, then use wrench to tighten a 1/4 turn
- maintain cleanliness
- bake out ferrules prior to use
- avoid contamination – fingerprints, 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

GC and GC/MS

Ferrules

Ferrule Troubleshooting



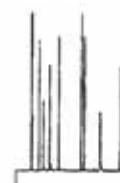
Normal Peaks

Correct column positioning in both injection port and FID



Tailing Solvent Peaks

Column positioned incorrectly in the injection port or possible ferrule particle in the carrier gas flow path



Wrong Peak Ratios

Column positioned in the inlet (either too far or not far enough; verify 4-6 mm installation distance)

Ferrule Selection Recommendations

Ferrule/ Seal Type	Upper Temperature 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
Vespel/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 retighten frequently
Vespel (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 retighten frequently



Tips & Tools

For prolonged instrument life never use graphite ferrules in a GC/MS transfer line. The vacuum will draw the ferrule into the transfer line, causing a leak and possible damage to oxygen-sensitive parts.

GC and GC/MS Capillary Column Ferrules



Agilent capillary ferrules are packaged in our novel dial packs which deliver one ferrule at a time, keeping the others clean and ready for use. The dial packaging has been tested to ensure no out gassing of contaminants, including phthalates.

Capillary Column Ferrules

Ferrule ID (mm)	Column ID (mm)	Unit	Part No.
General Purpose Graphite Ferrules (Short)			
0.5	0.1, 0.2, 0.25, 0.32	10/pk	5080-8853
0.4	0.05-0.25	10/pk	500-2114
0.8	0.45, 0.53	10/pk	500-2118
1.0	0.53	10/pk	5080-8773
85% Vespel, 15% Graphite Ferrules (Short)			
0.4	0.1, 0.2, 0.25	10/pk	5181-3323
0.5	0.32	10/pk	5062-3514
0.8	0.45, 0.53	10/pk	5062-3512
Preconditioned 85% Vespel, 15% Graphite Ferrules (Long)*			
0.3	0.1	10/pk	5062-3507
0.4	0.1, 0.2, 0.25	10/pk	5062-3508
0.5	0.32	10/pk	5062-3506
0.8	0.53	10/pk	5062-3538
No hole (for MSD)		10/pk	5181-3308
100% Vespel, High Performance Ferrules (Short)**			
0.4	0.1, 0.2, 0.25	10/pk	5181-3322
0.5	0.32	10/pk	5062-3513
0.8	0.45, 0.53	10/pk	5062-3511
Specialty Ferrules, 85% Vespel, 15% Graphite			
Two Hole			
0.4	0.1, 0.2, 0.25	10/pk	5062-3580
0.5	0.32	10/pk	5062-3581
No hole		10/pk	5181-7458
High Temp PTV Inlet, SS/Graphite			
0.4	0.320	10/pk	5188-5315
0.4	0.530	10/pk	5188-5314

*These ferrules are recommended for use with Agilent GC/MS Transferlines with the 05988-20066 MS interface column nut.

**These ferrules are recommended for use in isothermal analysis only.

SilTite ferrules are required for leak-tight seals with the Ultimate Union, Deans Switch, and Effluent Splitter.

SilTite Metal Ferrules

Description	Unit	Part No.
For use with 0.25 mm ID capillary columns	10/pk	5188-5361
For use with 0.32 mm ID capillary columns	10/pk	5188-5362
For use with 1/16 in. od stainless steel tubing Includes 2 column nuts	10/pk	5184-3571
For use with 0.53 mm ID capillary columns	10/pk	5188-5363

GC and GC/MS Ferrules

Column Nuts

Description	Part No.
Short Nuts	
Universal column nut, 1/16 in. hex, 2/pk	5181-8830
Finger tight column nut for 0.53 mm columns*	5020-8293
Finger tight column nut for 0.32 mm 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 Temp 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	
Open end wrench, 1/4 and 5/16 in.	8710-0510

*For use with graphite ferrules only

Note: Your Agilent MS interface column nut (or transfer line nut) is manufactured from a softer metal than the transfer line interface. This is to prevent stripping of the transfer line threads and costly repairs. Add a few MS interface column nuts to your next order and keep spares on hand.

Straight Ferrules

Description	Unit	Part No.
1/4 in. Teflon	10/pk	0100-1378
1/4 in. Graphite	10/pk	0100-1324
1/8 in. Graphite	10/pk	0100-1325
1/8 in. 85% Vespel/15% Graphite	10/pk	0100-1332
1/16 in. Teflon	10/pk	0100-1375
1/16 in. Graphite	10/pk	0100-1326
1/16 in. VG-2 Vespel, 40% Graphite	10/pk	0100-1379
6.4 mm Vespel		0100-1104
1/4 in. 85% Vespel/15% Graphite	10/pk	0100-1331

Reducing Ferrules

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



Tips & Tools

Always match short nuts with short ferrules and long nuts with long ferrules.

Column Connectors/Splitters

Ultimate Union

Extend the life of your analytical GC or GC/MS column by using a guard column reliably connected to you analytical column with our high performance capillary GC column connector, the Ultimate Union.

New-technology Ultimate Union kits eliminate the “arts and crafts” involved in connecting columns with a simple-to-use, fast and reliable solution. Quickly discover how much more productive your lab can be when you use Agilent Ultimate Unions to install your guard columns.

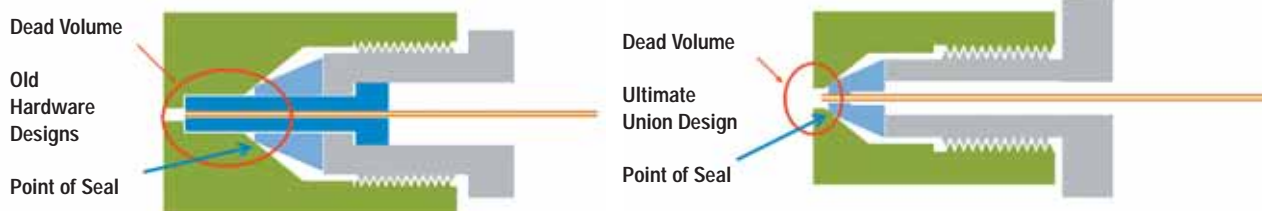
The Ultimate Union is part of Agilent’s Gas Phase Microfluidics family providing extremely low dead volume column connections. Like the QuickSwap, new Dean’s Switch and Purged Effluent Splitter, the Ultimate Union uses special fittings and SilTite ferrules to create an inert, leak free and robust seal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

Each Agilent Ultimate Union kit contains:

- 1 Union (your choice of deactivated or non-deactivated)
- 2 Internal nuts
- 1 Swaging nut
- 1 Oven wall clip
- Kits do not include SilTite ferrules. Please order ferrules for your column ID separately. SilTite ferrules include 2 transfer line nuts.

Ultimate Union Kits, Fittings and Ferrules

Description	Part No.
Ultimate union kit, deactivated	G3182-61580
Ultimate union kit, non-deactivated	G3182-61581
Internal nut	G2855-20530
Swaging nut	G2855-20555
SilTite Metal Ferrules, 0.20-0.25 mm ID capillary columns	5188-5361
SilTite Metal Ferrules, 0.32 mm ID capillary columns	5188-5362
SilTite Metal Ferrules, 0.53 mm ID capillary columns	5188-5363



GC and GC/MS

Column Connectors/Splitters

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 insuring an excellent seal. Now the only choice you have to make is between a Glass Union for standard applications, and Fused Silica Unions or Deactivated Quartz Unions for applications demanding maximum inertness.



Glass press-fit connections

Glass and Fused Silica Press-fit Connectors

Description	Unit	Part No.
Glass Union, Universal, 2-way	25/pk	705-0825
Fused Silica Union, Universal, 2-way	5/pk	705-0905
Fused Silica Union, Universal, 2-way	25/pk	705-0925
Fused Silica Union, Universal, 3-way		705-0903
Polymide sealing resin, 5 grams		500-1200



Quartz splitter

Quartz Press-fit Connectors/Splitters

Description	Unit	Part No.
Quartz column connector, 0.1 to 0.53 mm	5/pk	5181-3395
Deactivated quartz column connector	5/pk	5181-3396
Quartz splitter		5181-3397
Quartz deactivated splitter		5181-3398

Mechanical Capillary Column Connectors

Description	Unit	Part No.
Connector, body and nut		5061-5801
Ferrules for Connectors		
Vespel, 0.2 to 0.53 mm ID tubing	2/pk	5061-5804
Vespel, 0.32 to 0.32 mm ID tubing	2/pk	5061-5805
Vespel, 0.32 to 0.53 mm ID tubing	2/pk	5061-5806
Fused silica, undeactivated 530 µm tubing, 10 m		160-2530-10

GC and GC/MS Column Connectors/Splitters



Graphpak connector for Agilent capillary detectors



Graphpak divider for simultaneous sampling



Capillary injection port connector, 5021-7170

Graphpak Capillary Column Connectors (2.5 mm)*

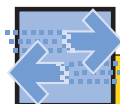
Column ID (mm)	Connector ID (mm)	Part No.
Capillary Detector Port Connector		
0.32/0.25	0.4	5021-7166
0.32/0.25	0.7	5021-7164
Capillary Divider for Simultaneous Sampling		
0.32/0.25	0.53	5021-7148
0.53	0.7	5021-7146
Capillary Injection Port Connector		
0.2	0.3	5021-7169
0.32/0.25	0.4	5021-7170
0.53	0.7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

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

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

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



Product Finder

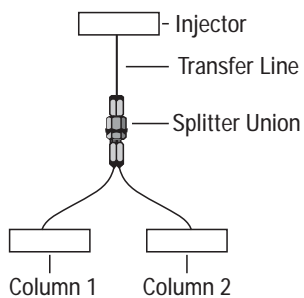
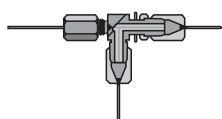
For a list of deactivated fused silica tubing for retention gaps or guard columns, turn to pages 318-319.

GC and GC/MS

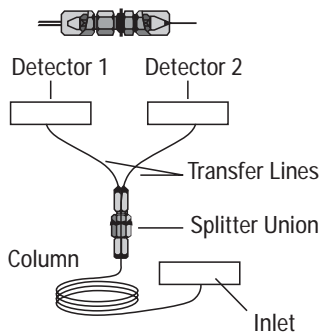
Column Connectors/Splitters

Capillary Column Splitters

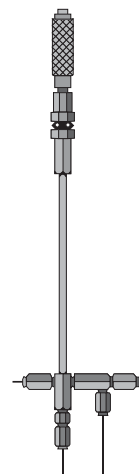
Description	Tubing ID (mm)	Part No.
Fixed Inlet Splitter		
	0.22	5181-3390
	0.32	5181-3391
	0.53	5181-3392
Fixed Outlet Splitter		
1:1 ratio splitter	0.22 to 0.22	0101-0594
1:5 ratio splitter	0.22 to 0.15	5181-3389
1:10 ratio splitter	0.21 to 0.11	0101-0595
Two-hole replacement ferrules, 10/pk		
	0.30	5181-3388
	0.4	5062-3580
	0.5	5062-3581
Variable Outlet Splitter		
Variable outlet system Includes metal body and 5 meter 0.22 mm ID transfer line with 0.4 mm 2-hole ferrule		5181-3393



Fixed inlet splitter



Fixed Outlet Splitter



Variable outlet splitter, 5181-3393

Deans Switch, QuickSwap, Microfluidic Supplies

Agilent offers a family of GC accessories based on our proprietary Gas Phase Microfluidic technology. These accessories increase system productivity and performance:

- QuickSwap MSD interface provides vent-free removal of columns
- Deans Switch device simplifies the analysis of complex samples
- Purged Effluent Splitter for inert, leak-free column effluent splitting

Fittings, Ferrules and Supplies

For leak-free, low dead volume and inert column connections with Microfluidic accessories, such as Deans Switch or QuickSwap MSD Interface, use only Siltite ferrules and specified nuts.



Description	Part No.
Internal nut	G2855-20530
Swaging nut	G2855-20555
Column storage fitting	G2855-20590
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
SilTite Metal Ferrules, 0.20-0.25 mm ID capillary columns	5188-5361
SilTite Metal Ferrules, 0.32 mm ID capillary columns	5188-5362
SilTite Metal Ferrules, 0.53 mm ID capillary columns	5188-5363

QuickSwap MS Interface Restrictors

Agilent's QuickSwap microfluidic switch accessory and pre-swaged fused silica tubing restrictors can increase the productivity of your Agilent 5973N and 5975 inert MSD systems, allowing you to change columns without venting the MSD. QuickSwap microfluidic switch not included.

These restrictors are prefabricated for convenience and ease of use. For applications requiring other restrictor sizes, Agilent offers a wide variety of deactivated fused silica tubing, SilTite ferrules and swaging tools.



Description	ID (mm)	Unit	Part No.
Quick Swap Restrictor	0.092	4/pk	G3185-60361
Quick Swap Restrictor	0.100	4/pk	G3185-60362
Quick Swap Restrictor	0.110	4/pk	G3185-60363
Quick Swap Restrictor	0.120	4/pk	G3185-60364
Quick Swap Restrictor Variety Pack, 2 each of the above ID restrictors			G3185-60300

Valves and Loops



Gas Sampling General Purpose Valves

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



Liquid Sampling General Purpose Valves

Liquid Sampling General Purpose Valves

Description	Part No.
0.2 µl replacement valve UWP series, 1,000 psi, 175°C	0101-0636
0.5 µl replacement valve UWP series, 1,000 psi, 175°C	0101-0637
1.0 µl replacement valve UWP series, 1,000 psi, 175°C	0101-0638
0.5 µl replacement valve UW series, 5,000 psi, 75°C	0101-0639

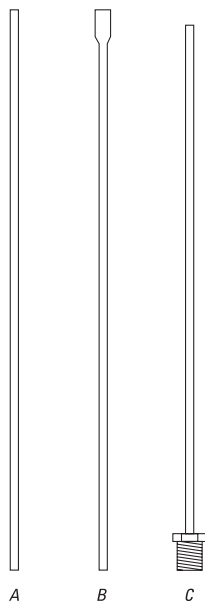
Parts for Interfacing Capillary Columns to W-Series Valves

Description	Part No.
Stainless steel bulkhead ZDV union, for interfacing 530 µm columns with 1/16 in. transfer line	0100-1515
Stainless steel bulkhead ZDV union, for interfacing 320 µm columns with 1/16 in. transfer line	0100-1527
Polymide ferrule, 1/16 in.	0100-1512
Polyimide liner for 530 µm columns	0100-1513
Polyimide liner for 320 µm columns	0100-1514
1/16 in. stainless steel counterbored nut	0100-1511
Installation tool for liners	18900-20850

GC and GC/MS Valves and Loops

Valve Supplies

Description	Part No.
1/16 in. stainless steel nut	5181-1291
1/16 in. front ferrule, stainless steel	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, for flow balancing gas flows of 2-50 ml/min	0101-0633
Air actuator	19325-60660
Solenoid valve for controlling actuator	05890-61090
Solenoid valve for controlling actuator, for GCs after serial number 3223A43573	05890-61095
Angle metering valve, 1/16 in., stainless steel	0101-0403



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

Description	Part No.
Sample loop, 0.25 cc	0101-0303
Sample loop, 0.50 cc	0101-0282
Sample loop, 1.00 cc	0101-0299
Sample loop, 2.00 cc	0101-0300
Sample loop, 5.00 cc	0101-0301
Sample loop, 10.00 cc	0101-0302
A. Tube, 1/16 in. stainless steel, 280 mm long	18900-20250
Tube, 1/16 in. stainless steel, 400 mm long	18900-20280
Tube, 1/16 in. stainless steel, 375 mm long	18900-20281
Tube, 1/16 in. stainless steel, 560 mm long	18900-20300
B. Tube, 1/16 in. with 1/8 in. flare, stainless steel, 360 mm long	1530-2163
Tube, 1/16 in. with 1/8 in. flare, stainless steel, 520 mm long	1530-2167
C. Tube, 1/16 in. with 1/8 in. bulkhead fitting, 520 mm long	07675-80050
Tube, nickel, 1/16 in. with 1/8 in. bulkhead fitting, 460 mm long	18900-80255

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 replacement rotor WT series, 300 psi, 350°C	1535-4952
10-port replacement rotor WT series, 300 psi, 350°C	1535-4954

GC Instrument Parts and Supplies

Purge and Trap Supplies

GC Instrument Parts and Supplies

When it comes to instrument replacement parts for your Agilent GCs, don't settle for an imitation, use genuine Agilent parts. Our inlets are designed, tested, and manufactured by Agilent engineers to work perfectly with our instruments and give you superior performance. Plus we supply every replacement part you would ever need for your entire system, not just a few select parts.



Tekmar 3100 and Agilent 7695A Purge and Trap Supplies

Glassware

Fritless Sparger

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. Available in 1/2 and 3/4 in. mount sizes.

Disposable (Needle) Tubes

The most practical choice for soil (and other solid or semi-solid) samples, these tubes permit easy sample loading and inexpensive disposal. Available only in 3/4 in. mount size, a 3/4 in. tube can be used on the 7695A Purge and Trap concentrator with the adapter (to convert from 7695A Purge and Trap 1/2 in. to this 3/4 in. size).

Needle Sparger with Foam Trap

This sparger is designed for samples that foam, particularly if the foaming cannot be controlled by a fritless sparger. Available only in 1/2 in. mount size.

Frit Sparger

This is the most efficient design in terms of purging and it is the standard choice for clean drinking water. Available in 1/2 and 3/4 in. mount sizes.

Note: The 7695A Purge and Trap concentrator has a 1/2 in. mount, and the automatic sampler has a 3/4 in. mount. An adapter is available to mount 3/4 in. glassware on the 7695A Purge and Trap concentrator, but there is no adapter for using 1/2 in. glass on the automatic sampler.

GC Instrument Parts and Supplies

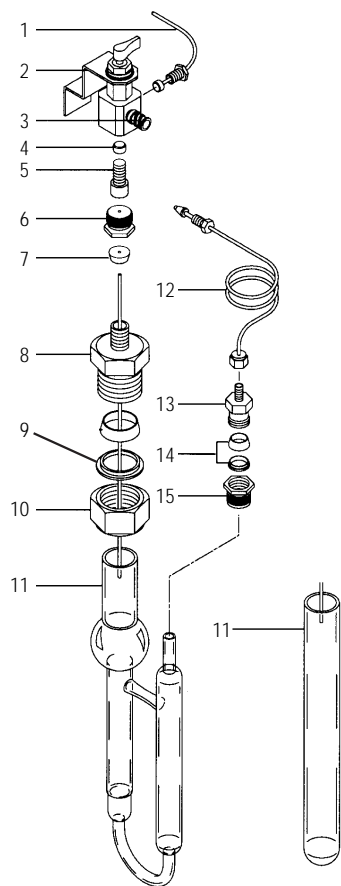
Purge and Trap Supplies

Tekmar 3100 and Agilent 7695A Purge and Trap Supplies

Description	Part No.
Glassware Supplies, 1/2 in. Mount	
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 Fit 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
Glassware and Corresponding Needles, 3/4 in. Mount	
5 ml Frit Sparger	5182-0893
Needle, 8 in.	14-3195-053TMR
25 ml Frit Sparger	5182-0894
Needle, 9 1/8 in.	5182-0789
5 ml Fritless Sparger	5182-0895
Needle, 9 1/8 in.	5182-0789
150 mm Disposable Needle Tube Sparger	12-0507-024TMR
Needle, Pointed 8 in.	14-5186-153TMR
Miscellaneous Supplies	
Sample valve, 3-port assembly	5182-0793
Female Luer connector for sample valve	5182-0792
Purge line assembly	14-5681-102
Needle for 5 ml frit or fritless sparger	5182-0788
Conversion kit adapter for use with 3/4 in. tube on 1/2 in. mount G1900A concentrators	5182-0746
5 ml Gas-tight syringe, Teflon luer lock	5182-9630

GC Instrument Parts and Supplies

Purge and Trap Autosampler Supplies



Tekmar 3100 and Agilent 7695A Purge and Trap Autosampler Supplies

Glassware Assembly, 3/4 in.

Item	Description	Part No.
1	Sample drain line assembly	14-3137-200TMR
2	Sample valve assembly, 3-port	14-0036-050TMR
3	Female luer connector for sample valve	14-0216-016TMR
4	Sample needle ferrule	14-3123-016TMR
5	Sample needle nut	14-3124-016TMR
6	Nut	14-2087-016TMR
7	Ferrule	14-3979-016TMR
8	Union	14-3914-016TMR
9	Ferrules, 3/4 in.	14-0739-016TMR
10	Nut, 3/4 in.	14-0857-016TMR
11	Glassware	
12	Sample purge line top	14-3197-100TMR
	Sample purge line bottom	14-3198-100TMR
13	1/4. in to 1/8 in. union	14-2261-016TMR
14	Ferrules	14-3965-016TMR
15	Nut	14-2087-016TMR

Autosampler Traps

Description	Part No.
Trap, Tenax (A Trap)	5182-0783
Trap, Tenax/Silica Gel/Charcoal (C Trap)	5182-0781
Trap, Tenax/Charcoal (D Trap)	5182-0780
Trap, OV-1/Tenax/Silica Gel/Charcoal (E Trap)	5182-0779
Trap, OV-1/Tenax/Silica/Gel (F Trap)	5182-0778
Trap, Vocab 3000 (K Trap)	5182-0775
Trap, Vocab 4000 (I Trap)	5182-0774
Trap, BTEX	5182-0773
Heater assembly trap	5182-0772
Hydrocarbon trap assembly	5182-0771

Tekmar Velocity Traps

Description	Part No.
Trap, Tenax (#1)	5188-2790
Trap, Tenax/Silica gel/Charcoal, 12 in. x 1/8 in. (#3)	5188-2791
Trap, Tenax/Charcoal, 12 in. x 1/8 in. (#4)	5188-2792
Trap, OV-1/Tenax/Silica gel, 12 in. x 1/8 in. (#6)	5188-2793
Trap, OV-1/Tenax/Silica gel/Charcoal, 12 in. x 1/8 in. (#5)	5188-2794
Trap, Vocab 3000	5188-2795
Trap, Vocab 4000	5188-2796
Trap, BTEX	5188-2797

GC Instrument Parts and Supplies

Purge and Trap Autosampler Supplies

Tekmar AQUATek 70 Purge and Trap Autosampler Supplies

Description	Part No.
Sample Loops	
5 ml sample loop, AQUATek 70	5182-9689
25 ml sample loop, AQUATek 70	5183-4733
20 ml sample loop, AQUATek 70	5183-4734
Glassware*	
25 ml Frit Sparger	5183-4735
5 ml Frit Sparger	5183-4736
5 ml Fritless Sparger	5183-4737
25 ml Fritless Sparger	5183-4738
Vials, Caps, Septa	
Screw caps for 40 ml vials, 24/pk	5183-4744
Septa for 40 ml vials, precleaned, 72/pk	5183-4743
Vial Kit, amber, 40 ml, vials, caps, septa, 72/pk	5183-4742
Vial Kit, 40 ml, vials, caps, septa, 72/pk	5183-4741

*Sparger has 3 connections

Miscellaneous Supplies

Description	Part No.
Spare/Alternative transfer line tubing, passivated nickel, for 0.53 mm ID fused silica or packed columns, 72 in. long	5181-8822
Chemical Standard, Method 501	8500-5901
Interface Cable, Agilent 5890 to 7695 and TMR-3100 P&T (P/N G1900A-010)	5183-4745
Interface Cable, Agilent 5890/MSD to 7695 and TMR-3100 P&T (P/N G1900A-011)	5183-4746

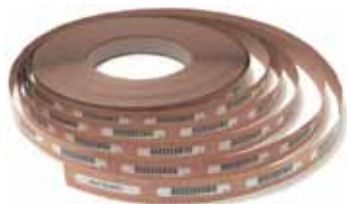


Free Newsletter

Receive a free subscription to *Separation Times* or *Agilent in Pharmaceutical Analysis*! Go to www.agilent.com/chem/subnews to register for the electronic newsletter that provides the science, solutions and special offers you need to ensure your lab achieves maximum productivity.

GC Instrument Parts and Supplies

Automatic Liquid Sampler Supplies



Bar Code Reader Labels

Automatic Liquid Sampler Supplies

Automatic Liquid Sampler Supplies

Description	Unit	Part No.
4 ml wash vial with screw caps	144/pk	9301-0723
Diffusion inserts for 4ml vials	12/pk	07673-40180
Septa for 4ml vial	144/pk	9301-1031
4 ml wash vials with fill markings and caps	25/pk	5182-0551
Screw for mounting syringe		07673-20570
Quadrant tray (4 tray sections)		18596-40015
7673 Basic Supply Kit		07673-60840
Contains 10 ml syringes (6/ea), 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)		

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
Label applicator	18587-60560

GC Instrument Parts and Supplies

Headspace Supplies

Headspace Supplies

Description	G1883A	G1888A	7694
Strain relief septum nut	301-205-HSP	301-205-HSP	301-205-HSP
Needle, headspace transfer line, deactivated 0.5 mm OD	2322590004	2322590004	2322590004
Needle for transfer line, 0.25 mm ID, 0.5 mm OD, nickel		301-016-HSP	301-016-HSP
Needle, headspace transfer line, deactivated 0.7 mm OD	2322590005	2322590005	2322590005
Needle for transfer line, 0.4 mm ID, 0.8 mm OD, nickel		301-015-HSP	301-015-HSP
Sample probe, deactivated	2322700011		
Needle assembly vial probe, deactivated		232-2790012-EHS	301-220-HSP
Needle assembly vial probe, nickel		232-2790010-EHS	301-013-HSP
Union, zero dead volume, deactivated	2307230001		
Union elbow M5		998-0000053-EHS	
Zero dead volume union			325-045-HSP
Sample loop, 1 ml, deactivated	2321700003	2321700003	2321700003
Sample loop, 1 ml, nickel		321-055-HSP	321-055-HSP
Sample loop, 3 ml, deactivated	2321700004	2321700004	2321700004
Sample loop, 3 ml, nickel		321-056-HSP	321-056-HSP
Oven adaptor for 10 ml vials		301-017-HSP	301-017-HSP
Tray adaptors for 10 ml vials, 25/pk			300-301-HSP
Tube, probe to 6-port valve, deactivated	1300502506		
Tube, needle, 6-port valve, deactivated		301-212-HSP	301-212-HSP
Tube, needle, 6-port valve, nickel		301-169-HSP	301-169-HSP
Tubing, solenoids to 6-port, deactivated	0410105017		
Tube, vent deactivated	1300530001		
Tube, vent-valve stainless steel		301-170-HSP	301-170-HSP
Tube, tee to pressure PCA	1300530010		



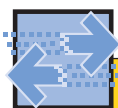
G1888A Headspace unit

GC Instrument Parts and Supplies

Headspace Supplies

Headspace Supplies

Description	G1883A	G1888A	7694
Sensor tube, 125 mm PTFE		321-057-HSP	321-057-HSP
Flow restrictor	2321390008		
Restrictor, stainless steel		321-002-HSP	321-002-HSP
Valve, solenoid vent kalrez	3600500001	3600500001	3600500001
Valve, solenoid vial pressurization	3600500002	3600500002	3600500002
Pressure regulator with knob	0410105007		
Pressure regulator		330-086-HSP	330-086-HSP
Flow controller with knob	0410105010		
Flow controller		330-055-HSP	330-055-HSP
Transfer line, deactivated	0410103101		
Transfer line, deactivated, 1 m		301-211-HSP	301-211-HSP
Transfer line, 1 m, nickel		301-152-HSP	301-152-HSP
Transfer line, 80 cm, nickel		301-011-HSP	301-011-HSP
Tray chain link repair kit	0410205001		
Bulkhead fitting, stainless steel	2307833901		
Bulkhead fitting kit		230-2533141-EHS	325-024-HSP
Transfer line nut		19258-20830	19258-20830
Transfer line ferrule		19258-20870	19258-20870
M6 union, brass	2302533140		
Union FF 6MB, 5-piece set		325-062-HSP	325-062-HSP
Union T6 MB, 5-piece set, brass		325-132-HSP	325-132-HSP
Tee, brass	2304533140		
Union T5 MA		325-185-HSP	325-185-HSP
M5 union, brass	2302532140		
Headspace leak test kit	G1888-60701	G1888-60701	G1888-60701
Headspace screw top, 20 ml, clear, 23 x 75 mm, 100/pk		5188-2753	
HeadSpace screw top, 10 mL, clear, 23 x 46 mm, 100/pk		5188-5392	
Flat bottom headspace vials, 10ml, 100/pk			5182-0838
OQ/PV Headspace Sample	5182-9733	5182-9733	5182-9733



Product Finder

For a complete selection of headspace vials, turn to page 49.

GC Instrument Parts and Supplies

Flip Top Inlet Sealing System



Flip Top Inlet Sealing System

Agilent's Flip Top Inlet Sealing System is the faster, smarter way to change inlet liners on Agilent GC's.

- 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
- Installs easily in 15 minutes (customer installable)

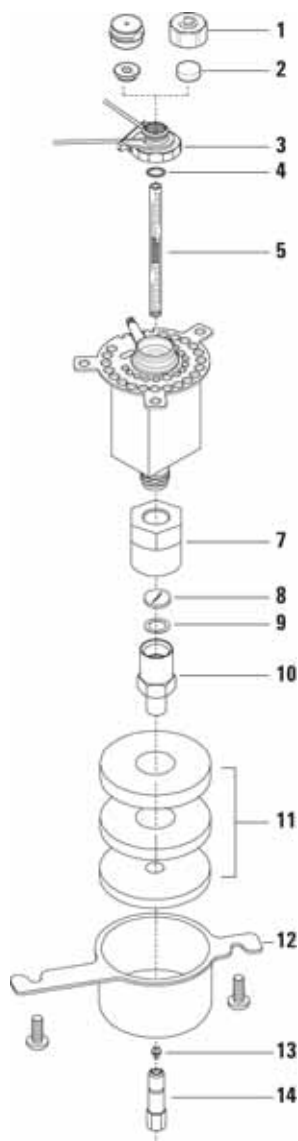
Available exclusively from Agilent, the Flip Top has a levered arm that attaches to any 6890/6850/5890 insert weldment and locks to the injection port using an adapter ring screwed onto the inlet. Once installed, the user simply lifts the arm of the Flip Top which releases the insert weldment from the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

Description	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

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies

7890/6890/6850 Inlet Supplies



6890 Split/splitless inlet

Split/Splitless Inlet Supplies

Item	Description	Unit	Part No.
1	Headspace septum retainer nut		18740-60830
	Septum retainer nut		18740-60835
2	11 mm Non-Stick BTO septa	50/pk	5183-4757
3	Insert Weldment Standard manual pneumatics		19251-60575
	Original standard EPC using 1/4 in. split vent filter		G1544-60575
	Similar to G1544-60575 except allowed insertion for 1/4 in. chemical filters to clean carrier gas for ECD operation		G1544-80580
	S/SL insert weldment. Used with large charcoal canister type filter, for 6890/6850		G1544-60585
	Similar to G1544-60575 except carrier lines separated for interface to valved systems of a G1540A instrument		G1580-60575
	S/SL insert assembly for G1540A with valved system option. This insert assembly uses the large charcoal canister split vent filter, for 6890/6850		G1580-60585
4	Graphite O-ring for Split liner	10/pk	5180-4168
	Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
	Graphite O-ring for Splitless liner	10/pk	5180-4173
5	Split Liner, taper, low pressure drop, glass wool	1/pk 25/pk	5183-4647 5183-4647
	Splitless Liner, single taper	1/pk 25/pk	5181-3316 5183-4696
6	Split vent trap kit1		G1544-60610
	Replacement cartridge for P/N G1544-60610		G1544-80530
	Split vent trap assembly		G1544-80550
7	Retaining nut		G1544-20590
8	Stainless steel seal		18740-20880
	Gold plated seal kit, includes washer ²		5188-5367
	Replacement for 18740-20885		
	Gold-plated seal with cross ³		5182-9652
9	Washers, 0.375 OD	12/pk	5061-5869
10	Reducing nut		18740-20800

¹Order replacement cartridge G1544-80530 at same time

²Use with total inlet flow rates of less than 200 ml/min

³Use with total flow rates of greater than 200 ml/min

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies

Split/Splitless Inlet Supplies (continued)



G1544-60610



G1544-80550

Item	Description	Unit	Part No.
11	Insulation Kit, 3 pieces		5188-5241
12	Lower insulation cover		19243-00070
13	Ferrules		
14	Universal column nut	2/pk	5181-8830
	6850 column nut	2/pk	5183-4732
	Split/splitless septum nut angled wrench		19251-00100
	Flip Top Inlet Sealing System For 6890, 6850, 5890 only; Not compatible with 7890		5188-2717
	Capillary Inlet Supplies Kit, Includes:		5181-8838
	Gold plated seal kit, includes washer		5188-5367
	Liner, split, straight, glass wool, non-deactivated	4 each*	19251-60540
	Liner, splitless, single-taper, glass wool, deactivated	2 each*	5062-3587
	Non-Stick Fluorocarbon O-ring	10/pk*	5188-5365
	Liner, direct, 2mm ID, deactivated		5181-8818
	11 mm Non-Stick BTO septa	50/pk*	5183-4757
	Capillary inlet cleaning wires	5/pk*	5180-4153

*Quantity when part ordered individually

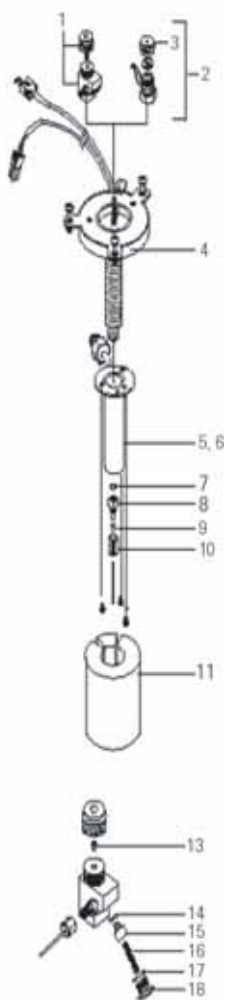


Tech Support

For additional assistance ordering inlet supplies, please contact an Agilent customer representative.

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies



PTV Inlet

Programmable Temperature Vaporizing (PTV) Inlet Supplies

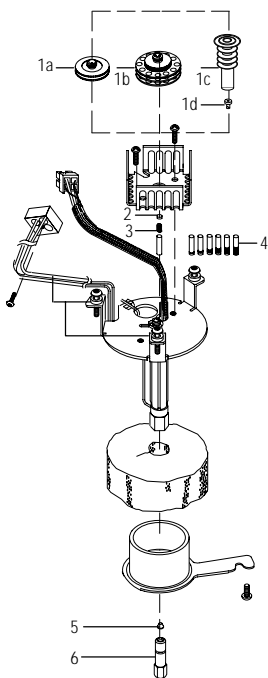
Item	Description	Column ID (mm)	Unit	Part No.
1	Septumless head			G2617-60507
2	Septum head			G2618-80500
3	Septum retainer nut			18740-60835
4	PTV inlet assembly			G2617-60506
5	PTV LC ₀₂ cooling jacket			G2617-60508
6	PTV LN ₂ cooling jacket			G2619-60501
7	Silver seal		5/pk	5182-9763
8	Graphpak 2M inlet adapter	0.20		5182-9754
		0.25-0.33		5182-9761
		0.53		5182-9762
9	Ferrules for Graphpak 2M inlet	0.20		5182-9756
		0.25		5182-9768
		0.32		5182-9769
		0.53		5182-9770
10	Replacement Graphpak column nut			5062-3525
11	PTV insulation block			G2617-20510
	PTV Cryo insulator			G2617-60510
	Teflon 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			5182-9747
	Contains Kalrez seal, valve body, and pressure spring			
	Graphpak 3D ferrules		5/pk	5182-9749
	Assembly tool for Graphpak 3D ferrules			G2617-80540

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies

Cool On-Column Inlet Supplies

Like the split/splitless inlet, the cool on-column inlet may be used with manual or automated injection. Required inlet hardware for manual injection can include either a septum nut and septum or cooling tower and duckbill septum (indicated on the part shown), along with the spring and insert. Automated injection requires the septum nut and septum, spring and insert.



5890COC inlet

Cool On-Column Inlet Supplies

Item	Description	Unit	Part No.
Automatic Injection			
1a	Septum nut base for 320 mm assembly		19245-80521
1b	Septum nut base for 530 mm assembly		G1545-80520
2	Advanced Green Inlet Septa, 5 mm	50/pk	5183-4760
	BTO Inlet Septa, 5 mm	50/pk	5183-4758
Manual Injection			
1c	Cooling tower assembly		19320-80625
1d	Duck bill	10/pk	19245-40050
	Fused silica syringe needles	6/pk	19091-63000
	On-column syringe, fused silica (barrel only)		9301-0658
Common Supplies			
3	Spring		19245-60760
4	Inserts for capillary columns		
	For 200 μm columns, 1 ring		19245-20510
	For 250 μm columns, 6 rings		19245-20515
	For 320 μm columns, 5 rings		19245-20525
	For 530 μm columns, no rings		19245-20580
	For 530 μm Al clad columns, 4 rings		19245-20780
5	320 μm 0.5 mm graphite ferrule		5080-8853
6	Universal column nut	2/pk	5181-8830

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies

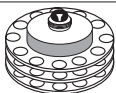

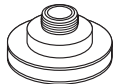

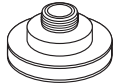


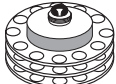



19245-80521



G1545-80520

Automatic or Manual Injection Using Stainless Steel Needles

Column Description	Needle	Septum Nut	Insert
Fused silica			
530 μm	5182-0832	G1545-80520	19245-20580
			
320 μm	5182-0831	19245-80521	19245-20525 (5 rings)
			
250 μm	5182-0833	19245-80521	19245-20515 (6 rings)
			
200 μm	Use cooling and tower duckbill septum		19245-20510 (1 ring)
			
Aluminum clad			
530 μm	5182-0832	G1545-80520	19245-20780
			

Column/Retention Gap Installation Supplies

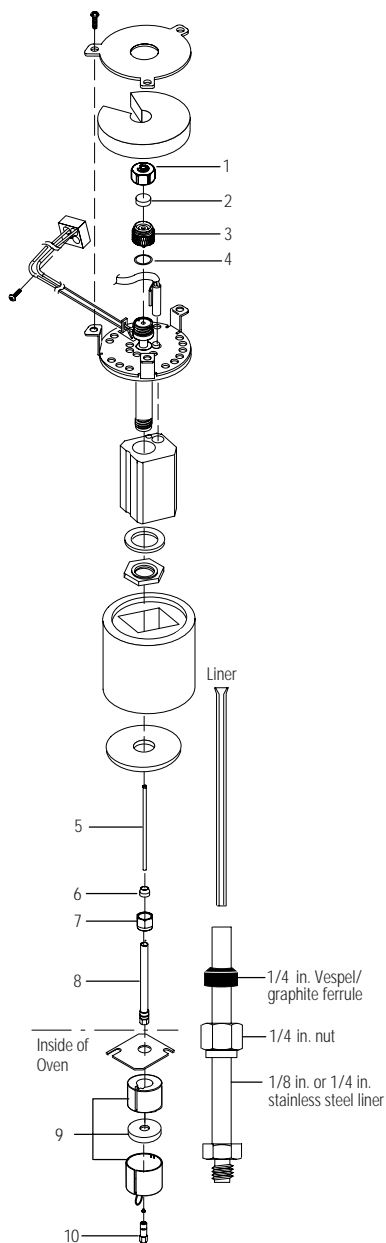
Description	Unit	Part No.
Universal column nut	2/pk	5181-8830
250 μm graphite ferrule	10/pk	500-2114
250 μm retention gap, one 5 m piece		160-2255-5
320 μm retention gap, one 5 m piece		160-2325-5
530 μm retention gap, one 5 m piece		160-2535-5
Deactivated quartz column connector	5/pk	5181-3396

GC Instrument Parts and Supplies

7890/6890/6850 Inlet Supplies

Packed Column Inlet Supplies

For purged-packed inlets, adapter selection is dependent on the type of column used: 1/4 in. packed, 1/8 in. packed, or 530 µm. It allows the columns to be connected to the inlet. Glass liners are often used with metal adapters to reduce reactivity and trap nonvolatile residues. Liners are installed from the top of the inlet and should be installed before the column.



Packed Column Inlet Supplies

Item	Description	Unit	Part No.
1	Septum retainer nut		18740-60835
2	11 mm Non-Stick BTO septa	50/pk	5183-4757
3	Top insert weldment		19243-80570
4	O-ring, Viton	12/pk	5080-8898
5	Disposable glass liner, 170 µl internal volume	25/pk	5080-8732
	Disposable glass insert, deactivated	5/pk	5181-3382
6	Ferrule, 1/4 in. Vespel	10/pk	5080-8774
7	1/4 in. nut, brass	10/pk	5180-4105
8	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
9	Nut warmer cup with insulation		19234-60720
10	Universal column nut	2/pk	5181-8830

Installation Matrix for Packed Metal Columns

Inlet or Detector	1/4 in. Columns		1/8 in. Columns	
	Where to Install	Key Points	Where to Install	Key Points
Purged packed inlet	1/4 in. liner		1/8 in. liner	
Adaptable NPD* or FID	1/4 in. adapter (P/N 19231-80530)	Remove or install adapter as desired	1/8 in. adapter (P/N 19231-80520)	
ECD	Detector fitting	Remove adapter if necessary	1/8 in. adapter (P/N 19301-80530)	
TCD	1/4 in. adapter (P/N G1532-20710)		Detector fitting	Remove adapter if necessary

*Do not remove plugs from your NPD until you are ready to connect the column and operate the detector.

GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies

7890/6890/6850 Series GC Detector Supplies

Detectors available for use with 7890/6890/6850

- Flame ionization detector (FID) for packed or capillary columns
- Thermal conductivity detector (TCD)
- Mass-selective detector (MSD)

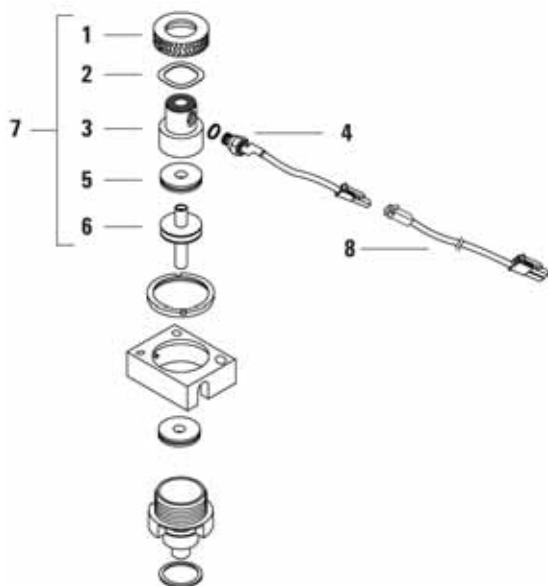
7890/6890 only

- Electron capture detector (ECD)
- Nitrogen phosphorous detector (NPD) for packed or capillary columns

GC Detector Information

GC/Detector	Max Op Temp	Sensitivity (MDL)	Dynamic Range	Makeup Gas Types	Selectivity
7890/6890 GC/FID 6850 GC/FID	450°C 375°C	<1.8 pg carbon/sec <5 pg carbon/sec	Linear: >10 ⁷ (±10%)	N ₂ He	Not applicable
7890/6890 GC/NPD	400°C	0.4 pg N/sec, <0.2 pg P/sec	>10 ⁵ N, >10 ⁵ P	He	25000 to 1 gN/gC 75000 to 1 gN/gC
7890/6890 GC/TCD 6850 GC/TCD	400°C 375°C	<400 pg propane/ml He	Linear: 10 ⁵ (±5%)	He N ₂	Not applicable
7890/6890 GC/ECD 6850 GC/ECD	400°C 375°C	<6.5 g/ml <0.088 pg/s	>5x10 ⁵	Methane N ₂ Ar	

Note: See GC data sheets for most current specifications. Any specifications listed are approximate and subject to change.



6890 Series GC FID Detector

Flame Ionization Detector (FID) Supplies

Item	Description	Unit	Part No.
	PTFE chimney (optional)		19231-21050
1	Collector nut		19231-20940
2	Spring washer	10/pk	5181-3311
3	Ignitor castle		19231-20910
	Hastelloy ignitor castle (optional)		19231-21060
4	Ignitor glow plug assembly		19231-60680
5	Collector insulator		G1531-20700
6	Collector body		G1531-20690
	Hastelloy Collector Body		G1531-21090
7	FID collector assembly		G1531-60690
	FID collector cleaning brush	2/pk	8710-1346
	Collector Housing		G1531-20740
	FID retainer nut wrench 5880, 5890, 6890		19301-00150
	1/4 in. nut driver for FID jet, drilled shaft		8710-1561
	FID flow measuring insert		19301-60660
8	FID ignitor cable for 6890/6850 only		G1531-60680
	FID ignitor cable, 7890A only		G3431-60680

GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies



G1531-20690

Flame Ionization Detector (FID) Supplies (continued)

Item	Description	Unit	Part No.
	FID performance evaluation sample kit This sample is used for the HP 5880, 5890 and 6890 with a FID or TCD. Solution of 0.033% C14, C15, and C16 normal alkanes in hexane. Three 0.5 ml ampoules.		18710-60170
	FID MDL test sample for 7890 only 3 x 0.5 ml ampoules. Contains 2.36 mg/L n-Tridecane, 2.36 mg/L n-Tetradecane, 23.6 mg/mL n-Penta- decane, 23.6 mg/mL n-Hexadecane in iso-octane		5188-5372
	O-rings	12/pk	5080-4978
	Wire, jet cleaning		19301-20720
	Cleaning wires for 0.03 in. ID jet	5/pk	5180-4150
	Cleaning wire for 0.018 in. ID/530 µm jet	5/pk	5180-4152
	FID/NPD adapter for capillary column		19244-80610
	FID/NPD 1/8 in. packed column		19231-80520
	FID/NPD 1/4 in. packed column		19231-80530

FID Supplies Kit



9301-0985

Description	Unit	Part No.
FID Supplies Kit, Includes:		5182-3450
Jet, packed standard 0.018 in. ID tip	3 each	18710-20119
FID performance evaluation sample kit	2 each	18710-60170
Ignitor glow plug assembly	2 each	19231-60680
Jet, 0.011 in. ID tip, capillary adaptable	3 each	19244-80560
FID flow measuring insert	2 each	19301-60660
Cleaning wires for 0.03 in. ID jet	5/pk	5180-4150
Cleaning wire for 0.018 in. ID/530 µm jet	5/pk	5180-4152
Wire, jet cleaning	5 each	19301-20720
Capillary inlet cleaning wires	5/pk	5180-4153
FID cleaning kit		9301-0985
FID collector cleaning brush	2/pk	8710-1346
1/4 in. nut driver for FID jet, drilled shaft		8710-1561

GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies



FID and NPD Jets

FID Jets

Description	Length (mm)	Part No.
Jets for capillary dedicated FID		
Jet, 0.011 in./0.29 mm ID tip, capillary dedicated	43	G1531-80560
High-temperature jet, SimDis 0.018 in. ID tip	43	G1531-80620
Adaptable FID Jets		
Jet, 0.011 in. ID tip, capillary adaptable	61.5	19244-80560
Jet, packed standard 0.018 in. ID tip	63.5	18710-20119
Jet, Packed wide-bore 0.030 in. ID (for high-bleed applications)	63.5	18789-80070
Jet (for simulated distillation)	61.5	19244-80620



Plugged FID Jet

Cleaning Your FID Jet

It is often more convenient to replace dirty jets than to clean them, especially if they have been badly contaminated. However, if you decide to clean a jet, be careful not to scratch the jet internally; scratches will ruin the jet. To be on the safe side, you may want to clean the jet using an aqueous bath only. To do this you will need the following materials:

- Small ultrasonic cleaning bath
- Aqueous detergent
- GC-grade methanol in a Teflon wash bottle
- Flame detector cleaning kit (P/N 9301-0985)
- Dry, filtered compressed air or nitrogen
- Forceps or tweezers

1. Run a cleaning wire through the top of the jet. Run it back and forth a few times until it moves smoothly. Be careful not to scratch the jet.
2. Fill the 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 minutes.

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 the 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 it to air dry.



Library

To view a video on FID column installation, jet replacement, collector maintenance and ignitor replacement, visit www.agilent.com/chem/howtovideos.

GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies

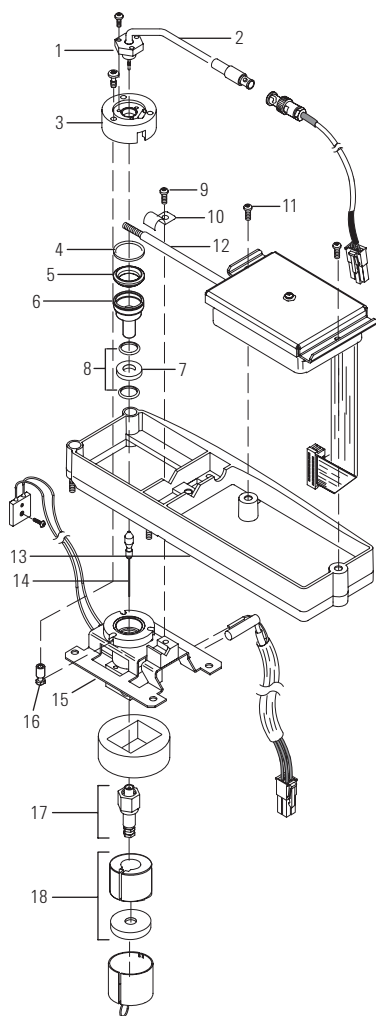


NPD Ceramic Bead

Nitrogen Phosphorus Detector (NPD) Supplies

The NPD for the 7890/6890 GC features a ceramic bead selective for nitrogen and phosphorous compounds. All Agilent NPD beads are preconditioned and come with a proof-of-performance chromatogram. The redesigned NPD bead is self-aligning for easy installation.

Like the FID, there are two types of NPD available. The capillary optimized NPD is only used with capillary columns and the adaptable NPD fits packed columns and can be adapted to fit capillary columns.



6890Series GC NPD detector

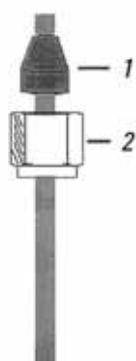
Nitrogen Phosphorus Detector (NPD) Supplies

Item	Description	Part No.
1	Screws, M3 x 0.5 x 8 mm (Pozidriv)	0515-0655
2	NPD bead assembly*	G1534-60570
	NPD black ceramic bead assembly**	5183-2007
3	Lid weldment	G1534-80510
4	Metal C-ring, top	0905-2580
5	Alumina insulator, upper	G1534-40020
6	Collector funnel	G1534-20530
7	Alumina insulator, lower	G1534-40030
8	Metal C-ring, bottom	0905-1284
9	Screw, M4 x 07 10 mm	0515-2495
10	J-Clamp	1400-0015
11	Screw, M4 x 07 10 mm	0515-2495
12	NPD interconnect assembly	G1534-60610
13	Mounting pallet	G1531-40020
14	Jet, 0.011 in./0.29 mm ID tip, capillary dedicated	G1531-80560
	Jet, 0.011 in. ID tip, capillary adaptable	19244-80560
	Jet, packed standard 0.018 in. ID tip	18710-20119
15	Base weldment, Capillary NPD for 6890/6850 only	G1534-80500
	Base weldment, Packed NPD for 6890/6850 only	G1534-80540
	Base weldment, Capillary NPD, 7890A	G3434-67500
	Base weldment, Packed NPD, 7890A	G3434-67540
16	Lid stop	G1534-20590
	NPD Ceramic Insulator Kit Includes items 4, 5, 7, and 8	5182-9722
17	FID/NPD adapter for capillary column	19244-80610
	FID/NPD 1/8 in. packed column	19231-80520
	FID/NPD 1/4 in. packed column	19231-80530
18	Nut warmer cup with insulation	19234-60720
	Ferrule, 1/4 in. Vespel, 10/pk	5080-8774
	1.0 mm graphite ferrule, 10/pk	5080-8773
	320 µm 0.5 mm graphite ferrule, 10/pk	5080-8853
	1/4 in. nut, brass, 10/pk	5180-4105
	Universal column nut, 2/pk	5181-8830
	Nitrogen-Phosphorus Detector Sample This sample is used for the HP 5880, 5890 and 6890 with a NPD. Solution of 0.65 ppm azobenzene, 1,000 ppm octadecane, and 1.00 ppm malathion in isoctane (w/v). Three 0.5 ml ampoules.	18789-60060

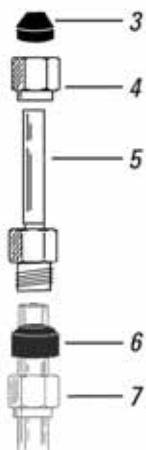
*This bead is more sensitive but exhibits some tailing for phosphorous compounds.
**The black bead is potentially a little less sensitive but does not exhibit peak tailing and typically has longer lifetime.

GC Instrument Parts and Supplies

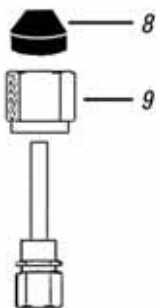
7890/6890/6850 Series GC Detector Supplies



1/8" SS Packed Column



1/4" SS glass packed column



Standard Design

Thermal Conductivity Detector (TCD) Supplies

Item	Description	Unit	Part No.
	6890 TCD Replacement Cell (original), 3-line manifold		G1532-60675
	6890 TCD Replacement Cell (new), 2-line mini manifold		G1532-60685
	6850 TCD Replacement Cell		G2630-61230
	7890A TCD Replacement Cell		G3432-67685
For 1/8 in. SS Packed Column Installation			
1	Vespel ferrule, 1/8 in.	10/pk	0100-1332
2	1/8 in. nut, brass	10/pk	5180-4103
For 1/4 in. SS Packed Column Installation			
3	Vespel ferrule, 1/8 in.	10/pk	0100-1332
4	1/8 in. nut, brass	10/pk	5180-4103
5	1/4 in. Packed Column Adapter		G1532-20710
6	Ferrule, 1/4 in. Vespel	10/pk	5080-8774
7	1/4 in. nut, brass	10/pk	5180-4105
For Capillary Column Installation (Standard)			
	TCD Capillary Column Adapter		G1532-80540
8	Vespel ferrule, 1/8 in.	10/pk	0100-1332
9	1/8 in. nut, brass	10/pk	5180-4103
	Universal column nut	2/pk	5181-8830
	6850 column nut	2/pk	5183-4732
	1.0 mm graphite ferrule	10/pk	5080-8773
	320 μ m 0.5 mm graphite ferrule	10/pk	5080-8853
	FID and TCD Sample		18710-60170

GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies

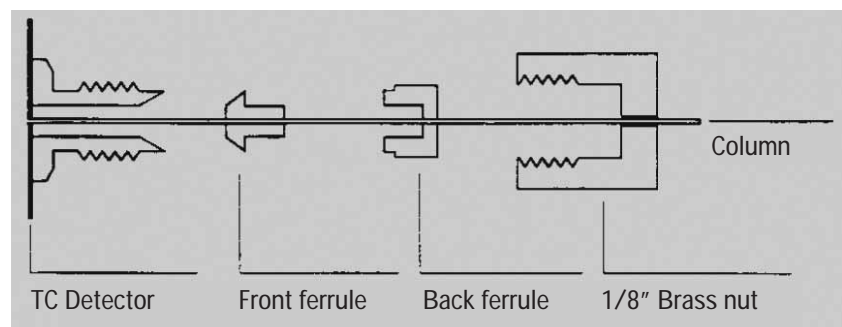
High Performance Capillary Column Installation

This ferrule system improves the analytical results for samples that may react with oxygen. It consists of a brass back ferrule, a graphite/Vespel front ferrule, which is available in three different hole sizes and a no hole version. The same size brass back ferrule is used for all column sizes and is reusable over a long lifetime.

1. The column is placed through the nut first and then the back ferrule.
2. The front ferrule is placed next and must have the tapered end towards the detector (just like a standard ferrule).
3. The protrusion in the front ferrule must enter into a matching recess in the back ferrule. Tighten the fitting until it holds the column enough to resist a pull on the column to remove it.

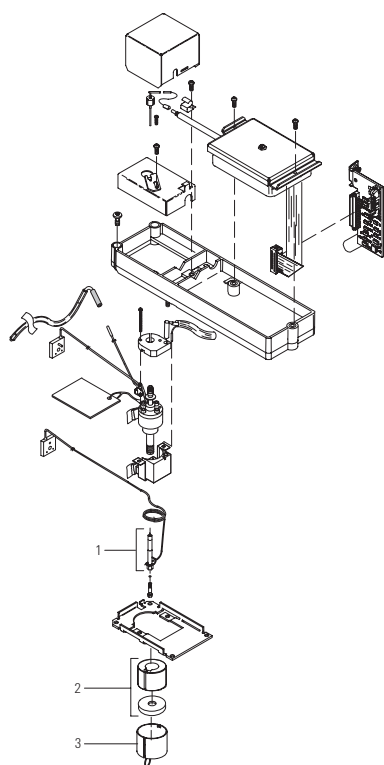
TCD Ferrules

Column ID (mm)	Back Ferrules,	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
TCD Back Ferrule for 1/8in detector fitting 10/pk	5180-4103	



GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies



ECD make up gas adapter

Electron Capture Detector (ECD) Supplies

Item	Description	Part No.
1	Standard ECD makeup gas adapter*	G1533-80565
	Micro ECD makeup gas adapter	G2397-80520
	ECD MUG adapter, fused silica liner for micro ECD	G2397-20540
	ECD makeup gas adapter, 7890A only	G3433-67565
2, 3	Nut warmer cup with insulation	19234-60720
	ECD adapter replacement liner, fused silica	19233-20625
	ECD adapter end cap	19233-20755
	Electron Capture Detector Sample This sample is used for the HP 5880, 5890 and 6890 with an ECD. Solution of 33 pg/mL (0.033 ppm) (w/v) each of lindane and aldrin in isooctane. Three 0.5 ml ampoules.	18713-60040
	Micro ECD wipe test kit	18713-60050

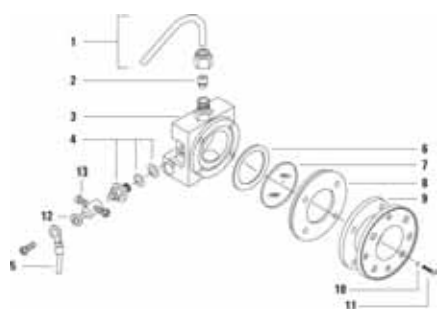
*Includes one each of P/N 19233-20625 and 19233-20755

Micro ECD wipe test kit

A wipe test kit is supplied with each new ECD. The kit includes an information card with instructions for performing the test. Records of tests and results must be maintained for possible inspection by the NRC (Nuclear Regulatory Commission) and/or responsible state agency.

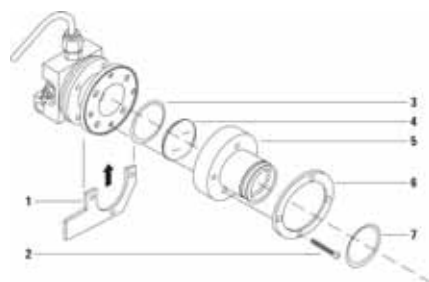
FPD Ignitor and Heat Shield Assembly

Item	Description	Part No.
1	FPD Exit Tube Assembly	
	Aluminum	19256-60700
	Stainless Steel	19256-20705
2	Ferrule, 1/4 in. Vespel, 10/pkg	5080-8774
3	Emissions block assembly	
	FPD single	19256-80560
	FPD, dual	19256-80600
4	FPD Ignitor Replacement Kit Includes items A, B, C	19256-60800
	A. O-ring, size 2-010	
	B. Spacer, ignitor	
	C. Glow plug	
5	Ignitor cable assembly	G1535-60600
6	Heat shield gasket, white	19256-80045
7	First heat shield window	19256-80030
8	Heat shield disk	19256-20580
9	Stainless steel coupling	19256-20550
10	Lock washer (4 required)	2190-0584
11	Screw, M3 x 12, T10 (4 required)	0515-1084
12	Collar	19256-20690
13	Screw, M3 x 66 mm, T10	0515-0680



GC Instrument Parts and Supplies

7890/6890/6850 Series GC Detector Supplies



FPD Lens Assembly

Item	Description	Part No.
1	Clamp	19256-00090
2	Screw, M3 x 25 (4 required)	0515-0683
3	Window O-ring, inner, 0.926 in. ID, orange	5061-5886
4	Convex lens	1000-1438
5	Lens housing	19256-20900
6	Flange ring	19256-00200
7	Fluorocarbon Elastomer O-ring, brown, 1.239 in. ID	5061-5890

FPD PMT and Bracket Assemblies

Description	Part No.
Chimney back cover	G1535-80520
Heator/sensor assembly	G1535-60610
Transfer line support bracket	19256-00320
Bracket/support	G1535-00010
Sulfur filter, 7890 and late model 6890*	1000-1437
Sulfur filter, blue, Early model 6890*	19256-80000
Phosphorus filter, yellow	19256-80010
Filter spacer (used only with sulfur filter)	19256-20910
PMT housing assembly	19256-60510
Dual FPD chimney front	G1535-00030

*Please contact Agilent technical support for assistance selecting the correct sulfur filter for your 6890 FPD detector.

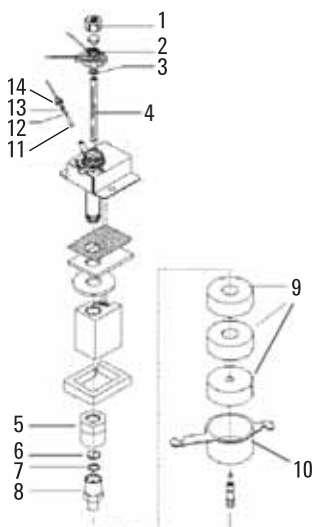


Library

More information is a click away. We have a variety of educational primers, application notes, maintenance guides, and literature available from Agilent for free. To learn more, call your local sales office or an authorized distributor or visit our website at www.agilent.com/chem/OnlineLibrary.

GC Instrument Parts and Supplies

5890 Inlet Supplies



5890 Split/splitless inlet



Patent Pending Metal Injection Molded Gold Inlet Seal

5890 Inlet Supplies

Split/Splitless Inlet Supplies

Item	Description	Unit	Part No.
1	Septum retainer nut		18740-60835
	Headspace septum retainer nut		18740-60830
2	Split/splitless insert weldment with tubing		19251-60575
3	Graphite O-ring for Split liner	10/pk	5180-4168
	Graphite O-ring for Splitless liner	10/pk	5180-4173
	Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
4	Split Liner, glass wool		19251-60540
5	Retaining nut		19251-20620
6	Stainless steel seal		18740-20880
	Gold plated seal kit, includes washer Replacement for 18740-20885		5188-5367
	Gold-plated seal with cross		5182-9652
7	Washers, 0.375 OD	12/pk	5061-5869
8	Reducing nut		18740-20800
9	Insulation Kit, 3 pieces		5188-5241
10	Lower insulation cover		19243-00070

For Split/Splitless Inlets Using Electronic Pressure Control

11	Splitter tube*		19251-80525
12	1/8 in. front ferrule, brass	10/pk	5180-4109
13	1/8 in. back ferrule, brass	10/pk	5180-4115
14	1/8 in. nut, brass	10/pk	5180-4103
	Split/splitless septum nut angled wrench		19251-00100
	Capillary inlet cleaning wires	5/pk	5180-4153
	Capillary Inlet Evaluation Sample (Split Mode): Solution of 1.0% (w/w) C ₉ , C ₁₆ in C ₁₄ . Three 0.5 ml ampoules.		8500-4789

*Includes 1 each of P/N 5180-4109, 5180-4115, 5180-4103

Split/Splitless Inlet Kits

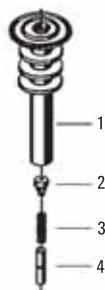
Description	Unit	Part No.
Split/Splitless Injection Port Kit, Includes:		5182-3449
Gold plated seal kit, includes washer Replacement for 18740-20885	3 each	5188-5367
Liner, split, with cup, glass wool and packing	3 each	18740-60840
Liner, split, straight, glass wool, non-deactivated	3 each	19251-60540
Column ferrule installation tool		19251-80680
Blanking plug, finger-tight style	2 each	5020-8294
Washers, 0.375 OD	12/pk	5061-5869
Liner, splitless, single-taper, glass wool, deactivated	3 each	5062-3587
Ferrule, Graphite 530 µm, 1.0 mm ID	10/pk	5080-8773
Ferrule, graphite 320 µm, 0.5 mm ID	10/pk	5080-8853
Graphite O-ring, 5700/5840/6890	10/pk	5180-4168
6.52 mm ID, 9.63 mm OD, 0.062 in. OD seals	10/pk	5180-4173
O-rings, ungreased for trap fitting	12/pk	5180-4181
Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
Glass wool, pesticide grade		5181-3317

GC Instrument Parts and Supplies

5890 Cool On-Column Inlet Supplies

Split/Splitless Inlet Kits (continued)

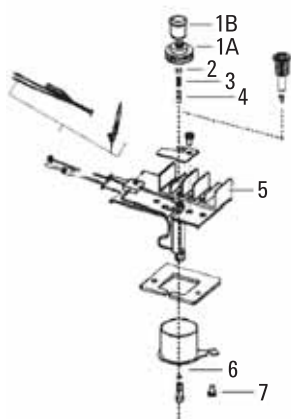
Description	Unit	Part No.
Plastic fitting	10/pk	5181-3394
Liner, direct, 2mm ID, deactivated	2 each	5181-8818
Universal column nut	2/pk	5181-8830
Capillary tubing cutter	4/pk	5181-8836
11 mm Non-Stick BTO septa	50/pk	5183-4757
Tool, wrench		8710-0510
Capillary Inlet Supplies Kit, Includes:		5181-8838
Gold plated seal kit, includes washer Replacement for 18740-20885	3 each	5188-5367
Liner, split, straight, glass wool, non-deactivated	4 each	19251-60540
Liner, splitless, single-taper, glass wool, deactivated	2 each	5062-3587
Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
Liner, direct, 2mm ID, deactivated		5181-8818
11 mm Non-Stick BTO septa	50/pk	5183-4757



Cool On-Column Inlets for Manual Injection

Cool On-Column Inlet Supplies

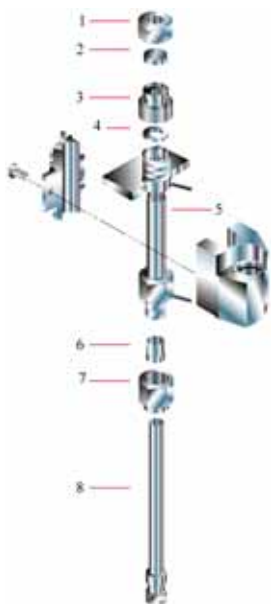
Item	Description	Unit	Part No.
Manual Injection			
1	Cooling tower assembly		19320-80625
2	Duck bill	10/pk	19245-40050
3	Spring		19245-60760
4	Inserts for capillary columns		
	For 530 μm columns, no rings		19245-20580
	For 530 μm Al clad columns, 4 rings		19245-20780
	For 320 μm columns, 5 rings		19245-20525
	For 200 μm columns, 1 ring		19245-20510
	Fused silica syringe needles	6/pk	19091-63000
	On-column syringe, fused silica (barrel only)		9301-0658
Automatic Injection			
1a	Septum nut		19245-80520
1b	Needle guide		19245-20670
2	Advanced Green Inlet Septa, 5 mm	50/pk	5183-4760
	BTO Inlet Septa, 5 mm	50/pk	5183-4758
3	Spring		19245-60760
4	Inserts for capillary columns		
	For 530 μm columns, no rings		19245-20580
	For 320 μm columns, 5 rings		19245-20525
	For 250 μm columns, 6 rings		19245-20515
Common Supplies			
5	Weldment (refer to instrument manuals)		
6	320 μm 0.5 mm graphite ferrule		5080-8853
7	Universal column nut	2/pk	5181-8830
Column/Retention Gap Installation Supplies			
	320 μm Vespel/Graphite ferrule	10/pk	5062-3514
	250 μm Vespel/Graphite ferrule	10/pk	5181-3323
	320 μm retention gap, one 5 m piece		160-2325-5
	Deactivated quartz column connector, fits 0.18-0.53 mm	5/pk	5181-3396



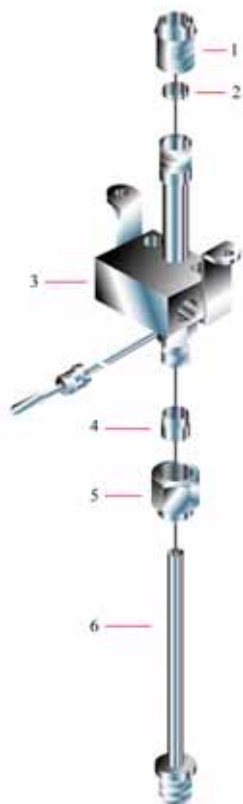
5890COC inlet

GC Instrument Parts and Supplies

5890 Packed Column Inlet Supplies



Septum-purged packed column inlet



Universal packed column inlet

Packed Column Inlet Supplies

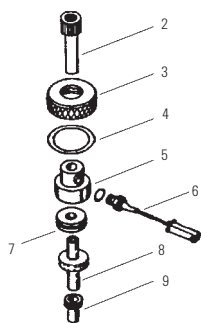
Item	Description	Unit	Part No.
Purged Packed Column Inlet Kit, Includes:			5181-8837
	Ferrule, 1/4 in. Vespel for inserts/glass columns	10/pk	5080-8774
	O-ring, Viton	12/pk	5080-8898
	Disposable glass insert, deactivated	5/pk	5181-3382
1	Septum retainer nut		18740-60835
	Headspace septum retainer nut		18740-60830
	Nonpurging septum nut assembly for manual flow control only, not EPC		19243-60570
2	11 mm Non-Stick BTO septa	50/pk	5183-4757
3	Top insert weldment		19243-80570
4	O-ring, Viton	12/pk	5080-8898
5	Weldment (refer to instrument manuals)		
6	Ferrule, 1/4 in. Vespel	10/pk	5080-8774
7	1/4 in. nut, brass	10/pk	5180-4105
8	Adapters		
	1/8 in. column adapter		19243-80510
	1/4 in. column adapter		19243-80520
	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
	Disposable glass liner, 170 µl internal volume	25/pk	5080-8732
	Disposable glass insert, deactivated	5/pk	5181-3382

Universal Packed Column Inlet (non-purged) Supplies

Item	Description	Unit	Part No.
1	Septum retainer nut, nonpurging, for headspace sampling		19243-60505
2	11 mm Non-Stick BTO septa	50/pk	5183-4757
3	Weldment (refer to instrument manuals)		
4	Ferrule, 1/4 in. Vespel	10/pk	5080-8774
5	1/4 in. nut, brass	10/pk	5180-4105
6	Adapters		
	1/8 in. column adapter		19243-80510
	1/4 in. column adapter		19243-80520
	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
	Septum nut, nonpurging, for headspace sampling, non EPC		19243-60500
	Disposable glass insert, deactivated	5/pk	5181-3382
	Disposable glass liner, 170 µl internal volume	25/pk	5080-8732

GC Instrument Parts and Supplies

5890 FID/NPD Supplies



5890 FID

Flame Ionization Detector (FID) Supplies

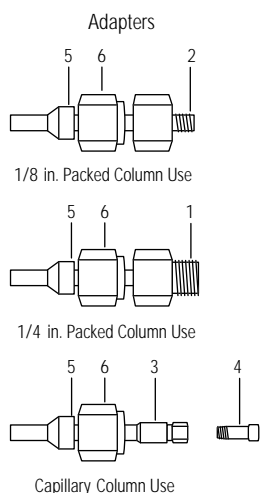
Item	Description	Part No.
1	Collector assembly (contains items 2-9)	19231-60690
2	PTFE chimney (optional)	19231-21050
3	Collector nut	19231-20940
4	Spring washer, 10/pk	5181-3311
5	Ignitor castle	19231-20910
	Hastelloy ignitor castle (optional)	19231-21060
6	Ignitor glow plug assembly	19231-60680
7	Upper collector insulator	19231-20970
8	Collector body	19231-20960
	Hastelloy collector (optional):	19231-21080
9	Lower collector insulator	19231-20950
	Nut warmer cup with insulation	19234-60720
	FID and TCD Sample: This sample is used for the HP 5880, 5890 and 6890 with a FID or TCD. Solution of 0.033% C14, C15, and C16 normal alkanes in hexane. Three 0.5 ml ampoules.	18710-60170

FID Supplies Kit

Description	Unit	Part No.
FID Supplies Kit, Includes:		5182-3450
Jet, packed standard 0.018 in. ID tip	3 each	18710-20119
FID performance evaluation sample kit	2 each	18710-60170
Ignitor glow plug assembly	2 each	19231-60680
Jet, 0.011 in. ID tip, capillary adaptable	3 each	19244-80560
FID flow measuring insert	2 each	19301-60660
Cleaning wires for 0.03 in. ID jet	5/pk	5180-4150
Cleaning wire for 0.018 in. ID/530 µm jet	5/pk	5180-4152
Wire, jet cleaning	5 each	19301-20720
Capillary inlet cleaning wires	5/pk	5180-4153
FID cleaning kit		9301-0985
FID collector cleaning brush	2/pk	8710-1346
1/4 in. nut driver for FID jet, drilled shaft		8710-1561

GC Instrument Parts and Supplies

5890 FID/NPD Supplies



FID and NPD Jets

Description	Part No.
Jet, 0.011 in. ID tip, capillary	19244-80560
Jet, packed standard 0.018 in. ID tip	18710-20119
Jet, Packed wide-bore 0.030 in. ID (for high-bleed applications)	18789-80070
Jet (for simulated distillation)	19244-80620
FID flow measuring insert	19301-60660
O-rings	5080-4978

Nitrogen Phosphorus Detector (NPD) Supplies

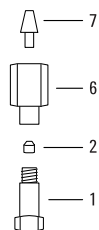
Description	Part No.
NPD collector (NPD bead)	19234-60540
Recoating kit, sufficient for 10 collectors	5080-8872
Nitrogen-Phosphorus Detector Sample: This sample is used for the HP 5880, 5890 and 6890 with a NPD. Solution of 0.65 ppm azobenzene, 1,000 ppm octadecane, and 1.00 ppm malathion in isooctane (w/v). Three 0.5 ml ampoules.	18789-60060

FID and NPD Adapters

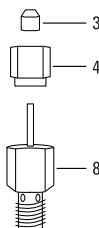
Item	Description	Unit	Part No.
1	FID/NPD 1/4 in. packed column		19231-80530
2	FID/NPD 1/8 in. packed column		19231-80520
3	FID/NPD adapter for capillary column		19244-80610
4	Universal column nut	2/pk	5181-8830
5	Ferrule, 1/4 in. Vespel	10/pk	5080-8774
	1.0 mm graphite ferrule	10/pk	5080-8773
	320 µm 0.5 mm graphite ferrule	10/pk	5080-8853
6	1/4 in. nut, brass	10/pk	5180-4105

GC Instrument Parts and Supplies

5890 TCD/ECD Supplies



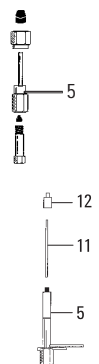
Thermal Conductivity Detector (TCD) Supplies



Thermal Conductivity Detector (TCD) Supplies

Thermal Conductivity Detector (TCD) Supplies

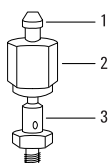
Item	Description	Unit	Part No.
1	Universal column nut	2/pk	5181-8830
2	320 μ m 0.5 mm graphite ferrule	10/pk	5080-8853
	1.0 mm graphite ferrule	10/pk	5080-8773
3	Vespel ferrule, 1/8 in.	10/pk	0100-1332
4	1/8 in. nut, brass	10/pk	5180-4103
5	TCD makeup gas adapter		19232-80550
6	TCD column adapter for capillary columns		18740-20960
7	TCD column adapter seal		18740-20950
8	TCD column adapter, 1/8 to 1/4 in. glass		19302-80020
	TCD replacement cartridge		19232-60676
	Thermal Conductivity Detector Sample: Solution of 0.33% C14, C15, and C16 normal alkanes in hexane (w/w). Three 0.5 ml ampoules.		18711-60060



ECD make up gas adapter

Electron Capture Detector (ECD) Supplies

Item	Description	Part No.
1	Ferrule, 1/4 in. Vespel, 10/pk	5080-8774
	85% Vespel/15% Graphite ferrule, 1/4 in.	0100-1331
2	1/4 in. nut, brass, 10/pk	5180-4105
3	ECD column adapter, 1/4 to 1/8 in. metal	19301-80530
5	ECD makeup gas adapter	19233-80565
11	ECD adapter replacement liner, fused silica	19233-20625
12	Stainless steel cap for ECD makeup gas adapter	19233-20755
	Electron Capture Detector Sample: This sample is used for the HP 5880, 5890 and 6890 with an ECD. Solution of 33 pg/mL (0.033 ppm) (w/v) each of lindane and aldrin in isooctane. Three 0.5 ml ampoules.	18713-60040



ECD packed for 1/4in. Glass columns

GC Instrument Parts and Supplies

5890 FPD Supplies

Flame Photometric Detector (FPD) Supplies

Description	Unit	Part No.
Adapter weldment, capillary		19256-80570
Exit tube		19256-60700
Window O-ring, inner	12/pk	5061-5886
Window O-ring, outer	12/pk	5061-5891
First heat shield window		19256-80030
Window, second heat shield		19256-80060
Ferrule, 1/4 in. Vespel	10/pk	5080-8774
Glow plug		0854-0141
FPD O-ring	12/pk	5061-5867
Non-Stick Fluorocarbon O-ring	10/pk	5188-5365
Liner/ferrule kit		19256-60590
Sulfur filter, blue		19256-80000
Phosphorus filter, yellow		19256-80010
O-ring, greased	12/pk	5080-8846
Fluorocarbon Elastomer O-ring, brown, 0.926 in. ID	12/pk	5061-5889
Fluorocarbon Elastomer O-ring, brown, 1.239 in. ID	12/pk	5061-5890
Flame Photometric Detector (FPD) Sample: This sample is used for the HP 5880, 5890 and 6890 with an FPD. Solution of 20 ng/μl (20 ppm) dodecanethiol and tributylphosphate in isooctane. Three 0.5 ml ampoules.		19305-60580



Quick Buy

It's easy to order catalog items online. Simply enter desired quantities and part numbers, and then click "Add to Cart."

GC Instrument Parts and Supplies

Gas Flow Supplies

Gas Flow Supplies



Backpressure regulator

Backpressure Regulators

Description	Part No.
0-15 psig backpressure regulator/gauge kit	19246-60620
0-60 psig backpressure regulator/gauge kit	19246-60630
0-15 psig (0-100 kPa)	19246-60560
0-30 psig (0-200 kPa)	19246-60570
0-60 psig (0-400 kPa)	19246-60580
0-100 psig (0-700 kPa)	19246-60690

Pressure Gauges

Description	Part No.
0-15 psig (0-100 kPa)	19246-60526
0-30 psig (0-200 kPa)	19320-60656
0-60 psig (0-400 kPa)	19363-60506
0-100 psig (0-700 kPa)	19361-60566



Mass flow controller restrictor (old style screw type)

Mass Flow Controllers

Description	Part No.
Mass flow controller with 20 ml/min restrictor for use with packed column inlets	19362-60565
Mass flow controller with 400 ml/min restrictor for use with capillary inlets	19362-60575

Restrictors - New Style

Description	Color Dot Code	Part No.
0-20 ml/min	Red and Purple	19362-60515
0-60 ml/min	Blue and Purple	19362-60525
0-110 ml/min	Green and Purple	19362-60535
0-400 ml/min	Black and Purple	19362-60545
0-750 ml/min	Yellow and Purple	19362-60555

Restrictors - Old Style

Description	Color Code	Color Dot	Part No.
0-20 ml/min	Red	Silver	19362-60510
0-60 ml/min	Red		19362-60520
0-110 ml/min	Green		19362-60530
0-400 ml/min	Black		19362-60540

Miscellaneous Instrument Parts and Supplies

Description	Part No.
Oven Exhaust deflector for 6890	G1530-80650
Oven Exhaust Deflector for 6850	G2630-60710

GC/MS Parts and Supplies

MSD Maintenance Schedule



Maintaining Mass Selective Detectors (MSD)

Your GC/MSD is highly sensitive. To continue achieving optimal results, it is critical to maintain your system properly by performing the essential tasks within this section. Some of the benefits of maintaining your GC/MSD include:

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

Maintenance Schedule

Some parts of the MSD require regularly scheduled maintenance.

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

<i>Task</i>	<i>Every week</i>	<i>Every 6 months</i>	<i>Every year</i>	<i>As needed</i>
Tune the MSD				◆
Change injection port liners	◆			
Check the foreline pump oil level	◆			
Gas ballast the foreline pump	◆			
Check the calibration vial		◆		
Replace the foreline pump oil		◆		
Check the diffusion pump fluid	◆			
Replace the diffusion pump fluid			◆	
Replace the traps and filters			◆	
Clean the ion source				◆
Change the carrier gas trap(s) and purifier				◆
Replace worn out parts				◆
Lubricate seals (where appropriate)				◆
Replace column				◆

Monitor

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

MSD Contamination

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

Contamination sources originating in the MSD

- Air leaks
- Cleaning solvents and materials
- Fingerprints inside the manifold
- Diffusion pump fluid
- Foreline pump oil

Air Leaks

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

Symptoms of leaks

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

Remedy

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

GC/MS Parts and Supplies

MSD Contamination

Cleaning Solvents

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

Remedy

- Dry all cleaned metal parts in the GC oven before reassembling and reinstalling them. Refer to specific cleaning procedures in your MSD Hardware Manual.
- Use a temperature above the boiling point of the solvent but below the limit of the column.

Fingerprints

Fingerprints contain hydrocarbons that can appear in mass spectra. Hydrocarbon contamination is characterized by a series of mass peaks 14 amu apart. The abundances of these peaks decrease as peak mass increases. Fingerprint contamination is usually caused by the failure to wear lint-free, nylon gloves during ion source cleaning, GC inlet maintenance, or from installing the column. Use special care to avoid recontamination of parts after you clean them. This typically occurs after some maintenance or part replacement.

Remedy

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

Diffusion Pump Fluid

If the diffusion pump fluid is allowed to operate with no column (carrier gas) flow into the vacuum system, vapor from the diffusion pump fluid can drift up into the vacuum manifold. A more serious problem is when fluid is back streamed into the vacuum manifold by sudden or improper venting of the vacuum system. If a diffusion pump has back streamed, a prominent peak will often be seen at m/z 446 and the spectral baseline will exhibit increased background noise.

Remedy

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

Foreline Pump Oil

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

Remedy

- Call Agilent for assistance.

GC/MS Parts and Supplies

MSD Contamination

MSD Contamination Identification

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

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

Tips for Optimum Performance

- The easiest way to insure that you minimize background contamination and remove damaging oxygen from your carrier gas system is to use a carrier gas purifying trap right before the gas enters your GC system.
- Column bleed generally appears as a continuous and increased rise in the baseline at higher column temperatures, especially at or near the upper temperature limit of the GC column. Septum bleed usually appears as discrete peaks, and can occur at any temperature.
- A crude sign of a “leak-free” MS system is when the ion ratio of m/z 28 (nitrogen) over m/z 32 (oxygen) is approximately two or greater. Even preconditioned ferrules can shrink slightly at very high temperatures, so if leak problems persist upon a new column installation, check this fitting first.

GC/MS Parts and Supplies

MSD Maintenance Supplies



Cleaning and Maintenance Supplies

Cleaning and Maintenance Supplies for 5975/5973

Description	Part No.
One Year Maintenance Kit (for diffusion pump systems) Includes Big Universal Trap for He (1/8 in.), abrasive sheets (5/pk), lint-free cloths (15/pk), cotton swabs (100/pk), SantoVac Ultra, 18.5 ml (2 each), rough pump oil (1 liter), filament assembly, Octafluoronaphthalene (OFN)	5183-2096
MSD Tool Kit Includes small cleaning rod, large cleaning rod, source hold tool, cotton swabs (100/pk), lint-free nylon gloves, abrasive sheets, 30 mm (5/pk), tool kit with wrenches and driving tools	05971-60561
Nylon gloves, lint-free, large, 1 pair	8650-0030
Nylon gloves, lint-free, small, 1 pair	8650-0029
Lint-free industrial wipes, 100% cotton, 9 x 9 in., 300/pk	9310-4828
Ion source cleaning kit Includes lint-free cloths (15/pk), abrasive sheets (5/pk), cotton swabs (100/pk), lint-free nylon gloves, Alumina powder, abrasive	5181-8863
Cloths, lint free, 15/pk	05980-60051
Cotton swabs, 100/pk	5080-5400
Abrasive sheets, aluminum oxide green lapping paper, 600 mesh, 5/pk	5061-5896
Alumina powder, abrasive	8660-0791
PFTBA sample, certified, 10 g	8500-0656
Replacement glass vial for PFTBA test sample, 5973	05980-20018
Activated alumina, absorbent pellets for Edwards rough pump traps, non-LC/MS, 1 lb can	8500-1233

GC/MS Parts and Supplies

MSD Maintenance Supplies

Cleaning and Maintenance Supplies for 5975/5973

Description	Part No.
Tools	
Screwdriver, 3 in. Pozidriv Shaft No. 1 pt, Fits no. 2-4 screws	8710-0899
Screwdriver, 4 in. Pozidriv shaft No. 2 pt, Fits no. 5-10 screws	8710-0900
Open end wrench, 1/4 and 5/16 in.	8710-0510
MS Interface Column Installation Tool	G1099-20030
Hex nut driver, 5.5 mm	8710-1220
Screwdriver, Torx T20	8710-1615
Screwdriver, Torx T15	8710-1622
Screwdriver, Torx T10	5182-3466
Ferrules	
0.4 mm Vespel Graphite ferrule for 200/250 μ m columns, 10/pk	5062-3508
0.5 mm Vespel Graphite ferrule for 320 μ m columns, 10/pk	5062-3506
250 μ m Vespel/Graphite ferrule, 10/pk	5181-3323
SilTite Metal Ferrules, 1/16 in., 10/pk Includes 2 column nuts	5184-3571
SilTite Metal Ferrules, 1/16 in. x 0.4mm ID, 10/pk Includes 2 column nuts	5184-3569
SilTite Metal Ferrules, 1/16 in. x 0.5mm ID, 10/pk Includes 2 column nuts	5184-3570
MS Interface Supplies	
MS interface column nut, female	05988-20066
Column nut for long or long two-hole ferrules	05921-21170
Universal column nut, 2/pk	5181-8830

GC/MS Parts and Supplies

MSD Ion Source



5973 Ion Source Assembly (EI)

Maintaining the Ion Source

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

Common measures of instrument performance

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

When to clean

- According to a customer's predefined schedule
- Based on instrument performance (e.g., deteriorated performance over time)

Frequency of cleaning

- The number of samples run (throughput)
- The type of samples
- Unique, established laboratory protocol

Selecting a cleaning method

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

Abrasive methods offer several advantages:

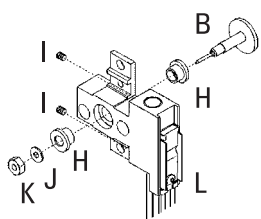
- Provide adequate energy to remove contamination from surfaces
- Require minimal equipment
- Pose minimal risks to user

GC/MS Parts and Supplies

MSD Ion Source



5975/5973 Ion source parts (EI)



5975/5973 Repeller Assembly (EI)

5975/5973 MSD Ion Source Parts (EI)

Item	Description	Non-Inert Part No.	Inert Part No.
A	Ion source body	G1099-20130	G2589-20043
B	Repeller	G1099-20132	G2589-20044
C	Interface socket	G1099-20136	G1099-20136
D	Drawout plate, 3 mm	05971-20134	G2589-20100
	Drawout plate, 6 mm	G3163-20530	G2589-20045
E	Drawout cylinder	G1072-20008	G1072-20008
F	Ion focus lens	05971-20143	05971-20143
G	Entrance lens	05971-20126	G3170-20126
H	Repeller insulator	G1099-20133	G1099-20133
I	Set screw for lens stack	0515-1446	G1999-20022
J	Washer, for Repeller M3	3050-0891	3050-0891
K	Nut, 5.5 mm	0535-0071	0535-0071
L	Ion source sensor	G1099-60104	G1099-60104
M	Lens insulator, 2/pk	05971-20130	05971-20130
	Ion source assembly	G1099-60106	G3170-65710
	Anodized source heater assembly	G3169-60177	G3169-60177
	Repeller assembly	G1099-60170	G2589-60102
	Screw for filament on the source	0515-1046	G1999-20021

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

Description	Part No.
Entrance lens	05971-20126
Lens insulator, 2/pk	05971-20130
Ion focus lens	05971-20143
Drawout cylinder	G1072-20008
Drawout plate, 3 mm	05971-20134
Set screw	0515-1446
Repeller assembly	05971-60170
Screw for filament on the source	0515-1046
Transfer line tip, gold plated, 5972/5971	05971-20305

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

GC/MS Parts and Supplies

MSD Filaments



5973/5972 Filament

MSD Filaments

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

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

MSD Filaments

Description	Part No.
5975/5973 High Temperature (EI)	G2590-60053
5975/5973 (CI), 2/pk	G1099-80053
5971 (EI/CI) / GCD (EI)	05971-60140

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

Since the GC/MS system is already vented, it's a good idea to replace other consumables in the flowpath at the same time as the filaments.



Tips & Tools

Agilent offers a variety of e-seminars, on-site training, and on-demand eLearning to help you learn how to be a more effective chromatographer. For more information, visit www.agilent.com/chem/Education.

GC/MS Parts and Supplies

MSD Vacuum Systems and Pumps

Vacuum Systems and Pumps

A properly maintained vacuum system will:

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

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

Calibration

The calibration valve is an electromechanical valve with a vial for tuning compounds.

Perfluorotributylamine (PFTBA) is the most commonly used tuning compound. It is required for automatic tuning of the MSD in EI mode. The tuning compound is usually a liquid but can be a volatile or semi-volatile solid.

Description	Unit	Part No.
PFTBA sample, certified	10 g	8500-0656
PFDTD sample	10 g	8500-8130

GC/MS Parts and Supplies

MSD Vacuum Systems and Pumps

Diffusion Pump

It is not necessary to change the diffusion pump fluid more than once a year, unless you observe symptoms that suggest a problem with the diffusion pump fluid. The MSD must be vented in order to check the diffusion pump fluid (except for the 5973). Therefore, the best time to check the fluid is when the instrument is already vented for other maintenance.

How to Check the Fluid Level

- If it is not vented already, shut down and vent the MSD according to instrument manual.
- Unplug the MSD power cord.
- Remove the pump and cover the top with aluminum foil.
- After heating the pump in a GC oven at 60°C for 15 minutes to make the fluid flow down into the reservoir at the bottom, remove the stack parts.
- Inspect the pump fluid. If the fluid is discolored or contains particulate material, the fluid must be changed.
- Use a metal ruler to determine the depth of the fluid. A pump that has been in operation should have a pool 9 mm +/- 1 mm deep. Fluid in freshly charged pumps will be 12 mm deep. It is normal that up to 2 ml of oil may be in the rear portion of the vacuum manifold. The recommended total fluid charge for the 5971/5972 is 18 ml (+/- 2 ml).
- For the 5973 use the sight glass to determine the depth of the fluid. The recommended total fluid charge is approximately 37 ml.

Description	Part No.
Ion Gauge/Controller, 5975	G3397A
Santovac 5P Ultra diffusion pump fluid, 18.5 ml , 5975, 5973, 5972 or 5971/GCD	6040-0809
Ion gauge controller, 5973/5972A	59864B
Ion gauge tube for measuring vacuum, 5971/5972	0960-0376
Triode gauge tube for measuring vacuum, 5972/5973	0960-0897

GC/MS Parts and Supplies

MSD Vacuum Systems and Pumps

Foreline Pump

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

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

Description	Part No.
Foreline pump oil, P3, 0.5 liter, 5975	6040-0621
Rotary pump oil, 4L, 1 gal, 5973, 5972 or 5971/GCD	6040-0798
Rotary pump oil, 1L, 1 liter, 5973, 5972 or 5971/GCD	6040-0834
Molecular sieve, 5973, 5972 or 5971/GCD	9301-1104
Oil mist filter kit for E2M18, RV3/E1M18/E2M18/E2M2	3162-1056
Oil mist filter kit for E2M8, For small rotary pump RV8/RV3/E2M8	5063-5224

General Instructions on How to Replace the Pump Oil

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

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

GC/MS Parts and Supplies

MSD Electron Multipliers/Replacement Horn



Electron Multiplier Replacement Horn

MSD Electron Multipliers and Replacement Horn

The lifetime of an electron multiplier is directly related to the current that flows through it and the extent of contamination or condensation that it experiences. Replace the electron multiplier or replacement horn when voltage is over 2500 volts. To maximize electron multiplier life:

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

Description	Part No.
Electron multiplier replacement horn For 5975, 5973, 5972, 5971, GCD. Use with electron multipliers with "straight" horns.	05971-80103
High Energy Dynode (HED) Electron Multiplier for 5973	G1099-80001
Electron multiplier kit for 5972 and 5971 For upgrading electron multipliers with "curved" horns to use replacement horn 05971-80103. Curved horns are no longer available.	05971-80102

Note: These are the recommended replacement multipliers and horns for the MSD. Other manufacturers' products may be incompatible with Agilent instruments and can result in reduced sensitivity, lifetime, and noise problems.

GC/MS Parts and Supplies

5975 Semi-Volatiles Application Kit

5975 and 5973A/N Extended Linearity Semi-Volatiles Application Kit

The 5975 and 5973 A/N Extended Linearity Applications Kit is designed for use in Agilent 5975 and 5973A/N GC/MSD systems. The kit provides modified and/or pretested components to improve system performance for USEPA Method 8270. With the kit, system linearity is maximized and activity is minimized.

Includes

- Start-up Guide, pub. no. 5988-3073EN
- Application Note, "Improvements in the Agilent 6890/5973 GC/MSD System for use with USEPA Method 8270," pub. no. 5988-3072EN
- Ultra Ion Source Chamber
- Ultra Repeller
- Ultra Large Aperture Drawout Plate
- Pretested column, 30 m x 250 μ m x 0.5 μ m HP5-MS, P/N 19091S-139
- Single taper splitless liner, 4 mm ID, deactivated, P/N 5181-3316
- Direct Connect Liner, single taper, 4 mm ID, deactivated, P/N G1544-80730
- Direct Connect Liner, dual taper, 4 mm ID, deactivated, P/N G1544-80700
- Floppy disk with tuning macros

Description	Part No.
5975 and 5973A/N Extended Linearity Semi-Volatiles Application Kit	G2860A

GC/MS Parts and Supplies

MS Engine Supplies

MS Engine Supplies

MS Engine Pump Lubricants and Oils

Lubricant Oil	5989 or 5988	Thermo or Electro Spray	5985 or 5987	5999x, 5993x or 5995x	Part No.
Turbo pump lubricant					
Balzers turbo pump lubricant, 0.25 liter	◆		◆		6040-0468
Diffusion pump oil					
SantoVac 5, 128 ml	◆		◆	◆	6040-0819
Rough pump oil					
Rotary pump oil, 4L, 1 gal	◆	◆	◆	◆	6040-0798
Rotary pump oil, 1L, 1 liter	◆	◆	◆	◆	6040-0834
Particle beam pump oil, Fomblin	◆				6040-0730

GC/MS Parts and Supplies

MS Test and Performance Samples

MS Test and Performance Samples

Each GC/MS has a specific test and performance sample. Refer to the chart below for the exact sample. All volumes are approximately 0.5-1 ml unless otherwise specified.

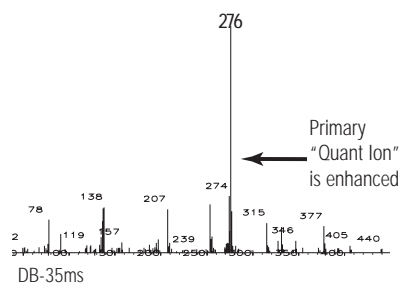
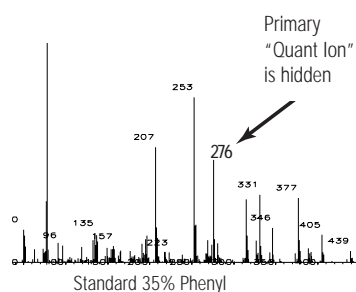
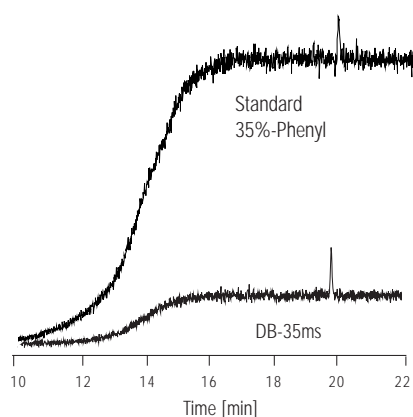
MSD	Tuning Samples		Performance Verification Samples			Checkout Samples	
	EI Tune	CI Tune	EI	Negative Mode CI	Positive Mode CI	Semi-Volatile	Volatile
5975	PFTBA	PFDTD	OFN 1 pg/μl	OFN 100 pg/μl	Benzophenone 100 pg/μl	DFTPP	BFB
5973	PFTBA	PFDTD	OFN 1 pg/μl	OFN 1 pg/μl	Benzophenone 100 pg/μl	DFTPP	BFB
5972	PFTBA	PFTBA	HCB 10 pg/μl	N/A	Benzophenone 100 pg/μl	DFTPP	BFB
5971	PFTBA	PFTBA	Methyl Stearate 500 pg/μl	N/A	Benzophenone 100 pg/μl	DFTPP	BFB
GCD	PFTBA	N/A	Sample A 10 ng/μl	N/A	N/A	DFTPP	BFB
MS Engine							
5989A	PFTBA	PFTBA	HCB 50 pg/μl	OFN 1 pg/μl	Benzophenone 100 pg/μl	DFTPP	BFB
5989B	PFTBA	PFTBA	HCB 20 pg/μl	OFN 500 fg/μl	Benzophenone 100 pg/μl	DFTPP	BFB

Description	Part No.
Evaluation sample for GC/MS systems Solution of dodecane, biphenyl, p-chlorodiphenyl, and Methyl palmitate in isooctane. Six 1.0 ml ampoules: 4 at 10 ng/μl, 1 at 100 ng/μl, 1 at 100 pg/μl.	05970-60045
GC/MS tuning standard Contains DFTPP, Benzidine, Pentachlorophenol, and p,p'-DDT 1 mg/ml in methylene chloride	8500-5995
PFTBA sample, certified, 10 g	8500-0656
PFDTD sample, 10 g	8500-8130
Benzophenone 100 pg/μl, 5 ampoules	8500-5440
Hexachlorobenzene 10 pg/μl, 1 ng/μl	8500-5808
Methyl stearate (in methanol): 1 ng/μl, 2 ea PFTBA not certified	05990-60075
p-Bromofluorobenzene (BFB), 25 μg/ml	8500-5851

The J&W Scientific Brand of Technically Advanced GC Columns

In 2000 Agilent Technologies merged with J&W Scientific. The world's two largest column manufacturers combined to become one. HP- and DB- are both dependable GC column names that you have relied upon for over 25 years. Now you can find both in one box, under one brand name—J&W Scientific—from one company, Agilent Technologies. Your J&W Scientific columns are backed by decades of chromatography experience and column manufacturing know-how. This enables us to provide superior-quality, dependable GC columns and unmatched service and support.

The DB- and HP- capillary columns are manufactured in Folsom, California, USA. Every GC column meets the tightest quality control specifications in the industry. Our goal is to continually refine our materials and processes to provide the best columns in the world, so that each one will continue to deliver the high quality and superior performance you have come to expect.



One nanogram of benzo[*g,h,i*]perylene (*m/z* 276) at 340°C on a standard 35%-phenyl column and on DB 35ms. The increased signal-to-noise ratio is apparent in the chromatograms (top), and the cleaner spectra (lower) will result in more confident peak identifications.

The Industry's Best Low-Bleed Columns

We'd rather be known for "no bleed."

Which is precisely why we're obsessed with reducing column bleed to the bare minimum and continuously developing new stationary phase chemistries. Why all the concern about column bleed, you ask? Because column bleed is the degradation of the stationary-phase polymer that accelerates at a higher temperature, elevating the baseline as the temperature rises to the column's upper thermal limit. Ultimately, the signal-to-noise ratio dictates analytical sensitivities and detection limits. Decrease the noise and the sensitivity will increase. Get

Why low-bleed columns are a smart choice

If you perform trace analyses where sensitivity and instrument performance are important, column bleed (or the lack thereof) should be important to you. Many GC detectors are sensitive to contamination from bleed. By using low-bleed columns, these detectors require less maintenance. Due to the unique relationship between ion storage capacity of the trap and sensitivity levels, ion trap MS users will especially benefit from low-bleed columns. J&W brand's low-bleed GC columns also give you the advantages of superior inertness and increased upper temperature limits.

What makes J&W Scientific low-bleed columns so special?

In short, it's J&W's unique polymer chemistry and proprietary deactivation. Our MS columns utilize special surface deactivation and siloxane chemistries that enhance the chromatographic performance of siloxane polymers. To provide selectivities virtually identical to their conventional counterparts, we offer DB-5ms, DB-35ms, DB-17ms, and DB-225ms. The HP-5ms uses the same stationary phase as the standard HP-5, providing low bleed without the use of arylene technology. DB-1ms and HP-1ms provide the same selectivity as the standard 100% dimethylpolysiloxane (DB-1) type column. Plus, our unique DB-1ms polymer chemistry and proprietary deactivation techniques help us increase temperature limits (340/360°C), improving thermal stability and optimizing performance.

With the Tightest QC Specs in the Business

We make more capillary GC columns than anyone else in the world. And we still build them with our consistently rigid performance criteria, such as separation efficiency, retention characteristics, peak height ratios and bleed rates.

Better precision. For better results.

J&W Scientific columns adhere to very tight retention factor (*k*) specifications, helping ensure consistent retention from column to column. To assure separation reproducibility for the widest range of compounds, we measure multiple retention indices for each column. Narrow retention index ranges help ensure reproducible peak separations from column to column.

GC Columns

Higher performance. And nice and narrow peaks.

Theoretical plates per meter measures efficiency (N). Columns with higher plate numbers generate the narrowest peaks, improving the resolution of closely eluting peaks. Paying close attention to the surface deactivation process and coating efficiency of the stationary phase is critical to obtain the highest number of theoretical plates.

Increased sensitivity. With very low bleed levels.

Bleed is the column's contribution to the background signal. The lowest-bleed columns provide the best analytical sensitivity, which is why we devote substantial research to reduce column bleed. We work hard to create the widest ranged of low-bleed stationary phases. We've also improved our standard phase columns, resulting in even lower bleed levels.

Excellent peak shape

Agilent's stringent QC performance evaluation tests provide the utmost confidence in the qualitative and quantitative results, especially for difficult to chromatograph compounds. We measure peak height ratios for acidic and basic compounds to ensure the highest column performance for the widest range and types of compounds. We also carefully monitor peak symmetry and tailing for a broad range of chemically active compounds.

Tighter GC Column Performance Criteria

Feature	Advantage	Benefit
Narrow Retention Index and Retention Factor Window	Highest level of column-to-column reproducibility	Confidence in analytical results
	Minimal method adjustment when changing columns	Improved sample throughput, reduced downtime
	Specify J&W chemistry for intra-company methodologies	Confidence in method transfer and intra-company results
Increased Plates per Meter	Highest level of "resolving power" Improved sample throughput	Accurate quantification Potentially shorter run times
Lowest Bleed	Increased analytical sensitivity for all detectors	Improved detection limits Reliable compound identification
	Fast baseline stabilization Faster column exchange	Minimized conditioning time Increased sample throughput
	Excellent thermal stability	Increased column lifetime, reduced downtime Increased sample throughput

Choosing a Capillary GC Column

The first step should always be to refer to what has already been done. Our chemists have put together a variety of resources to help you find the right column for your analysis. Take a look at:

Chromatograms

Our chemists continue to evaluate and develop methods for a multitude of applications. We've put together some of the more common chromatograms with column recommendations and method parameters for your reference in this catalog. If you don't find what you're looking for, take a look on our website for a more extensive chromatogram library and a compound search function (go to www.agilent.com/chem, then click on Library).

Method Guides

We've evaluated the most common Environmental/EPA methods, ASTM methods, USP methods, and general compound analyses and have put together simple guides which specify the best column recommendation for these methods.

Retention Data Lists

Take a look at our solvent and pesticide retention data lists. We've analyzed hundreds of compounds on several different phases to help you determine which column will be the best choice for your list of compounds.

Reference Section

If you are still unable to find an existing method for your application, take a look at our reference section. While there are no foolproof techniques, shortcuts, tricks or secrets to column selection, there are some guidelines. Our reference guide gives you helpful hints for choosing a stationary phase, picking the right column dimensions, developing temperature programs and determining the right inlet and detector for the application.

Contact Us

Even though we've developed many reference tools to help you find the right column, we are always ready and happy to give the best column recommendation and method development advice possible. Our Technical Support Chemists have more than 100 years of combined experience running samples and developing methods. We are the gas chromatography column experts and we are at your disposal.

Send in questions on the Technical Support question form on our website www.agilent.com/chem or contact your local Agilent office.

Columns for GC/MS

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

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

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

You can find columns for GC/MS throughout this chapter:

Columns for GC/MS	Page No.
DB-1ms	242
HP-1ms	243
DB-5ms	248–249
HP-5ms	250
DB-XLB	253–254
DB-35ms	256
DB-17ms	259
DB-225ms	266

DuraGuard

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

DuraGuard columns of different phases and dimensions are available through Agilent Technologies' custom column shop. Any DB polysiloxane or low bleed phase can be made as a DuraGuard column with 0.18 mm ID or larger fused silica tubing. Ask for a custom column quote (part number 100-2000 and specify the phase, ID, length, and film thickness of analytical column, and desired length of DuraGuard).

DuraGuard

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

GC Columns

Polysiloxane Polymers

Industry Standard Stationary Phases

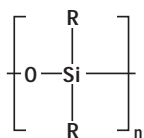
Agilent makes more capillary columns than anyone else in the world and our commitment to product reliability and repeatability has raised the level of quality that chromatographers demand. We still continue to tighten our performance criteria such as separation efficiency, retention characteristics, peak height ratios and bleed rates. Our vast selection of high quality products is sure to meet the chromatographic needs for virtually any application.

Polysiloxane Polymers

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

You'll also find our GC/MS phases listed in this section. While some of the GC/MS phases utilize different polymer chemistries, their selectivities mimic the standard polysiloxane phases and offer the advantage of low bleed and in some cases extended temperature ranges.

With the merger of Agilent and J&W Scientific there were many similar columns with the same type of polymer. In some cases the manufacturing and QC processes were exactly the same. In these cases the DB version was kept. In the cases where the HP and the DB columns had any manufacturing or QC differences, we opted to keep both phases available as in the case of DB-1 and HP-1. Each of these columns is a high quality product made to meet exacting quality control testing. However there may be some subtle performance differences. For example the DB-35 and the HP-35 have slightly different selectivities. Therefore, we are still offering both the DB and the HP version for our customers who have methods already developed on these columns.



R=CH₃

methyl

CH₂CH₂CH₂CN

cyanopropyl

CH₂CH₂CF₃

trifluoropropyl

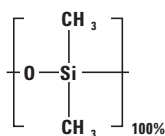


phenyl

Polysiloxanes

GC Columns

Polysiloxane Polymers



Structure of Dimethylpolysiloxane

DB-1

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

Similar Phases: HP-1, Ultra-1, SPB-1, CP-Sil 5 CB Low Bleed/MS, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, CP-Sil 5 CB MS, ZB-1, AT-1, MDN-1

DB-1 Chromatograms

	Page		Page
Aldehydes and Ketones	406	Glycols III	411
Anabolic Steroids	426	Halogenated Hydrocarbons II	413
Anticonvulsants	422	Nitrogen Based Solvents I	416
Aromatics I	407	PFBHA Derivative	407
Aromatics in Finished Gasoline- ASTM Method 5769	441	Polyethylene	443
DNPH Derivative	407	Pyrethrins	372
EPA Air Analysis Compendium Method TO-14 Standard	385	Regular Unleaded Gasoline (California Phase 1) - "Normal" GC Run II	442
EPA Method 551	383	Triethylene Glycol and Impurities	412
Esters I	409	Volatile Amines	404
Fragrance Reference Standard I	390	Volatile Sulfur Compounds	435

GC Columns

Polysiloxane Polymers

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.05	10	0.05	-60 to 325/350	126-1012
0.05	10	0.20	-60 to 325/350	126-1013
0.10	5	0.12	-60 to 325/350	127-100A
0.10	10	0.10	-60 to 325/350	127-1012
0.10	10	0.40	-60 to 325/350	127-1013
0.10	20	0.10	-60 to 325/350	127-1022
0.10	20	0.40	-60 to 325/350	127-1023
0.10	40	0.20	-60 to 325/350	127-1046
0.10	40	0.40	-60 to 325/350	127-1043
0.15	10	1.20	-60 to 325/350	12A-1015
0.18	10	0.18	-60 to 325/350	121-1012
0.18	10	0.20	-60 to 325/350	121-101A
0.18	10	0.40	-60 to 325/350	121-1013
0.18	20	0.18	-60 to 325/350	121-1022
0.18	20	0.40	-60 to 325/350	121-1023
0.18	40	0.40	-60 to 325/350	121-1043
0.20	12	0.33	-60 to 325/350	128-1012
0.20	25	0.33	-60 to 325/350	128-1022
0.20	50	0.33	-60 to 325/350	128-1052
0.25	15	0.10	-60 to 325/350	122-1011
0.25	15	0.25	-60 to 325/350	122-1012
0.25	15	1.00	-60 to 325/350	122-1013
0.25	25	0.25	-60 to 325/350	122-1022
0.25	30	0.10	-60 to 325/350	122-1031
0.25	30	0.25	-60 to 325/350	122-1032
0.25	30	0.50	-60 to 325/350	122-103E
0.25	30	1.00	-60 to 325/350	122-1033
0.25	50	0.25	-60 to 325/350	122-1052
0.25	60	0.10	-60 to 325/350	122-1061
0.25	60	0.25	-60 to 325/350	122-1062
0.25	60	0.50	-60 to 325/350	122-106E
0.25	60	1.00	-60 to 325/350	122-1063
0.25	100	0.50	-60 to 325/350	122-10AE
0.25	150	1.00	-60 to 325/350	122-10G3

GC Columns Polysiloxane Polymers

DB-1 (Continued)

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.32	15	0.10	-60 to 325/350	123-1011
0.32	15	0.25	-60 to 325/350	123-1012
0.32	15	1.00	-60 to 325/350	123-1013
0.32	15	3.00	-60 to 280/300	123-1014
0.32	15	5.00	-60 to 280/300	123-1015
0.32	25	0.12	-60 to 325/350	123-1027
0.32	25	0.25	-60 to 325/350	123-1022
0.32	25	0.52	-60 to 325/350	123-1026
0.32	25	1.05	-60 to 325/350	123-102F
0.32	30	0.10	-60 to 325/350	123-1031
0.32	30	0.25	-60 to 325/350	123-1032
0.32	30	0.50	-60 to 325/350	123-103E
0.32	30	1.00	-60 to 325/350	123-1033
0.32	30	1.50	-60 to 300/320	123-103B
0.32	30	3.00	-60 to 280/300	123-1034
0.32	30	5.00	-60 to 280/300	123-1035
0.32	50	0.25	-60 to 325/350	123-1052
0.32	50	0.52	-60 to 325/350	123-1056
0.32	50	1.05	-60 to 325/350	123-105F
0.32	50	1.20	-60 to 325/350	123-105C
0.32	50	5.00	-60 to 280/300	123-1055
0.32	60	0.10	-60 to 325/350	123-1061
0.32	60	0.25	-60 to 325/350	123-1062
0.32	60	0.50	-60 to 325/350	123-106E
0.32	60	1.00	-60 to 325/350	123-1063
0.32	60	1.50	-60 to 300/320	123-106B
0.32	60	2.00	-60 to 280/300	123-106G
0.32	60	3.00	-60 to 280/300	123-1064
0.32	60	5.00	-60 to 280/300	123-1065
0.45	30	1.27	-60 to 325/350	124-1032
0.45	30	2.55	-60 to 260/280	124-1034

GC Columns

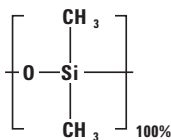
Polysiloxane Polymers

DB-1 (Continued)

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.53	5	2.65	-60 to 325/350	125-100B
0.53	5	5.00	-60 to 325/350	125-1005
0.53	7.5	1.5	-60 to 325/350	125-1002
0.53	10	2.65	-60 to 260/280	125-10HB
0.53	10	5.00	-60 to 260/280	125-10H5
0.53	15	0.15	-60 to 340/360	125-1011
0.53	15	0.25	-60 to 320/340	125-101K
0.53	15	0.50	-60 to 300/320	125-1017
0.53	15	1.00	-60 to 300/320	125-101J
0.53	15	1.50	-60 to 300/320	125-1012
0.53	15	3.00	-60 to 260/280	125-1014
0.53	15	5.00	-60 to 260/280	125-1015
0.53	25	1.00	-60 to 300/320	125-102J
0.53	25	5.00	-60 to 260/280	125-1025
0.53	30	0.10	-60 to 340/360	125-1039
0.53	30	0.25	-60 to 320/340	125-103K
0.53	30	0.50	-60 to 300/320	125-1037
0.53	30	1.00	-60 to 300/320	125-103J
0.53	30	1.50	-60 to 300/320	125-1032
0.53	30	2.65	-60 to 260/280	125-103B
0.53	30	3.00	-60 to 260/280	125-1034
0.53	30	5.00	-60 to 260/280	125-1035
0.53	50	5.00	-60 to 260/280	125-1055
0.53	60	1.00	-60 to 300/320	125-106J
0.53	60	1.50	-60 to 300/320	125-1062
0.53	60	3.00	-60 to 260/280	125-1064
0.53	60	5.00	-60 to 260/280	125-1065
0.53	105	5.00	-60 to 260/280	125-10B5

GC Columns

Polysiloxane Polymers



Structure of Dimethylpolysiloxane

HP-1

- 100% Dimethylpolysiloxane
- Non-polar
- Excellent general purpose column-“Industry Standard”
- Wide range of applications
- Superior performance for low molecular weight alcohols (<C5)
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G2

Similar Phases: DB-1, Ultra-1, SPB-1, CP-Sil 5 CB, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, CP-Sil 5 CB MS, ZB-1, AT-1, MDN-1

HP-1 Chromatograms

	Page		Page
Common Industrial Solvents	415	Organotin Compounds I	373
Denatured Fuel Ethanol ASTM D5501	440	Oxygenates in Gasoline ASTM D5599 (GC-OFID)	439
Glycols/Diols	412	Solvents IV	414
Inorganic Hydride Gases	420	Sulfur Compounds in Natural Gas-Synthetic Mixture	437

GC Columns

Polysiloxane Polymers

HP-1

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	12	0.33	-60 to 325/350	19091-60312
0.20	17	0.10	-60 to 325/350	19091Z-008
0.20	25	0.11	-60 to 325/350	19091Z-002
0.20	25	0.33	-60 to 325/350	19091Z-102
0.20	25	0.50	-60 to 325/350	19091Z-202
0.20	50	0.11	-60 to 325/350	19091Z-005
0.20	50	0.33	-60 to 325/350	19091Z-105
0.20	50	0.50	-60 to 325/350	19091Z-205
0.25	15	0.10	-60 to 325/350	19091Z-331
0.25	15	0.25	-60 to 325/350	19091Z-431
0.25	15	1.00	-60 to 325/350	19091Z-231
0.25	30	0.10	-60 to 325/350	19091Z-333
0.25	30	0.25	-60 to 325/350	19091Z-433
0.25	30	1.00	-60 to 325/350	19091Z-233
0.25	60	0.25	-60 to 325/350	19091Z-436
0.25	60	1.00	-60 to 325/350	19091Z-236
0.25	100	0.50	-60 to 325/350	19091Z-530
0.32	15	0.25	-60 to 325/350	19091Z-411
0.32	15	1.00	-60 to 325/350	19091Z-211
0.32	25	0.17	-60 to 325/350	19091Z-012
0.32	25	0.52	-60 to 325/350	19091Z-112
0.32	25	1.05	-60 to 325/350	19091Z-212
0.32	30	0.10	-60 to 325/350	19091Z-313
0.32	30	0.25	-60 to 325/350	19091Z-413
0.32	30	1.00	-60 to 325/350	19091Z-213
0.32	30	3.00	-60 to 260/280	19091Z-513
0.32	30	4.00	-60 to 260/280	19091Z-613
0.32	30	5.00	-60 to 260/280	19091Z-713
0.32	50	0.17	-60 to 325/350	19091Z-015
0.32	50	0.52	-60 to 325/350	19091Z-115
0.32	50	1.05	-60 to 325/350	19091Z-215
0.32	60	0.25	-60 to 325/350	19091Z-416
0.32	60	1.00	-60 to 325/350	19091Z-216
0.32	60	5.00	-60 to 260/280	19091Z-716

GC Columns

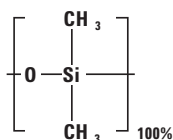
Polysiloxane Polymers

HP-1 (Continued)

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.53	5	0.15	-60 to 320/400	19095Z-220
0.53	5	0.88	-60 to 320/400	19095Z-020
0.53	5	2.65	-60 to 260/280	19095S-100
0.53	7.5	5.00	-60 to 260/280	19095Z-627
0.53	10	0.88	-60 to 300/320	19095Z-021
0.53	10	2.65	-60 to 260/280	19095Z-121
0.53	15	0.15	-60 to 320/400	19095Z-221
0.53	15	1.50	-60 to 300/320	19095Z-321
0.53	15	3.00	-60 to 260/280	19095Z-421
0.53	15	5.00	-60 to 260/280	19095Z-621
0.53	30	0.88	-60 to 300/320	19095Z-023
0.53	30	1.50	-60 to 300/320	19095Z-323
0.53	30	2.65	-60 to 260/280	19095Z-123
0.53	30	3.00	-60 to 260/280	19095Z-423
0.53	30	5.00	-60 to 260/280	19095Z-623
0.53	60	5.00	-60 to 260/280	19095Z-626

GC Columns

Polysiloxane Polymers



Structure of Dimethylpolysiloxane

DB-1ms

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

Similar Phases: HP-1ms, Rtx-1ms, CP-Sil 5 CB Low Bleed/MS, MDN-1, AT-1

DB-1ms Chromatograms

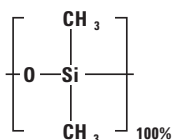
	Page
Drug Screen	421

DB-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.10	10	0.10	-60 to 340/360	127-0112
0.10	10	0.40	-60 to 340/360	127-0113
0.10	20	0.10	-60 to 340/360	127-0122
0.10	20	0.40	-60 to 340/360	127-0123
0.20	12	0.33	-60 to 340/350	128-0112
0.20	25	0.33	-60 to 340/350	128-0122
0.25	15	0.25	-60 to 340/360	122-0112
0.25	30	0.10	-60 to 340/360	122-0131
0.25	30	0.25	-60 to 340/360	122-0132
0.25	60	0.25	-60 to 340/360	122-0162
0.32	15	0.25	-60 to 340/360	123-0112
0.32	30	0.10	-60 to 340/360	123-0131
0.32	30	0.25	-60 to 340/360	123-0132
0.32	60	0.25	-60 to 340/360	123-0162

GC Columns

Polysiloxane Polymers



Structure of Dimethylpolysiloxane

HP-1ms

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

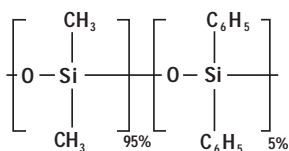
Similar Phases: DB-1ms, Rtx-1ms, CP-Sil 5 CB Low Bleed/MS, MDN-1, AT-1

HP-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	25	0.33	-60 to 325/350	19091S-602
0.25	15	0.25	-60 to 325/350	19091S-931
0.25	30	0.10	-60 to 325/350	19091S-833
0.25	30	0.25	-60 to 325/350	19091S-933
0.25	30	0.50	-60 to 325/350	19091S-633
0.25	30	1.00	-60 to 325/350	19091S-733
0.25	60	0.25	-60 to 325/350	19091S-936
0.32	15	0.25	-60 to 325/350	19091S-911
0.32	25	0.52	-60 to 325/350	19091S-612
0.32	30	0.25	-60 to 325/350	19091S-913
0.32	30	1.00	-60 to 325/350	19091S-713
0.32	60	0.25	-60 to 325/350	19091S-916

GC Columns

Polysiloxane Polymers



Structure du diphenyldiméthylpolysiloxane

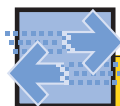
DB-5

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

Similar Phases: HP-5, Ultra-2, SPB-5, CP-Sil 8CB, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, HP-5MS, ZB-5, AT-5, MDN-5

DB-5 Chromatograms

	Page		Page
Amphetamines and Precursors - TMS Derivatives	422	Marijuana (Δ^9 -THC) and Major Metabolites - TMS Derivatives	427
Antihistamines	423	Lemon Oil	393
Bacterial Fatty Acid Methyl Esters	398	Narcotics and Adulterants	425
Cold-Pressed Orange Oil	393	Over-the-Counter Pain Killers - TMS Derivatives	426
Common Drug Screen	421	Organochlorine Pesticides, DB-5/1701P	363



Product Finder

Many improvements have been made to GC columns, especially for pesticide applications. If you are using a DB-5, you may find that a DB-XLB is a better column. For a list of DB-XLB applications, turn to pages 253-254.

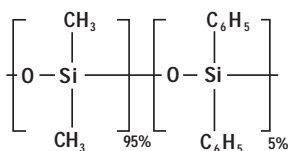
GC Columns Polysiloxane Polymers

DB-5

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.10	10	0.10	-60 to 325/350	127-5012
0.10	10	0.17	-60 to 325/350	127-501E
0.10	10	0.33	-60 to 325/350	127-501N
0.10	10	0.40	-60 to 325/350	127-5013
0.10	20	0.10	-60 to 325/350	127-5022
0.10	20	0.40	-60 to 325/350	127-5023
0.15	10	1.20	-60 to 300/320	12A-5015
0.18	10	0.18	-60 to 325/350	121-5012
0.18	10	0.40	-60 to 325/350	121-5013
0.18	20	0.18	-60 to 325/350	121-5022
0.18	20	0.40	-60 to 325/350	121-5023
0.18	40	0.18	-60 to 325/350	121-5042
0.20	12	0.33	-60 to 325/350	128-5012
0.20	15	0.20	-60 to 325/350	128-50H7
0.20	25	0.33	-60 to 325/350	128-5022
0.20	50	0.33	-60 to 325/350	128-5052
0.25	15	0.10	-60 to 325/350	122-5011
0.25	15	0.25	-60 to 325/350	122-5012
0.25	15	0.50	-60 to 325/350	122-501E
0.25	15	1.00	-60 to 325/350	122-5013
0.25	25	0.25	-60 to 325/350	122-5022
0.25	30	0.10	-60 to 325/350	122-5031
0.25	30	0.25	-60 to 325/350	122-5032
0.25	30	0.50	-60 to 325/350	122-503E
0.25	30	1.00	-60 to 325/350	122-5033
0.25	50	0.25	-60 to 325/350	122-5052
0.25	60	0.10	-60 to 325/350	122-5061
0.25	60	0.25	-60 to 325/350	122-5062
0.25	60	0.50	-60 to 325/350	122-506E
0.25	60	1.00	-60 to 325/350	122-5063
0.32	15	0.10	-60 to 325/350	123-5011
0.32	15	0.25	-60 to 325/350	123-5012
0.32	15	1.00	-60 to 325/350	123-5013
0.32	25	0.17	-60 to 325/350	123-502D
0.32	25	0.25	-60 to 325/350	123-5022
0.32	25	0.52	-60 to 325/350	123-5026
0.32	25	1.05	-60 to 325/350	123-502F
0.32	30	0.10	-60 to 325/350	123-5031
0.32	30	0.25	-60 to 325/350	123-5032
0.32	30	0.50	-60 to 325/350	123-503E
0.32	30	1.00	-60 to 325/350	123-5033
0.32	30	1.50	-60 to 325/350	123-503B
0.32	50	0.25	-60 to 325/350	123-5052
0.32	50	0.52	-60 to 325/350	123-5056
0.32	50	1.00	-60 to 325/350	123-5053
0.32	60	0.25	-60 to 325/350	123-5062

GC Columns

Polysiloxane Polymers



Structure du diphényldiméthylpolysiloxane

HP-5

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

Similar Phases: DB-5, Ultra-2, SPB-5, CP-Sil 8 CB, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, HP-5MS, ZB-5, AT-5, MDN-5

HP-5 Chromatograms

	Page		Page
Organomercury Compounds I	373	Organotin Compounds II	373

GC Columns

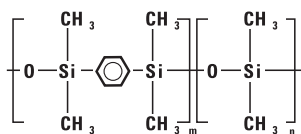
Polysiloxane Polymers

HP-5

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	12	0.33	-60 to 325/350	19091J-101
0.20	25	0.11	-60 to 325/350	19091J-002
0.20	25	0.33	-60 to 325/350	19091J-102
0.20	25	0.50	-60 to 325/350	19091J-202
0.20	50	0.11	-60 to 325/350	19091J-005
0.20	50	0.33	-60 to 325/350	19091J-105
0.20	50	0.50	-60 to 325/350	19091J-205
0.25	15	0.25	-60 to 325/350	19091J-431
0.25	15	1.00	-60 to 325/350	19091J-231
0.25	30	0.10	-60 to 325/350	19091J-333
0.25	30	0.25	-60 to 325/350	19091J-433
0.25	30	1.00	-60 to 325/350	19091J-233
0.25	60	0.25	-60 to 325/350	19091J-436
0.25	60	1.00	-60 to 325/350	19091J-236
0.32	15	0.25	-60 to 325/350	19091J-411
0.32	25	0.17	-60 to 325/350	19091J-012
0.32	25	0.52	-60 to 325/350	19091J-112
0.32	25	1.05	-60 to 325/350	19091J-212
0.32	30	0.10	-60 to 325/350	19091J-313
0.32	30	0.25	-60 to 325/350	19091J-413
0.32	30	0.50	-60 to 325/350	19091J-113
0.32	30	1.00	-60 to 325/350	19091J-213
0.32	50	0.17	-60 to 325/350	19091J-015
0.32	50	0.52	-60 to 325/350	19091J-115
0.32	50	1.05	-60 to 325/350	19091J-215
0.32	60	0.25	-60 to 325/350	19091J-416
0.32	60	1.00	-60 to 325/350	19091J-216
0.53	10	2.65	-60 to 260/280	19095J-121
0.53	15	1.50	-60 to 300/320	19095J-321
0.53	15	5.00	-60 to 260/280	19095J-621
0.53	30	0.88	-60 to 300/320	19095J-023
0.53	30	1.50	-60 to 300/320	19095J-323
0.53	30	2.65	-60 to 260/280	19095J-123
0.53	30	5.00	-60 to 260/280	19095J-623

GC Columns

Polysiloxane Polymers



Structure of Poly(dimethylsiloxoxy)poly(1,4-bis(dimethylsiloxoxy)phenylene)siloxane

DB-5ms

- Phenyl Arylene polymer virtually equivalent to a (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Excellent inertness for active compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- MSD testing and certification available
- Exact replacement of HP-5TA
- Close equivalent to USP Phase G27
- Test mix available. See pages 97-98 for test mix information.

Similar Phases: Rtx-5ms, PTE-5, CP-Sil 8 CB Low Bleed/MS, BPX-5, AT-5ms

DB-5ms Chromatograms

	Page		Page
Formaldehyde, 50ppb	387	Organochlorine Pesticides II EPA Method 8081A	358
Amines and Nitriles	405	Organophosphorous Pesticides I EPA Method 8141A	364
Diesel Fuel	356	Phenols	377
EPA Air Analysis Method TO-15 (1 ppbV Standard)	386	Phenols	418
EPA Method 525.2	375	Polyethyleneamines	404
EPA Method 551.1	384	Substituted Anilines	418
EPA Method 8061 (Phthalate Esters)	376	Sulfur in Air	387
Narcotics	425		

GC Columns

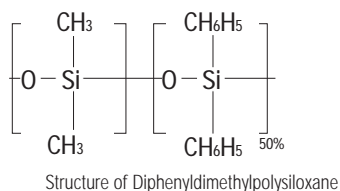
Polysiloxane Polymers

DB-5ms

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.18	20	0.18	-60 to 325/350	121-5522
0.18	40	0.18	-60 to 325/350	121-5542
0.20	12	0.33	-60 to 325/350	128-5512
0.20	25	0.33	-60 to 325/350	128-5522
0.20	50	0.33	-60 to 325/350	128-5552
0.25	15	0.10	-60 to 325/350	122-5511
0.25	15	0.25	-60 to 325/350	122-5512
0.25	15	0.50	-60 to 325/350	122-5516
0.25	15	1.00	-60 to 325/350	122-5513
0.25	25	0.25	-60 to 325/350	122-5522
0.25	25	0.40	-60 to 325/350	122-552A
0.25	30	0.10	-60 to 325/350	122-5531
0.25	30	0.25	-60 to 325/350	122-5532
0.25	30	0.50	-60 to 325/350	122-5536
0.25	30	1.00	-60 to 325/350	122-5533
0.25	50	0.25	-60 to 325/350	122-5552
0.25	60	0.10	-60 to 325/350	122-5561
0.25	60	0.25	-60 to 325/350	122-5562
0.25	60	1.00	-60 to 325/350	122-5563
0.32	15	0.10	-60 to 325/350	123-5511
0.32	15	0.25	-60 to 325/350	123-5512
0.32	15	1.00	-60 to 325/350	123-5513
0.32	25	0.52	-60 to 325/350	123-5526
0.32	30	0.10	-60 to 325/350	123-5531
0.32	30	0.25	-60 to 325/350	123-5532
0.32	30	0.50	-60 to 325/350	123-5536
0.32	30	1.00	-60 to 325/350	123-5533
0.32	60	0.10	-60 to 325/350	123-5561
0.32	60	0.25	-60 to 325/350	123-5562
0.32	60	0.50	-60 to 325/350	123-5566
0.32	60	1.00	-60 to 325/350	123-5563
0.53	15	1.50	-60 to 300/320	125-5512
0.53	30	0.50	-60 to 300/320	125-5537
0.53	30	1.00	-60 to 300/320	125-553J
0.53	30	1.50	-60 to 300/320	125-5532

GC Columns

Polysiloxane Polymers



HP-5ms

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

Similar Phases: Rtx-5MS, Rtx-5 Amine, DB-5ms, PTE-5, CP-Sil 8CB Low Bleed/MS, BPX-5

HP-5ms Chromatograms

	Page		Page
Chlorinated Pesticides, EPA Method 508	360	Organohalide Pesticides in Water, EPA Method 505	360
Nitrogen/Phosphorus Containing Pesticides, EPA Method 507	364	Phenols I	418
Semivolatiles Compounds, EPA Method 8270	374		

HP-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	12	0.33	-60 to 325/350	19091S-101
0.20	25	0.33	-60 to 325/350	19091S-102
0.20	50	0.33	-60 to 325/350	19091S-105
0.25	15	0.10	-60 to 325/350	19091S-331
0.25	15	0.25	-60 to 325/350	19091S-431
0.25	15	1.00	-60 to 325/350	19091S-231
0.25	30	0.10	-60 to 325/350	19091S-333
0.25	30	0.25	-60 to 350/325	19091S-433
0.25	30	0.50	-60 to 325/350	19091S-133
0.25	30	1.00	-60 to 325/350	19091S-233
0.25	60	0.10	-60 to 325/350	19091S-336
0.25	60	0.25	-60 to 350/325	19091S-436
0.32	25	0.52	-60 to 325/350	19091S-112
0.32	30	0.10	-60 to 325/350	19091S-313
0.32	30	0.25	-60 to 325/350	19091S-413
0.32	30	0.50	-60 to 325/350	19091S-113
0.32	30	1.00	-60 to 325/350	19091S-213
0.32	60	0.25	-60 to 325/350	19091S-416

GC Columns

Polysiloxane Polymers

Ultra 1

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

Similar Phases: DB-1, HP-1, SPB-1, CP-Sil 5 CB, Rtx-1, BP-1, 007-1(MS)

Ultra 1 Chromatograms

	Page
Ethylene Glycol Mixture	412

Ultra 1

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	12	0.33	-60 to 325/350	19091A-101
0.20	25	0.11	-60 to 325/350	19091A-002
0.20	25	0.33	-60 to 325/350	19091A-102
0.20	50	0.11	-60 to 325/350	19091A-005
0.20	50	0.33	-60 to 325/350	19091A-105
0.32	25	0.17	-60 to 325/350	19091A-012
0.32	25	0.52	-60 to 325/350	19091A-112
0.32	50	0.17	-60 to 325/350	19091A-015
0.32	50	0.52	-60 to 325/350	19091A-115

GC Columns

Polysiloxane Polymers

Ultra 2

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

Similar Phases: DB-5, HP-5, SPB-5, CP-Sil 8 CB, Rtx-5, BP-5, CB-5, 007-5, 2B-5

Ultra 2 Chromatograms

	Page		Page
Tricyclic Antipsychotics	423	Antiepileptic Drugs	423
Urine Drug Screen	422	Flavor Mixture	392

Ultra 2

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	12	0.33	-60 to 325/350	19091B-101
0.20	25	0.11	-60 to 325/350	19091B-002
0.20	25	0.33	-60 to 325/350	19091B-102
0.20	50	0.11	-60 to 325/350	19091B-005
0.20	50	0.33	-60 to 325/350	19091B-105
0.32	25	0.17	-60 to 325/350	19091B-012
0.32	25	0.52	-60 to 325/350	19091B-112
0.32	50	0.17	-60 to 325/350	19091B-015
0.32	50	0.52	-60 to 325/350	19091B-115

DB-XLB

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

Note: "DB-XLB is designed for inhibiting column bleed at high temperatures. It also appears to have inadvertently inherited an exceptional ability for separating many PCB congeners when used with MS detection. This stellar performance was maximized after careful optimization of the column dimensions, temperature programs, and carrier gas flow conditions..."
(Frame, G. Analytical Chemistry News & Features, Aug. 1, 1997, 468A-475A)

Similar Phases: Rtx-XLB, MDN-12

DB-XLB Chromatograms

	Page		Page
Aroclors 1016-1268 (without 1221)	369	Garlic Oil	393
CLP Pesticides	357	Herbicides	366
Congeners in DIN Method PCBs	370	PBDEs	369
Pesticides, EPA 508.1	359	PCBs by EPA Method 8082	371
EPA Method 552.2	378	Phenols	377
Phenoxy Acid Herbicides - Methyl Derivatives, EPA 8151A	365	Ylang Ylang Oil	394



Tips & Tools

PAH's are often difficult to analyze at trace levels, especially that latter eluting PAH's. If on-column injection is not available or practical, Direct Connect liners can be the next best thing. Turn to page 168.

GC Columns

Polysiloxane Polymers

DB-XLB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	0.18	30 to 340/360	121-1222
0.18	30	0.18	30 to 340/360	121-1232
0.20	12	0.33	30 to 340/360	128-1212
0.20	25	0.33	30 to 340/360	128-1222
0.25	15	0.10	30 to 340/360	122-1211
0.25	15	0.25	30 to 340/360	122-1212
0.25	30	0.10	30 to 340/360	122-1231
0.25	30	0.25	30 to 340/360	122-1232
0.25	30	0.50	30 to 340/360	122-1236
0.25	30	1.00	30 to 340/360	122-1233
0.25	60	0.25	30 to 340/360	122-1262
0.32	30	0.25	30 to 340/360	123-1232
0.32	30	0.50	30 to 340/360	123-1236
0.32	60	0.25	30 to 340/360	123-1262
0.53	15	1.50	30 to 320/340	125-1212
0.53	30	1.50	30 to 320/340	125-1232

DB-35

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

Similar Phases: Rtx-35, SPB-35, AT-35, Sup-Herb, HP-35, BPX-35

DB-35

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	0.25	40 to 300/320	122-1932
0.25	60	0.25	40 to 300/320	122-1962
0.32	30	0.25	40 to 300/320	123-1932
0.32	30	0.50	40 to 300/320	123-1933
0.53	15	1.00	40 to 280/300	125-1912
0.53	30	0.50	40 to 280/300	125-1937
0.53	30	1.00	40 to 280/300	125-1932

GC Columns

Polysiloxane Polymers

HP-35

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

Similar Phases: Rtx-35, SPB-35, AT-35, Sup-Herb, DB-35, BPX-35

HP-35

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	15	0.25	40 to 300/320	19091G-131
0.25	30	0.25	40 to 300/320	19091G-133
0.32	30	0.25	40 to 300/320	19091G-113
0.32	30	0.50	40 to 300/320	19091G-213

GC Columns

Polysiloxane Polymers

DB-35ms

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

Similar Phases: Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35

DB-35ms Chromatograms

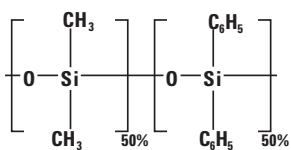
	Page		Page
Anilines	417	Organochlorine Pesticides I EPA Method 8081A	358
Barbiturates	423	PCBs by EPA Method 8082	371
Benzodiazepines	424	Toxaphene	372
Chlordane	372	Pesticides, EPA 508.1	359
CLP Pesticides	357	Phenoxy Acid Herbicides - Methyl Derivatives, EPA 8151A	365
EPA Method 552.2	378		

DB-35ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	15	0.33	50 to 340/360	128-3812
0.20	25	0.33	50 to 340/360	128-3822
0.25	15	0.25	50 to 340/360	122-3812
0.25	30	0.15	50 to 340/360	122-3831
0.25	30	0.25	50 to 340/360	122-3832
0.25	60	0.25	50 to 340/360	122-3862
0.32	15	0.25	50 to 340/360	123-3812
0.32	30	0.25	50 to 340/360	123-3832
0.53	30	0.50	50 to 320/340	125-3837
0.53	30	1.00	50 to 320/340	125-3832

GC Columns

Polysiloxane Polymers



Structure of Diphenyldimethylpolysiloxane

DB-17

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

Similar Phases: HP-50+, Rtx-50, CP-Sil 24 CB, 007-17(MPS-50), HP-17, SP-2250, SPB-50, ZB-50, AT-50

DB-17 Chromatograms

	Page	Page
Common Drug Screen	421	Triazine Herbicides II 367
Free Steroids	426	

GC Columns

Polysiloxane Polymers

DB-17

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.05	10	0.10	40 to 280/300	126-1713
0.10	10	0.10	40 to 280/300	127-1712
0.10	10	0.20	40 to 280/300	127-1713
0.10	20	0.10	40 to 280/300	127-1722
0.18	20	0.18	40 to 280/300	121-1722
0.18	20	0.30	40 to 280/300	121-1723
0.25	15	0.15	40 to 280/300	122-1711
0.25	15	0.25	40 to 280/300	122-1712
0.25	15	0.50	40 to 280/300	122-1713
0.25	30	0.15	40 to 280/300	122-1731
0.25	30	0.25	40 to 280/300	122-1732
0.25	30	0.50	40 to 280/300	122-1733
0.25	60	0.25	40 to 280/300	122-1762
0.32	15	0.15	40 to 280/300	123-1711
0.32	15	0.25	40 to 280/300	123-1712
0.32	15	0.50	40 to 280/300	123-1713
0.32	30	0.15	40 to 280/300	123-1731
0.32	30	0.25	40 to 280/300	123-1732
0.32	30	0.50	40 to 280/300	123-1733
0.32	60	0.25	40 to 280/300	123-1762
0.53	5	2.00	40 to 280/300	125-1704
0.53	15	0.25	40 to 260/280	125-1711
0.53	15	0.50	40 to 260/280	125-1717
0.53	15	1.00	40 to 260/280	125-1712
0.53	15	1.50	40 to 260/280	125-1713
0.53	30	0.25	40 to 260/280	125-1731
0.53	30	0.50	40 to 260/280	125-1737
0.53	30	1.00	40 to 260/280	125-1732
0.53	30	1.50	40 to 260/280	125-1733
0.53	60	1.00	40 to 260/280	125-1762

GC Columns

Polysiloxane Polymers

DB-17ms

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

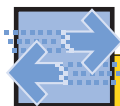
Similar Phases: HP-50+, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50

DB-17ms Chromatograms

	Page		Page
Hallucinogens	425	Tocopherols	424
PAHs	376		

DB-17ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	0.18	40 to 320/340	121-4722
0.25	15	0.15	40 to 320/340	122-4711
0.25	15	0.25	40 to 320/340	122-4712
0.25	30	0.15	40 to 320/340	122-4731
0.25	30	0.25	40 to 320/340	122-4732
0.25	60	0.25	40 to 320/340	122-4762
0.32	15	0.25	40 to 320/340	123-4712
0.32	30	0.25	40 to 320/340	123-4732



Product Finder

The Mass Spectrum of Septum Bleed can look very much like GC column bleed, so the two are often confused. An easy way to tell them apart: If you see bleed peaks, peaks generally come from the lower-quality septa or septa being used beyond their operating limits. To minimize septa bleed contributions, use quality Agilent BTO, Long Life, or Advanced Green septa. Turn to pages 157–158.

GC Columns

Polysiloxane Polymers

HP-50+

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

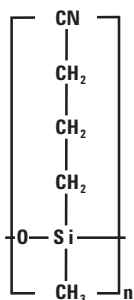
Similar Phases: DB-17, Rtx-50, CP-Sil 24 CB, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

HP-50+

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	12	0.31	40 to 280/300	19091L-101
0.25	15	0.25	40 to 280/300	19091L-431
0.25	30	0.15	40 to 280/300	19091L-333
0.25	30	0.25	40 to 280/300	19091L-433
0.25	30	0.50	40 to 280/300	19091L-133
0.32	30	0.25	40 to 280/300	19091L-413
0.32	30	0.50	40 to 280/300	19091L-113
0.32	60	0.25	40 to 280/300	19091L-416
0.53	15	1.00	40 to 260/280	19095L-021
0.53	30	0.50	40 to 260/280	19095L-523
0.53	30	1.00	40 to 260/280	19095L-023

GC Columns

Polysiloxane Polymers



Structure of cyanopropylmethylpolysiloxane

DB-23

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

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

DB-23 Chromatograms

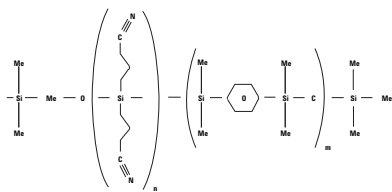
	Page		Page
Canola Oil Margarine Partially Hydrogenated FAMES AOCS Method 1c-89	400	FAMES	398

DB-23

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.18	20	0.20	40 to 250/260	121-2323
0.25	15	0.25	40 to 250/260	122-2312
0.25	30	0.15	40 to 250/260	122-2331
0.25	30	0.25	40 to 250/260	122-2332
0.25	60	0.15	40 to 250/260	122-2361
0.25	60	0.25	40 to 250/260	122-2362
0.32	30	0.25	40 to 250/260	123-2332
0.32	60	0.25	40 to 250/260	123-2362
0.53	15	0.50	40 to 230/240	125-2312
0.53	30	0.50	40 to 230/240	125-2332

GC Columns

Polysiloxane Polymers



Structure of cyanopropylaryl-polysiloxane

HP-88

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

Similar Phases: CP-Sil 88, SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

HP-88 Chromatograms

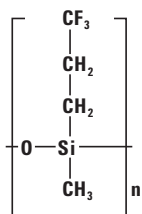
	Page
Resolution of Critical C18:1 positional FAME isomers	399

HP-88

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.25	100	0.20	0 to 250/260	112-88A7
0.25	60	0.20	0 to 250/260	112-8867
0.25	30	0.20	0 to 250/260	112-8837

GC Columns

Polysiloxane Polymers



Structure of trifluoropropylmethylpolysiloxane

DB-200

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

Similar Phases: Rtx-200

DB-200 Chromatograms

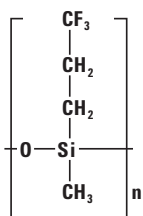
	Page		Page
Acrylate Impurities I	416	Solvents I	413
Aromatic Solvents	415		

DB-200

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	0.25	30 to 300/320	122-2032
0.25	30	0.50	30 to 300/320	122-2033
0.32	30	0.25	30 to 300/320	123-2032
0.32	30	0.50	30 to 300/320	123-2033
0.53	30	1.00	30 to 280/300	125-2032

GC Columns

Polysiloxane Polymers



Structure of trifluoropropylmethylpolysiloxane

DB-210

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

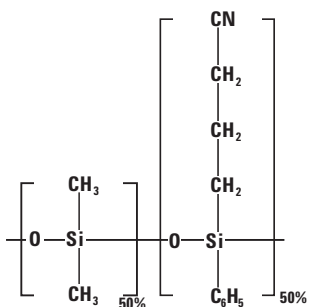
Similar Phases: SP-2401

DB-210

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.25	15	0.25	45 to 240/260	122-0212
0.25	30	0.25	45 to 240/260	122-0232
0.25	30	0.50	45 to 240/260	122-0233
0.32	15	0.50	45 to 240/260	123-0213
0.32	30	0.25	45 to 240/260	123-0232
0.32	30	0.50	45 to 240/260	123-0233
0.53	15	1.00	45 to 220/240	125-0212
0.53	30	1.00	45 to 220/240	125-0232

GC Columns

Polysiloxane Polymers



Structure of cyanopropylphenylmethylpolysiloxane

DB-225

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

Similar Phases: SP-2330, CP-Sil 43 CB, Rtx-225, BP-225, OV-225, 007-225, AT-225

DB-225 Chromatograms

	Page		Page
Alditol Acetates	396	Tetrachlorodibenzo-p-furans	368
FAME Standard II	400		

DB-225

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.10	20	0.10	40 to 220/240	127-2222
0.18	20	0.20	40 to 220/240	121-2223
0.25	15	0.25	40 to 220/240	122-2212
0.25	30	0.15	40 to 220/240	122-2231
0.25	30	0.25	40 to 220/240	122-2232
0.32	30	0.25	40 to 220/240	123-2232
0.53	15	1.00	40 to 200/220	125-2212
0.53	30	0.50	40 to 200/220	125-2237
0.53	30	1.00	40 to 200/220	125-2232

GC Columns

Polysiloxane Polymers

DB-225ms

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

Similar Phases: HP-225, SP-2330, CP-Sil 43 CB, Rtx-225, BP-225, OV-225, 007-225, AT-225

DB-225ms Chromatograms

	Page
Tetrachlorodibenzo-p-furans	368

DB-225ms

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	15	0.25	40 to 240	122-2912
0.25	30	0.25	40 to 240	122-2932
0.25	60	0.25	40 to 240	122-2962
0.32	30	0.25	40 to 240	123-2932

GC Columns

Polysiloxane Polymers

DB-624

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

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

DB-624 Chromatograms

	Page		Page
1,3-Butadiene	433	Ethers	410
Alcohols I	402	Fast VOC Analysis	382
EPA Method 504 by GC/MS II	383	Glycols II	411
EPA Volatiles by GC/MS II (Split Injector)	383	Halogenated Hydrocarbons I	412
Extended Analyte List for EPA Method 8021	381–382	Nitrogen Based Solvents II	416
Esters II	410	Residual Solvents, USP 467	428

DB-624

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	1.00	-20 to 280	121-1324
0.20	25	1.12	-20 to 260	128-1324
0.25	30	1.40	-20 to 260	122-1334
0.25	60	1.40	-20 to 260	122-1364
0.32	30	1.80	-20 to 260	123-1334
0.32	60	1.80	-20 to 260	123-1364
0.45	30	2.55	-20 to 260	124-1334
0.45	75	2.55	-20 to 260	124-1374
0.53	30	3.00	-20 to 260	125-1334
0.53	60	3.00	-20 to 260	125-1364
0.53	75	3.00	-20 to 260	125-1374

GC Columns

Polysiloxane Polymers

DB-1301 and DB-1701

- DB-1301: (6%-Cyanopropyl-phenyl) methylpolysiloxane
- DB-1301: Equivalent to USP Phase G43
- DB-1701: (14%-Cyanopropyl-phenyl)-methylpolysiloxane
- Low/midpolarity
- Bonded and cross-linked
- Exact replacement of HP-1301 and HP-1701
- Solvent rinsable

Similar Phases: **DB-1301:** Rtx-1301, PE-1301
DB-1701: SPB-1701, CP-Sil 19 CB, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701

DB-1701 Chromatograms

	Page		Page
Acrylate Impurities II	416	Phenoxy Acid Herbicides	366
Fentanyls	424	TMS Sugars	397
Organochlorine Pesticides III	362	Triazine Herbicides I	367

DB-1301

ID (mm)	Length (m)	Film (μ m)	Temp Limits ($^{\circ}$ C)	Part No.
0.25	30	0.25	-20 to 280/300	122-1332
0.25	30	1.00	-20 to 280/300	122-1333
0.25	60	0.25	-20 to 280/300	122-1362
0.25	60	1.00	-20 to 280/300	122-1363
0.32	30	0.25	-20 to 280/300	123-1332
0.32	30	1.00	-20 to 280/300	123-1333
0.32	60	1.00	-20 to 280/300	123-1363
0.53	15	1.00	-20 to 260/280	125-1312
0.53	30	1.00	-20 to 260/280	125-1332
0.53	30	1.50	-20 to 260/280	125-1333

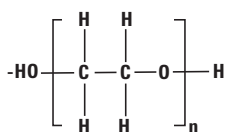
GC Columns Polysiloxane Polymers

DB-1701

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.10	20	0.10	-20 to 280/300	127-0722
0.10	20	0.40	-20 to 280/300	127-0723
0.18	10	0.40	-20 to 280/300	121-0713
0.25	15	0.25	-20 to 280/300	122-0712
0.25	15	1.00	-20 to 280/300	122-0713
0.25	30	0.15	-20 to 280/300	122-0731
0.25	30	0.25	-20 to 280/300	122-0732
0.25	30	1.00	-20 to 280/300	122-0733
0.25	60	0.15	-20 to 280/300	122-0761
0.25	60	0.25	-20 to 280/300	122-0762
0.25	60	0.50	-20 to 280/300	122-0766
0.25	60	1.00	-20 to 280/300	122-0763
0.32	15	0.25	-20 to 280/300	123-0712
0.32	15	1.00	-20 to 280/300	123-0713
0.32	30	0.15	-20 to 280/300	123-0731
0.32	30	0.25	-20 to 280/300	123-0732
0.32	30	1.00	-20 to 280/300	123-0733
0.32	50	1.00	-20 to 280/300	123-0753
0.32	60	0.25	-20 to 280/300	123-0762
0.32	60	1.00	-20 to 280/300	123-0763
0.53	15	1.00	-20 to 260/280	125-0712
0.53	30	0.25	-20 to 260/280	125-0731
0.53	30	0.50	-20 to 260/280	125-0737
0.53	30	1.00	-20 to 260/280	125-0732
0.53	30	1.50	-20 to 260/280	125-0733
0.53	60	1.00	-20 to 260/280	125-0762

GC Columns

PEG Columns



Structure of Polyethylene glycol

Polyethylene Glycol (PEG) Columns

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

PEG Column	Features	Benefits
DB-WAX DB-WaxFF	Lowest operating temperature limit Most similar to Carbowax 20M Available in 0.10 mm ID Highly inert	Analyze low boiling point analytes Transfer older methods to bonded phase Used for Fast GC for high sample throughput Broad analyte compatibility
DB-WAXetr	Middle operating temperature range	Compromise for high and low boiling analytes
HP-INNOWax	Highest upper temperature limit Wide chemical compatibility Lowest bleed at elevated temperatures Highly inert	Analyze high boiling point compounds Excellent general purpose column Best choice for MS use Broad analyte compatibility
DB-FFAP, HP-FFAP	Acid modified	Can inject organic acids without derivization
CAM	Base modified Non-bonded	Good peak shape for basic compounds Cannot be solvent rinsed

DB-WAX and DB-WaxFF

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

Similar Phases: HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, Rtx-WAX, ZB-WAX

DB-WAX and DB-WaxFF Chromatograms

	Page		Page
Aldehydes and Ketones	406	Fragrance Reference Standard II	391
Aromatics	408	Glycols I	411
Ethylene Oxide	419	Peppermint Oil	394
FAME Standard I	399	Phenols	419
Fast Styrene Analysis	439	Spearmint Oil (Western)	394
Formaldehyde Underivatized	407	Lavender Oil Spiked with Camphor	391

GC Columns

PEG Columns

DB-WAX and DB-WaxFF

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
DB-WAX				
0.05	10	0.05	20 to 250/260	126-7012
0.05	10	0.10	20 to 240/250	126-7013
0.10	10	0.10	20 to 250/260	127-7012
0.10	10	0.20	20 to 240/250	127-7013
0.10	20	0.10	20 to 250/260	127-7022
0.10	20	0.20	20 to 240/250	127-7023
0.18	10	0.18	20 to 250/260	121-7012
0.18	20	0.18	20 to 250/260	121-7022
0.18	20	0.30	20 to 240/250	121-7023
0.18	40	0.30	20 to 240/250	121-7043
0.20	25	0.20	20 to 250/260	128-7022
0.20	25	0.20	20 to 250/260	128-7032
0.20	50	0.20	20 to 250/260	128-7052
0.25	15	0.25	20 to 250/260	122-7012
0.25	15	0.50	20 to 240/250	122-7013
0.25	30	0.15	20 to 250/260	122-7031
0.25	30	0.25	20 to 250/260	122-7032
0.25	30	0.50	20 to 240/250	122-7033
0.25	60	0.15	20 to 250/260	122-7061
0.25	60	0.25	20 to 250/260	122-7062
0.25	60	0.50	20 to 240/250	122-7063
0.32	15	0.25	20 to 250/260	123-7012
0.32	15	0.50	20 to 240/250	123-7013
0.32	30	0.15	20 to 250/260	123-7031
0.32	30	0.25	20 to 250/260	123-7032
0.32	30	0.50	20 to 240/250	123-7033
0.32	60	0.25	20 to 250/260	123-7062
0.32	60	0.50	20 to 240/250	123-7063
0.45	30	0.85	20 to 230/240	124-7032
0.53	15	0.50	20 to 230/240	125-7017
0.53	15	1.00	20 to 230/240	125-7012
0.53	30	0.25	20 to 230/240	125-7031
0.53	30	0.50	20 to 230/240	125-7037
0.53	30	1.00	20 to 230/240	125-7032
0.53	60	1.00	20 to 230/240	125-7062
DB-WaxFF				
0.10	20	0.20	20 to 240/250	127-7023FF

DB-WAXetr

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

Similar Phases: HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, ZB-WAX

DB-WAXetr Chromatograms

	Page		Page
Alcohols II	402	Organic Acids	403
Impurities in Mixed Xylenes	409	Solvents I	413
Impurities in Styrene	408	Solvents II	414

DB-WAXetr

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	25	0.40	30 to 250/260	128-7323
0.25	30	0.25	30 to 260/280	122-7332
0.25	30	0.50	30 to 250/260	122-7333
0.25	60	0.25	30 to 260/280	122-7362
0.25	60	0.50	30 to 250/260	122-7363
0.32	15	0.25	30 to 260/280	123-7312
0.32	15	1.00	30 to 250/260	123-7314
0.32	30	0.25	30 to 260/280	123-7332
0.32	30	0.50	30 to 250/260	123-7333
0.32	30	1.00	30 to 250/260	123-7334
0.32	50	1.00	30 to 250/260	123-7354
0.32	60	0.25	30 to 260/280	123-7362
0.32	60	0.50	30 to 250/260	123-7363
0.32	60	1.00	30 to 250/260	123-7364
0.53	15	1.00	30 to 240/260	125-7312
0.53	15	2.00	50 to 230/250	125-7314
0.53	30	1.00	30 to 240/260	125-7332
0.53	30	1.50	30 to 230/240	125-7333
0.53	30	2.00	50 to 230/250	125-7334
0.53	60	1.00	30 to 240/260	125-7362

HP-INNOWax

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

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

HP-INNOWax Chromatograms

	Page		Page
Alcohols III	403	Impurities in Ethylbenzene	409
Aldehydes and Acids	405	Impurities in p-Xylene-ASTM D3798	438
Aromatics Analysis - Ethylbenzene Impurities	438	Monomers in Latex Paint by Headspace	417
Aromatics Analysis: ASTM D16 Analytes	438	Perfume	392
Bourbon	395	Polyunsaturated Fatty Acid Methyl Esters	399
Chlorinated Isooctane	413–443	Rapid Analysis of Water in Organic Solvents	415
Esters III	410	Strawberry Syrup	396
Free Fatty Acids	397	Sulfur and Selenium in Garlic by Headspace	396
Free Organic Acids/C4-C5 Isomers	403		

GC Columns

PEG Columns

HP-INNOWax

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	25	0.20	40 to 260/270	19091N-102
0.20	25	0.40	40 to 260/270	19091N-202
0.20	50	0.20	40 to 260/270	19091N-105
0.20	50	0.40	40 to 260/270	19091N-205
0.25	15	0.25	40 to 260/270	19091N-131
0.25	15	0.50	40 to 260/270	19091N-231
0.25	30	0.15	40 to 260/270	19091N-033
0.25	30	0.25	40 to 260/270	19091N-133
0.25	30	0.50	40 to 260/270	19091N-233
0.25	60	0.15	40 to 260/270	19091N-036
0.25	60	0.25	40 to 260/270	19091N-136
0.25	60	0.50	40 to 260/270	19091N-236
0.32	15	0.25	40 to 260/270	19091N-111
0.32	30	0.15	40 to 260/270	19091N-013
0.32	30	0.25	40 to 260/270	19091N-113
0.32	30	0.50	40 to 260/270	19091N-213
0.32	60	0.25	40 to 260/270	19091N-116
0.32	60	0.50	40 to 260/270	19091N-216
0.53	15	1.00	40 to 240/250	19095N-121
0.53	30	1.00	40 to 240/250	19095N-123
0.53	60	1.00	40 to 240/250	19095N-126

DB-FFAP

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

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

Similar Phases: Stabilwax-DA, HP-FFAP, Nukol, 007-FFAP, BP21, CP-Wax 58 (FFAP) CB, AT-1000, OV-351, CP-FFAP-CB

DB-FFAP Chromatograms

	Page		Page
Aspirin and Ibuprofen in Methanol	426	Organic Acids	397

DB-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	15	0.25	40 to 250	122-3212
0.25	30	0.25	40 to 250	122-3232
0.25	30	0.50	40 to 250	122-3233
0.25	60	0.25	40 to 250	122-3262
0.25	60	0.50	40 to 250	122-3263
0.32	15	0.25	40 to 250	123-3212
0.32	25	0.50	40 to 250	123-3223
0.32	30	0.25	40 to 250	123-3232
0.32	30	0.50	40 to 250	123-3233
0.32	30	1.00	40 to 250	123-3234
0.32	50	0.50	40 to 250	123-3253
0.32	60	0.25	40 to 250	123-3262
0.32	60	0.50	40 to 250	123-3263
0.32	60	1.00	40 to 250	123-3264
0.45	30	0.85	40 to 250	124-3232
0.53	10	1.00	40 to 250	125-32H2
0.53	15	0.50	40 to 250	125-3217
0.53	15	1.00	40 to 250	125-3212
0.53	30	0.25	40 to 250	125-3231
0.53	30	0.50	40 to 250	125-3237
0.53	30	1.00	40 to 250	125-3232
0.53	30	1.50	40 to 250	125-3233
0.53	60	1.00	40 to 250	125-3262

HP-FFAP

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

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

Similar Phases: Stabilwax-DA, DB-FFAP, Nukol, 007-FFAP, BP21, CP-WAX 58 (FFAP) CB, AT-1000, OV-351, CP-FFAP-CB

HP-FFAP Chromatograms

	Page		Page
Acrylates	417	Ethoxyethanol	403
Alcohol Beverage Standard	395		

HP-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	25	0.30	60 to 240/250	19091F-102
0.20	50	0.30	60 to 240/250	19091F-105
0.25	30	0.25	60 to 240/250	19091F-433
0.32	25	0.50	60 to 240/250	19091F-112
0.32	30	0.25	60 to 240/250	19091F-413
0.32	50	0.50	60 to 240/250	19091F-115
0.53	10	1.00	60 to 240	19095F-121
0.53	15	1.00	60 to 240	19095F-120
0.53	30	1.00	60 to 240	19095F-123

Special Application Columns

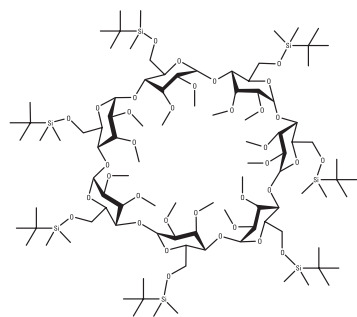
Agilent's chemists have developed many columns with unique characteristics designed to solve the most difficult separation problems of a given method. As a result, we offer a comprehensive line of specialty columns for a variety of applications to enhance the standard phase portfolio. From columns for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

Chiral

Our proven Cyclodex-B, CycloSil-B and HP-Chiral B offer the chiral analyst a broad range of chiral separations. Although no single column resolves every enantiomeric pair, our no-hassle return policy allows you to try the column for your application and if it doesn't work, simply return it.

Recommendations for choosing a chiral column

- Contact Technical Support through your local Agilent office for a more specific recommendation
- Refer to existing applications and literature
- Choose CycloSil-B as a general purpose column
- Use HP-Chiral B when using a nitrogen specific detector



30% Heptakis
(2,3-di-O-methyl-6-O-t-butyl dimethylsilyl)-β-cyclodextrin

CycloSil-B

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

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

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

CycloSil-B Chromatograms

	Page	Page
Citrus Flavored Carbonated Beverage (Soda)	395	Rosemary Oil
		395

CycloSil-B

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.25	30	0.25	35 to 260/280	112-6632
0.32	30	0.25	35 to 260/280	113-6632

Cyclodex-B

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

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

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

Cyclodex-B Chromatograms

	Page
Menthol	392

Cyclodex-B

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.25	30	0.25	50 to 230/250	112-2532
0.25	60	0.25	50 to 230/250	112-2562
0.32	30	0.25	50 to 230/250	113-2532

GC Columns

Chiral Columns/Food and Flavors

HP-Chiral β

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

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

HP-Chiral 10 β

ID (mm)	Length (m)	Film (μ m)	Temp Limits ($^{\circ}$ C)	Part No.
0.25	30	0.25	30 to 240/250	19091G-B133

HP-Chiral 20 β

0.25	30	0.25	30 to 240/250	19091G-B233
0.32	30	0.25	30 to 240/250	19091G-B213

Food and Flavors

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

Recommended Columns for Food and Flavors

- HP-88 for cis and trans FAME isomers
- DB-XLB and DB-17ht for triglycerides
- DB-FFAP for organic acids
- DB-1, DB-WAX for fragrance compounds
- Microbore (0.1 mm ID) DB-1, DB-5 or DB-Wax for fast analysis of fragrances and FAMES
- Highly reproducible and specially tested Microbore (0.1 mm ID) DB-WaxFF for fragrance analysis



Tips & Tools

For Food, Flavor and Fragrance applications, turn to page 389.

High Temperature DB-1ht

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

Similar Phases: Stx-1ht

DB-1ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	15	0.10	-60 to 400	122-1111
0.25	30	0.10	-60 to 400	122-1131
0.32	15	0.10	-60 to 400	123-1111
0.32	30	0.10	-60 to 400	123-1131

DB-5ht

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

Similar Phases: HT5, Stx-5ht

DB-5ht Chromatograms

	Page
Butter Triglycerides	401

DB-5ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	15	0.10	-60 to 400	122-5711
0.25	30	0.10	-60 to 400	122-5731
0.32	15	0.10	-60 to 400	123-5711
0.32	30	0.10	-60 to 400	123-5731

GC Columns

High Temperature Columns

DB-17ht

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

Similar Phases: Rtx-65TG, BPX50, CP-TAP CB

DB-17ht Chromatograms

	Page
Butter Triglycerides II	401

DB-17ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	15	0.15	40 to 340/365	122-1811
0.25	30	0.15	40 to 340/365	122-1831
0.32	15	0.15	40 to 340/365	123-1811
0.32	30	0.15	40 to 340/365	123-1831
0.32	60	0.15	40 to 340/365	123-1861

Life Sciences

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

Recommended Columns for Life Sciences

- DB-ALC1 and DB-ALC2 for U.S. Blood Alcohol analysis
- DB-ALC2 and HP-Blood Alcohol column for European Blood Alcohol analysis
- Low-bleed columns for controlled substances
- DB-35ms for barbiturates
- DB-17ms for hallucinogens
- DB-EVDX for analysis of drugs of abuse
- DB-624, DB-1, DB-WAX or HP-INNOWax for Residual Solvent analysis

DB-ALC1 and DB-ALC2

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

Similar Phases: Rtx-BAC1, Rtx-BAC2

DB-ALC1 and DB-ALC2 Chromatograms

	Page		Page
Blood Alcohols I (Static Headspace/Split)	427	Blood Alcohols II (Static Headspace/Split)	427
Blood Pollutants I	428	Blood Pollutants II	428

DB-ALC1 and DB-ALC2

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
DB-ALC1	0.32	30	1.80	20 to 260/280	123-9134
DB-ALC1	0.53	30	3.00	20 to 260/280	125-9134
DB-ALC2	0.32	30	1.20	20 to 260/280	123-9234
DB-ALC2	0.53	30	2.00	20 to 260/280	125-9234

HP-Blood Alcohol

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

HP-Blood Alcohol

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.32	7.5	20.00	-60 to 270/290	19091S-510

DB-5ms EVDX

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

DB-EVDX Chromatograms

	Page		Page
Anesthetics	422	Sedative Hypnotics	425

DB-EVDX

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.20	25	0.33	-60 to 325/350	128-8522

HP-Fast Residual Solvent

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

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

HP-Fast Residual Solvent

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.53	30	1.00	-20 to 260	19095V-420

Pesticides

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

Recommended Columns for Pesticides

- DB-35ms (P/N 123-3832) and DB-XLB (PN 122-1236) for CLP pesticides, chlorinated herbicides, and EPA Method 508.1 pesticides
- Also ideal for other dual ECD applications such as 8082 PCBs (Aroclors) and haloacetic acids
- DB-5ms (PN 122-5532) and DB-35ms (P/N 122-3832) for organophosphorous pesticides (EPA Method 8141A)
- HP-5ms for over 550 pesticides using retention time locking software and database

HP-PAS5

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

Similar Phases: DB-5, Ultra-2, SPB-5, CP-Sil 8CB, RSL-200, Rtx-5, BP-5, CB-5, OV-5, 007-2 (MPS-5), SE-52, SE-54, XTI-5, PTE-5, HP-5MS, CC-5, ZB-5

HP-PAS5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.32	25	0.52	-60 to 325/350	19091S-010

DB-1701P

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

Similar Phases: SPB-1701, CP-Sil 19CB, Rtx-1701, BP-10, CB-1701, OV-1701, 007-1701

DB-1701P

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	0.25	-20 to 280/300	122-7732
0.32	25	0.25	-20 to 280/300	123-7722
0.32	30	0.25	-20 to 280/300	123-7732
0.53	30	1.00	-20 to 260/280	125-7732

DB-608

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

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

DB-608 Chromatograms

	Page
Organochlorine Pesticides II	361

DB-608

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	0.25	40 to 280/300	122-6832
0.32	30	0.50	40 to 280/300	123-1730
0.45	30	0.70	40 to 260/280	124-1730
0.53	15	0.83	40 to 260/280	125-1710
0.53	30	0.50	40 to 260/280	125-6837
0.53	30	0.83	40 to 260/280	125-1730

Petroleum

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

Recommended Columns for Petroleum

- DB-HT SimDis for Simulated distillation
- HP-PONA, DB-5 or HP-1 for PONA and PIANO analysis

DB-2887

- 100% Dimethylpolysiloxane
- Specifically designed for simulated distillation using ASTM Method D2887
- Rapid conditioning, fast run time and low bleed when compared to packed columns
- Bonded and cross-linked
- Solvent rinsable

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

DB-2887 Chromatograms

	Page		Page
Reference Gas Oil	441	Simulated Distillation	441

DB-2887

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.53	10	3.00	-60 to 350	125-2814

DB-HT SimDis

- 100% dimethylpolysiloxane
- “Boiling point” phase for high temperature simulated distillation
- Durable stainless steel tubing
- 430°C upper temperature limit
- Distillation range of C6 to C110+
- Low bleed – even at 430°C!
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Petrocol EX2887, CP-SimDist Ultimetel, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887

DB-HT SimDis Chromatograms

	Page
n-Paraffin Standard	443

DB-HT SimDis

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.53	5	0.15	-60 to 400/430	145-1001

HP-PONA

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

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

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

HP-PONA Chromatograms

	Page	Page
Refinery Gas III	435	Sulfur Compounds in Naphtha 437

HP-PONA

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
HP-PONA	0.20	50	0.50	-60 to 325/350	19091S-001
HP-1	0.20	50	0.50	-60 to 325/350	19091Z-205
HP-1	0.25	100	0.50	-60 to 325/350	19091Z-530

DB-Petro

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

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

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

DB-Petro Chromatograms

	Page		Page
Propylene, Butene-1 and Ethylene	432	Unleaded Gasoline II	440
Regular Unleaded Gasoline (California Phase 1) - "Normal" GC Run I	442	PONA Mix as Specified by AFNOR Method #2	440

DB-Petro

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	50	0.50	-60 to 325/350	128-1056
0.25	100	0.50	-60 to 325/350	122-10A6

Semivolatiles

Recommended Columns for Semivolatiles

- HP-5ms for EPA methods 8270 and 525
- DB-XLB for PCB congeners
- HP-5ms or DB-35ms for PAHs
- DB-5ms or DB-XLB for phenols

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

DB-Dioxin

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

Similar Phases: SP-2331, 007-23, Rtx-2332, CP-Sil 88

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

DB-Dioxin Chromatograms

	Page
Dioxins and Furans	368

DB-Dioxin

ID (mm)	Length (m)	Film (μ m)	Temp Limits ($^{\circ}$ C)	Part No.
0.25	60	0.15	40 to 250/270	122-2461
0.25	60	0.25	40 to 250/270	122-2462

DB-5.625

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

* Pentachlorophenol, 2,4-Dinitrophenol, Carbazole, and N-Nitrosodiphenylamine used to test response factors.

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

DB-5.625 Chromatograms

	Page
European Red List Volatiles	384

DB-5.625

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	0.36	-60 to 325/350	121-5622
0.25	30	0.25	-60 to 325/350	122-5631
0.25	30	0.50	-60 to 325/350	122-5632
0.25	30	1.00	-60 to 325/350	122-5633
0.25	60	0.25	-60 to 325/350	122-5661
0.32	30	0.25	-60 to 325/350	123-5631
0.32	30	0.50	-60 to 325/350	123-5632

Volatiles

Recommended Columns for Volatiles

- DB-VRX and DB-624 for EPA methods 502.2 and 8021
- DB-VRX (60 m, 0.25 mm ID) for GC/MS volatiles methods
- DB-VRX (20 m, 0.18 mm ID) for fast GC/MS volatiles analysis using a 5973 MSD (Not recommended for Ion Trap MS or older MSDs)
- DB-MTBE for extended EPA method 8020
- DB-TPH for the analysis of BTEX and gasoline total petroleum hydrocarbons

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

DB-VRX

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

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

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

DB-VRX Chromatograms

	Page		Page
EPA Method 504 by GC/MS I	383	Unleaded Gasoline I	355
EPA Volatiles by GC/MS (Split Injector)	383	Extended Analyte List for EPA Method 8021	381–382
High Speed VOC, EPA Method 8260	380		

DB-VRX

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	1.00	-10 to 260	121-1524
0.18	40	1.00	-10 to 260	121-1544
0.25	30	1.40	-10 to 260	122-1534
0.25	60	1.40	-10 to 260	122-1564
0.32	30	1.80	-10 to 260	123-1534
0.32	60	1.80	-10 to 260	123-1564
0.45	30	2.55	-10 to 260	124-1534
0.45	75	2.55	-10 to 260	124-1574

DB-624

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

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

DB-624 Chromatograms

	Page		Page
1,3-Butadiene	433	Ethers	410
Alcohols I	402	Fast VOC Analysis	382
EPA Method 504 by GC/MS II	383	Glycols II	411
EPA Volatiles by GC/MS II (Split Injector)	383	Halogenated Hydrocarbons I	412
Extended Analyte List for EPA Method 8021	381–382	Nitrogen Based Solvents II	416
Esters II	410	Residual Solvents, USP 467	428

GC Columns

Volatiles

DB-624

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.18	20	1.00	-20 to 280	121-1324
0.20	25	1.12	-20 to 260	128-1324
0.25	30	1.40	-20 to 260	122-1334
0.25	60	1.40	-20 to 260	122-1364
0.32	30	1.80	-20 to 260	123-1334
0.32	60	1.80	-20 to 260	123-1364
0.45	30	2.55	-20 to 260	124-1334
0.45	75	2.55	-20 to 260	124-1374
0.53	30	3.00	-20 to 260	125-1334
0.53	60	3.00	-20 to 260	125-1364
0.53	75	3.00	-20 to 260	125-1374

DB-502.2

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

Similar Phases: Rtx-502.2, VOCOL, HP-VOC

DB-502.2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.32	60	1.80	0 to 260/280	123-1464
0.53	105	3.00	0 to 260/280	125-14A4

HP-VOC

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

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

HP-VOC

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.20	30	1.10	-60 to 280/290	19091R-303
0.20	60	1.10	-60 to 280/290	19091R-306
0.32	60	1.80	-60 to 280/290	19091R-316
0.32	90	1.80	-60 to 280/290	19091R-319
0.53	90	3.00	-60 to 280/290	19095R-429
0.53	105	3.00	-60 to 280/290	19095R-420

DB-MTBE

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

DB-MTBE Chromatograms

	Page	Page
Methyl tert-butyl ether (MTBE) FID, Extended 8020 Analysis	355	Methyl tert-butyl ether (MTBE) PID, Extended 8020 Analysis

DB-MTBE

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.45	30	2.55	35 to 260/280	124-0034
0.53	30	3.00	35 to 260/280	125-0034

DB-TPH

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

DB-TPH

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.32	30	0.25	-10 to 320	123-1632

GC Columns

PLOT Columns

PLOT

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

PLOT Column Application Recommendations

Column	Stationary Phase	Typical Applications
HP-PLOT Molesieve	5Å molecular sieve zeolite	Permanent and noble gases. Thick and thin films available. Thick film column will resolve argon and oxygen at 35°C.
HP-PLOT Al ₂ O ₃ KCl	Aluminum oxide deactivated with KCl	Least "polar" Alumina phase. Lowest retention of olefins relative to comparable paraffin. C1 to C8 hydrocarbon isomers. Column of choice for accurate quantitation of dienes, especially propadiene and butadiene from ethylene and propylene streams.
HP-PLOT Al ₂ O ₃ S	Aluminum oxide deactivated with sodium sulfate	Excellent general use Alumina column for light hydrocarbons: C1 to C8 isomers. Best for resolving acetylene from butane and propylene from isobutane.
GS-Alumina	Aluminum oxide with proprietary deactivation	Most "polar" of the Alumina columns. Highest retention of olefins relative to comparable paraffin. Excellent general use Alumina column for light hydrocarbons: C1 to C8 isomers. Best for resolving cyclopropane from propylene. Good stability and recovery from water saturation.
HP-PLOT Q	Polystyrene-divinylbenzene	C1 to C3 isomers, alkanes to C12, CO ₂ , methane, air/CO, water, oxygenated compounds, sulfur compounds, solvents.
HP-PLOT U	Divinylbenzene/ethylene	More polar than HP-PLOT Q and GS-Q. C1 to C7 hydrocarbons, CO ₂ , methane, air/CO, water, glycol dimethacrylate oxygenates, amines, solvents, alcohols, ketones, aldehydes.
GS-GasPro	Proprietary, bonded silica-based	C1 to C12 hydrocarbons, CO ₂ , trace-level sulfurs, hydride gases, inorganic gases, halocarbons, SF ₆ , oxygen/nitrogen separation at -80°C.
GS-CarbonPLOT	Bonded, monolithic carbon layer	C1 to C5 hydrocarbons, CO ₂ , air/CO, trace acetylene in ethylene, methane.
GS-OxyPLOT	High selectivity absorbant	High retention for oxygenated hydrocarbons (M ₂ OH retention index 71300). Useful for alcohols, ketones, and ethers in gasoline, diesel, and C1-C4 hydrocarbon streams.

GS-OxyPLOT

- Excellent selectivity for C1-C10
- Suitable for ASTM D4815
- Useful for alcohols, ketones, and ethers in gasoline

Similar Phases: CP-LowOX

GS-OxyPLOT

ID (mm)	Length (m)	Temp Limits (°C)	Part No.
0.53	10	350	115-4912

HP-PLOT Al₂O₃ KCl

- Least “polar” Alumina phase
- Aluminum oxide deactivated with KCl
- Standard column choice for light hydrocarbon analysis: C1 to C8 hydrocarbon isomers
- Low retention of olefins relative to comparable paraffin
- Excellent for quantitation of dienes, especially propadiene and butadiene from ethylene and propylene streams
- Recommended phase for many ASTM methods
- Preferred KCl deactivated Alumina

Similar Phases: CP-Al₂O₃/KCl PLOT, Rt-Alumina PLOT, Alumina PLOT, Al₂O₃/KCl

HP-PLOT Al₂O₃ KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	5.00	-60 to 200	19091P-K33
0.32	50	8.00	-60 to 200	19091P-K15
0.53	30	15.00	-60 to 200	19095P-K23
0.53	50	15.00	-60 to 200	19095P-K25

GS-Alumina KCl

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

Similar Phases: CP-Al₂O₃/KCl PLOT, Rt-Alumina PLOT, Alumina PLOT, Al₂O₃/KCl

GS-Alumina KCl Chromatograms

	Page		Page
Impurities in Ethylene	431	Impurities in Propylene	431

GS-Alumina KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.53	30		-60 to 200	115-3332
0.53	50		-60 to 200	115-3352

HP-PLOT Al₂O₃ S

- Middle range of "polarity" for Alumina phases
- Aluminum oxide deactivated with sodium sulfate
- Excellent general use column for light hydrocarbon analysis: C1 to C8 hydrocarbon isomers
- Best for resolving acetylene from butane and propylene from isobutane

Similar Phases: GS-Alumina

HP-PLOT Al₂O₃ "S" Chromatograms

	Page		Page
Ethylene	431	Refinery Gas II	435
Natural Gas	430		

HP-PLOT Al₂O₃ S

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.25	30	5.00	-60 to 200	19091P-S33
0.32	25	8.00	-60 to 200	19091P-S12
0.32	50	8.00	-60 to 200	19091P-S15
0.53	15	15.00	-60 to 200	19095P-S21
0.53	30	15.00	-60 to 200	19095P-S23
0.53	50	15.00	-60 to 200	19095P-S25

GS-Alumina

- Most "polar" Alumina phase
- Aluminum oxide with proprietary deactivation
- Excellent general use column for light hydrocarbon analysis: C1 to C8 hydrocarbon isomers
- Separates C1-C4 saturated and unsaturated hydrocarbons
- Best for resolving cyclopropane from propylene
- Faster, more efficient and provides more sensitivity than packed equivalents
- Minimal conditioning time required
- Preferred substitution for sodium sulfate deactivated Alumina because of its regenerative nature

Similar Phases: $\text{Al}_2\text{O}_3/\text{KCl}$, $\text{Al}_2\text{O}_3/\text{Na}_2\text{SO}_4$, Rt-Alumina PLOT, Alumina PLOT

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

GS-Alumina Chromatograms

	Page		Page
1,3-Butadiene Purity	433	Propylene	432
Extended Hydrocarbon Analysis on GS-Alumina	434		

GS-Alumina

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^\circ\text{C}$)	Part No.
0.53	30		-60 to 200	115-3532
0.53	50		-60 to 200	115-3552

HP-PLOT Al_2O_3 M

- Most "polar" Alumina phase (similar to GS-Alumina)
- Aluminum oxide deactivated with proprietary deactivation
- Good general use column for light hydrocarbon analysis: C1 to C8 hydrocarbon isomers
- Good for resolving acetylene from butane and propylene from isobutane

Similar Phases: GS-Alumina

HP-PLOT Al_2O_3 M

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^\circ\text{C}$)	Part No.
0.32	50	8.00	-60 to 200	19091P-M15
0.53	30	15.00	-60 to 200	19095P-M23
0.53	50	15.00	-60 to 200	19095P-M25

GS-GasPro

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

Similar Phases: CP-Silica PLOT

GS-GasPro Chromatograms

	Page		Page
C1 and C2 Halocarbons (Freons)	387	Mercaptans	437
Extended Hydrocarbon Analysis on GS-GasPro	434	Sulfur Compounds in Propylene (1 ppm)	437
Halocarbons	419	Sulfur Gas Analysis in Light Hydrocarbon Streams I	436
Halothane	419	Inorganic Gases	420

GS-GasPro

ID (mm)	Length (m)	Temp Limits (°C)	Part No.
0.32	5	-80 to 260/300	113-4302
0.32	15	-80 to 260/300	113-4312
0.32	30	-80 to 260/300	113-4332
0.32	60	-80 to 260/300	113-4362

GS-CarbonPLOT

- High stability, bonded carbon layer stationary phase
- Unique selectivity for inorganic and organic gases
- Extended temperature limit of 360°C

Similar Phases: CarboPack, CLOT, Carboxen-1006 PLOT, CP-CarboPLOT P7

GS-CarbonPLOT Chromatograms

	Page
N ₂ O III	388

GS-CarbonPLOT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.32	15	1.50	0 to 360	113-3112
0.32	30	1.50	0 to 360	113-3132
0.32	30	3.00	0 to 360	113-3133
0.32	60	1.50	0 to 360	113-3162
0.53	15	3.00	0 to 360	115-3113
0.53	30	3.00	0 to 360	115-3133

HP-PLOT Molesieve

- A PLOT column for the analysis of permanent gases
- O₂, N₂, CO and CH₄ resolve in less than 5 minutes
- Durable molecular sieve 5Å coating minimizes baseline spiking and damage to multiport valves
- Select a thick film for Ar/O₂ separation without cryogenic cooling
- Select thin film HP-PLOT Molesieve columns for routine air monitoring applications
- Replaces GS-Molesieve

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

HP-PLOT Molesieve Chromatograms

	Page		Page
Noble Gases	430	N ₂ O II	388
Permanent Gases	430		

HP-PLOT Molesieve

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.32	30	12.00	-60 to 300	19091P-MS4
0.32	15	25.00	-60 to 300	19091P-MS7
0.32	30	25.00	-60 to 300	19091P-MS8
0.53	15	25.00	-60 to 300	19095P-MS5
0.53	30	25.00	-60 to 300	19095P-MS6
0.53	15	50.00	-60 to 300	19095P-MS9
0.53	30	50.00	-60 to 300	19095P-MS0

HP-PLOT Q

- Bonded polystyrene-divinylbenzene based column
- A PLOT column with polarity between Porapak-Q and Porapak-N
- Excellent column for C1 to C3 isomers and Alkanes to C12, CO₂, methane, air/CO, oxygenated compounds, sulfur compounds and solvents
- A PLOT column to replace packed gas-solid columns
- Separates ethane, ethylene and ethyne (acetylene)
- Improved resolution in less time than conventional packed columns
- Minimal conditioning time required—1 hour
- Preferred “Q” column due to its robust nature

Similar Phases: CP PoraPLOT Q, CP PoraPLOT Q-HT, Rt-QPLOT, SupelQ PLOT, GS-Q

HP-PLOT Q Chromatograms

	Page		Page
Baseline Resolution of Air/CO, CO ₂ , and Methane in a Natural Gas Sample	430	Oxygenates	439
Ethylene Oxide Synthetic Standard N ₂ O I	439 388	Refinery Gas I	435

HP-PLOT Q

ID (mm)	Length (m)	Film (μm)	Temp Limits (°C)	Part No.
0.32	15	20.00	-60 to 270/290	19091P-Q03
0.32	30	20.00	-60 to 270/290	19091P-Q04
0.53	15	40.00	-60 to 270/290	19095P-Q03
0.53	30	40.00	-60 to 270/290	19095P-Q04

Particle Traps for Use with PLOT Columns

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

Particle Traps for Use with PLOT Columns

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

GS-Q

- Porous divinylbenzene homopolymer
- A PLOT column with polarity between Porapak-Q and Porapak-N
- Separates ethane, ethylene and ethyne (acetylene)
- Not recommended for quantification of polar compounds
- Minimal conditioning time required—1 hour

Similar Phases: CP PoraPLOT Q, CP PoraPLOT Q-HT, Rt-QPLOT, SupelQ PLOT, HP-Q PLOT

GS-Q Chromatograms

	Page
Sulfur Gas Analysis in Light Hydrocarbon Streams II	436

GS-Q

GS-Q

ID (mm)	Length (m)	Temp Limits (°C)	Part No.
0.32	30	-60 to 250	113-3432
0.53	10	-60 to 250	115-34H2
0.53	15	-60 to 250	115-3412
0.53	25	-60 to 250	115-3422
0.53	30	-60 to 250	115-3432

HP-PLOT U

- Bonded divinylbenzene/ethylene glycol dimethacrylate
- More polar than HP-PLOT Q
- Excellent column for C1 to C7 hydrocarbons, CO₂, methane, air/CO, water, oxygenates, amines, solvents, alcohols, ketones, and aldehydes
- Improved resolution in less time than conventional packed columns

Similar Phases: PoraPlot U, RTU PLOT

HP-PLOT U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.32	30	0.10	-60 to 190	19091P-U04
0.53	15	0.20	-60 to 190	19095P-U03
0.53	30	0.20	-60 to 190	19095P-U04

Metal DB-ProSteel

- Excellent inertness
- Virtually unbreakable
- Available in a wide variety of stationary phases
- Bonded and cross-linked
- Ideal for high temperature analysis and process applications

Our easy to handle DB-ProSteel metal columns are deactivated with a new formula (this is not glass lined steel) to provide inertness which truly rivals fused silica. DB-ProSteel metal columns can be custom wound upon request for small GC ovens. Several of our most popular bonded phases are available in metal.

DB-ProSteel GC columns have the same outer diameter as standard Megabore (0.53 mm ID), so no special ferrules are required.

DB-ProSteel

Phase	ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
DB-PS2887	0.53	10	3.00	-60 to 350	145-2814
DB-PS1	0.53	15	0.15	-60 to 340/360	145-1011
DB-PSWAX	0.53	30	1.00	20 to 230/240	145-7032
DB-PS624	0.53	30	3.00	-20 to 260	145-1334

Non-Bonded Stationary Phases

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

HP-101

- 100% Dimethylpolysiloxane

Similar Phases: OV-101, SP 200, DB-1, HP-1

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

HP-101

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	25	0.20	-60 to 280	19091Y-102
0.32	25	0.30	-60 to 280	19091Y-012
0.32	50	0.30	-60 to 280	19091Y-015

HP-17

- 50% Phenyl and 50% Methyl siloxane

Similar Phases: OV-17, SP-2250, DB-17, HP-50+

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

HP-17

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.53	10	2.00	25 to 260/280	19095L-121

GC Columns

Non-Bonded Phases

Carbowax 20M and HP-20M

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

Similar Phases: DB-WAX, HP-INNOWax, DB-WAXetr

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

Carbowax 20M

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	30	0.25	60 to 220/240	112-2032
0.32	30	0.25	60 to 220/240	113-2032

HP-20M

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.20	25	0.10	60 to 220	19091W-102
0.20	50	0.10	60 to 220	19091W-105
0.32	25	0.30	60 to 220	19091W-012
0.32	50	0.30	60 to 220	19091W-015
0.53	10	1.33	60 to 220	19095W-121
0.53	30	1.33	60 to 220	19095W-123

CAM

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

Similar Phases: Stabilwax-DB, Carbowax Amine

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

CAM Chromatograms

	Page		Page
Amines in Water	405	Primary Amines	404

CAM

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	15	0.25	60 to 220/240	112-2112
0.25	30	0.25	60 to 220/240	112-2132
0.25	30	0.50	60 to 220/240	112-2133
0.25	60	0.25	60 to 220/240	112-2162
0.32	30	0.25	60 to 220/240	113-2132
0.32	30	0.50	60 to 220/240	113-2133
0.53	30	1.00	60 to 200/220	115-2132

DX-1 and DX-4

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

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

DX-1

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.32	30	0.25	50 to 250/270	123-6432
0.32	30	1.00	50 to 250/270	123-6133
0.32	60	0.25	50 to 250/270	123-6462

DX-4

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	30	0.25	50 to 250/270	122-6432
0.25	60	0.25	50 to 250/270	122-6462
0.32	15	0.25	50 to 250/270	123-6412
0.32	30	0.25	50 to 250/270	123-6432
0.32	60	0.25	50 to 250/270	123-6462

GC Columns

SE Series GC columns

SE-30 and SE-54

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

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

SE-30

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.32	30	0.25	0 to 325/350	113-3032

SE-54

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
0.25	30	0.25	0 to 325/350	112-5432
0.25	60	0.25	0 to 325/350	112-5462
0.32	30	0.25	0 to 325/350	113-5432

Custom GC Column Ordering

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

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

Custom columns are ordered under the part number 100-2000. Be sure to provide the details of your desired custom service or column including phase, length, ID, and film thickness.

Contact your local Agilent office or your authorized Agilent Distributor to receive a quote for your Custom Column needs. You can find order forms in the back of the catalog.

Customers in the United States, Canada, and Puerto Rico can request a Custom Column Quote online at www.agilent.com/chem/CustomColumn.

GC Columns

5-inch cage

Columns for the 6850 GC

GC capillary columns are typically wound on 7 inch cages that fit into “standard-sized” GCs like the 6890. The 6850 GC has a smaller oven which requires the use of columns wound on a smaller cage diameter. The 5-inch cage configurations listed here are available as standard products.

If you require a column for your 6850 that is not listed below, simply order part number 100-2000 and specify:

- The standard cage part number, on 5-inch cage, or
- The phase and dimensions (length, internal diameter, film thickness), on 5-inch cage

The price of the 5-inch cage column will be the same as the same column on a standard cage.

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
CAM				
0.32	30	0.25	60 to 220/240	113-2132E
DB-1				
0.10	10	0.10	-60 to 325/350	127-1012E
0.10	10	0.40	-60 to 325/350	127-1013E
0.10	20	0.10	-60 to 325/350	127-1022E
0.25	30	0.25	-60 to 325/350	122-1032E
0.25	30	1.00	-60 to 325/350	122-1033E
0.32	30	1.00	-60 to 325/350	123-1033E
0.32	60	5.00	-60 to 280/300	123-1065E
0.53	15	0.15	-60 to 340/360	125-1011E
0.53	15	1.50	-60 to 300/320	125-1012E
0.53	30	3.00	-60 to 260/280	125-1034E
0.53	30	5.00	-60 to 260/280	125-1035E
DB-5				
0.25	30	0.25	-60 to 325/350	122-5032E
0.32	15	0.25	-60 to 325/350	123-5012E
0.32	30	0.25	-60 to 325/350	123-5032E
0.53	30	1.50	-60 to 300/320	125-5032E
DB-5ms				
0.25	30	1.00	-60 to 325/350	122-5533E
0.32	30	0.25	-60 to 325/350	123-5532E
DB-17				
0.32	30	0.25	40 to 280/300	123-1732E
DB-624				
0.25	30	1.40	-20 to 260	122-1334E
0.25	60	1.40	-20 to 260	122-1364E
0.32	30	1.80	-20 to 260	123-1334E
0.32	60	1.80	-20 to 260	123-1364E
0.53	30	3.00	-20 to 260	125-1334E
0.53	75	3.00	-20 to 260	125-1374E
DB-1301				
0.25	60	1.00	-20 to 280/300	122-1363E

GC Columns 5-inch cage

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
DB-1701				
0.25	30	0.25	-20 to 280/300	122-0732E
0.32	30	0.25	-20 to 280/300	123-0732E
0.32	30	1.00	-20 to 280/300	123-0733E
0.32	60	1.00	-20 to 280/300	123-0763E
0.53	30	1.00	-20 to 260/280	125-0732E
DB-FFAP				
0.32	30	0.25	40 to 250	123-3232E
DB-MTBE				
0.53	30	3.00	35 to 260/280	125-0034E
DB-Petro				
0.25	100	0.50	-60 to 325/350	122-10A6E
DB-Dioxin				
0.25	60	0.15	40 to 250/270	122-2461E
DB-VRX				
0.25	60	1.40	-10 to 260	122-1564E
DB-WAX				
0.10	10	0.10	20 to 250/260	127-7012E
0.25	30	0.25	20 to 250/260	122-7032E
0.25	30	0.50	20 to 240/250	122-7033E
0.32	30	0.25	20 to 250/260	123-7032E
0.32	30	0.50	20 to 240/250	123-7033E
0.32	60	0.50	20 to 240/250	123-7063E
0.53	30	1.00	20 to 230/240	125-7032E
GS-Q				
0.32	30		-60 to 250	115-3432E
HP-1				
0.20	25	0.33	-60 to 325/350	19091Z-102E
0.25	30	0.25	-60 to 325/350	19091Z-433E
0.25	30	1.00	-60 to 325/350	19091Z-233E
0.25	60	1.00	-60 to 325/350	19091Z-236E
0.25	100	0.50	-60 to 325/350	19091Z-530E
0.32	15	0.25	-60 to 325/350	19091Z-411E
0.32	25	0.17	-60 to 325/350	19091Z-012E
0.32	25	0.52	-60 to 325/350	19091Z-112E
0.32	30	0.25	-60 to 325/350	19091Z-413E
0.32	30	1.00	-60 to 325/350	19091Z-213E
0.32	30	3.00	-60 to 325/350	19091Z-513E
0.32	30	5.00	-60 to 300/320	19091Z-713E
0.32	50	0.52	-60 to 325/350	19091Z-115E
0.32	60	1.00	-60 to 325/350	19091Z-216E
0.53	5	2.65	-60 to 260/280	19095S-100E

GC Columns

5-inch cage

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
HP-1				
0.53	10	2.65	-60 to 260/280	19095Z-121E
0.53	15	0.15	-60 to 320/400	19095Z-221E
0.53	15	3.00	-60 to 260/280	19095Z-421E
0.53	30	1.50	-60 to 300/320	19095Z-323E
0.53	30	2.65	-60 to 260/280	19095Z-123E
0.53	30	3.00	-60 to 260/280	19095Z-423E
0.53	30	5.00	-60 to 260/280	19095Z-623E
HP-1ms				
0.25	30	0.25	-60 to 325/350	19091S-933E
0.25	60	0.25	-60 to 325/350	19091S-936E
HP-5				
0.20	25	0.33	-60 to 325/350	19091J-102E
0.25	30	0.25	-60 to 325/350	19091J-433E
0.25	60	0.25	-60 to 325/350	19091J-436E
0.25	60	1.00	-60 to 325/350	19091J-236E
0.32	25	0.52	-60 to 325/350	19091J-112E
0.32	30	0.25	-60 to 325/350	19091J-413E
0.32	30	1.00	-60 to 325/350	19091J-213E
0.53	10	2.65	-60 to 260/280	19095J-121E
0.53	30	0.88	-60 to 300/320	19095J-023E
0.53	30	1.50	-60 to 300/320	19095J-323E
0.53	30	2.65	-60 to 260/280	19095J-123E
HP-5ms				
0.20	25	0.33	-60 to 325/350	19091S-102E
0.25	30	0.25	-60 to 350/325	19091S-433E
0.25	30	1.00	-60 to 325/350	19091S-233E
HP-50+				
0.32	30	0.25	40 to 280/300	19091L-413E
0.53	30	1.00	40 to 260/280	19095L-023E
HP-Blood Alcohol				
0.32	7.5	20.00	-60 to 270/290	19091S-510E
HP-Fast Residual Solvent				
0.53	30	1.00	-20 to 260	19095V-420E
HP-FFAP				
0.20	50	0.30	60 to 240/250	19091F-105E
0.25	30	0.25	60 to 240/250	19091F-433E
0.32	25	0.50	60 to 240/250	19091F-112E
0.32	50	0.50	60 to 240/250	19091F-115E
0.53	15	1.00	60 to 240	19095F-120E
0.53	30	1.00	60 to 240	19095F-123E

GC Columns 5-inch cage

ID (mm)	Length (m)	Film (μm)	Temp Limits ($^{\circ}\text{C}$)	Part No.
HP-INNOWax				
0.25	30	0.25	40 to 260/270	19091N-133E
0.25	30	0.50	40 to 260/270	19091N-233E
0.25	60	0.25	40 to 260/270	19091N-136E
0.32	30	0.25	40 to 260/270	19091N-113E
0.32	30	0.50	40 to 260/270	19091N-213E
0.32	60	0.50	40 to 260/270	19091N-216E
0.53	15	1.00	40 to 240/250	19095N-121E
0.53	30	1.00	40 to 240/250	19095N-123E
HP-PLOT AI203 "KCI"				
0.32	50	8.00	-60 to 200	19091P-K15E
HP-PLOT AI203 "S"				
0.53	50	15.00	-60 to 200	19095P-S25E
HP-PLOT Molesieve				
0.32	30	12.00	-60 to 300	19091P-MS4E
0.53	30	25.00	-60 to 300	19095P-MS6E
0.53	30	50.00	-60 to 300	19095P-MS0E
HP-PLOT Q				
0.32	30	20.00	-60 to 270/290	19091P-Q04E
0.53	15	40.00	-60 to 270/290	19095P-Q03E
0.53	30	40.00	-60 to 270/290	19095P-Q04E
HP-PLOT U				
0.53	30	0.20	-60 to 190	19095P-U04E
HP-PONA				
0.20	50	0.50	-60 to 325/350	19091S-001E
0.25	100	0.50	-60 to 325/350	19091Z-530E
Ultra 1				
0.20	25	0.33	-60 to 325/350	19091A-102E
Ultra 2				
0.20	25	0.33	-60 to 325/350	19091B-102E
0.32	25	0.17	-60 to 325/350	19091B-012E

GC Columns

Quality Control Specifications

Quality Control Specifications

Quality Control Specifications

ID (mm)	Length (m)	Film (µm)	Maximum Allowable Bleed (ΔpA)	RI Tolerance (± I)	Minimum Plates/Meter	Temp Limits (°C)	Part No.
DB-1							
0.18	10	0.18	4	0.5	5150	-60 to 325/350	121-1012
0.18	10	0.40	6	0.5	4850	-60 to 325/350	121-1013
0.18	20	0.18	6	0.5	5150	-60 to 325/350	121-1022
0.18	20	0.40	6	0.5	4850	-60 to 325/350	121-1023
0.18	40	0.40	8	0.5	4600	-60 to 325/350	121-1043
0.20	12	0.33	4	0.5	4800	-60 to 325/350	128-1012
0.20	25	0.33	6	0.5	4800	-60 to 325/350	128-1022
0.20	50	0.33	8	0.5	4650	-60 to 325/350	128-1052
0.25	15	0.10	4	0.5	3900	-60 to 325/350	122-1011
0.25	15	0.25	4	0.5	3900	-60 to 325/350	122-1012
0.25	15	1.00	10	0.5	3500	-60 to 325/350	122-1013
0.25	30	0.10	6	0.5	3900	-60 to 325/350	122-1031
0.25	30	0.25	6	0.5	3900	-60 to 325/350	122-1032
0.25	30	1.00	15	0.5	3500	-60 to 325/350	122-1033
0.25	60	0.10	7	0.5	3700	-60 to 325/350	122-1061
0.25	60	0.25	7	0.5	3700	-60 to 325/350	122-1062
0.25	60	1.00	15	0.5	3300	-60 to 325/350	122-1063
0.32	15	0.10	4	0.5	3100	-60 to 325/350	123-1011
0.32	15	0.25	4	0.5	3100	-60 to 325/350	123-1012
0.32	15	1.00	10	0.5	3000	-60 to 325/350	123-1013
0.32	25	0.52	15	0.5	3100	-60 to 325/350	123-1026
0.32	30	0.10	6	0.5	3100	-60 to 325/350	123-1031
0.32	30	0.25	6	0.5	3100	-60 to 325/350	123-1032
0.32	30	1.00	15	0.5	3000	-60 to 325/350	123-1033
0.32	60	0.10	8	0.5	3000	-60 to 325/350	123-1061
0.32	60	0.25	8	0.5	3000	-60 to 325/350	123-1062
0.32	60	1.00	15	0.5	2800	-60 to 325/350	123-1063
DB-1ms							
0.20	12	0.33	3	0.5	4800	-60 to 340/350	128-0112
0.20	25	0.33	4	0.5	4800	-60 to 340/350	128-0122
0.25	15	0.25	3	0.5	3900	-60 to 340/360	122-0112
0.25	30	0.10	3	0.5	3900	-60 to 340/360	122-0131
0.25	30	0.25	4	0.5	3900	-60 to 340/360	122-0132
0.25	60	0.25	7	0.5	3700	-60 to 340/360	122-0162
0.32	15	0.25	3.5	0.5	3100	-60 to 340/360	123-0112
0.32	30	0.10	3	0.5	3100	-60 to 340/360	123-0131
0.32	30	0.25	4	0.5	3100	-60 to 340/360	123-0132
0.32	60	0.25	8	0.5	3000	-60 to 340/360	123-0162

GC Columns

Quality Control Specifications

Quality Control Specifications (Continued)

ID (mm)	Length (m)	Film (μm)	Maximum Allowable Bleed (ΔpA)	RI Tolerance (\pm I)	Minimum Plates/Meter	Temp Limits ($^{\circ}\text{C}$)	Part No.
DB-5							
0.18	10	0.18	4	0.5	5150	-60 to 325/350	121-5012
0.18	10	0.40	8	0.5	5150	-60 to 325/350	121-5013
0.18	20	0.18	7	0.5	5150	-60 to 325/350	121-5022
0.18	20	0.40	8	0.5	5150	-60 to 325/350	121-5023
0.20	12	0.33	5	0.5	4600	-60 to 325/350	128-5012
0.20	25	0.33	7	0.5	4600	-60 to 325/350	128-5022
0.20	50	0.33	10	0.5	4300	-60 to 325/350	128-5052
0.25	15	0.10	4	0.5	3900	-60 to 325/350	122-5011
0.25	15	0.25	5	0.5	3900	-60 to 325/350	122-5012
0.25	15	1.00	10	0.5	3500	-60 to 325/350	122-5013
0.25	30	0.10	6	0.5	3900	-60 to 325/350	122-5031
0.25	30	0.25	6	0.5	3900	-60 to 325/350	122-5032
0.25	30	1.00	15	0.5	3500	-60 to 325/350	122-5033
0.25	60	0.10	8	0.5	3700	-60 to 325/350	122-5061
0.25	60	0.25	10	0.5	3700	-60 to 325/350	122-5062
0.25	60	1.00	15	0.5	3500	-60 to 325/350	122-5063
0.32	15	0.10	6	0.5	3100	-60 to 325/350	123-5011
0.32	15	0.25	6	0.5	3100	-60 to 325/350	123-5012
0.32	15	1.00	10	0.5	2800	-60 to 325/350	123-5013
0.32	25	0.52	12	0.5	3100	-60 to 325/350	123-5026
0.32	30	0.10	6	0.5	3100	-60 to 325/350	123-5031
0.32	30	0.25	8	0.5	3100	-60 to 325/350	123-5032
0.32	30	1.00	15	0.5	2800	-60 to 325/350	123-5033
0.32	50	1.00	15	0.5	2800	-60 to 325/350	123-5053
0.32	60	0.25	10	0.5	2950	-60 to 325/350	123-5062
0.32	60	1.00	15	0.5	2800	-60 to 325/350	123-5063
DB-5ms							
0.18	20	0.18	3	0.5	4900	-60 to 325/350	121-5522
0.18	40	0.18	3	0.5	4900	-60 to 325/350	121-5542
0.20	12	0.33	3	0.5	4600	-60 to 325/350	128-5512
0.20	25	0.33	4	0.5	4600	-60 to 325/350	128-5522
0.20	50	0.33	5	0.5	4300	-60 to 325/350	128-5552
0.25	15	0.10	2.5	0.5	3700	-60 to 325/350	122-5511
0.25	15	0.25	3	0.5	3700	-60 to 325/350	122-5512
0.25	15	1.00	6	0.5	3500	-60 to 325/350	122-5513
0.25	30	0.10	3	0.5	3700	-60 to 325/350	122-5531
0.25	30	0.25	4	0.5	3700	-60 to 325/350	122-5532
0.25	30	0.50	5	0.5	3700	-60 to 325/350	122-5536
0.25	60	0.10	6	0.5	3500	-60 to 325/350	122-5561
0.25	60	0.25	8.5	0.5	3700	-60 to 325/350	122-5562
0.32	15	0.10	2.5	0.5	3100	-60 to 325/350	123-5511
0.32	15	0.25	3.5	0.5	3000	-60 to 325/350	123-5512

GC Columns

Quality Control Specifications

Quality Control Specifications (Continued)

ID (mm)	Length (m)	Film (µm)	Maximum Allowable Bleed (ΔpA)	RI Tolerance (± I)	Minimum Plates/Meter	Temp Limits (°C)	Part No.
0.32	15	1.00	6	0.5	2800	-60 to 325/350	123-5513
0.32	25	0.52	5	0.5	3000	-60 to 325/350	123-5526
0.32	30	0.10	3	0.5	3100	-60 to 325/350	123-5531
0.32	30	0.25	4	0.5	3000	-60 to 325/350	123-5532
0.32	30	0.50	5	0.5	3000	-60 to 325/350	123-5536
0.32	60	0.10	6	0.5	2800	-60 to 325/350	123-5561
0.32	60	0.25	9	0.5	2800	-60 to 325/350	123-5562
DB-WAX							
0.18	10	0.18	10	2.5	4600	20 to 250/260	121-7012
0.18	20	0.18	15	2.5	4600	20 to 250/260	121-7022
0.18	20	0.30	15	2	4600	20 to 240/250	121-7023
0.18	40	0.30	20	2	4300	20 to 240/250	121-7043
0.25	15	0.25	20	2	3500	20 to 250/260	122-7012
0.25	15	0.50	20	2.5	3300	20 to 240/250	122-7013
0.25	30	0.15	15	2	3600	20 to 250/260	122-7031
0.25	30	0.25	20	2	3500	20 to 250/260	122-7032
0.25	30	0.50	20	2.5	3300	20 to 240/250	122-7033
0.25	60	0.15	15	2.5	3600	20 to 250/260	122-7061
0.25	60	0.25	30	2.5	3500	20 to 250/260	122-7062
0.25	60	0.50	30	2.5	3300	20 to 240/250	122-7063
0.32	15	0.25	20	2	3000	20 to 250/260	123-7012
0.32	15	0.50	20	2	2800	20 to 240/250	123-7013
0.32	30	0.15	15	2	3000	20 to 250/260	123-7031
0.32	30	0.25	20	2	3000	20 to 250/260	123-7032
0.32	30	0.50	20	2	2800	20 to 240/250	123-7033
0.32	60	0.25	30	2	2800	20 to 250/260	123-7062
0.32	60	0.50	30	2	2800	20 to 240/250	123-7063
DB-17							
0.18	20	0.18	10	1	4850	40 to 280/300	121-1722
0.18	20	0.30	15	1	3950	40 to 280/300	121-1723
0.25	15	0.15	10	1	3700	40 to 280/300	122-1711
0.25	15	0.25	10	1	3700	40 to 280/300	122-1712
0.25	15	0.50	15	1	2900	40 to 280/300	122-1713
0.25	30	0.15	10	1	3700	40 to 280/300	122-1731
0.25	30	0.25	10	1	3700	40 to 280/300	122-1732
0.25	30	0.50	15	1	2900	40 to 280/300	122-1733
0.25	60	0.25	15	1	3500	40 to 280/300	122-1762
0.32	15	0.15	10	1	3000	40 to 280/300	123-1711
0.32	15	0.25	10	1	3000	40 to 280/300	123-1712
0.32	15	0.50	15	1	2650	40 to 280/300	123-1713
0.32	30	0.15	10	1	3000	40 to 280/300	123-1731
0.32	30	0.25	10	1	3000	40 to 280/300	123-1732
0.32	30	0.50	15	1	2650	40 to 280/300	123-1733

GC Columns

Quality Control Specifications

Quality Control Specifications (Continued)

ID (mm)	Length (m)	Film (µm)	Maximum Allowable Bleed (ΔpA)	RI Tolerance (± I)	Minimum Plates/Meter	Temp Limits (°C)	Part No.
DB-17ms							
0.18	20	0.18	5.5	1.5	3700	40 to 320/340	121-4722
0.25	15	0.25	5.5	1	3700	40 to 320/340	122-4712
0.25	30	0.25	5.5	1	3700	40 to 320/340	122-4732
0.25	60	0.25	11	1	3500	40 to 320/340	122-4762
0.32	15	0.25	7	1	2800	40 to 320/340	123-4712
0.32	30	0.25	7	1	2800	40 to 320/340	123-4732
DB-35ms							
0.20	25	0.33	5	1	4300	50 to 340/360	128-3822
0.25	15	0.25	5.5	1	3500	50 to 340/360	122-3812
0.25	30	0.25	6	1	3500	50 to 340/360	122-3832
0.25	60	0.25	13	1	3500	50 to 340/360	122-3862
0.32	30	0.25	7.5	1	2800	50 to 340/360	123-3832
DB-200							
0.25	30	0.25	10	1	3500	30 to 300/320	122-2032
0.25	30	0.50	15	1	3500	30 to 300/320	122-2033
0.32	30	0.25	10	1	2800	30 to 300/320	123-2032
0.32	30	0.50	15	1	2800	30 to 300/320	123-2033
DB-225ms							
0.25	15	0.25	15	3	3300	40 to 240	122-2912
0.25	30	0.25	15	3	3300	40 to 240	122-2932
0.25	60	0.25	30	3	3300	40 to 240	122-2962
0.32	30	0.25	15	3	2625	40 to 240	123-2932
0.18	20	0.18	6	1	5150	30 to 340/360	121-1222
0.18	30	0.18	6	1	5150	30 to 340/360	121-1232
0.20	12	0.33	5	1	4600	30 to 340/360	128-1212
DB-XLB							
0.20	25	0.33	6	1	4600	30 to 340/360	128-1222
0.25	15	0.10	4	1	3700	30 to 340/360	122-1211
0.25	15	0.25	6	1	3900	30 to 340/360	122-1212
0.25	30	0.10	4	1	3700	30 to 340/360	122-1231
0.25	30	0.25	6	1	3900	30 to 340/360	122-1232
0.25	30	0.50	9.5	1	3700	30 to 340/360	122-1236
0.25	60	0.25	12	1	3700	30 to 340/360	122-1262
0.32	30	0.25	7.5	1	3000	30 to 340/360	123-1232
0.32	60	0.25	15	1	3000	30 to 340/360	123-1262

Fused Silica Tubing

Deactivated Tubing

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

Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.05	0.36	1	160-2655-1
0.05	0.36	5	160-2655-5
0.05	0.36	10	160-2655-10
0.10	0.19	1	160-1010-1
0.10	0.19	5	160-1010-5
0.10	0.19	10	160-1010-10
0.10	0.36	1	160-2635-1
0.10	0.36	5	160-2635-5
0.10	0.36	5	19091-60620E
0.10	0.36	10	160-2635-10
0.15	0.36	1	160-2625-1
0.15	0.36	5	160-2625-5
0.15	0.36	10	160-2625-10
0.18	0.34	1	160-2615-1
0.18	0.34	5	160-2615-5
0.18	0.34	10	160-2615-10
0.20	0.36	1	160-2205-1
0.20	0.36	5	160-2205-5
0.20	0.36	10	160-2205-10
0.25	0.36	1	160-2255-1
0.25	0.36	5	160-2255-5
0.25	0.36	10	160-2255-10
0.25	0.36	30	160-2255-30
0.32	0.43	1	160-2325-1
0.32	0.43	5	160-2325-5
0.32	0.43	10	160-2325-10
0.32	0.43	30	160-2325-30
0.45	0.67	1	160-2455-1
0.45	0.67	5	160-2455-5
0.45	0.67	10	160-2455-10
0.53	0.67	1	160-2535-1
0.53	0.67	5	160-2535-5
0.53	0.67	10	160-2535-10
0.53	0.67	30	160-2535-30

GC Columns Fused Silica Tubing

Deactivated Fused Silica High Temperature (400°C)

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

ProSteel Deactivated Fused Silica

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

Undeactivated Fused Silica

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

Undeactivated Fused Silica

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

GC Columns

Stationary Phase Applications Guide

GC Columns Stationary Phase Applications Guide

Agilent Phase	Application	Composition	Polarity	Approximate Temp Range (°C)	Similar Phases
General Applications					
HP-1ms, DB-1ms, HP-1, DB-1	Amines, hydrocarbons, pesticides, PCBs, phenols, sulfur compounds, flavors and fragrances	1 Dimethylpolysiloxane	Non-polar	From -60 to 325/350	BP-1, SPB-1, CP-Sil 5, Rtx-1, OV-1, SE-30, 007-1, ZB-1
HP-5ms, DB-5, HP-5	Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides	5% Phenyl 95% dimethyl-polysiloxane	Non-polar	From -60 to 325/350	SPB-5, XTI-5, Mtx-5, CP-Sil 8CB, SE-54, Rtx-5, BPX-5, MDN-5, Rtx-5ms, BP-5, ZB-5
DB-5ms	Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides	5% Phenyl 95% dimethyl arylene siloxane	Non-polar	From -60 to 325/350	Rtx-5ms, PTE-5, CP-Sil 8 CB Low Bleed/MS, BPX-5, AT-5ms
DB-1301	Aroclors, alcohols, pesticides, VOCs	6% Cyanopropyl-phenyl 94% dimethyl polysiloxane	Mid-polar	From -20 to 280/300	DB-1301: Rtx-1301, PE-1301
DB-35, HP-35	CLP-pesticides, aroclors, pharmaceuticals, drugs of abuse	35% Phenyl 65% dimethyl polysiloxane	Mid-polar	From 40 to 300/320	Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35
DB-35ms	CLP-pesticides, aroclors, pharmaceuticals, drugs of abuse	35% Phenyl 65% dimethyl arylene siloxane	Mid-polar	From 50 to 340/360	Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35
DB-1701, DB-1701P	Pesticides, herbicides, TMS sugars, aroclors	14% Cyanopropyl-phenyl 86% dimethyl polysiloxane	Mid-polar	From -20 to 280/300	SPB-1701, CP-Sil 19 CB, Rtx-1701, CB-1701, OV-1701, 007-1701, BPX-10
HP-50+, DB-17	Drugs, glycols, pesticides, steroids	50% Phenyl 50% dimethylpolysiloxane	Mid-polar	From 40 to 280/300	Rtx-50, CP-Sil 19 CB, BPX-50, SP-2250
DB-17ms	Drugs, glycols, pesticides, steroids	50% Phenyl 50% dimethyl arylene siloxane	Mid-polar	From 40 to 320/340	HP-50+, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50
DB-200	Residual solvents, pesticides, herbicides	35% Trifluoropropyl 65% dimethyl polysiloxane	Polar	From 30 to 300/320	Rtx-200
DB-210		50% Trifluoropropyl 50% dimethyl polysiloxane	Polar	From 45 to 240/260	SP-2401
DB-225ms, DB-225	FAMES, alditol acetates, neutral sterols	50% Cyanopropyl-phenyl 50% dimethyl polysiloxane	Polar	From 40 to 220/240	SP-2330, CP-Sil 43 CB, OV-225, Rtx-225, BP-225, 007-225
HP-INNOWax	Alcohols, free organic acids, solvents, essential oils, flavors and fragrances	Polyethylene glycol	Polar	From 40 to 260/270	HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, DB-WAXetr, ZB-WAX
DB-WAX	Solvents, glycols, alcohols	Polyethylene glycol	Polar	From 20 to 250/260	HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, Rtx-WAX, ZB-WAX
CAM	Amines, basic compounds	Polyethylene glycol-base modified	Polar	From 60 to 220/240	Stabilwax-DB, Carbowax Amine
HP-FFAP, DB-FFAP	Organic acids, alcohols, aldehydes, ketones, acrylates	Polyethylene glycol- acid modified	Polar	From 40 to 250	OV-351, SP-1000, Stabilwax-DA, 007-FFAP, Nukol

GC Columns

Stationary Phase Applications Guide

GC Columns Stationary Phase Applications Guide (Continued)

Agilent Phase	Application	Composition	Polarity	Approximate Temp Range (°C)	Similar Phases
General Applications					
HP-1ms, DB-1ms, HP-1, DB-1	Amines, hydrocarbons, pesticides, PCBs, phenols, sulfur compounds, flavors and fragrances	1 Dimethylpolysiloxane	Non-polar	From -60 to 325/350	BP-1, SPB-1, CP-Sil 5, Rtx-1, OV-1, SE-30, 007-1, ZB-1
HP-5ms, DB-5, HP-5	Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides	5% Phenyl 95% dimethylpolysiloxane	Non-polar	From -60 to 325/350	SPB-5, XTI-5, Mtx-5, CP-Sil 8CB, SE-54, Rtx-5, BPX-5, MDN-5, Rtx-5ms, BP-5, ZB-5
DB-5ms	Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides	5% Phenyl 95% dimethyl arylene siloxane	Non-polar	From -60 to 325/350	Rtx-5ms, PTE-5, CP-Sil 8 CB Low Bleed/MS, BPX-5, AT-5ms
DB-1301	Aroclors, alcohols, pesticides, VOCs	6% Cyanopropyl-phenyl 94% dimethyl polysiloxane	Mid-polar	From -20 to 280/300	DB-1301: Rtx-1301, PE-1301
DB-35, HP-35	CLP-pesticides, aroclors, pharmaceuticals, drugs of abuse	35% Phenyl 65% dimethyl polysiloxane	Mid-polar	From 40 to 300/320	Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35
DB-35ms	CLP-pesticides, aroclors, pharmaceuticals, drugs of abuse	35% Phenyl 65% dimethyl arylene siloxane	Mid-polar	From 50 to 340/360	Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35
DB-1701, DB-1701P	Pesticides, herbicides, TMS sugars, aroclors	14% Cyanopropyl-phenyl 86% dimethyl polysiloxane	Mid-polar	From -20 to 280/300	SPB-1701, CP-Sil 19 CB, Rtx-1701, CB-1701, OV-1701, 007-1701, BPX-10
HP-50+, DB-17	Drugs, glycols, pesticides, steroids	50% Phenyl 50% dimethylpolysiloxane	Mid-polar	From 40 to 280/300	Rtx-50, CP-Sil 19 CB, BPX-50, SP-2250
DB-17ms	Drugs, glycols, pesticides, steroids	50% Phenyl 50% dimethyl arylene siloxane	Mid-polar	From 40 to 320/340	HP-50+, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50
DB-200	Residual solvents, pesticides, herbicides	35% Trifluoropropyl 65% dimethyl polysiloxane	Polar	From 30 to 300/320	Rtx-200
DB-210		50% Trifluoropropyl 50% dimethyl polysiloxane	Polar	From 45 to 240/260	SP-2401
DB-225ms, DB-225	FAMES, alditol acetates, neutral sterols	50% Cyanopropyl-phenyl 50% dimethyl polysiloxane	Polar	From 40 to 220/240	SP-2330, CP-Sil 43 CB, OV-225, Rtx-225, BP-225, 007-225
HP-INNOWax	Alcohols, free organic acids, solvents, essential oils, flavors and fragrances	Polyethylene glycol	Polar	From 40 to 260/270	HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, DB-WAXetr, ZB-WAX
DB-WAX	Solvents, glycols, alcohols	Polyethylene glycol	Polar	From 20 to 250/260	HP-20M, SUPELCOWAX 10, CP-WAX 52 CB, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, Rtx-WAX, ZB-WAX
CAM	Amines, basic compounds	Polyethylene glycol-base modified	Polar	From 60 to 220/240	Stabilwax-DB, Carbowax Amine
HP-FFAP, DB-FFAP	Organic acids, alcohols, aldehydes, ketones, acrylates	Polyethylene glycol- acid modified	Polar	From 40 to 250	OV-351, SP-1000, Stabilwax-DA, 007-FFAP, Nukol

GC Columns

Stationary Phase Applications Guide

GC Columns Stationary Phase Applications Guide (Continued)

Agilent Phase	Application	Composition	Polarity	Approximate Temp Range (°C)	Similar Phases
DB-35ms	CLP Pesticides, Chlorinated Herbicides, PCBs, 508.1 Pesticides	35% Phenyl, 65% dimethyl arylene siloxane	Mid-polar	From 50 to 340/360	Rtx-35, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-35
DB-XLB (confirmation column)		Proprietary phase	Non-polar	From 30 to 340/360	Rtx-XLB, MDN-12
HP-5ms, DB-5, HP-5	Semivolatiles by EPA Method 8270	5% Phenyl, 95% dimethylpolysiloxane	Non-polar	From -60 to 325/350	SPB-5, XTI-5, Mtx-5, CP-Sil 8CB, SE-54, Rtx-5, BPX-5, MDN-5, Rtx-5ms
DB-XLB (confirmation column)	PCB Congener Analysis (209 Congeners) CLP Pesticides, Chlorinated Herbicides, PCBs, 508.1 Pesticides	Proprietary phase	Non-polar	From 30 to 340/360	Rtx-XLB, MDN-12
DB-TPH	Leaking Underground Fuel Tank (LUFT) testing	Proprietary phase	Non-polar	From -10 to 290	None
DB-MTBE	MTBE in Soil and Water	Proprietary phase	Non-polar	From 35 to 260/280	None
Specialty Phases - Other					
HP-Fast GC Residual Solvents	Residual Solvents	6% Cyanopropyl-phenyl, 94% dimethyl polysiloxane	Mid-polar	From -20 to 260	DB-624, PE-624, 007-624, 007-502, CP-624, ZB-624
DB-ALC1	Blood Alcohol Testing	Proprietary phase	Mid-polar	From 20 to 260/280	Rtx-BAC1, Rtx-BAC2
DB-ALC2	Blood Alcohol Testing	Proprietary phase	Mid-polar	From 20 to 260/280	Rtx-BAC1, Rtx-BAC2
HP-Blood Alcohol	Blood Alcohol Testing	Proprietary phase	Mid-polar	From -60 to 270/290	None



Tech Support

If you would like help selecting any of Agilent's essential consumables for your method, simply visit www.agilent.com/chem/TechRep to get in touch with your local Agilent Technical Representative.

Environmental/EPA Methods

Many possible column and instrument combinations can be used to obtain successful Environmental and EPA Analyses. Listed below are a few of the columns Agilent would recommend for these analyses. The following recommendations are based upon GCs equipped with split/splitless injectors (except for the volatiles methods). Other column configurations may be suitable with different instrument configurations. To tailor your analytical system to your particular needs, contact your local Agilent office for the best column recommendation.

Environmental/EPA Methods

Analyte Type	EPA Method Reference	Common Sample Preparation	Detector Types	Sample Matrix	Recommended Agilent Column
Volatiles					
Trihalomethanes	501	Purge and trap, direct injection, headspace	ELCD, ECD	Drinking water	124-1534, 124-1334
Volatile Organic Compounds (VOCs)	502.2, 8021, CLP-Volatiles	Purge and trap, direct injection, headspace	PID, ELCD	Drinking water, waste water, solid wastes	124-1574, 124-1374
Purgeable Halogenated Organics	601, 8010	Purge and trap, headspace for screening	PID, ELCD	Waste water, solid wastes	124-1574, 124-1374
Purgeable Aromatic Organics	503.1, 602, 8020	Purge and trap, headspace for screening	PID	Drinking water, waste water, solid wastes	124-1534, 124-1334
Volatile Organic Compounds (VOCs) Using MSD	524.2, 624, 8240, 8260, CLP-VOCs	Purge and trap, direct injection, headspace	MSD	Drinking water, waste water, solid wastes	122-1564, 122-1364, 19091R-306
Volatile Organic Compounds (VOCs) Using 5973 MSD	524.2, 624, 8240, 8260, CLP-VOCs	Purge and trap, direct injection, headspace	MSD (5973)	Drinking water, waste water, solid wastes	121-1524, 121-1324
EDB and DBCP	504.1, 8011	Microextraction with Hexane	ECD	Drinking water, solid wastes	121-1324, 124-1534
Acrylonitrile and Acrolein	603, 8015, 8031	Purge and trap, liquid extraction, sonication	FID, NPD	Waste water, solid wastes	124-1334, 124-1534
Semivolatiles					
Semivolatile Organic Compounds	525, 625, 8270	Liquid extraction, sonication, soxhlet extraction, SPE	MSD	Drinking water, waste water, solid wastes	19091S-133
Phenols	528, 604, 8040, 8041	Liquid extraction, sonication, soxhlet extraction, derivatization	ECD, FID	Waste water, solid wastes	122-5532, 122-1232, 125-5532, 125-6837
Phthalate Esters	506, 606, 8060, 8061	Liquid extraction, sonication, soxhlet extraction, SPE	ECD, FID	Drinking water, waste water, solid wastes	122-5532, 125-5532, 125-6837
Benzidines	605	Liquid extraction	ECD	Waste water	122-5532, 125-5532, 125-6837
Nitrosamines	607, 8070	Liquid extraction, sonication, soxhlet extraction, SPE	NPD	Waste water, solid wastes	122-5532, 125-5532

GC Columns

Environmental/EPA Methods/USP GC Phases

Environmental/EPA Methods (Continued)

Analyte Type	EPA Method Reference	Common Sample Preparation	Detector Types	Sample Matrix	Recommended Agilent Column
Nitroaromatics and Isophorone	609, 8090	Liquid extraction, sonication, soxhlet extraction, SPE	ECD, FID	Waste water, solid wastes	19091S-133, 125-5532, 125-6837
Polynuclear Aromatic Hydrocarbons (PAHs)	610, 8100	Liquid extraction, sonication, soxhlet extraction, SPE	FID	Waste water, solid wastes	122-5532, 123-5532, 122-0132
Chlorinated Hydrocarbons	612, 8120, 8121	Liquid extraction, sonication, soxhlet extraction, SPE	ECD	Waste water, solid wastes	123-5536, 19091S-113, 123-103E
Chlorinated Disinfection Byproducts	551, 551.1A	Liquid extraction, derivatization	ECD	Drinking water	122-5533, 122-1033
Halogenated Acetic Acids	552, 552.1, 552.2	Liquid extraction, derivatization	ECD	Drinking water	123-3832, 123-1236
Pesticides, Herbicides, and PCBs					
Organochlorine Pesticides and PCBs	552, 552.1, 552.2	Liquid extraction, derivatization	ECD	Drinking water	123-3832, 123-1236

United States Pharmacopoeia (USP) GC Phases

USP	Phase Composition	Agilent Phase Recommendation
G1	Dimethylpolysiloxane oil	HP-1*, DB-1*, HP-1ms*, DB-1ms*
G2	Dimethylpolysiloxane gum	HP-1*, DB-1*, HP-1ms*, DB-1ms*
G3	50% Phenyl - 50% methylpolysiloxane	DB-17*, HP-50+*
G5	3-cyanopropyl polysiloxane	DB-23
G6	Trifluoropropylmethylpolysilicone	DB-200, DB-210
G7	50% 3-cyanopropyl - 50% phenylmethylsilicone	DB-225, DB-225ms
G14	Polyethylene glycol (average molecular weight of 950-1,050)	DB-WAX
G15	Polyethylene glycol (average molecular weight of 3,000-3,700)	DB-WAX
G16	Polyethylene glycol (average molecular weight of 15,000)	DB-WAX*
G17	75% Phenyl - 25% methylpolysiloxane	DB-17, HP-50+
G19	25% Phenyl - 25% cyanopropylmethylsilicone	DB-225*, DB-225ms
G20	Polyethylene glycol (average molecular weight of 380-420)	DB-WAX
G25	Polyethylene glycol TPA (Carbowax 20M terephthalic acid)	DB-FFAP*, HP-FFAP*
G27	5% Phenyl - 95% methylpolysiloxane	DB-5*, HP-5*, HP-5ms*, DB-5ms
G28	25% Phenyl - 75% methylpolysiloxane	DB-35, HP-35, DB-35ms
G32	20% Phenylmethyl - 80% dimethylpolysiloxane	DB-35, HP-35, DB-35ms
G35	Polyethylene glycol & diepoxide esterified with nitroterephthalic acid	DB-FFAP*, HP-FFAP*
G36	1% Vinyl - 5% phenylmethylpolysiloxane	DB-5, HP-5, HP-5ms, DB-5ms
G38	Phase G1 plus a tailing inhibitor	DB-1, HP-1, HP-1ms, DB-1ms
G39	Polyethylene glycol (average molecular weight of 1,500)	DB-WAX
G41	Phenylmethyl dimethylsilicone (10% phenyl substituted)	DB-5, HP-5, HP-5ms, DB-5ms
G42	35% Phenyl - 65% dimethylvinylsiloxane	DB-35*, HP-35*, DB-35ms
G43	6% Cyanopropylphenyl - 94% dimethylpolysiloxane	DB-624*, DB-1301
G45	Divinylbenzene-ethylene glycol-dimethacrylate	HP-PLOT U*
G46	14% Cyanopropylphenyl - 86% methylpolysiloxane	DB-1701*

*Indicates an exact equivalent

ASTM Methods

Method Designation	Method Title	Column Recommendation	Part No.
D 1945	Standard Test Method for the Analysis of Natural Gas by GC	HP-PLOT Q, 15 m x 0.53 mm, 40.00 μm	19095P-MS9
		HP-PLOT Q, 15 m x 0.53 mm, 40.00 μm	19095P-Q03
D 1946	Standard Test Method for the Analysis of Reformed Gas by GC	HP-PLOT MoleSieve, 15 m x 0.53 mm, 50.00 μm	19095P-MS9
		HP-PLOT Q, 15 m x 0.53 mm, 40.00 μm	19095P-Q03
D 1983	Standard Test Method for Fatty Acid Composition by Gas-Liquid Chromatography of Methyl Esters	DB-WAX, 30 m x 0.25 mm, 0.25 μm	122-7032
D 2163	Standard Test Method for the Analysis of Liquified Petroleum (LP) Gases and Propene Concentrates by GC	HP-PLOT Al2O3 "KCI", 30 m x 0.53 mm, 15.00 μm	19095P-K23
		HP-PLOT Al2O3 "S", 30 m x 0.53 mm, 15.00 μm	19095P-S23
D 2268	Standard Test Method for Analysis of High-Purity n-Heptane and Isooctane by Capillary GC	DB-1, 60 m x 0.25 mm, 0.50 μm	122-106E
D 2306	Standard Test Method for C8 Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.25 mm, 0.25 μm	19091N-136
D 2426	Standard Test Method for Butadiene Dimer and Styrene in Butadiene Concentrates by GC	DB-1, 30 m x 0.53 mm, 5.00 μm	125-1035
D 2427	Standard Test Method for Determination of C2 through C5 Hydrocarbons in Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 μm	125-1035
		GS-Alumina, 30 m x 0.53 mm,	115-3532
D 2504	Standard Test Method for Noncondensable Gases in C2 and Lighter Hydrocarbon Products by GC	HP-PLOT MoleSieve, 30 m x 0.53 mm, 50.00 μm	19095P-MS0
D 2505	Standard Test Method for Ethylene, Other Hydrocarbons, and Carbon Dioxide in High-Purity Ethylene by GC	GS-GasPro, 60 m x 0.32 mm,	113-4362
D 2593	Standard Test Method for Butadiene Purity and Hydrocarbon Impurities by GC	GS-Alumina, 30 m x 0.53 mm,	115-3532
D 2712	Standard Test Method for Hydrocarbon Traces in Propylene Concentrates by GC	GS-Alumina, 50 m x 0.53 mm,	115-3552
D 2804	Standard Test Method for Purity of Methyl Ethyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 μm	125-7032
		DB-210, 15 m x 0.53 mm, 1.00 μm	125-0212
D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 μm	125-2814
Extended D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC, to C60	HP-1, 10 m x 0.53 mm, 0.88 μm	19095Z-021
		HP-1, 5 m x 0.53 mm, 0.88 μm	19095Z-020
D 2908	Standard Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection GC		
D 3054	Standard Test Method for Analysis of Cyclohexane by GC	DB-1, 60 m x 0.32 mm, 0.50 μm	123-106E
D 3257	Standard Test Method for Aromatics in Mineral Spirits by GC	DB-624, 30 m x 0.53 mm, 3.00 μm	125-1334
D 3329	Standard Test Method for Purity of Methyl Isobutyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 μm	125-7032
		DB-624, 30 m x 0.45 mm, 2.55 μm	124-1334
D 3432	Standard Test Method for Unreacted Toluene Diisocyanates in Urethane Prepolymers and Coating Solutions by GC	HP-1MS, 30 m x 0.32 mm, 1.00 μm	19091S-713

GC Columns

ASTM Methods

ASTM Methods (Continued)

Method Designation	Method Title	Column Recommendation	Part No.
D 3447	Standard Test Method for Purity of Halogenated Organic Solvents	DB-624, 30 m x 0.53 mm, 3.00 μ m	125-1334
D 3545	Standard Test Method for Alcohol Content and Purity of Acetate Esters by GC	DB-624, 30 m x 0.53 mm, 3.00 μ m	125-1334
D 3687	Standard Test Method for Analysis of Organic Vapors Collected by the Activated Charcoal Tube Adsorption Method	DB-WAX, 30 m x 0.53 mm, 1.00 μ m	125-7032
		DB-WAX, 30 m x 0.53 mm, 1.00 μ m	124-7032
D 3695	Standard Test Method for Volatile Alcohols in Water by Direct Aqueous-Injection GC	DB-WAX, 30 m x 0.53 mm, 1.00 μ m	125-7032
D 3710	Standard Test Method for Boiling Range Distribution of Gasoline and Gasoline Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 μ m	125-2814
D 3760	Standard Test Method for Analysis of Isopropylbenzene (Cumene) by GC	DB-WAX, 60 m x 0.32 mm, 0.25 μ m	123-7062
		HP-1, 50 m x 0.32 mm, 0.52 μ m	19091Z-115
D 3797	Standard Test Method for Analysis of o-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 μ m	19091N-216
D 3798	Standard Test Method for Analysis of p-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 μ m	19091N-216
D 3871	Standard Test Method for Purgeable Organic Compounds in Water Using Headspace Sampling	DB-VRX, 75 m x 0.45 mm, 2.55 μ m	124-1574
D 3893	Standard Test Method for Purity of Methyl Amyl Ketone and Methyl Isoamyl Ketone by GC	DB-VRX, 30 m x 0.45 mm, 2.55 μ m	124-1534
D 3973	Standard Test Method for Low-Molecular Weight Halogenated Hydrocarbons in Water	DB-VRX, 30 m x 0.45 mm, 2.55 μ m	124-1534
D 4415	Standard Test Method for Determination of Dimer in Acrylic Acid	DB-FFAP, 30 m x 0.32 mm, 0.25 μ m	123-3232
D 4424	Standard Test Method for Butylene Analysis by GC	HP-PLOT Al2O3 "S", 50 m x 0.53 mm, 15.00 μ m	19095P-S25
D 4443	Standard Test Method for Residual Vinyl Chloride Monomer Content in PPB Range in Vinyl Chloride Homo- and Co-Polymers by Headspace GC	DB-VRX, 30 m x 0.45 mm, 2.55 μ m	124-1534
D 4735	Standard Test Method for Determination of Trace Thiophene in Refined Benzene by GC	DB-FFAP, 30 m x 0.45 mm, 0.85 μ m	124-3232
D 4773	Standard Test Method for Propylene Glycol Monomethyl Ether, Dipropylene Glycol Monomethyl Ether, and Propylene Glycol Monomethyl Ether Acetate	Custom	100-2000
D 4864	Standard Test Method for Determination of Traces of Methanol in Propylene Concentrates by GC	DB-WAX, 30 m x 0.45 mm, 0.85 μ m	124-7032
D 4947	Standard Test Method for Chlordane and Heptachlor Residues in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 μ m	125-5032
		DB-608, 30 m x 0.53 mm, 0.83 μ m	125-1730
D 4961	Standard Test Method for GC Analysis of Major Organic Impurities in Phenol Produced by the Cumene Process	DB-FFAP, 30 m x 0.45 mm, 0.85 μ m	124-3232
		HP-PLOT Q, 15 m x 0.53 mm, 40.00 μ m	19095P-Q03
D 4983	Standard Test Method for Cyclohexylamine Morpholine and Diethylaminoethanol in Water and Condensed Steam by Direct Aqueous Injection GC	HP-5MS, 30 m x 0.32 mm, 1.00 μ m	19091S-213
		CAM, 30 m x 0.53 mm, 1.00 μ m	115-2132

ASTM Methods (Continued)

Method Designation	Method Title	Column Recommendation	Part No.
D 5008	Standard Test Method for Ethyl Methyl Pentonal Content and Purity Value of 2-Ethylhexanol by GC	HP-1, 15 m x 0.53 mm, 5.00 μ m	19095Z-621
		HP-INNOWax, 30 m x 0.32 mm, 0.25 μ m	19091N-113
D 5060	Standard Test Method for Determining Impurities in High-Purity Ethylbenzene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 μ m	19091N-216
D 5075	Standard Test Method for Nicotine in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 μ m	125-5032
		DB-5, 30 m x 0.32 mm, 1.00 μ m	123-5033
D 5134	Standard Test Method for Detailed Analysis of Petroleum Naphthas Through n-Nonane by Capillary GC	HP-PONA, 50 m x 0.20 mm, 0.50 μ m	19091S-001
D 5135	Standard Test Method for Analysis of Styrene by Capillary GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 μ m	19091N-216
D 5175	Standard Test Method for Organohalide Pesticides and Polychlorinated Biphenyls in Water by Microextraction and GC	DB-1, 30 m x 0.32 mm, 1.00 μ m	123-1033
		DB-608, 30 m x 0.32 mm, 0.50 μ m	123-1730
		DB-XLB, 30 m x 0.25 mm, 0.25 μ m	122-1232
D 5303	Standard Test Method for Trace Carbonyl Sulfide in Propylene by GC	GS-GasPro, 30 m x 0.32 mm,	113-4332
		HP-PLOT Q, 30 m x 0.53 mm, 40.00 μ m	19095P-004
D 5307	Standard Test Method for Determination of Boiling Range Distribution of Crude Petroleum by GC	HP-1, 7.5 m x 0.53 mm, 5.00 μ m	19095Z-627
D 5310	Standard Test Method for Tar Acid Composition by Capillary GC	HP-5MS, 30 m x 0.25 mm, 0.25 μ m	19091S-433
		DB-225ms, 30 m x 0.25 mm, 0.25 μ m	122-2932
D 5316	Standard Test Method for 1, 2-Dibromoethane and 1, 2-Dibromo-3-Chloropropane in Water by Microextraction and GC	HP-1MS, 30 m x 0.32 mm, 1.00 μ m	19091S-713
		DB-624, 30 m x 0.45 mm, 2.55 μ m	124-1334
D 5317	Standard Test Method for Determination of Chlorinated Organic Acid Compounds in Water by GC with Electron Capture Detector	HP-5MS, 30 m x 0.25 mm, 0.25 μ m	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 μ m	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 μ m	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 μ m	122-3832
D 5320	Standard Test Method for Determination of 1, 1-Trichloroethane and Methylene Chloride in Stabilized Trichloroethylene and Tetrachloroethylene	DB-1, 30 m x 0.53 mm, 3.00 μ m	125-1034
		DB-VRX, 30 m x 0.32 mm, 1.80 μ m	123-1534
D 5399	Standard Test Method for Boiling Point Distribution of Hydrocarbon Solvents by GC	DB-2887, 30 m x 0.32 mm, 1.80 μ m	125-2814
D 5441	Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBD) by GC	HP-PONA, 50 m x 0.20 mm, 0.50 μ m	19091S-001
		DB-Petro, 100 m x 0.25 mm, 0.50 μ m	122-10A6
D 5442	Standard Test Method for Analysis of Petroleum Waxes by GC	DB-1, 25 m x 0.32 mm, 0.25 μ m	123-1022
		DB-5, 15 m x 0.25 mm, 0.25 μ m	122-5012
D 5475	Standard Test Method for Nitrogen- and Phosphorus-Containing Pesticides in Water by GC with a Nitrogen Phosphorus Detector	HP-5MS, 30 m x 0.25 mm, 0.25 μ m	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 μ m	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 μ m	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 μ m	122-3832
D 5480	Standard Test Method for Engine Oil Volatility by GC	DB-PS1, 15 m x 0.53 mm, 0.15 μ m	145-1011
D 5501	Standard Test Method for Determination of Ethanol Content of Denatured Fuel Ethanol by GC	HP-1, 100 m x 0.25 mm, 0.50 μ m	19091Z-530
D 5507	Standard Test Method for Determination of Trace Organic Impurities in Monomer Grade Vinyl Chloride by Capillary Column/Multi-dimensional GC	HP-PLOT Q, 15 m x 0.53 mm, 40.00 μ m	19095P-Q03
		HP-PLOT U, 30 m x 0.53 mm, 0.20 μ m	19095P-U04
D 5508	Standard Test Method for Determination of Residual Acrylonitrile Monomer in Styrene-Acrylonitrile Co-polymer Resins and Nitrile-Butadiene Rubber by Headspace Capillary GC	HP-PLOT Q, 30 m x 0.53 mm, 40.00 μ m	19095P-Q04

GC Columns

ASTM Methods

ASTM Methods (Continued)

Method Designation	Method Title	Column Recommendation	Part No.
D 5580	Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, C9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 μ m	125-1035
D 5599	Standard Test Method for Determination of Oxygenates in Gasoline by GC and Oxygen Selective Flame Ionization Detection	DB-5, 30 m x 0.25 mm, 0.25 μ m	122-5032
D 5623	Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by GC and Sulfur Selective Detection	HP-1, 30 m x 0.32 mm, 4.00 μ m	19091Z-613
D 5713	Standard Test Method for Analysis of High Purity Benzene for Cyclohexane Feedstock by Capillary GC	DB-Petro, 50 m x 0.20 mm, 0.50 μ m	128-1056
D 5739	Standard Practice for Oil Spill Source Identification by GC and Positive Ion Electron Impact Low Resolution Mass Spectrometry	DB-5, 30 m x 0.25 mm, 0.25 μ m DB-TPH, 30 m x 0.32 mm, 0.25 μ m	122-5032 123-1632
D 5769	Standard Test Method for Determination of Benzene, Toluene, and Total Aromatics in Finished Gasoline by GC/MS	HP-1, 60 m x 0.25 mm, 1.00 μ m	19091Z-236
D 5790	Standard Test Method for Measurement of Purgeable Organic Compounds in Water by Capillary Column GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 μ m DB-VRX, 20 m x 0.18 mm, 1.00 μ m DB-624, 60 m x 0.25 mm, 1.40 μ m DB-624, 20 m x 0.18 mm, 1.00 μ m	122-1564 121-1524 122-1364 121-1324
D 5812	Standard Test Method for Determination of Organochlorine Pesticides in Water by Capillary Column GC	HP-5MS, 30 m x 0.25 mm, 0.25 μ m DB-1701P, 30 m x 0.25 mm, 0.25 μ m DB-XLB, 30 m x 0.25 mm, 0.25 μ m DB-35ms, 30 m x 0.25 mm, 0.25 μ m	19091S-433 122-7732 122-1232 122-3832
D 5917	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC and External Calibration	HP-INNOWax, 60 m x 0.32 mm, 0.25 μ m	19091N-116
D 5974	Standard Test Method for Fatty and Rosin Acids in Tall Oil Fraction Products by Capillary GC	DB-23, 60 m x 0.25 mm, 0.25 μ m	122-2362
D 5986	Standard Test Method for Determination of Oxygenates, Benzene, Toluene, C8-C12 Aromatics and Total Aromatics in Finished Gasoline by GC/FTIR	HP-1, 60 m x 0.53 mm, 5.00 μ m	19095Z-626
D 6144	Standard Test Method for Trace Impurities in Alpha-Methylstyrene by Capillary GC	HP-1, 60 m x 0.25 mm, 1.00 μ m	19091Z-236
D 6159	Standard Test Method for Determination of Hydrocarbon Impurities in Ethylene by GC	HP-PLOT Al2O3 "KCl", 50 m x 0.53 mm, 15.00 μ m GS-Alumina, 50 m x 0.53 mm, DB-1, 50 m x 0.53 mm,	19095P-K25 115-3552 125-1035
D 6160	Standard Test Method for Determination of PCBs in Waste Materials by GC	HP-5MS, 30 m x 0.32 mm, 0.25 μ m DB-XLB, 30 m x 0.25 mm, 0.25 μ m	19091S-413 122-1232
D 6352	Standard Test Method for Boiling Range Distribution of Petroleum Distillates in Boiling Range from 174 to 700 by GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 μ m	145-1001
D 6417	Standard Test Method for Estimation of Engine Oil Volatility by Capillary GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 μ m	145-1001
D 2360	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.32 mm, 0.25 μ m	19091N-116
E 1616	Standard Test Method for Analysis of Acetic Anhydride Using GC	HP-1, 50 m x 0.32 mm, 0.52 μ m	19091Z-115
E 1863	Standard Test Method for Analysis of Acrylonitrile By GC	DB-WAXetr, 60 m x 0.32 mm, 1.00 μ m	123-7364
E 202	Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols	DB-624, 30 m x 0.53 mm, 3.00 μ m	125-1334
E 475	Standard Test Method for Assay of Di-tert-Butyl Peroxide Using GC	HP-5, 30 m x 0.53 mm, 5.00 μ m	19095J-623

Capillary Column Installation Quick Reference Guide

For more detailed installation information, refer to the GC Column Installation Guide which is provided with each column.

Precolumn Installation Check List

- Replace oxygen, moisture, and hydrocarbon traps as needed.
- Check gas cylinder pressures to ensure that an adequate supply of carrier, makeup, and fuel gases is available. Minimum recommended carrier gas purity percentages are: Helium 99.995 and Hydrogen 99.995.
- Clean the injection port, replace critical injection port seals, replace injection port liners, and change septa as needed.
- Check detector seals, and replace as necessary. Clean or replace detector jets as necessary.
- Carefully inspect the column for damage or breakage.
- Gather the necessary installation tools: You will need a column cutter, column nuts, ferrules, a magnifying loupe, and typewriter correction fluid.

Installing the Column

- Uncoil approximately 0.5 m of tubing from the column basket at both ends of the column for injector and detector installation. Avoid sharp bends in the tubing.
- Mount the column in the oven. Use the hanging bracket if available.
- Install the column nut and Vespel or graphite ferrule at each column end; pull the nut and ferrule down the tubing approximately 5 cm. (Table 1)
- Score (cut) the column. Use a light touch to score the column about 4 to 5 cm from each end.
- Make a clean break. Grasp the column between the thumb and forefinger as close to the score point as possible. Gently pull and bend the column. The column should part easily. If the column doesn't break easily, don't force it. Score the column again in a different place and try for a clean break.

Table 1. Ferrule Sizes

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

GC and GC/MS

Troubleshooting and Maintenance

- Use a magnifying loupe to inspect the cut. Make sure the cut is square across the tubing with no polyimide or glass fragments at the end of the tube.
- Install the column in the inlet. Check the GC manufacturer's instrument manual for the correct insertion distance. Mark the correct distance on the column with typewriter correction fluid. Insert the column into the injector. Finger tighten the column nut until it starts to grab the column, and then tighten the nut an additional 1/4 to 1/2 turn so that the column cannot be pulled from the fitting when gentle pressure is applied.
- Turn on the carrier gas and establish the proper flow rate. Set head pressure, split flow, and septum purge flow to appropriate levels. See Table 2 (page 331) for nominal head pressures. If using a split/splitless inlet, check that the purge (split) valve is on (open).
- Confirm carrier gas flow through the column. Immerse the end of the column in a vial of solvent and check for bubbles.
- Install the column into the detector. Check the instrument manufacturer's manual for the proper insertion distance.
- Check for leaks. This is very important. Don't heat the column without thoroughly checking for leaks.
- Establish proper injector and detector temperatures.
- Establish proper makeup and detector gas flows. Ignite or turn on the detector.
- Purge the column for a minimum of 10 minutes at ambient temperature. Add the appropriate additional purge time following inlet or trap maintenance.
- Inject a nonretained substance to check for proper injector installation. Examples: butane or methane (FID), headspace vapors from acetonitrile (NPD), headspace vapors from methylene chloride (ECD), air (TCD), argon (mass spectrometer). Proper installation is indicated by a symmetrical peak. If tailing is observed, reinstall the column into the inlet.

GC and GC/MS

Troubleshooting and Maintenance

Conditioning and Testing the Column

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

Table 2. Approximate Head Pressures (psig)

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

GC and GC/MS

Troubleshooting and Maintenance



Figure 1: GC Capillary Column

Capillary GC Columns

On the most basic level, a capillary column is composed of two parts: the tubing and stationary phase (Figure 1). Fused silica (with an external polyimide coating) and stainless steel are the primary tubing materials. There are numerous stationary phases. Most are high molecular weight, thermally stable polymers that are liquids or gums. The most common stationary phases of this type are the polysiloxanes (sometimes incorrectly called silicones) and the polyethylene glycols. The next most common type of stationary phases is small, porous particles composed of polymers or zeolites (e.g., alumina, molecular sieves).

Stationary Phase Selection

If no information or ideas about which stationary phase to use is available, start with a DB-1 or DB-5.

Low bleed (ms) columns are usually more inert and have higher temperature limits.

Use the least polar stationary phase that provides satisfactory resolution and analysis times. Non-polar stationary phases have superior lifetimes to polar phases.

Use a stationary phase with a polarity similar to that of the solutes. This approach works more times than not; however, the best stationary phase is not always found using this technique.

If poorly separated solutes possess different dipoles or hydrogen bonding strengths, change to a stationary phase with a different amount (not necessarily more) of the dipole or hydrogen bonding interaction. Other co-elutions may occur upon changing the stationary phase, thus the new stationary phase may not provide better overall resolution.

If possible, avoid using a stationary phase that contains a functionality that generates a large response with a selective detector. For example, cyanopropyl containing stationary phases exhibit a disproportionately large baseline ridge (due to column bleed) with NPDs.

A DB-1 or DB-5, DB-1701, DB-17 and DB-WAX cover the widest range of selectivities with the smallest number of columns.

PLOT columns are used for the analysis of gaseous samples at above ambient column temperatures.

GC and GC/MS

Troubleshooting and Maintenance

Column Diameter Selection

Use 0.18-0.25 mm ID columns when higher column efficiencies are needed. 0.18 mm ID columns are especially well suited for GC/MS systems with low pumping capacities. Smaller diameter columns have the lowest capacities and require the highest head pressures.

Use 0.32 mm ID columns when higher sample capacity is needed. They often provide better resolution of earlier eluting solutes for splitless injections or large injection volumes ($> 2 \mu\text{l}$) than 0.25 mm ID columns.

Use 0.45 mm ID columns when only a Megabore direct injector is available and higher column efficiency is desired. Well suited for high carrier gas flow rate situations such as with purge & trap and headspace samplers

Use 0.53 mm ID columns when only a Megabore direct injector is available. Well suited for high carrier gas flow rate situations such as with purge & trap and headspace samplers. 0.53 mm ID columns have the highest sample capacities at constant df.

Column Length Selection

Start with 25-30 meter columns when the best length is unknown.

10-15 meter columns are well suited for samples containing very well separated solutes or very few solutes. Shorter lengths are used for very small diameter columns to reduce head pressures.

50-60 meters should be used when resolution is not possible by other means (smaller diameter, different stationary phase, change in column temperature). Best suited for complex samples containing a large number of solutes. Long columns have long analysis times and higher cost.

Column Film Thickness Selection

For 0.18-0.32 mm ID columns, a film thickness of 0.18-0.25 μm is average or standard (i.e., not thin or thick) and used for most analyses.

For 0.45-0.53 mm ID columns, a film thickness of 0.8-1.5 μm is average or standard (i.e., not thin or thick) and used for most analyses.

Thick film columns are used to retain and resolve volatile solutes (e.g., light solvents, gases). Thick columns are more inert and have higher capacities. Thick film columns exhibit higher column bleed and decreased upper temperature limits.

Thin film columns are used to minimize the retention of high boiling, high molecular weight solutes (e.g., steroids, triglycerides). Thin columns are less inert and have lower capacities. Thin film columns exhibit lower column bleed.

GC and GC/MS

Troubleshooting and Maintenance

Equation 1. Average Linear Velocity Carrier Gases

$$\bar{\mu} \text{ (cm/sec)} = \frac{L}{t_m}$$

L = column length (cm)

t_m = retention time of an unretained peak (sec)

Recommended average linear velocities

He: 30-40 cm/sec

H₂: 50-80 cm/sec

Unretained Compounds

Detector Unretained Compound

FID	methane, butane ¹
ECD	methylene chloride ^{2,3} , dichlorodifluoromethane
NPD	acetonitrile ⁴
TCD, MS	methane, butane ¹ , air
PID, ELCD	vinyl chloride

1. From a disposable lighter.
2. Place 1-2 drops in an autosampler vial and tightly cap. Shake and inject 1-2 μ L from the headspace of the vial. Do not inject any liquid.
3. Use a column temperature above 50°C.
4. Use a column temperature above 90°C.

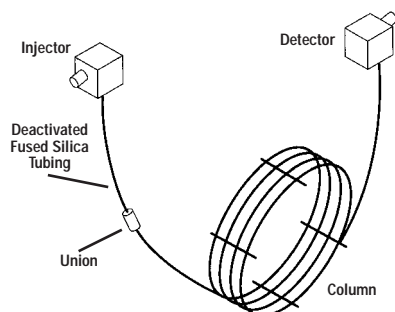
The carrier gas linear velocity or flow rate directly influences retention time and efficiency. The proper selection and setting of the carrier gas are essential to obtaining the best analysis times, efficiency and reproducibility. The carrier gas linear velocity or flow rate is controlled by adjusting the carrier gas pressure at the front of the column (commonly called the head pressure). The pressure setting is dependent on the type of carrier gas, the column length and diameter, column temperature, and the desired linear velocity or flow rate.

For capillary columns, the average linear velocity (μ) is a better and more meaningful measure of the carrier gas than the flow rate (F). The average linear velocity can be thought of as the average "speed" of the carrier gas is cm/sec (i.e., centimeters of column traveled per second by a carrier gas molecule). The average linear velocity is calculated using Equation 1.

Carrier gas linear velocities (and flow rates) are dependent on column temperature. At a constant head pressure, carrier gas linear velocities decrease as column temperature increases. This means the average linear velocity needs to be set at the same temperature for a given method if reproducible results are desired. Setting the average linear velocity at a different column temperature results in retention and resolution changes. Since the average linear velocity is dependent on column temperature, the velocity decreases during a temperature program run. Electronic pressure controlled injectors can be programmed to maintain a constant average linear velocity or flow rate throughout the temperature program. Using this feature may result in better resolution of the later eluting peaks or shorter analysis times.

Contrary to common perception, hydrogen is a safe carrier gas. It is extremely diffusive in air and only explosive when air is present within a narrow concentration range. In other words, it is difficult to create a hydrogen explosion under GC conditions. Finally, safety features built into modern GCs greatly reduce any explosion possibilities and hazards.

Unfortunately, there are no "industry standards" for carrier gas suppliers. What one gas supplier might label "High Purity Helium" may not be suitable for using as a carrier gas. While an impurity trap is not recommended as a substitute for using the right grade of carrier gas, it can minimize the impact of differences from one bottle of carrier gas to the next, and from gas supplier to the next. One of the easiest traps to use is the Big Universal Trap.



Guard Columns or Retention Gap

A guard column and retention gap are the same thing, but they serve different purposes. Both are 1-10 meters of deactivated fused silica tubing attached to the front of the column. Deactivated fused silica tubing does not contain any stationary phase; however, the surface is deactivated to minimize solute interactions. A suitable union is used to attach the tubing to the column. In most cases, the diameter of the retention gap or guard column should be the same as the column. If the tubing sizes are different, it is better to have a larger diameter guard column or retention gap than a smaller one.

Guard columns are used when samples contain nonvolatile residues that may contaminate a column. The nonvolatile residues deposit in the guard column and not in the column. This greatly reduces the interaction between the residues and the sample since the guard column does not retain the solutes (because it contains no stationary phase). Also, the residues do not coat the stationary phase which often results in poor peak shapes. Periodic cutting or trimming of the guard column is usually required upon a build-up of residues. Guard columns are often 5-10 meters in length to allow substantial trimming before the entire guard column has to be replaced. The onset of peak shape problems is the usual indicator that the guard column needs trimming or changing.

Retention gaps are used to improve peak shapes for some types of samples, columns, and GC conditions. Usually a minimum of 3-5 meters of tubing is required to obtain the benefits of a retention gap. The situations that benefit the most from retention gaps are large volume injections ($> 2 \mu\text{l}$) and solvent-stationary phase polarity mismatches for splitless, Megabore direct and on-column injections. Peak shapes are sometimes distorted when using combinations of these conditions. Polarity mismatches occur when the sample solvent and column stationary phase are very different in polarity. The greatest improvement is seen for the peaks eluting closest to the solvent front or solutes very similar to the solvent in polarity. The benefits of a retention gap are often unintentionally obtained when using a guard column.

Causes of Column Performance Degradation

Column Breakage

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

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

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

A union can be installed to repair a broken column. Any suitable union will work to rejoin the column. No more than 2-3 unions should be installed on any one column. Problems with dead volume (peak tailing) may occur with multiple unions.

Thermal Damage

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

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

GC and GC/MS

Troubleshooting and Maintenance

Oxygen Damage

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

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

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

Chemical Damage

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

Inorganic or mineral bases and acids are the primary compounds to avoid introducing in a column. The acids include hydrochloric (HCl), sulfuric (H₂SO₄), nitric (HNO₃), phosphoric (H₃PO₄), and chromic (CrO₃). The bases include potassium hydroxide (KOH), sodium hydroxide (NaOH), and ammonium hydroxide (NH₄OH). Most of these acids and bases are not very volatile and accumulate at the front of the column. If allowed to remain, the acids or bases damage the stationary phase. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). The symptoms are very similar to thermal and oxygen damage. Hydrochloric acid and ammonium hydroxide are the least harmful of the group. Both tend to follow any water that is present in the sample. If the water is not or only poorly retained by the column, the residence time of the HCl and NH₄OH in the column is short. This tends to eliminate or minimize any damage by these compounds. Thus, if HCl or NH₄OH are present in a sample, using conditions or a column with no water retention will render these compounds relatively harmless to the column.

GC and GC/MS

Troubleshooting and Maintenance

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

Since chemical damage is usually limited to the front of the column, trimming or cutting 1/2-1 meter from the front of the column often eliminates any chromatographic problems. In more severe cases, 5 or more meters may need to be removed. The use of a guard column or retention gap will minimize the amount of column damage; however, frequent trimming of the guard column may be necessary. The acid or base often damages the surface of the deactivated fused silica tubing which leads to peak shape problems for active compounds.

Column Contamination

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

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

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

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

GC and GC/MS Troubleshooting and Maintenance

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

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

Solvent Rinsing Columns

Solvent rinsing columns involves removing the column from the GC and passing milliliters of solvent through the column. Any residues soluble in the rinse solvents are washed from the column. Injecting large volumes of solvent while the column is still installed is not rinsing a column nor does it remove any contaminants from the column. A capillary GC column must have a bonded and cross-linked stationary phase before it can be solvent rinsed. Solvent rinsing a nonbonded stationary phase results in severe damage to the column.



Figure 2: Solvent Rinse Kit

A column rinse kit is used to force solvent through the column (Figure 2). The rinse kit is attached to a pressurized gas source (N_2 or He), and the column is inserted into the rinse kit. Solvent is added to the vial, and the vial is pressurized using the gas source. The pressure forces solvent to flow through the column. Residues dissolve into the solvent and are backflushed out of the column with the solvent. The solvent is then purged from the column, and the column is properly conditioned.

Before rinsing a column, cut about 1/2 meter from the front (i.e., injector end) of the column. Insert the detector end of the column into the rinse kit. Multiple solvents are normally used to rinse columns. Each successive solvent must be miscible with the previous one. High boiling point solvents should be avoided especially as the last solvent. The sample solvent(s) is often a good choice.

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

GC and GC/MS

Troubleshooting and Maintenance

Table 3 lists the suggested solvent volumes for different diameter columns. Using larger solvent volumes is not harmful, but rarely better and merely wasteful. After adding the first solvent, pressurize the rinse kit, but stay below 20 psi. Use the highest pressure that keeps the solvent flow rate below 1 ml/min. Except for most 0.53 mm ID columns, the rinse kit pressure will reach 20 psi before the flow rate reaches 1 ml/min. Longer rinse times are required when using heavy or viscous solvents, and for longer or smaller diameter columns. When all or most of the first solvent has entered the column, add the next solvent. The previous solvent does not have to vacate the column before the next solvent is started through the column.

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

Table 3.
Solvent Volumes for Rinsing Columns

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

Using larger volumes will not damage the column

Column Storage

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

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

Evaluating the Problem

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

Checking the Obvious

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

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

The Most Common Problems

Ghost Peaks or Carryover

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

GC and GC/MS

Troubleshooting and Maintenance

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

Condensation Test

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

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

Excessive Baseline Noise

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

GC and GC/MS Troubleshooting and Maintenance

Baseline Instability or Disturbances

Possible Cause	Solution	Comments
Injector contamination	Clean the injector	Try a condensation test; gas lines may also need cleaning
Unequilibrated detector	Allow the detector to stabilize	Some detectors may require up to 24 hours to fully stabilize
Incompletely conditioned column	Fully condition the column	More critical for trace level analyses
Change in carrier gas flow rate during the temperature program	Normal in many cases	MS, TCD and ECD respond to changes in carrier gas flow rate
Column contamination	Trim the column	Remove 1/2-1 meter from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases Check for inlet contamination
Column activity	Irreversible. Replace the column	Only affects active compounds
Solvent-phase polarity mismatch	Change sample solvent	More tailing for the early eluting peaks or those closest to the solvent front
	Use a retention gap	3-5 meter retention gap is sufficient
Solvent effect violation for splitless or on-column injections	Decrease the initial column temperature	Peak tailing decreases with retention
Too low of a split ratio	Increase the split ratio	Flow from split vent should be 20 ml/min or higher
Poor column installation	Reinstall the column	More tailing for the early eluting peaks
Some active compounds always tail	None	Most common for amines and carboxylic acids

Split Peaks

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



Tips & Tools

The sources of baseline disturbances are many. One way to be sure you give your method the best possible chance to be free of these problems is to use quality Agilent Septa and Inlet Liners. These products are manufactured and tested to ensure that they minimize potential contaminants that can cause extra peaks and wavy baselines. Turn to pages 157-158.

GC and GC/MS

Troubleshooting and Maintenance

Retention Time Shift

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

Change in Peak Size

Possible Cause	Solution	Comments
Change in detector response	Check gas flows, temperatures and settings	All peaks may not be equally affected
	Check background level or noise	May be caused by system contamination and not the detector
Change in the split ratio	Check split ratio	All peaks may not be equally affected
Change in the purge activation time	Check the purge activation line	For splitless injection
Change in injection volume	Check the injection technique	Injection volumes are not linear
Change in sample concentration	Check and verify sample concentration	Changes may also be caused by degradation, evaporation, or variances in sample temperature or pH
Leak in the syringe	Use a different syringe	Sample leaks passed the plunger or around the needle; leaks are not often readily visible
Column contamination	Trim the column	Remove 1/2-1 meter from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Column activity	Irreversible	Only affects active compounds
Coelution	Change column temperature or stationary phase	Decrease column temperature and check for the appearance of a peak shoulder or tail
Change in injector discrimination	Maintain the same injector parameters	Most severe for split injections
Sample flashback	Inject less, use a larger liner, reduce the inlet temperature	Less solvent and higher flow rates are most helpful
Decomposition from inlet contamination	Clean the injector; replace liner, gold seal	Only use deactivated liners and glass wool in the inlet

GC and GC/MS

Troubleshooting and Maintenance

Loss of Resolution

Possible Cause	Solution	Comments
Decrease in separation		
Different column temperature	Check the column temperature	Differences in other peaks will be visible
Different column dimensions or phase	Verify column identity	Differences in other peaks will be visible
Coelution with another peak	Change column temperature	Decrease column temperature and check for the appearance of a peak shoulder or tail
Increase in peak width		
Change in carrier gas velocity	Check the carrier gas velocity	A change in the retention time also occurs
Column contamination	Trim the column	Remove 1/2-1 meter from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Change in the injector	Check the injector settings	Typical areas: split ratio, liner, temperature, injection volume
Change in sample concentration	Try a different sample concentration	Peak widths increase at higher concentrations
Improper solvent effect, lack of focusing	Lower oven temperature, better solvent, sample phase polarity match, use a retention gap	For splitless injection

GC Supplies

DB-35ms PAH

DB-35ms PAH Conditions:

Column: DB-35ms
30 m x 0.25 mm ID, 0.25 µm film
P/N: 122-3832
Carrier: Helium, 1.0 mL/min (38 cm/sec), constant flow
Oven: 110°C initial temperature (no hold),
5°/min to 155°,
25°/min to 275°,
2.5°/min to 335° (hold 10 minutes)
Injector: Cool-on-column, oven-track mode
1 µL injection
Detector: 5973 Inert MSD, 280°C transfer line,
300°C source temperature (Agilent Inert Source)

Table Credits:

Agilent wishes to thank the following individuals for graciously providing this data: Louis Vromet, Serge Moore and Sylvain Levesque from the Centre d'Expertise en Analyse Environnementale du Québec, Ministère de l'Environnement du Québec, St-Vincent-de-Paul (Laval), Québec, Canada.

Publication of this data does not constitute an endorsement of the products used in this application by the authors or the Canadian government.

Name	RT	m/z 1	m/z 2
naphthalene-d8	4:30	136.11	134.10
naphthalene	5:27	128.06	127.06
2-methylnaphthalene	7:19	142.08	141.07
1-methylnaphthalene	7:47	142.08	141.07
2-chloronaphthalene	9:14	162.02	164.02
1-chloronaphthalene	9:20	162.02	164.02
1,3-dimethylnaphthalene	9:46	156.09	155.09
acenaphthylene	10:34	152.06	151.06
acenaphthene-d10	10:49	164.14	162.13
acenaphthene	10:54	153.07	154.08
2,3,5-trimethylnaphthalene	11:22	170.11	155.09
fluorene	11:50	166.08	165.07
phenanthrene-d10	13:18	188.14	184.11
phenanthrene	13:20	178.08	176.06
anthracene-d10	13:22	188.14	184.11
anthracene	13:24	178.08	176.06
carbazole	13:48	167.07	166.07
fluoranthene-d10	14:54	212.14	208.11
fluoranthene	14:56	202.08	200.06
pyrene-d10	15:20	212.14	208.11
pyrene	15:23	202.08	200.06
2-methylfluoranthene	15:33	216.09	215.09
benzo[c]phenanthrene	17:28	228.09	226.08
benzo[c]acridine	17:36	229.09	228.08
benzo[a]anthracene-d12	17:56	240.17	236.14
benzo[a]anthracene	18:01	228.09	226.08
chrysene-d12	18:08	240.17	236.14
chrysene	18:14	228.09	226.08
3-methylchrysene	19:15	242.11	241.10
2-methylchrysene	19:26	242.11	241.10
6-methylchrysene	19:34	242.11	241.10
5-methylchrysene	19:36	242.11	241.10
4-methylchrysene	19:42	242.11	241.10
1-nitropyrene	20:19	247.06	201.07

GC Supplies DB-35ms PAH

benzo[b]fluoranthene	22:00	252.09	250.08
7,12-dimethylbenzanthracene	22:02	256.13	241.10
benzo[k]fluoranthene	22:07	252.09	250.08
benzo[j]fluoranthene	22:10	252.09	250.08
benzo[e]pyrene-d12	23:30	264.17	260.14
benzo[e]pyrene	23:31	252.09	250.08
benzo[a]pyrene-d12	23:39	264.17	260.14
benzo[a]pyrene	23:46	252.09	250.08
perylene	24:17	252.09	250.08
3-methylcholanthrene	24:59	268.13	252.09
dibenzo[a,h]acridine	28:10	279.10	277.09
dibenzo[a,j]acridine	28:23	279.10	277.09
dibenzo[a,j]anthracene	28:30	278.11	276.09
dibenzo[a,h]anthracene-d12	29:07	292.20	288.17
dibenzo[a,c]anthracene	29:09	278.11	276.09
indeno[1,2,3cd]pyrene	29:18	276.09	274.08
dibenzo[a,h]anthracene	29:19	278.11	276.09
benzo[g,h,i]perylene-d12	30:45	288.17	284.14
benzo[g,h,i]perylene	30:55	276.09	274.08
7h-dibenzo[c,g]carbazole	31:38	267.10	265.09
anthanthrene	31:43	276.09	274.08
dibenzo[a,e]fluoranthene	36:47	302.11	300.09
dibenzo[a,l]pyrene	37:00	302.11	300.09
dibenzo[a,e]pyrene	38:54	302.11	300.09
coronene	39:11	300.09	298.08
dibenzo[a,i]pyrene	39:59	302.11	300.09
dibenzo[a,h]pyrene	40:32	302.11	300.09

GC and GC/MS Applications

Solvent Retention Data

Solvent Retention Data

DB-624 - Alphabetical Order

Column: DB-624
30 m x 0.53 mm ID, 3 μm

P/N: 125-1334

Oven: 40°C for 5 min
40-260°C at 10°/min
260°C for 3 min

Carrier: Helium, constant pressure
at 30 cm/sec (40°C)

Injector: Split 1:10, 250°C

Detector: FID, 300°C

Warning! Other manufacturer's DB-624 look-a-like columns do not have the same selectivity as Agilent's DB-624. This data cannot be used on their columns. See page 432 for proof.

Retention Time	Compound
10.58	acetal (acetaldehyde diethyl acetal)
2.46	acetaldehyde
9.10	acetic acid
4.05	acetone
4.27	acetonitrile
19.69	acetophenone
3.81	acrolein
12.21	acrylic acid
5.22	acrylonitrile
9.65	allyl ether
6.41	allyl ethyl ether
15.57	amyl acetate
17.45	benzaldehyde
8.69	benzene
18.21	benzotrile
21.07	benzyl acetate
19.27	benzyl alcohol
29.08	benzyl ether
16.39	bromobenzene
7.59	bromochloromethane
10.64	bromodichloromethane
4.27	bromoethane
15.61	bromoform
16.10	1,3-butanediol
17.70	1,4-butanediol
14.14	2,3-butanediol
6.99	2,3-butanedione (diacetal)
9.73	1-butanol
7.19	2-butanone (MEK)
9.87	2-buten-1-ol (crotyl alcohol)
9.02	3-buten-1-ol
15.89	2-butoxyethanol (butyl cellosolve)
13.24	butyl acetate
18.69	butylbenzene
14.41	butyl ether
9.34	butyl ethyl ether
7.10	butyl methyl ether
6.84	butyraldehyde
4.27	carbon disulfide
8.34	carbon tetrachloride
14.25	chlorobenzene
8.25	1-chlorobutane
13.25	chlorodibromomethane
7.75	chloroform
14.21	1-chlorohexane
23.06	1-chloro-4-nitrobenzene
4.57	3-chloropropene (allyl chloride)
19.35	4-chlorostyrene
16.71	2-chlorotoluene
16.82	3-chlorotoluene
16.82	4-chlorotoluene
9.18	crotonaldehyde
8.10	cyclohexane
15.63	cyclohexanol
16.04	cyclohexanone
13.16	cyclopentanol
13.39	cyclopentanone
16.82	decane
27.43	1,10-decanediol
22.65	1-decanol
20.02	1,2-dibromo-3-chloropropane (DBCP)
13.43	1,2-dibromoethane (EDB)
10.37	dibromomethane

Retention Time	Compound	Retention Time	Compound
18.69	1,2-dichlorobenzene	17.68	iso-butylbenzene
17.96	1,3-dichlorobenzene	5.66	iso-butyraldehyde
18.79	1,4-dichlorobenzene	8.81	iso-octane
16.46	<i>trans</i> -1,4-dichloro-2-butene	21.04	isophorone
6.11	1,1-dichloroethane	4.27	iso-propanol
9.62	1,2-dichloroethane (ethylene dichloride)	8.87	iso-propyl acetate
4.00	1,1-dichloroethylene (vinylidene chloride)	15.88	iso-propylbenzene (cumene)
7.16	<i>cis</i> -1,2-dichloroethylene	6.23	iso-propyl ether
5.33	<i>trans</i> -1,2-dichloroethylene	6.01	methacrolein
8.72	1,1-dichloropropane	7.53	methacrylonitrile
10.17	1,2-dichloropropane	2.59	methanol
12.86	1,3-dichloropropane	8.67	2-methoxyethanol (methyl cellosolve)
7.16	2,2-dichloropropane	4.60	methyl acetate
8.34	1,1-dichloropropene	19.90	methyl benzoate
11.38	<i>cis</i> -1,3-dichloropropene	11.87	2-methyl-1-butanol (active amyl alcohol)
12.30	<i>trans</i> -1,3-dichloropropene	8.73	2-methyl-2-butanol (tert-amyl alcohol)
18.24	diethylene glycol	11.78	3-methyl-1-butanol (iso-amyl alcohol)
21.46	diethylene glycol monobutyl ether	9.21	3-methyl-2-butanone
18.04	diethylene glycol monoethyl ether	7.91	2-methyl-3-buten-2-ol
16.78	diethylene glycol monomethyl ether	12.85	3-methyl-2-buten-1-ol
9.92	diglyme (diethylene glycol dimethyl ether)	14.82	2-methylbutyl acetate
20.35	1,3-diisopropylbenzene	4.80	methylene chloride
20.73	1,4-diisopropylbenzene	2.80	methyl formate
12.94	2,4-dimethyl-3-pentanone (diisopropyl ketone)	16.52	5-methyl-3-heptanone
17.06	2,6-dimethyl-4-heptanone (diisobutyl ketone)	14.73	5-methyl-2-hexanone
10.38	1,4-dioxane	11.85	2-methyl-3-pentanone
7.30	1,3-dioxolane	11.64	4-methyl-2-pentanone (MIBK; methyl isobutyl ketone)
13.73	DMF (dimethylformamide)	12.28	4-methyl-2-pentanol
15.58	DMSO (methyl sulfoxide)	13.20	4-methyl-3-penten-3-one
20.58	dodecane	19.60	α-methylphenyl alcohol
11.22	epichlorohydrin	7.88	methyl propionate
3.47	ethanol	19.66	1-methylpyrrolidone
10.98	2-ethoxyethanol (cellosolve)	17.22	α-methylstyrene
15.57	2-ethoxyethyl acetate	17.68	4-methylstyrene
7.34	ethyl acetate	5.30	methyl tert-butyl ether (MTBE)
10.02	ethyl acrylate	12.98	morpholine
14.42	ethylbenzene	20.35	nitrobenzene
21.22	ethyl benzoate	21.60	2-nitrotoluene
12.15	ethylene glycol	22.40	3-nitrotoluene
15.84	ethylene glycol monobutyl ether	22.79	4-nitrotoluene
10.95	ethylene glycol monoethyl ether	19.71	nonanal
8.64	ethylene glycol monomethyl ether	14.63	nonane
3.72	ethyl ether	26.02	1,9-nonanediol
4.27	ethyl formate	20.97	1-nonanol
18.40	2-ethyl-1-hexanol	17.76	octanal
22.65	α-ethylphenethyl alcohol	12.11	octane
23.03	β-ethylphenethyl alcohol	24.54	1,8-octanediol
10.37	ethyl propionate	19.17	1-octanol
3.72	ethyl vinyl ether	17.63	2-octanone
9.18	fluorobenzene	17.45	3-octanone
3.24	fluorotrifluoromethane (Freon 11)	27.10	pentachlorobenzene
3.72	furan	25.26	pentadecane
14.63	furfural	10.25	pentanal (valeraldehyde)
15.32	furfuryl alcohol	3.37	pentane
11.93	glycidol	19.52	1,5-pentanediol
8.65	glyme (propylene glycol dimethyl ether)	10.34	2,3-pentanedione
15.60	heptanal	12.63	1-pentanol
9.15	heptane	10.60	2-pentanol
22.97	1,7-heptanediol	10.60	3-pentanol
17.22	1-heptanol	10.11	2-pentanone
15.63	2-heptanol	10.34	3-pentanone
15.53	3-heptanol	10.20	1-penten-3-ol
15.46	2-heptanone	12.63	2-penten-1-ol
15.29	3-heptanone	10.03	1-penten-3-one (ethyl vinyl ketone)
14.95	4-heptanone	6.93	3-penten-2-one (methyl vinyl ketone)
17.22	<i>trans</i> -2-hepten-1-ol	18.53	pentyl ether
17.22	<i>cis</i> -4-hepten-1-ol	22.65	2-phenoxyethanol
21.69	hexachloro-1,3-butadiene	22.91	4-phenyl-2-butanone (benzyl acetone)
26.63	hexadecane	13.13	1,3-propanediol
13.14	hexanal	6.34	1-propanol
5.82	hexane	6.21	2-propen-1-ol (allyl alcohol)
21.30	1,6-hexanediol	3.91	propionaldehyde
15.06	1-hexanol	11.89	propionic acid
13.31	2-hexanol	7.25	propionitrile
13.16	3-hexanol	10.51	propyl acetate
13.01	2-hexanone	16.56	propylbenzene
12.80	3-hexanone	22.92	propyl benzoate
15.19	<i>cis</i> -2-hexen-1-ol	13.16	propylene glycol (1,2-propanediol)
14.88	<i>cis</i> -3-hexen-1-ol	9.05	propyl ether
14.24	4-hexen-3-one	7.66	propyl formate
14.98	4-hydroxy-4-methyl-2-pentanone	13.07	propyl propionate
18.10	iodobenzene	7.55	2-propyn-1-ol (propargyl alcohol)
4.27	iodomethane	11.70	pyridine
14.75	iso-amyl acetate		
8.60	iso-butanol		
12.19	iso-butyl acetate		

GC and GC/MS Applications Solvent Retention Data

Retention Time	Compound
7.55	sec-butanol
11.76	sec-butyl acetate
17.68	sec-butylbenzene
15.28	styrene
19.46	styrene oxide
8.89	tert-amyl methyl ether
5.01	tert-butanol
10.02	tert-butyl acetate
17.39	tert-butylbenzene
6.90	tert-butyl ethyl ether
19.35	4-tert-butyltoluene
24.02	1,2,4,5-tetrachlorobenzene
14.38	1,1,1,2-tetrachloroethane
16.38	1,1,2,2-tetrachloroethane
12.86	tetrachloroethylene
23.80	tetradecane
10.06	tetrahydrofuran
7.64	THF (tetrahydrofuran)
19.63	m-tolualdehyde
19.63	o-tolualdehyde
19.96	p-tolualdehyde
11.93	toluene
22.23	1,2,3-trichlorobenzene
21.41	1,2,4-trichlorobenzene
20.35	1,3,5-trichlorobenzene
8.05	1,1,1-trichloroethane
12.60	1,1,2-trichloroethane
9.80	trichloroethylene
16.46	1,2,3-trichloropropane
4.00	1,1,2-trichlorotrifluoroethane (Freon 113)
22.24	tridecane
8.91	triethylamine
21.95	triglyme (triethylene glycol dimethyl ether)
18.18	1,2,3-trimethylbenzene (hemimellitene)
17.47	1,2,4-trimethylbenzene (pseudocumene)
16.82	1,3,5-trimethylbenzene (mesitylene)
18.78	undecane
6.37	vinyl acetate
14.62	m-xylene
15.28	o-xylene
14.62	p-xylene

DB-1 - Alphabetical Order

Column: DB-1
30 m x 0.53 mm ID, 3 µm

P/N: 125-1034

Oven: 40°C for 5 min
40-260°C at 10°/min

Carrier: Helium, constant pressure
at 30 cm/sec (40°C)

Injector: Split 1:10, 250°C

Detector: FID, 300°C

Warning! Other manufacturer's DB-1 look-a-like columns may not have the same selectivity as Agilent's DB-1. We do not advise using this data on their columns.

Retention Time	Compound
10.21	acetal (acetaldehyde diethyl acetal)
2.16	acetaldehyde
5.4	acetic acid
3.05	acetone
2.87	acetonitrile
18.13	acetophenone
2.98	acrolein
19.16	acrylic acid
3.43	acrylonitrile
9.05	allyl ether
6.00	allyl ethyl ether
14.04	amyl acetate
15.88	benzaldehyde
8.00	benzene
16.26	benzyl acetate
17.42	benzyl alcohol
27.72	benzyl ether
15.54	bromobenzene
4.79	bromochloromethane
9.22	bromodichloromethane
3.75	bromoethane
14.20	bromoform

Retention Time	Compound
13.30	1,3-butanediol
15.03	1,4-butanediol
11.40	2,3-butanediol
5.09	2,3-butanedione (diacetal)
7.90	1-butanol
5.41	2-butanone (MEK; methyl ethyl ketone)
7.99	2-buten-1-ol (crotyl alcohol)
6.95	3-buten-1-ol
14.72	2-butoxyethanol (butyl cellosolve)
12.36	butyl acetate
14.39	butyl ether
9.18	butyl ethyl ether
6.85	butyl methyl ether
18.24	butylbenzene
5.29	butyraldehyde
4.37	iso-butyraldehyde
4.09	carbon disulfide
8.18	carbon tetrachloride
13.44	chlorobenzene
7.56	1-chlorobutane
11.81	chlorodibromomethane
6.34	chloroform
13.69	1-chlorohexane
21.34	1-chloro-4-nitrobenzene
3.96	3-chloropropene (allyl chloride)
18.56	4-chlorostyrene
16.07	2-chlorotoluene
16.07	3-chlorotoluene
16.07	4-chlorotoluene
7.03	crotonaldehyde
8.32	cyclohexane
14.26	cyclohexanol
14.26	cyclohexanone
11.56	cyclopentanol
11.42	cyclopentanone
11.90	2,4-dimethyl-3-pentanone (diisopropyl ketone)
16.26	2,6-dimethyl-4-heptanone (diisobutyl ketone)
17.12	decane
25.84	1,10-decanediol
21.85	1-decanol
18.50	1,2-dibromo-3-chloropropane (DBCP)
12.10	1,2-dibromoethane (EDB)
8.93	dibromomethane
17.81	1,2-dichlorobenzene
17.20	1,3-dichlorobenzene
17.31	1,4-dichlorobenzene
14.91	trans-1,4-dichloro-2-butene
5.02	1,1-dichloroethane
7.17	1,2-dichloroethane (ethylene dichloride)
3.75	1,1-dichloroethylene (vinylidene chloride)
5.98	cis-1,2-dichloroethylene
6.17	trans-1,2-dichloroethylene
8.55	1,1-dichloropropane
8.93	1,2-dichloropropane
11.35	1,3-dichloropropane
6.34	2,2-dichloropropane
7.85	1,1-dichloropropene
10.20	cis-1,3-dichloropropene
10.80	trans-1,3-dichloropropene
15.60	diethylene glycol
20.26	diethylene glycol monobutyl ether
16.60	diethylene glycol monoethyl ether
15.09	diethylene glycol monomethyl ether
8.68	diglyme (diethylene glycol dimethyl ether)
20.02	1,3-diisopropylbenzene
20.42	1,4-diisopropylbenzene
10.80	DMF (dimethylformamide)
11.94	DMSO (methylsulfoxide)
9.18	1,4-dioxane
4.09	1,3-dioxolane
20.85	dodecane
9.35	epichlorohydrin
2.68	ethanol
9.39	2-ethoxyethanol (cellosolve)
14.40	2-ethoxyethyl acetate
6.21	ethyl acetate
8.93	ethyl acrylate
13.90	ethylbenzene
20.15	ethyl benzoate
8.54	ethylene glycol
14.68	ethylene glycol monobutyl ether
9.35	ethylene glycol monoethyl ether
6.72	ethylene glycol monomethyl ether
3.50	ethyl ether
3.56	ethyl formate
17.42	2-ethyl-1-hexanol
21.38	α-ethylphenethyl alcohol

Retention Time	Compound
21.71	β-ethylphenethyl alcohol
9.42	ethyl propionate
3.50	ethyl vinyl ether
8.36	fluorobenzene
3.23	fluorotrichloromethane (Freon 11)
3.36	furan
12.54	furfural
13.25	furfuryl alcohol
9.10	glycidol
7.56	glyme (propylene glycol dimethyl ether)
14.52	heptanal
9.58	heptane
21.03	1,7-heptanediol
16.13	1-heptanol
14.61	2-heptanol
14.54	3-heptanol
14.26	2-heptanone
14.19	3-heptanone
13.88	4-heptanone
16.13	trans-2-hepten-1-ol
16.02	cis-4-hepten-1-ol
21.46	hexachloro-1,3-butadiene
26.88	hexadecane
11.88	hexanal
6.25	hexane
19.17	1,6-hexanediol
13.81	1-hexanol
12.06	2-hexanol
11.97	3-hexanol
11.60	2-hexanone
11.52	3-hexanone
13.81	cis-2-hexen-1-ol
13.51	cis-3-hexen-1-ol
12.76	4-hexen-3-one
12.89	4-hydroxy-4-methyl-2-pentanone
17.87	iodobenzene
3.75	iodomethane
13.97	iso-amyl acetate
6.74	iso-butanol
11.30	iso-butyl acetate
17.31	iso-butylbenzene
9.27	iso-octane
19.31	isophorone
3.22	iso-propanol
7.88	iso-propyl acetate
6.21	iso-propyl ether
15.43	iso-propylbenzene (cumene)
4.68	methacrolein
5.36	methacrylonitrile
2.15	methanol
6.74	2-methoxyethanol (methyl cellosolve)
3.79	methyl acetate
18.76	methyl benzoate
10.30	2-methyl-1-butanol (active amyl alcohol)
7.14	2-methyl-2-butanol (tert-amyl alcohol)
10.17	3-methyl-1-butanol (iso-amyl alcohol)
7.60	3-methyl-2-butanone
6.17	2-methyl-3-buten-2-ol
11.33	3-methyl-2-buten-1-ol
14.81	2-methylbutyl acetate
3.85	methylene chloride
2.44	methyl formate
15.55	5-methyl-3-heptanone
13.46	5-methyl-2-hexanone
10.59	2-methyl-3-pentanone
10.22	4-methyl-2-pentanone (MIBK; methyl isobutyl ketone)
10.93	4-methyl-2-pentanol
11.90	4-methyl-3-penten-3-one
18.03	α-methylphenyl alcohol
6.78	methyl propionate
17.21	1-methyl-2-pyrrolidone
16.62	α-methylstyrene
16.99	4-methylstyrene
5.06	methyl tert-butyl ether (MTBE)
13.62	morpholine
18.84	nonanal
14.95	nonane
24.33	1,9-nonanediol
20.11	1-nonanol
18.56	nitrobenzene
20.02	2-nitrotoluene
20.72	3-nitrotoluene

GC and GC/MS Applications

Solvent Retention Data

Retention Time	Compound
21.05	4-nitrotoluene
16.80	octanal
12.48	octane
22.73	1,8-octanediol
18.21	1-octanol
16.46	2-octanone
16.46	3-octanone
26.38	pentachlorobenzene
25.51	pentadecane
8.76	(valeraldehyde)
3.51	pentane
17.17	1,5-pentanediol
8.66	2,3-pentanedione
11.11	1-pentanol
9.10	2-pentanol
9.10	3-pentanol
8.46	2-pentanone
8.80	3-pentanone
8.54	1-penten-3-ol
11.11	2-penten-1-ol
8.40	1-penten-3-one (ethyl vinyl ketone)
5.09	3-penten-2-one (methyl vinyl ketone)
18.51	pentyl ether
20.92	2-phenoxyethanol
21.36	4-phenyl-2-butanone (benzyl acetone)
9.95	1,3-propanediol
4.44	1-propanol
4.09	2-propen-1-ol (allyl alcohol)
3.11	propionaldehyde
18.18	propionic acid
4.43	propionitrile
4.57	2-propyn-1-ol (propargyl alcohol)
9.47	propyl acetate
16.07	propylbenzene
21.91	propyl benzoate
9.05	propyl ether
9.90	propylene glycol (1,2-propanediol)
6.48	propyl formate
12.25	propyl propionate
10.21	pyridine
5.80	sec-butanol
10.91	sec-butyl acetate
17.37	sec-butylbenzene
14.55	styrene
18.24	styrene oxide
8.68	tert-amyl methyl ether
3.72	tert-butanol
9.32	tert-butyl acetate
16.99	tert-butylbenzene
6.85	tert-butyl ethyl ether
18.97	4-tert-butyltoluene
23.35	1,2,4,5-tetrachlorobenzene
13.43	1,1,1,2-tetrachloroethane
14.67	1,1,2,2-tetrachloroethane
12.66	tetrachloroethylene
24.06	tetradecane
9.35	tetrahydrofuran
6.75	THF (tetrahydrofuran)
18.23	m-tolualdehyde
18.23	o-tolualdehyde
18.50	p-tolualdehyde
11.33	toluene
21.28	1,2,3-trichlorobenzene
20.63	1,2,4-trichlorobenzene
19.85	1,3,5-trichlorobenzene
7.56	1,1,1-trichloroethane
11.00	1,1,2-trichloroethane
9.22	trichloroethylene
14.84	1,2,3-trichloropropane
4.09	1,1,2-trichlorotrifluoroethane (Freon 113)
22.51	tridecane
8.93	triethylamine
20.75	triglyme (triethylene glycol dimethyl ether)
17.61	1,2,3-trimethylbenzene (hemimellitene)
16.99	1,2,4-trimethylbenzene (pseudocumene)
16.41	1,3,5-trimethylbenzene (mesitylene)
19.07	undecane
4.09	vinyl acetate
14.11	m-xylene
14.69	o-xylene
14.11	p-xylene

DB-WAX - Alphabetical Order

Column: DB-WAX
30 m x 0.53 mm ID, 1 µm

P/N: 125-7032

Oven: 40°C for 5 min
40-230°C at 10°/min
230°C for 7 min

Carrier: Helium, constant pressure
at 34 cm/sec (40°C)

Injector: Split 1:10, 250°C

Detector: FID, 300°C

Warning! Other manufacturer's DB-Wax look-a-like columns may not have the same selectivity as Agilent's DB-Wax. We do not advise using this data on their columns.

Retention Time	Compound
5.09	acetal (acetaldehyde diethyl acetal)
2.47	acetaldehyde
16.87	acetic acid
3.60	acetone
8.12	acetonitrile
20.13	acetophenone
4.10	acrolein
19.61	acrylic acid
7.81	acrylonitrile
6.04	allyl ether
3.05	allyl ethyl ether
10.96	amyl acetate
17.25	benzaldehyde
6.46	benzene
19.55	benzonitrile
21.01	benzyl acetate
22.82	benzyl alcohol
30.41	benzyl ether
15.47	bromobenzene
9.26	bromochloromethane
11.76	bromodichloromethane
2.95	bromoethane
17.00	bromoform
20.96	1,3-butanediol
23.14	1,4-butanediol
18.70	2,3-butanediol
7.44	2,3-butanedione (diacetal)
11.48	1-butanol
5.35	2-butanone (MEK: methyl ethyl ketone)
12.95	2-buten-1-ol (crotyl alcohol)
12.02	3-buten-1-ol
16.31	2-butoxyethanol (butyl cellosolve)
9.85	butyl acetate
14.81	butylbenzene
6.97	butyl ether
3.27	butyl ethyl ether
2.80	butyl methyl ether
4.72	butyraldehyde
2.65	carbon disulfide
4.85	carbon tetrachloride
13.00	chlorobenzene
3.99	1-chlorobutane
14.52	chlorodibromomethane
8.58	chloroform
9.10	1-chlorohexane
23.97	1-chloro-4-nitrobenzene
3.46	3-chloropropene (allyl chloride)
18.19	4-chlorostyrene
14.71	2-chlorotoluene
14.90	3-chlorotoluene
14.90	4-chlorotoluene
9.07	crotonaldehyde
2.27	cyclohexane
16.31	cyclohexanol
14.61	cyclohexanone
14.57	cyclopentanol
12.46	cyclopentanone
7.63	decane
34.11	1,10-decanediol
21.12	1-decanol
20.57	1,2-dibromo-3-chloropropane (DBCP)
13.80	1,2-dibromoethane (EDB)
11.98	dibromomethane
17.80	1,2-dichlorobenzene

Retention Time	Compound
16.60	1,3-dichlorobenzene
17.06	1,4-dichlorobenzene
17.00	trans-1,4-dichloro-2-butene
9.10	1,1-dichloroethane
7.20	1,2-dichloroethane (ethylene dichloride)
2.65	1,1-dichloroethylene (vinylidene chloride)
7.84	cis-1,2-dichloroethylene
4.38	trans-1,2-dichloroethylene
9.71	1,1-dichloropropane
4.95	1,2-dichloropropane
12.38	1,3-dichloropropane
3.99	2,2-dichloropropane
4.56	1,1-dichloropropene
11.27	cis-1,3-dichloropropene
12.78	trans-1,3-dichloropropene
23.91	diethylene glycol
21.74	diethylene glycol monobutyl ether
19.48	diethylene glycol monoethyl ether
19.06	diethylene glycol monomethyl ether
19.06	diglyme (diethylene glycol dimethyl ether)
6.04	1,3-diisopropylbenzene
15.47	1,4-diisopropylbenzene
16.20	2,4-dimethyl-3-pentanone (diisopropyl ketone)
7.94	2,6-dimethyl-4-heptanone (diisobutyl ketone)
12.03	1,4-dioxane
9.65	1,3-dioxolane
7.09	DMF (dimethylformamide)
15.25	DMSO (methyl sulfoxide)
19.21	dodecane
12.23	epichlorohydrin
11.69	ethanol
6.46	2-ethoxyethanol (cellosolve)
13.11	2-ethoxyethyl acetate
14.31	ethyl acetate
5.03	ethyl acrylate
7.87	ethylbenzene
11.13	ethyl benzoate
20.27	ethylene glycol
19.47	ethylene glycol monobutyl ether
16.24	ethylene glycol monoethyl ether
13.11	ethylene glycol monomethyl ether
12.24	ethyl ether
2.13	ethyl formate
3.78	2-ethyl-1-hexanol
17.41	α-ethylphenethyl alcohol
23.10	β-ethylphenethyl alcohol
24.12	ethyl propionate
6.93	ethyl vinyl ether
2.39	fluorobenzene
7.72	fluorotrichloromethane (Freon 11)
2.13	furan
3.27	furfural
18.32	furfuryl alcohol
19.90	glycidol
17.25	glyme (propylene glycol dimethyl ether)
6.04	heptanal
12.32	heptane
2.65	heptane
27.26	1,7-heptanediol
16.91	1-heptanol
14.71	2-heptanol
14.29	3-heptanol
12.27	2-heptanone
11.66	3-heptanone
11.06	4-heptanone
17.77	trans-2-hepten-1-ol
17.67	cis-4-hepten-1-ol
17.84	hexachloro-1,3-butadiene
18.70	hexadecane
10.07	hexanal
25.75	1,6-hexanediol
2.05	hexane
15.31	1-hexanol
12.95	2-hexanol
12.49	3-hexanol
10.04	2-hexanone
9.34	3-hexanone
16.31	cis-2-hexen-1-ol
15.87	cis-3-hexen-1-ol
12.55	4-hexen-3-one
15.70	4-hydroxy-4-methyl-2-pentanone
18.30	iodobenzene
3.46	iodomethane
10.96	iso-amyl acetate
10.31	iso-butanol
8.36	iso-butyl acetate
13.47	iso-butylbenzene
3.54	iso-butyraldehyde
2.44	iso-octane

GC and GC/MS Applications

Solvent Retention Data

Retention Time	Compound	Retention Time	Compound
19.47	isophorone	19.46	styrene oxide
6.28	iso-propanol	3.27	tert-amyl methyl ether
5.32	iso-propyl acetate	5.54	tert-butanol
12.13	iso-propylbenzene (cumene)	5.40	tert-butyl acetate
3.27	iso-propyl ether	13.41	tert-butylbenzene
4.83	methacrolein	2.47	tert-butyl ethyl ether
7.54	methacrylonitrile	15.13	4-tert-butyltoluene
5.40	methanol	22.08	1,2,4,5-tetrachlorobenzene
12.25	2-methoxyethanol (methyl cellosolve)	13.80	1,1,1,2-tetrachloroethane
3.78	methyl acetate	17.73	1,1,2,2-tetrachloroethane
19.70	methyl benzoate	8.58	tetrachloroethylene
12.73	2-methyl-1-butanol (active amyl alcohol)	15.75	tetradecane
8.43	2-methyl-2-butanol (tert-amyl alcohol)	5.83	tetrahydrofuran
12.73	3-methyl-1-butanol (iso-amyl alcohol)	4.45	HF (tetrahydrofuran)
6.15	3-methyl-2-butanone	19.77	m-tolualdehyde
9.11	2-methyl-3-buten-2-ol	19.73	o-tolualdehyde
14.82	3-methyl-2-buten-1-ol	20.13	p-tolualdehyde
12.05	2-methylbutyl acetate	9.06	toluene
6.18	methylene chloride	21.25	1,2,3-trichlorobenzene
2.85	methyl formate	20.03	1,2,4-trichlorobenzene
12.38	5-methyl-3-heptanone	18.19	1,3,5-trichlorobenzene
11.40	5-methyl-2-hexanone	4.85	1,1,1-trichloroethane
7.94	2-methyl-3-pentanone	13.80	1,1,2-trichloroethane
8.19	4-methyl-2-pentanone (MIBK; methyl isobutyl ketone)	7.84	trichloroethylene
11.89	4-methyl-2-pentanol	17.06	1,2,3-trichloropropane
11.26	4-methyl-3-penten-3-one	2.13	1,1,2-trichlorotrifluoroethane (Freon 113)
22.00	α -methylphenyl alcohol	14.09	tridecane
5.54	methyl propionate	3.26	triethylamine
15.13	α -methylstyrene	20.77	triglyme (triethylene glycol dimethyl ether)
15.61	4-methylstyrene	15.29	1,2,3-trimethylbenzene (hemimellitene)
20.71	1-methyl-2-pyrrolidone	14.27	1,2,4-trimethylbenzene (pseudocumene)
2.30	methyl tert-butyl ether (MTBE)	13.55	1,3,5-trimethylbenzene (mesitylene)
13.62	morpholine	10.10	undecane
21.41	nitrobenzene	5.03	vinyl acetate
22.62	2-nitrotoluene	11.44	m-xylene
21.92	3-nitrotoluene	12.39	o-xylene
23.14	4-nitrotoluene	11.30	p-xylene
16.05	nonanal		
4.97	nonane		
31.29	1,9-nonanediol		
19.80	1-nonanol		
14.29	octanal		
3.22	octane		
29.06	1,8-octanediol		
18.40	1-octanol		
14.20	2-octanone		
13.66	3-octanone		
25.09	pentachlorobenzene		
17.28	pentadecane		
7.46	pentanal (valeraldehyde)		
1.89	pentane		
24.43	1,5-pentanediol		
9.49	2,3-pentanedione		
13.54	1-pentanol		
10.94	2-pentanol		
10.66	3-pentanol		
7.44	2-pentanone		
7.44	3-pentanone		
11.77	1-penten-3-ol		
14.65	2-penten-1-ol		
8.56	1-penten-3-one (ethyl vinyl ketone)		
6.61	3-penten-2-one (methyl vinyl ketone)		
12.66	pentyl ether		
26.14	2-phenoxyethanol		
22.76	4-phenyl-2-butanone (benzyl acetone)		
18.97	1,3-propanediol		
9.11	1-propanol		
10.78	2-propen-1-ol (allyl alcohol)		
3.25	propionaldehyde		
18.18	propionic acid		
8.72	propionitrile		
7.38	propyl acetate		
12.86	propylbenzene		
21.46	propyl benzoate		
18.96	propylene glycol (1,2-propanediol)		
3.05	propyl ether		
5.93	propyl formate		
9.17	propyl propionate		
15.16	2-propyn-1-ol (propargyl alcohol)		
12.44	pyridine		
8.77	sec-butanol		
7.69	sec-butyl acetate		
13.64	sec-butylbenzene		
13.80	styrene		

These solvent tables have many uses, not least of which is to determine impurities in bulk solvents. All of the columns in the preceding pages were selected for:

- their capacity—the ability to handle large amounts of a single component in order to look for impurities;
- their selectivity—each one having a different elution order than the other for closely eluting solvents;
- and their column to column reproducibility so that you can build methods on columns that are nearly plug and play.

GC and GC/MS Applications

Pesticide Retention Data

Pesticide Elution Order Using Low Bleed Phases

Run Conditions:

Columns:	30 m x 0.25 mm ID, 0.25 μ m	
Carrier Gas:	Helium at 35 cm/sec, measured at 50°C	
Oven:	50°C for 1 min	
	50-100°C at 25°/min	
	100-300°C at 5°/min	(DB-1701 ramped to 280°C)
	300°C for 5 min	(DB-1701 held at 280°C for 10 min)

Alphabetical Order By Analyte

Compound	DB-5ms	DB-XLB	DB-35ms	DB-17ms	DB-1701
Alachlor	24.29	25.84	27.40	27.91	27.59
Aldrin	25.99	27.33	28.28	28.54	26.79
Aspon	25.72	26.69	28.11	27.55	28.22
Atrazine	21.11	22.65	24.82	24.50	25.12
Azinphos-ethyl	37.51	39.94	43.31	43.27	48.74
Azinphos-methyl	36.28	38.83	42.60	42.75	45.86
α -BHC	20.01	21.83	23.50	23.83	23.06
β -BHC	21.12	24.95	26.62	26.70	24.84
γ -BHC	21.46	23.37	25.32	25.73	27.97
δ -BHC	22.70	25.98	27.83	28.08	28.89
Bolstar	32.16	33.89	36.25	35.94	34.96
1-Bromo-2-nitrobenzene (IS)	11.50	12.73	14.87	15.66	14.68
2-Bromobiphenyl (SS)	17.31	18.49	20.24	21.01	18.62
Captafol	33.91	36.35	39.46	40.31	40.40
Captan	27.98	30.15	33.20	34.14	32.25
Carbophenothion	32.56	34.49	36.69	36.26	35.48
γ -Chlordane	28.54	30.72	31.77	31.91	30.91
α -Chlordane	29.06	30.90	32.19	32.43	31.21
Chlorfenvinphos	27.61	29.34	31.47	31.15	31.02
4-Chloro-3-nitrobenzotrifluoride (SS)	7.66	8.55	8.83	8.59	10.00
Chlorobenzilate	31.28	32.82	34.03	34.27	33.78
Chloroneb	15.53	16.87	18.68	19.37	17.92
Chloropropylate	31.28	32.92	34.48	34.85	33.98
Chlorothalonil	22.16	26.44	28.06	28.08	27.73
Chlorpyrifos	25.84	27.52	29.31	28.86	28.36
Chlorpyrifos-methyl	23.86	25.64	27.79	27.55	26.70
Coumaphos	38.74	41.40	44.01	43.52	
Crotoxyphos	28.16	29.48	32.13	32.09	31.89
Dacthal	26.11	27.55	29.13	29.61	28.82
p,p'-DDD	31.62	33.93	35.60	35.92	34.60
p,p'-DDE	29.97	31.82	33.20	33.53	31.50
p,p'-DDT	33.07	35.12	36.71	37.05	35.37
Demeton-O	17.91	18.97	20.58	20.13	20.49
Demeton-S	20.52	21.83	24.03	23.67	24.05
Diallate A	19.88	20.87	21.97	22.31	21.42
Diallate B	20.26	21.35	22.40	22.71	22.10
Diazinon	21.99	23.05	24.59	24.21	24.16
1,2-Dibromo-3-chloropropane	6.63	7.11	8.05	8.47	7.90

GC and GC/MS Applications Pesticide Retention Data

Many analysts have reported obtaining excellent results with the DB-35ms. Some now use it as their primary analytical column in selective detector applications because of its selectivity, inertness, and high upper temperature limits.

Alphabetical Order By Analyte (Continued)

Compound	DB-5ms	DB-XLB	DB-35ms	DB-17ms	DB-1701
α,α -Dibromo-m-xylene	16.72	18.27	20.60	21.40	19.41
Dibutylchlorodate (SS)	36.32	37.75	38.67	38.74	39.65
Dichlofenthion	23.64	25.07	26.58	26.02	26.02
Dichlorvos	9.31	9.93	11.53	11.39	12.45
Dicrotophos	19.12	20.58	23.77	23.98	24.66
Dieldrin	30.14	32.03	33.59	33.90	32.16
Dimethoate	20.52	22.32	25.80	26.02	26.70
Dioxathion	21.41	22.78	25.53	25.49	24.80
Disulfoton	22.37	23.68	25.53	25.09	24.95
Endosulfan I	29.06	30.95	32.37	32.61	30.72
Endosulfan II	31.39	34.11	36.04	36.36	34.97
Endosulfan sulfate	32.88	35.74	37.84	38.13	38.91
Endrin	31.00	32.92	34.89	35.35	32.97
Endrin aldehyde	31.96	34.57	37.00	37.52	37.01
Endrin ketone	34.68	37.26	40.23	40.99	41.57
EPN	34.86	37.04	39.61	39.26	41.19
Ethion	31.55	33.09	35.39	35.11	34.85
Ethoprop	18.47	19.60	21.42	21.02	21.29
Ethylparathion	26.17	28.09	29.94	29.36	30.10
Famphur	32.38	34.38	37.69	37.72	39.69
Fenitrothion	25.19	26.96	29.47	29.22	29.36
Fensulfothion	31.25	33.31	36.44	36.36	37.10
Fenthion	26.02	27.62	30.25	30.22	29.07
Fonofos	21.76	23.19	25.29	25.03	24.41
Heptachlor	24.52	25.98	26.92	27.11	25.69
Heptachlor epoxide	27.59	29.32	30.76	31.07	29.68
Hexachlorobenzene	20.12	22.13	22.91	23.01	21.03
Hexachlorocyclopentadiene	11.42	11.94	12.08	12.25	11.60
Hexamethylphosphoramide	10.25	11.10	12.74	12.54	15.46
Isodrin	27.17	28.71	30.10	30.48	28.44
Kelthane	35.37	37.59	39.54	39.91	
Kelthane Decomp. Product	26.57	28.71	30.35	30.68	
Leptophos	36.17	38.15	40.73	40.55	40.94
Malathion	25.62	26.96	29.31	29.13	29.20
Merphos	30.01	31.47	32.94	32.22	31.89
Methoxychlor	35.22	37.05	39.54	40.31	38.91
Methylparathion	24.14	26.14	28.56	28.22	28.57
Mevinphos	13.50	14.48	16.72	16.69	17.56
Mirex	37.09	39.12	40.67	40.99	37.96
Monocrotophos	19.55	21.15	24.70	24.97	26.50
Naled	18.86	20.15	22.72	22.70	22.41
trans-Nonachlor	29.18	31.15	31.91	31.91	31.29

GC and GC/MS Applications

Pesticide Retention Data

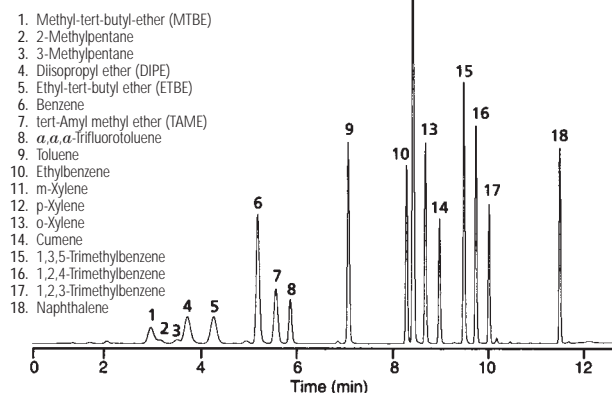
Alphabetical Order By Analyte (Continued)

Compound	DB-5ms	DB-XLB	DB-35ms	DB-17ms	DB-1701
Pentachloronitrobenzene (IS)	21.22	23.47	24.84	25.08	23.64
<i>cis</i> -Permethrine	38.62	40.27	42.12	42.53	42.25
<i>trans</i> -Permethrine	38.89	40.57	42.42	42.80	46.52
Perthane	31.00	32.67	34.29	34.68	32.51
Phorate	19.79	21.02	22.85	22.45	22.33
Phosmet	34.73	37.24	40.83	40.91	42.38
Phosphamidon	23.56	23.40	27.79	27.72	28.85
Propachlor	17.88	19.32	21.17	21.81	21.74
Ronnel	24.58	26.14	27.95	27.55	27.10
Simazine	20.91	22.65	25.05	24.87	25.23
Stirophos	28.66	30.50	32.94	32.69	32.27
Sulfotep	19.37	20.42	22.46	22.27	22.56
TEPP	16.76	17.91	20.69	20.74	21.98
Terbufos	21.64	22.78	24.23	23.67	23.91
Terrazole	14.17	15.12	16.60	17.25	15.86
Tetrachloro-m-xylene (SS)	18.12	19.81	20.24	20.32	18.70
Thionazin	17.72	18.97	21.26	21.12	20.85
Tokuthion	29.55	31.19	32.83	32.22	31.67
Trichloronate	26.51	28.09	29.31	28.59	28.57
Trifluralin	19.30	20.35	19.98	19.47	22.15
Tri-o-cresylphosphate	36.64	38.40	40.93	40.83	42.62

Environmental-Hydrocarbons

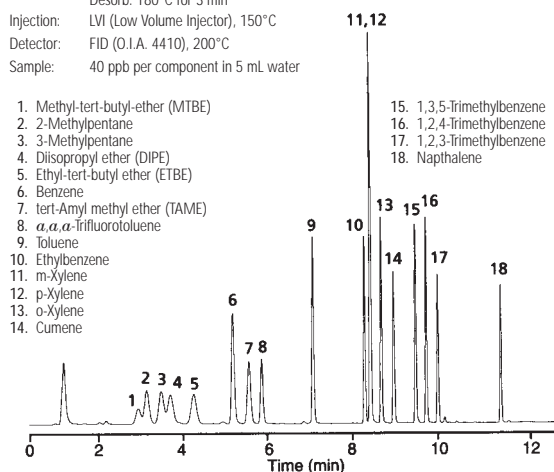
Methyl tert-butyl ether (MTBE) PID, Extended 8020 Analysis

Column: DB-MTBE
124-0034
30 m x 0.45 mm, 2.55 µm
Carrier: Helium at 10 mL/min
Oven: 35°C for 4 min
35-200°C at 20°/min
200°C for 5 min
Sampler: Purge and Trap (O.I.A. 4560)
Trap: Tenax only
Preheat: 175°C
Desorb: 180°C for 3 min
Injection: LVI (Low Volume Injector), 150°C
Detector: PID (O.I.A. 4430), 200°C
Sample: 40 ppb per component in 5 mL water



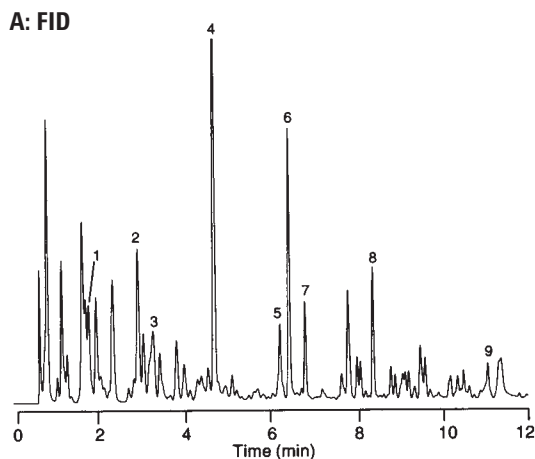
Methyl tert-butyl ether (MTBE) FID, Extended 8020 Analysis

Column: DB-MTBE
124-0034
30 m x 0.45 mm, 2.55 µm
Carrier: Helium at 10 mL/min
Oven: 35°C for 4 min
35-200°C at 20°/min
200°C for 5 min
Sampler: Purge and Trap (O.I.A. 4560)
Trap: Tenax only
Preheat: 175°C
Desorb: 180°C for 3 min
Injection: LVI (Low Volume Injector), 150°C
Detector: FID (O.I.A. 4410), 200°C
Sample: 40 ppb per component in 5 mL water



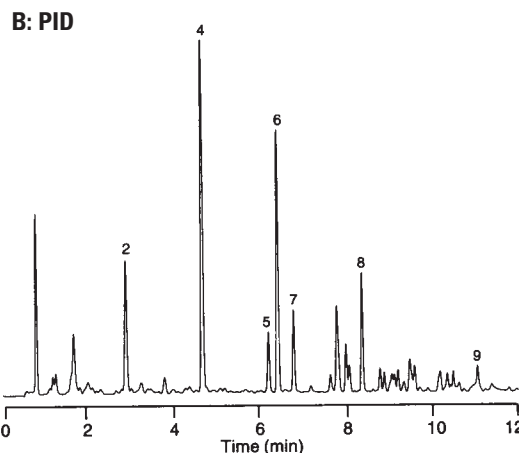
Unleaded Gasoline I

Column: DB-VRX
124-1534
30 m x 0.45 mm, 2.55 µm
Carrier: Helium at 109 cm/sec (10.4 mL/min), measured at 40°C
Oven: 40°C for 2 min
40-200°C at 12°/min
200°C for 5 min
Sampler: Purge and Trap (O.I.A. 4560)
Trap: BTEX (Supelco) at 50°C during purge
Preheat:
Desorb: 270°C for 1 min
Injection: LVI (Low Volume Injector)



Detector: A: PID (O.I.A. 4430), 200°C
B: FID, 250°C
Sample: 115 ppb gasoline in 5 mL water

- 3-Methylpentane
- Benzene
- iso-Octane
- Toluene
- Ethylbenzene
- m*, *p*-Xylene
- o*-Xylene
- 1,2,4-Trimethylbenzene
- Naphthalene



C174

GC and GC/MS Applications

Environmental-Hydrocarbons

Diesel Fuel

Column: DB-5ms

125-5532

30 m x 0.53 mm, 1.50 μ m

Carrier: Helium at 48.5 cm/sec, measured at 60°C

Oven: 60°C for 2 min
60-300°C at 12°/min
300°C for 10 min

Injection: Direct, 280°C

Detector: FID, 250°C
Nitrogen makeup gas at 30 mL/min

Sample: 1 μ L injection in hexane
A - Standard, 50 ng/component
B - Sample, 0.6 mg/mL

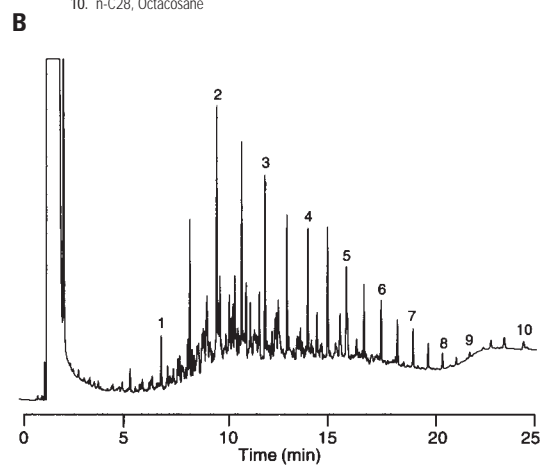
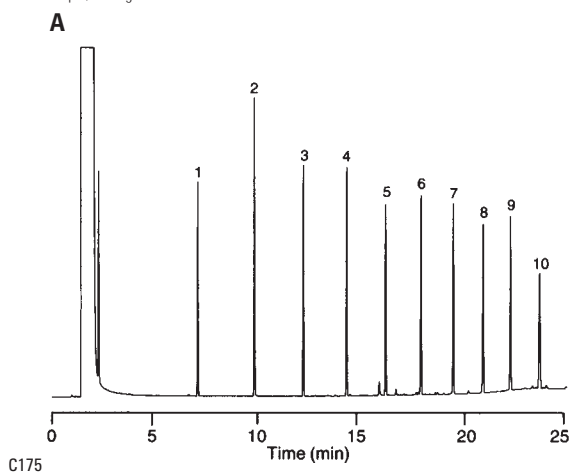
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

1. n-C10, Decane
2. n-C12, Dodecane
3. n-C14, Tetradecane
4. n-C16, Hexadecane
5. n-C18, Octadecane
6. n-C20, Eicosane
7. n-C22, Docosane
8. n-C24, Tetracosane
9. n-C26, Hexacosane
10. n-C28, Octacosane



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Environmental-Pesticides and Herbicides

CLP Pesticides

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 μm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 μm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110°C for 0.5 min
 110-320°C at 15° C/min
 320°C for 2 min

Injection: Splitless, 250°C
 30 sec purge activation time

Detector: μECD, 350°C
 Nitrogen makeup gas
 (column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

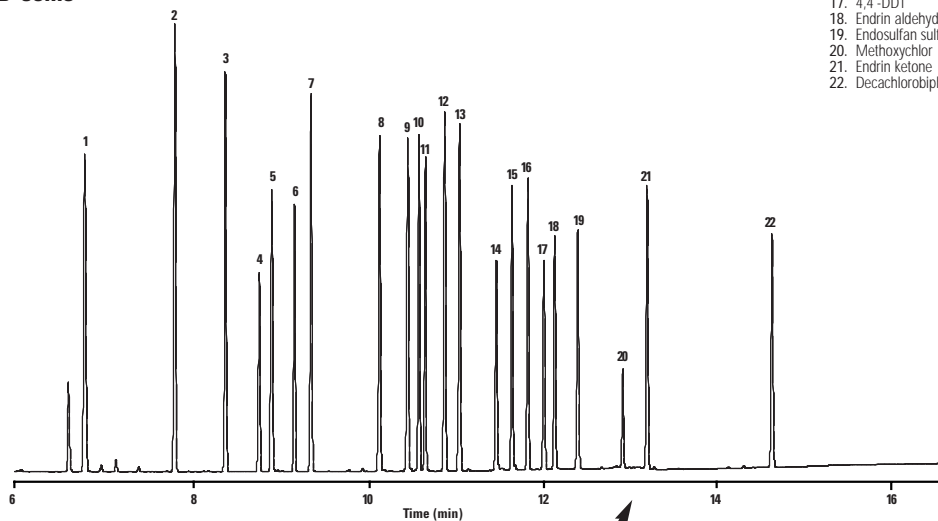
Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 μl tapered, FN 23-26s/42/HP, 5181-1267

1. Tetrachloro m-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. Heptachlor
6. δ-BHC
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (SS)

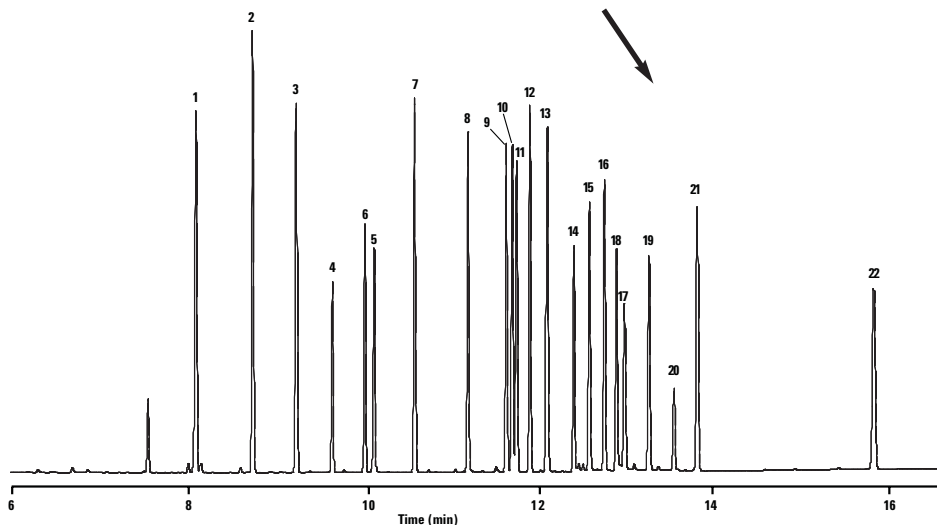
SS - Surrogate Standard

DB-35ms



C7844-2

DB-XLB



C7843

Complete resolution and confirmation of 22
 CLP Pesticides in under 16 minutes!

GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Organochlorine Pesticides I EPA Method 8081A

Column: DB-35ms
122-3832
30 m x 0.25 mm, 0.25 µm
 Carrier: Helium at 35 cm/sec, measured at 50°C
 Oven: 50°C for 1 min
 50-100°C at 25°/min
 100-300°C at 5°/min
 300°C for 5 min
 Injection: Splitless, 250°C
 30 sec purge activation time
 Detector: MSD, 300°C transfer line
 Full scan at m/z 50-500
 Sample: 1 µL of 35 µg/mL composite 8081A standards, Accustandard Inc.

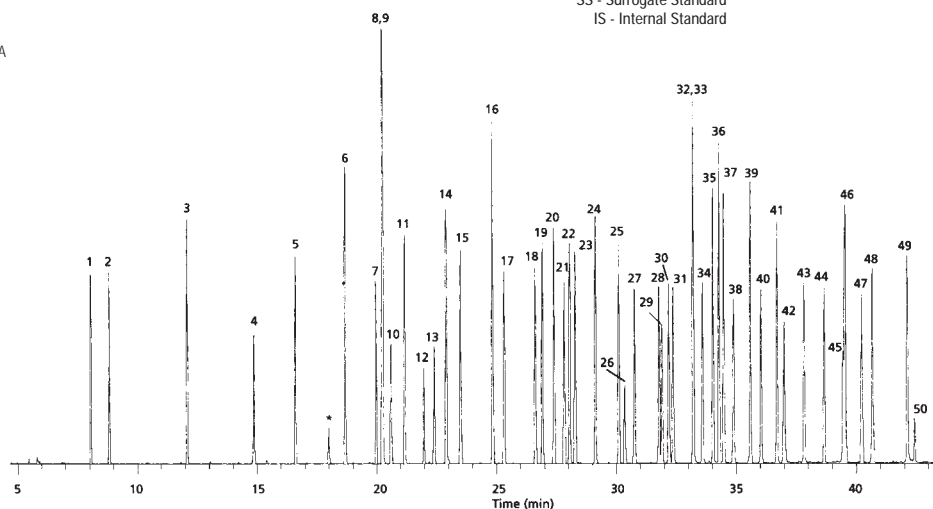
1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α , α -Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α -BHC
16. Pentachloronitrobenzene (IS)
17. γ -BHC
18. β -BHC
19. Heptachlor
20. Alachlor
21. δ -BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane

27. Heptachlor epoxide
28. γ -Chlordane
29. trans-Nonachlor
30. α -Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin

39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

Standards used were a composite of individual solutions supplied courtesy of Accustandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

* Breakdown Products
 SS - Surrogate Standard
 IS - Internal Standard



Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Organochlorine Pesticides II EPA Method 8081A

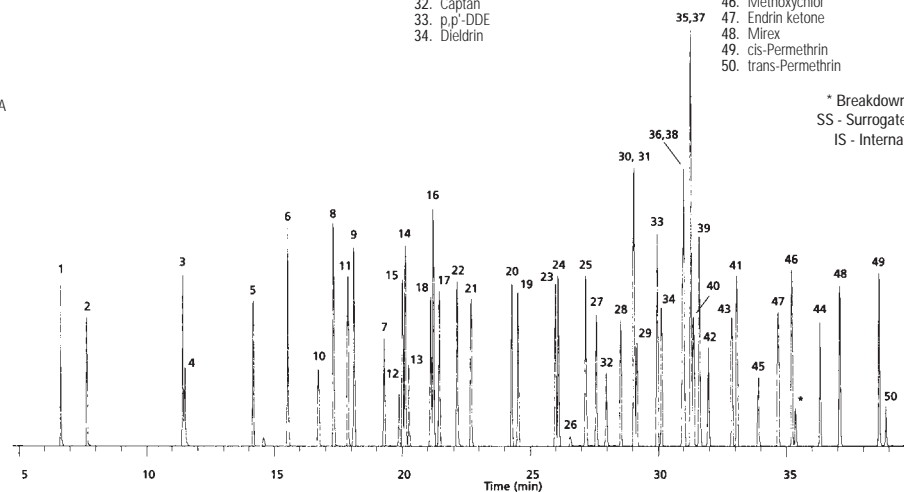
Column: DB-5ms
122-5532
30 m x 0.25 mm, 0.25 µm
 Carrier: Helium at 35 cm/sec, measured at 50°C
 Oven: 50°C for 1 min
 50-100°C at 25°/min
 100-300°C at 5°/min
 300°C for 5 min
 Injection: Splitless, 250°C
 30 sec purge activation time
 Detector: MSD, 300°C transfer line
 Full scan at m/z 50-500
 Sample: 1 µL of 35 µg/mL composite 8081A standards, Accustandard Inc.

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α , α -Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α -BHC
16. Pentachloronitrobenzene (IS)
17. γ -BHC
18. β -BHC
19. Heptachlor
20. Alachlor

21. δ -BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ -Chlordane
29. trans-Nonachlor
30. α -Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin

35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
 SS - Surrogate Standard
 IS - Internal Standard



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Pesticides, EPA 508.1

Column: DB-35ms
123-3832
30 m x 0.32 mm, 0.25 μ m

Column: DB-XLB
123-1236
30 m x 0.32 mm, 0.50 μ m

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 75°C for 0.5 min
75-300°C at 10° C/min
300°C for 2 min

Injection: Splitless, 250°C
30 sec purge activation time

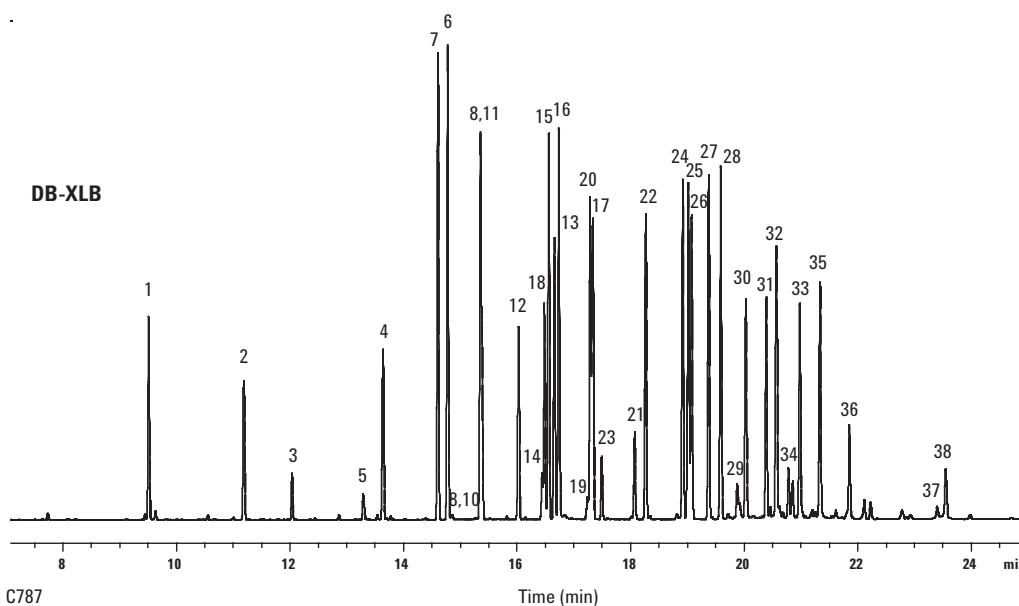
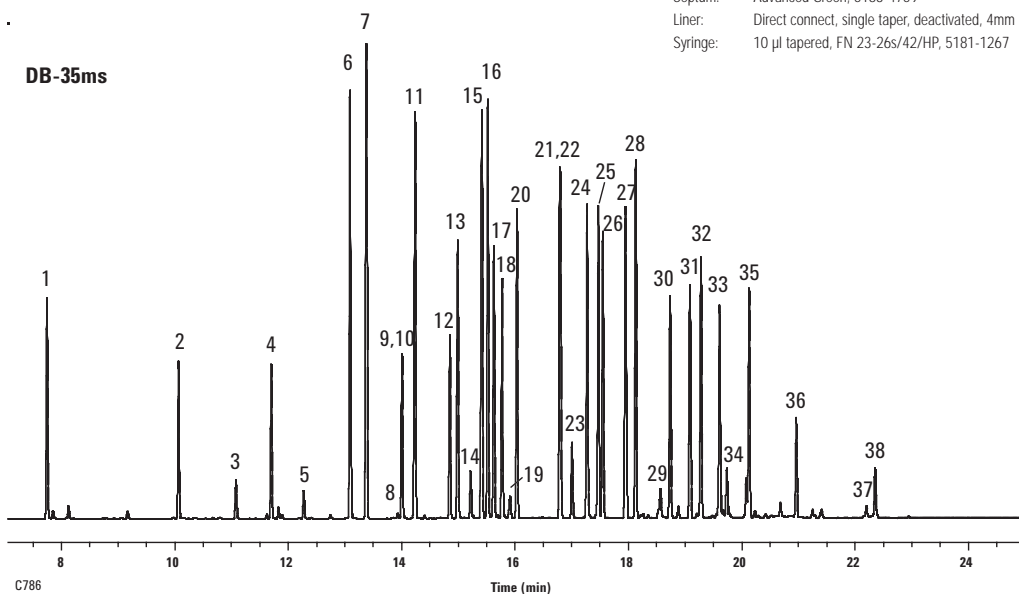
Detector: μ ECD, 350°C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

- | | |
|------------------------------|--------------------------|
| 1. Hexachlorocyclopentadiene | 20. DCPA |
| 2. Etridiazole | 21. 4,4'-Dibromobiphenyl |
| 3. Chloroneb | 22. Heptachlor epoxide |
| 4. Trifluralin | 23. Cyanazine |
| 5. Propachlor | 24. γ -Chlordane |
| 6. Hexachlorobezene | 25. α -Chlordane |
| 7. α -BHC | 26. Endosulfan I |
| 8. Altrazine | 27. 4,4'-DDE |
| 9. Pentachloronitrobenzene | 28. Dieldrin |
| 10. Simazine | 29. Chlorobenzilate |
| 11. γ -BHC | 30. Endrin |
| 12. β -BHC | 31. 4,4'-DDD |
| 13. Heptachlor | 32. Endosulfan II |
| 14. Alachlor | 33. 4,4'-DDT |
| 15. δ -BHC | 34. Endrin aldehyde |
| 16. Chlorothalonil | 35. Endosulfan sulfate |
| 17. Aldrin | 36. Methoxychlor |
| 18. Metribuzin | 37. cis-Permethrin |
| 19. Metolachlor | 38. trans-Permethrin |

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Chlorinated Pesticides, EPA Method 508

Column: HP-5ms

19091S-433

30 m x 0.25 mm, 0.25 μ m

Carrier: Helium, 24 psi, 45 cm/sec (80°C) constant flow

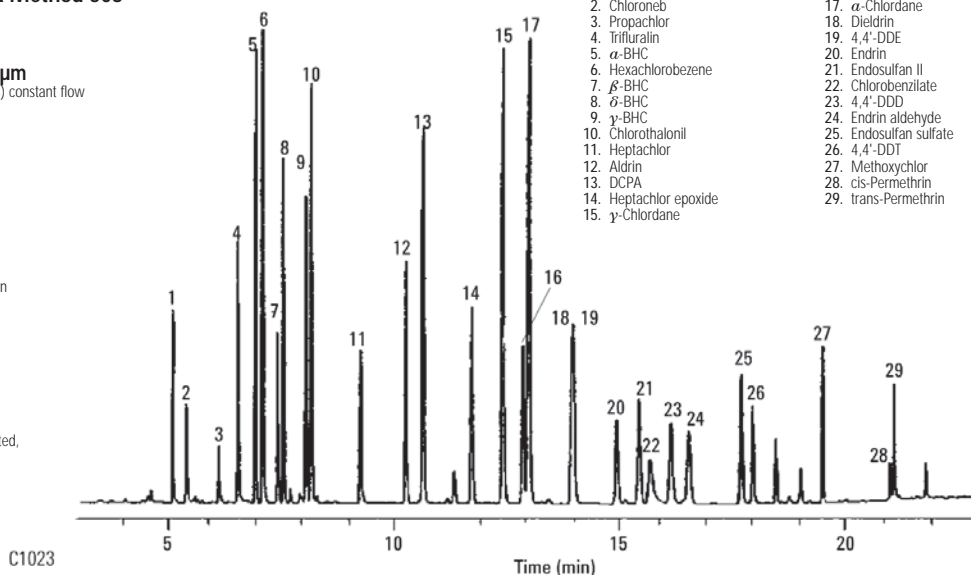
Oven: 80°C for 1 min
80-180°C at 30°C/min
180-205°C at 3°C/min
205°C for 4 min
205-290°C at 20°C/min
290°C for 2 min

Injection: Splitless
1 min purge delay

Detector: ECD, 320°C
Makeup gas Nitrogen, 60 mL/min
Anode purge 3 mL/min

Sample: 1 μ L

- | | |
|-------------------------|-------------------------|
| 1. Etridiazole | 16. Endosulfan I |
| 2. Chlorobenz | 17. α -Chlordane |
| 3. Propachlor | 18. Dieldrin |
| 4. Trifluralin | 19. 4,4'-DDE |
| 5. α -BHC | 20. Endrin |
| 6. Hexachlorobenzene | 21. Endosulfan II |
| 7. β -BHC | 22. Chlorobenzilate |
| 8. δ -BHC | 23. 4,4'-DDD |
| 9. γ -BHC | 24. Endrin aldehyde |
| 10. Chlorothalonil | 25. Endosulfan sulfate |
| 11. Heptachlor | 26. 4,4'-DDT |
| 12. Aldrin | 27. Methoxychlor |
| 13. DCPA | 28. cis-Permethrin |
| 14. Heptachlor epoxide | 29. trans-Permethrin |
| 15. γ -Chlordane | |



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Organohalide Pesticides in Water, EPA Method 505

Column: HP-5ms

19091S-433

30 m x 0.25 mm, 0.25 μ m

Carrier: Helium, 2.0 mL/min, constant flow, 42 cm/sec (22.4 psi at 80°C)

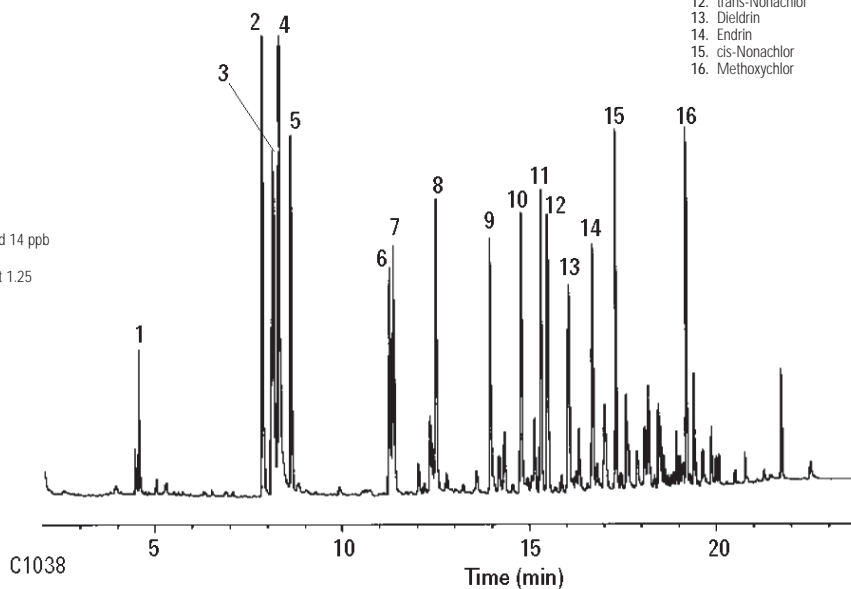
Oven: 80°C for 1 min
80-175°C at 30°C/min
175°C for 4 min
175- 215°C at 6°C/min
215°C for 2 min
215- 290°C at 15°C/min
290°C for 5 min

Injection: Splitless, 250°C
1 min purge delay

Detector: ECD, 300°C
Makeup gas: N₂, 60 mL/min
Anode purge 6 mL/min

Sample: 1 μ L injection volume
16 components EPA-505 targeted pesticides and 14 ppb Aroclor 1260 in hexane.
Concentration of pesticides: 50 ppb each except 1.25 ppm for atrazine and simazine.

- | |
|------------------------------|
| 1. Hexachlorocyclopentadiene |
| 2. Hexachlorobenzene |
| 3. Simazine |
| 4. Atrazine |
| 5. Lindane |
| 6. Heptachlor |
| 7. Alachlor |
| 8. Adrin |
| 9. Heptachlor epoxide |
| 10. α -Chlordane |
| 11. β -Chlordane |
| 12. trans-Nonachlor |
| 13. Dieldrin |
| 14. Endrin |
| 15. cis-Nonachlor |
| 16. Methoxychlor |



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Organochlorine Pesticides I

Column: DB-5

125-5037

30 m x 0.53 mm, 0.50 μ m

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275°C at 4°/min

275°C for 30 min

Injection: Splitless, 250°C

Detector: ECD, 300°C

Nitrogen makeup gas at 30 mL/min

Sample: 0.7 μ L of 100 pg/ μ L standard in isoctane

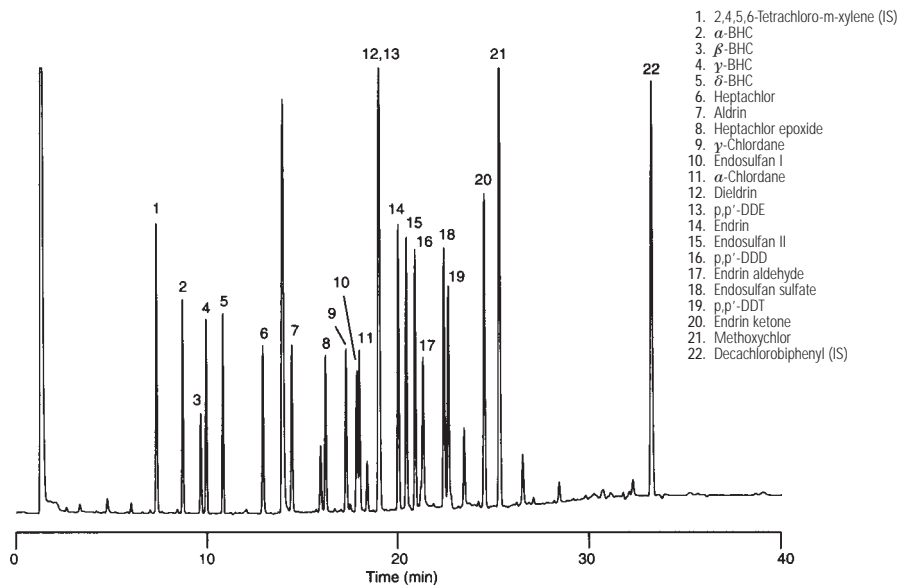
Suggested Supplies

Liner: Splitless, single taper, deactivated, 4mm

ID, 5181-3316

Seal: Advanced Green, 5183-4759

Syringe: 10 μ L tapered, FN 23-26s/42/HP,
5181-1267



Organochlorine Pesticides II

Column: DB-608

125-6837

30 m x 0.53 mm, 0.50 μ m

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275°C at 4°/min

275°C for 30 min

Injection: Splitless, 250°C

Detector: ECD, 300°C

Nitrogen makeup gas at 30 mL/min

Sample: 0.7 μ L of 100 pg/ μ L standard in isoctane

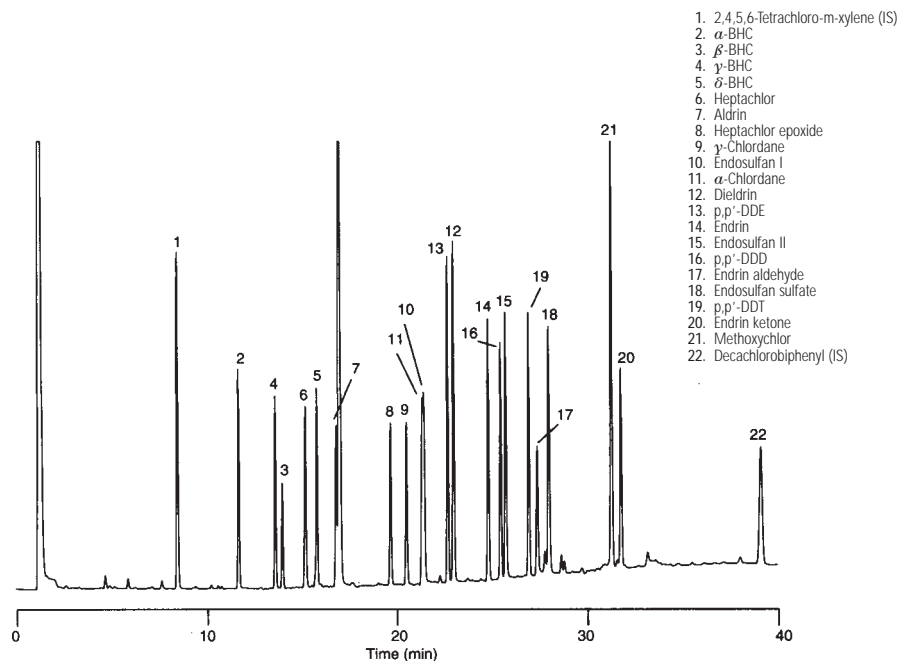
Suggested Supplies

Liner: Splitless, single taper, deactivated, 4mm

ID, 5181-3316

Seal: Advanced Green, 5183-4759

Syringe: 10 μ L tapered, FN 23-26s/42/HP,
5181-1267



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Organochlorine Pesticides III

Column: DB-1701

125-0737

30 m x 0.53 mm, 0.50 μ m

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275°C at 4°/min

275°C for 30 min

Injection: Splitless, 250°C

Detector: ECD, 300°C

Nitrogen makeup gas at 30 mL/min

Sample: 0.7 μ L of 100 pg/ μ L standard in isoctane

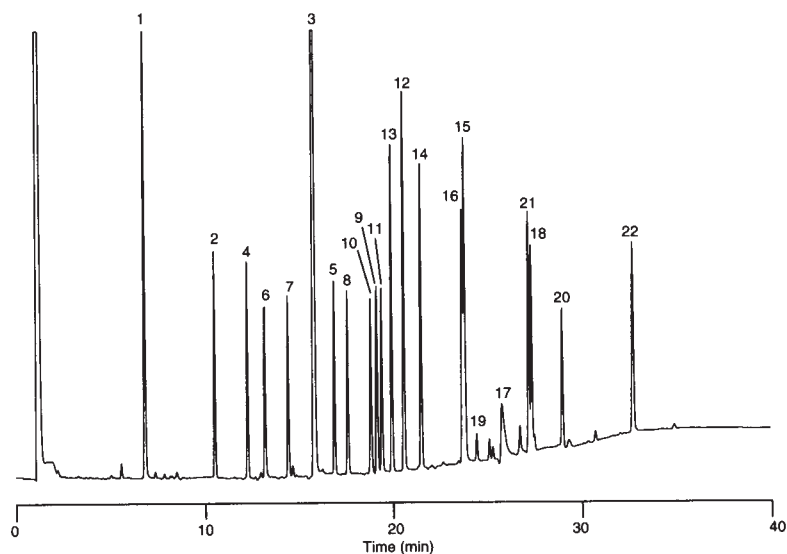
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

- | | |
|--------------------------------------|-----------------------------|
| 1. 2,4,5,6-Tetrachloro-m-xylene (IS) | 21. Methoxychlor |
| 2. α -BHC | 22. Decachlorobiphenyl (IS) |
| 3. β -BHC | |
| 4. γ -BHC | |
| 5. δ -BHC | |
| 6. Heptachlor | |
| 7. Aldrin | |
| 8. Heptachlor epoxide | |
| 9. γ -Chlordane | |
| 10. Endosulfan I | |
| 11. α -Chlordane | |
| | 12. Dieldrin |
| | 13. p,p'-DDE |
| | 14. Endrin |
| | 15. Endosulfan II |
| | 16. p,p'-DDD |
| | 17. Endrin aldehyde |
| | 18. Endosulfan sulfate |
| | 19. p,p'-DDT |
| | 20. Endrin ketone |



Organochlorine Pesticides IV

Column: DB-35

125-1937

30 m x 0.53 mm, 0.50 μ m

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275°C at 4°/min

275°C for 30 min

Injection: Splitless, 250°C

Detector: ECD, 300°C

Nitrogen makeup gas at 30 mL/min

Sample: 0.7 μ L of 100 pg/ μ L standard in isoctane

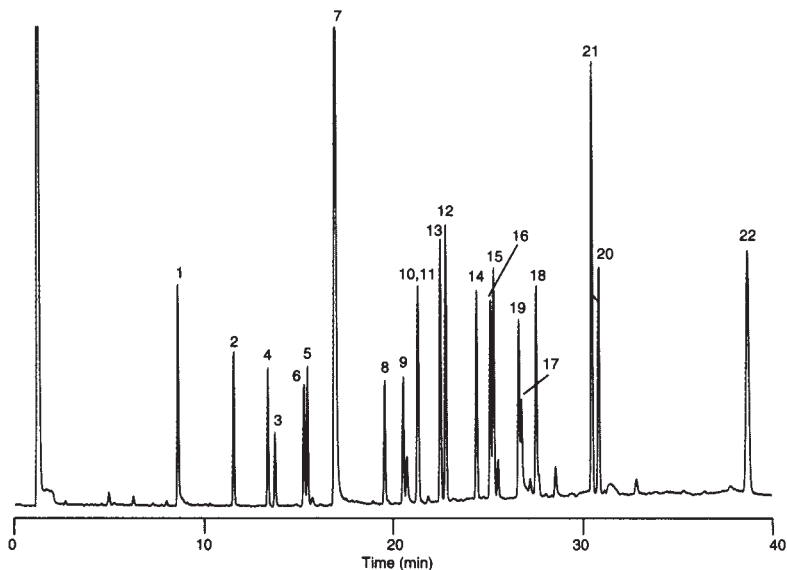
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

- | | |
|--------------------------------------|-----------------------------|
| 1. 2,4,5,6-Tetrachloro-m-xylene (IS) | 12. Dieldrin |
| 2. α -BHC | 13. p,p'-DDE |
| 3. β -BHC | 14. Endrin |
| 4. γ -BHC | 15. Endosulfan II |
| 5. δ -BHC | 16. p,p'-DDD |
| 6. Heptachlor | 17. Endrin aldehyde |
| 7. Aldrin | 18. Endosulfan sulfate |
| 8. Heptachlor epoxide | 19. p,p'-DDT |
| 9. γ -Chlordane | 20. Endrin ketone |
| 10. Endosulfan I | 21. Methoxychlor |
| 11. α -Chlordane | 22. Decachlorobiphenyl (IS) |



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Organochlorine Pesticides, DB-5/1701P

Column: DB-5

123-5032

30 m x 0.32 mm, 0.25 μ m

123-7732, 160-2535-10

Carrier: Helium at 29.2 cm/sec, measured at 150°C

Oven: 60°C for 0.5 min
60-140°C at 20°/min
140-280°C at 11°/min

280°C for 23 min

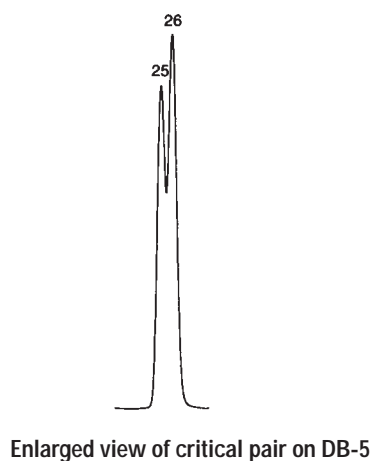
Injection: Splitless, 200°C

Detector: ECD, 325°C

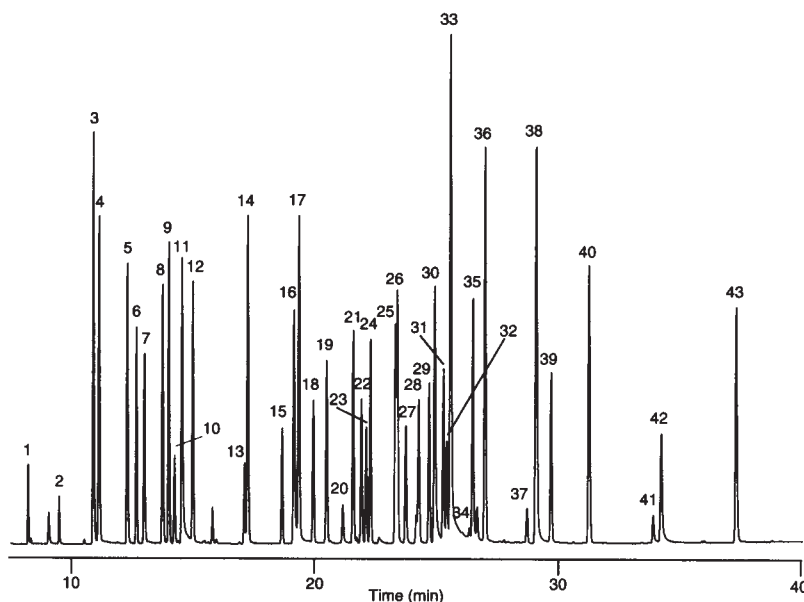
Nitrogen makeup gas at 30 mL/min

Sample: 2.0 μ L, 20-200 pg/ μ L

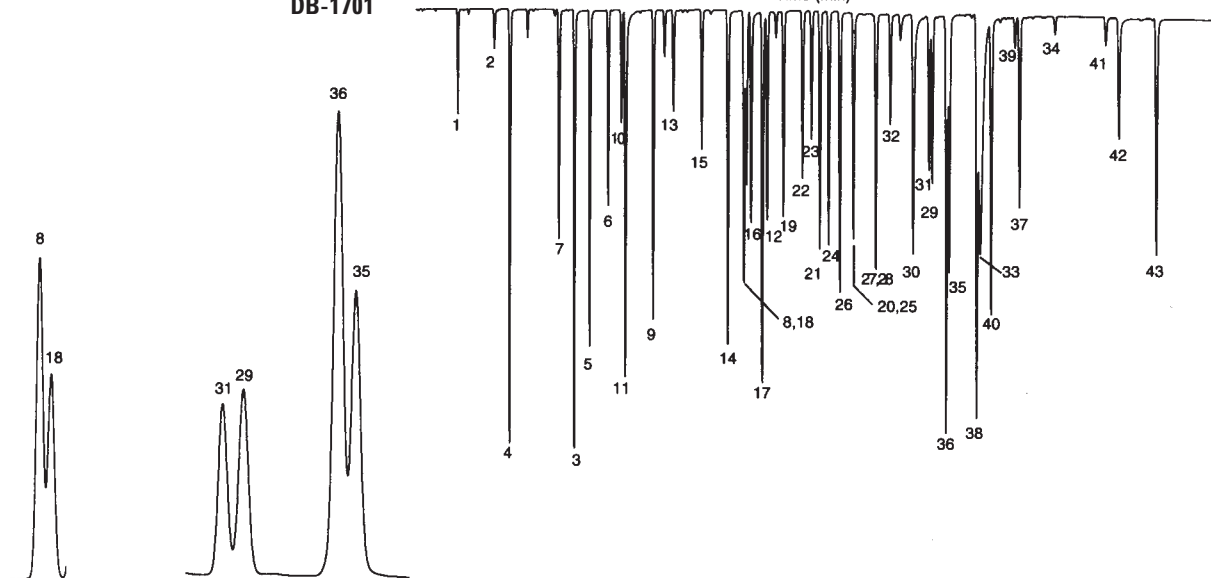
- | | | |
|------------------------------|-------------------------|-----------------------------|
| 1. Etridiazole | 15. Aldrin | 29. Endosulfan II |
| 2. Chloroneb | 16. Chlorpyrifos | 30. Chlorobenzilate |
| 3. Propachlor | 17. DCPA | 31. p,p'-DDD |
| 4. Tetrachloro-m-xylene (IS) | 18. Isodrin | 32. o,p'-DDT |
| 5. Trifluralin | 19. Heptachlor epoxide | 33. Endrin aldehyde |
| 6. α -BHC | 20. Captan | 34. Endrin ketone |
| 7. Hexachlorobenzene | 21. γ -Chlordane | 35. Carbophenothion |
| 8. β -BHC | 22. o,p'-DDE | 36. p,p'-DDT |
| 9. γ -BHC | 23. Endosulfan I | 37. Endosulfan sulfate |
| 10. Pentachloronitrobenzene | 24. α -Chlordane | 38. Hexabromobenzene (HBB) |
| 11. p,p'-Dichlorobiphenyl | 25. Dieldrin | 39. Methoxychlor |
| 12. δ -BHC | 26. p,p'-DDE | 40. Mirex |
| 13. Heptachlor | 27. o,p'-DDD | 41. cis-Permethrin |
| 14. Alachlor | 28. Endrin | 42. trans-Permethrin |
| | | 43. Decachlorobiphenyl (IS) |



DB-5



DB-1701



C176

Enlarged view of critical pairs on DB-1701

GC and GC/MS

GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Nitrogen/Phosphorus Containing Pesticides, EPA Method 507

Column: HP-5ms

19091S-433

30 m x 0.25 mm, 0.25 µm

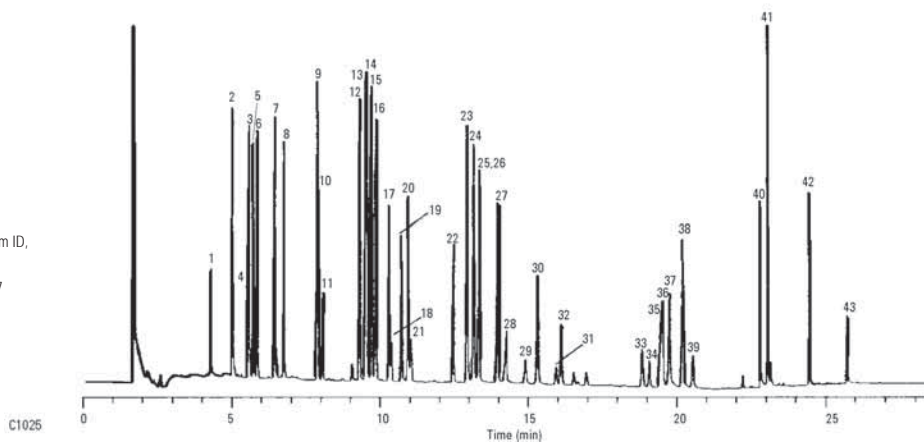
Carrier: Helium, 30 cm/sec (13.6 psi) pressure program

Oven: 80-178°C at 30°C/min
178°C for 4 min
178-205°C at 2°C/min
205-310°C at 30°C/min
310°C for 4 min

Injection: Splitless, 260°C
1 min purge delay

Detector: NPD, 290°C
Helium makeup gas at 30 mL/min

- | | | |
|------------------|----------------|-----------------|
| 1. Dichlorvos | 12. Atraton | 23. Simetryn |
| 2. EPTC | 13. Simazine | 24. Alachlor |
| 3. Butylate | 14. Prometon | 25. Ametryn |
| 4. Mevinphos | 15. Atrazine | 26. Prometryn |
| 5. Vernolate | 16. Propazine | 27. Terbutryn |
| 6. Pebulate | 17. Terbufos | 28. Bromacil |
| 7. Tebuthiuron | 18. Pronamide | 29. Metolachlor |
| 8. Molinate | 19. Diazinon | 30. Triademefon |
| 9. Ethoprop | 20. Disulfoton | 31. MGK-264 |
| 10. Cycloate | 21. Terbacil | 32. Diphenamid |
| 11. Chlorpropham | 22. Metribuzin | 33. Stirofos |



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Organophosphorous Pesticides I, EPA Method 8141A

Column: DB-5ms

122-5532

30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50°C

Oven: 50°C for 1 min
50-100°C at 25°/min
100-300°C at 5°/min
300°C for 5 min

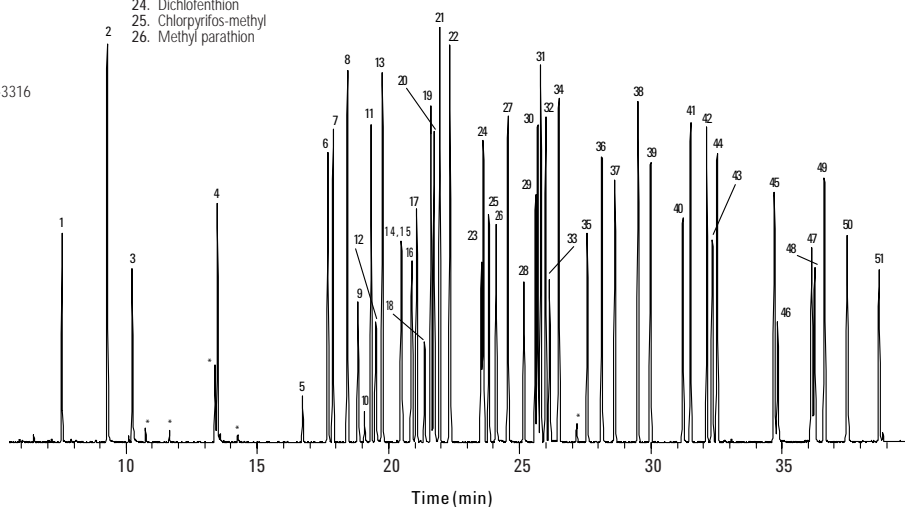
Injection: Splitless, 250°C
30 sec purge activation time

Detector: MSD, 300°C transfer line
Full scan m/z 50-500

Sample: 1 µL of 40 µg/mL 8141A standards
Accustandard Inc.

- | | | |
|--------------------------------|---------------------|----------------------------|
| 1. 4-Chloro-3-nitrotrifluoride | 27. Ronnel | 38. Tokuthion |
| 2. Dichlorvos | 28. Fenitrothion | 39. Merphos |
| 3. Hexamethylphosphoramide | 29. Malathion | 40. Fensulfotiothion |
| 4. Mevinphos | 30. Aspon | 41. Ethion |
| 5. TEPP | 31. Chlorpyrifos | 42. Bolstar |
| 6. Thionazin | 32. Fenthion | 43. Famphur |
| 7. Demeton-O | 33. Ethyl parathion | 44. Carbophenothion |
| 8. Ethoprop | 34. Trichloronate | 45. Phosmet |
| 9. Naled | 35. Chlorfenvinphos | 46. EPN |
| 10. Dicrotophos | 36. Crotoxyphos | 47. Leptophos |
| 11. Sulfotepp | 37. Stirophos | 48. Azinphos methyl |
| 12. Monocrotophos | | 49. Tri-o-cresyl phosphate |
| 13. Phorate | | 50. Azinphos ethyl |
| 14. Dimethoate | | 51. Coumaphos |
| 15. Demeton-S | | |
| 16. Simazine | | |
| 17. Atrazine | | |
| 18. Dioxathion | | |
| 19. Terbufos | | |
| 20. Fonofos | | |
| 21. Diazinon | | |
| 22. Disulfoton | | |
| 23. Phosphamidon | | |
| 24. Dichlofenthion | | |
| 25. Chlorpyrifos-methyl | | |
| 26. Methyl parathion | | |

* Breakdown products



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Note: All standards used were supplied courtesy of Accustandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Organophosphorous Pesticides II, EPA Method 8141A

Column: DB-35ms
122-3832
30 m x 0.25 mm, 0.25 µm

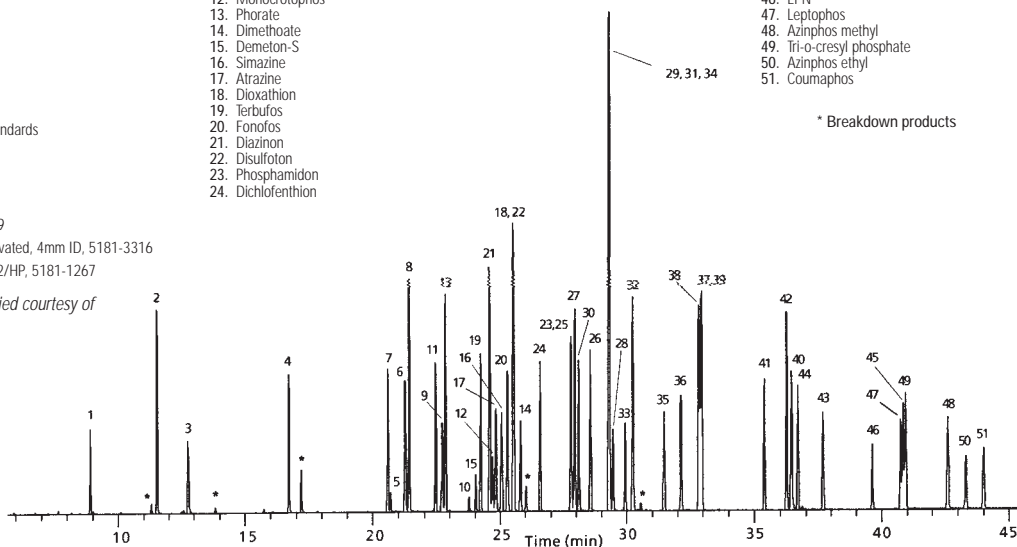
Carrier: Helium at 35 cm/sec, measured at 50°C
 Oven: 50°C for 1 min
 50-100°C at 25°/min
 100-300°C at 5°/min
 300°C for 5 min
 Injection: Splitless, 250°C
 30 sec purge activation time
 Detector: MSD, 300°C transfer line
 Full scan m/z 50-500
 Sample: 1 µL of 40 µg/mL 8141A standards
 Accustandard Inc.

- | | | |
|--------------------------------|-------------------------|----------------------------|
| 1. 4-Chloro-3-nitrotrifluoride | 25. Chlorpyrifos-methyl | 35. Chlorfenvinphos |
| 2. Dichlorvos | 26. Methyl parathion | 36. Crotoxyphos |
| 3. Hexamethylphosphoramide | 27. Ronnel | 37. Stirophos |
| 4. Mevinphos | 28. Fenitrothion | 38. Tokuthion |
| 5. TEPP | 29. Malathion | 39. Merphos |
| 6. Thionazin | 30. Aspon | 40. Fensulfothion |
| 7. Demeton-O | 31. Chlorpyrifos | 41. Ethion |
| 8. Ethoprop | 32. Fenthion | 42. Bolstar |
| 9. Naled | 33. Ethyl parathion | 43. Famphur |
| 10. Dicrotophos | 34. Trichloronate | 44. Carbofenthothion |
| 11. Sulfotepp | | 45. Phosmet |
| 12. Monocrotophos | | 46. EPN |
| 13. Phorate | | 47. Leptophos |
| 14. Dimethoate | | 48. Azinphos methyl |
| 15. Demeton-S | | 49. Tri-o-cresyl phosphate |
| 16. Simazine | | 50. Azinphos ethyl |
| 17. Atrazine | | 51. Coumaphos |
| 18. Dioxathion | | |
| 19. Terbufos | | |
| 20. Fonofos | | |
| 21. Diazinon | | |
| 22. Disulfoton | | |
| 23. Phosphamidon | | |
| 24. Dichlofenthion | | |

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Note: All standards used were supplied courtesy of Accustandard Inc., New Haven, CT



Phenoxy Acid Herbicides - Methyl Derivatives, EPA 8151A

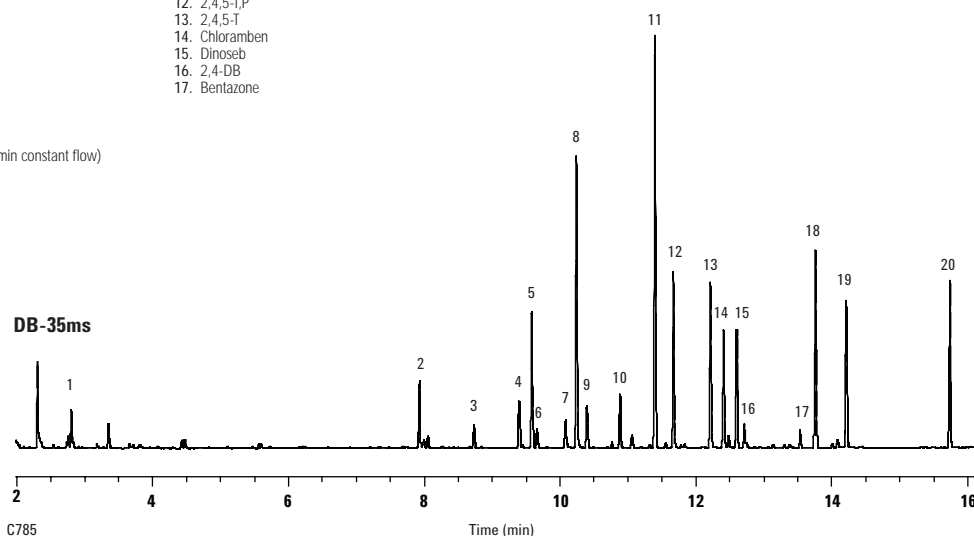
Column: DB-35ms
123-3832
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)
 Oven: 50°C for 0.5 min
 50-100°C at 25°C/min
 100-320°C at 12°C/min
 320°C for 2 min
 Injection: Splitless, 250°C
 30 sec purge activation time
 Detector: µECD, 350°C
 Nitrogen makeup gas
 (column + makeup flow = 30 mL/min constant flow)
 Sample: 50 pg per component

- | | |
|--|-----------------|
| 1. Dalapon | 18. DCPA |
| 2. 3,5-Dichlorobenzoic acid | 19. Picloram |
| 3. 4-Nitrophenol | 20. Acifluorfen |
| 4. Methyl-2,4-dichlorophenylacetate (SS) | |
| 5. Dicamba | |
| 6. MCPA | |
| 7. MCPA | |
| 8. 4,4 | |
| 9. Dichloroprop | |
| 10. 2,4-D | |
| 11. Pentachlorophenol | |
| 12. 2,4,5-T,P | |
| 13. 2,4,5-T | |
| 14. Chloramben | |
| 15. Dinoseb | |
| 16. 2,4-DB | |
| 17. Bentazone | |

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Phenoxy Acid Herbicides

Column: DB-1701
123-0732
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50°C

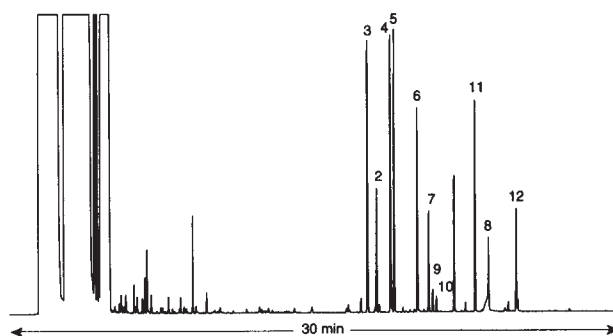
Oven: 50°C for 1 min
50-160°C at 10°/min
160°C for 3 min
160-260°C at 10°/min
260°C for 5 min

Injection: Splitless, 250°C
45 sec purge activation time

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 0.1 µg/µL standard in methanol

TMS Esters



Suggested Supplies

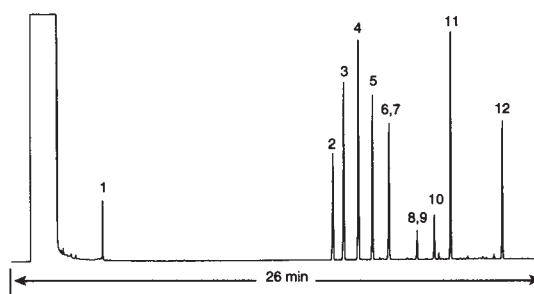
Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

1. Dalapon
2. Dicamba
3. MCPP
4. MCPA
5. Dichloroprop
6. 2,4-D
7. Pentachlorophenol
8. Dinoseb
9. 2,4,5-TP
10. 2,4,5-T
11. 2,4-DB
12. Picloram

Methyl Esters



Herbicides

Column: DB-XLB
122-1232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 32 cm/sec, measured at 50°C

Oven: 50°C for 1 min
50-180°C at 10°/min
180-230°C at 5°/min
230-320°C at 10°/min
320°C for 2 min

Injection: Splitless, 250°C
30 sec purge activation time

Detector: MSD, 300°C transfer line
Full scan 50-400

Sample: 2 µL x 10-50 ng/µL solution in acetone

Suggested Supplies

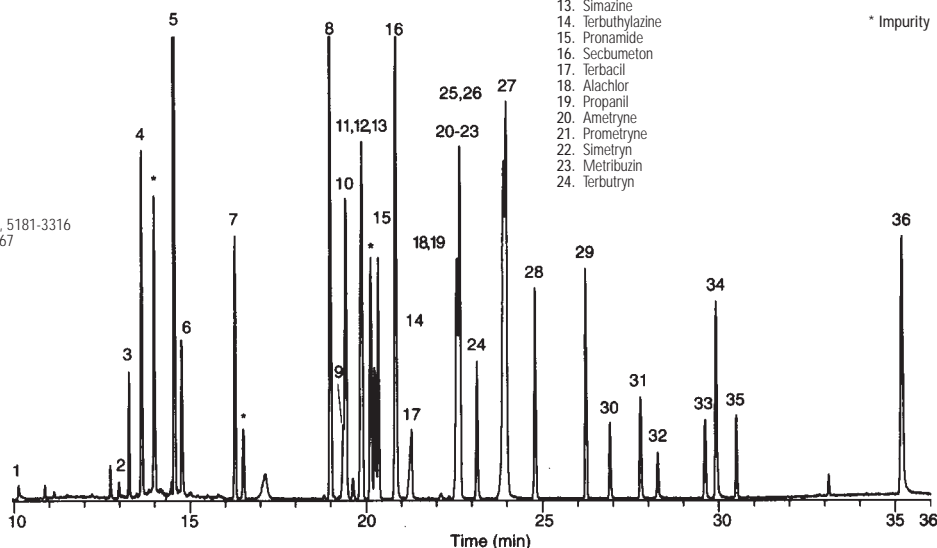
Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

- | | |
|-------------------|------------------|
| 1. Monuron | 25. Metolachlor |
| 2. Diuron | 26. Bromacil |
| 3. EPTC | 27. Dacthal |
| 4. Dichlobenil | 28. Diphenamid |
| 5. Vernolate | 29. Butachlor |
| 6. Pebulate | 30. Napropamide |
| 7. Molinate | 31. Carboxin |
| 8. Sulfallate | 32. Tricyclazole |
| 9. Atraton | 33. Norflurazon |
| 10. Prometon | 34. Hexazinone |
| 11. Altrazine | 35. Difololan |
| 12. Propazine | 36. Fluridone |
| 13. Simazine | |
| 14. Terbutylazine | |
| 15. Pronamide | |
| 16. Secbumeton | |
| 17. Terbacil | |
| 18. Alachlor | |
| 19. Propanil | |
| 20. Ametryne | |
| 21. Prometryne | |
| 22. Simetryn | |
| 23. Metribuzin | |
| 24. Terbutryn | |

* Impurity



GC and GC/MS Applications

Environmental-Pesticides and Herbicides

Triazine Herbicides I

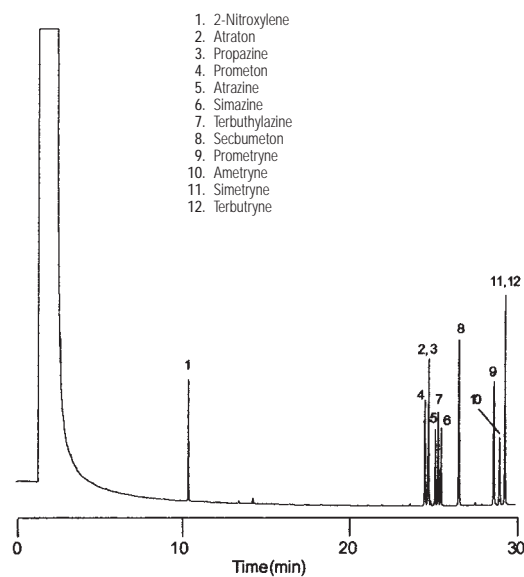
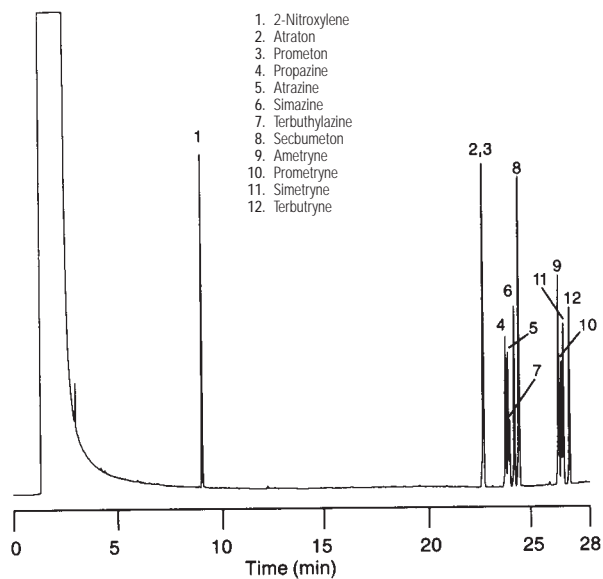
Column: DB-1701
123-0732
30 m x 0.32 mm, 0.25 µm
 Carrier: Helium at 35 cm/sec, measured at 50°C
 Oven: 50°C for 1 min
 50-100°C at 25°/min
 100-250°C at 5°/min
 Injection: Splitless, 250°C
 40 sec purge activation time
 Detector: FID, 300°C
 Nitrogen makeup gas at 30 mL/min
 Sample: 1 µL of 0.1 µg/µL in methanol

Triazine Herbicides II

Column: DB-17
122-1732
30 m x 0.25 mm, 0.25 µm
 Carrier: Helium at 35 cm/sec, measured at 50°C
 Oven: 50°C for 1 min
 50-100°C at 25°/min
 100-250°C at 5°/min
 Injection: Splitless, 250°C
 40 sec purge activation time
 Detector: FID, 300°C
 Nitrogen makeup gas at 30 mL/min
 Sample: 1 µL of 0.1 µg/µL in methanol

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Environmental-Semivolatiles

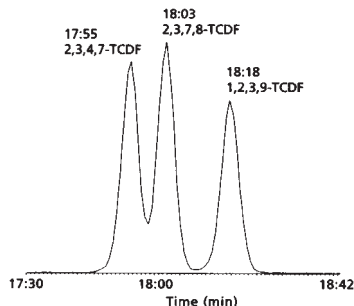
Environmental-Semivolatiles

Tetrachlorodibenzo-p-furans

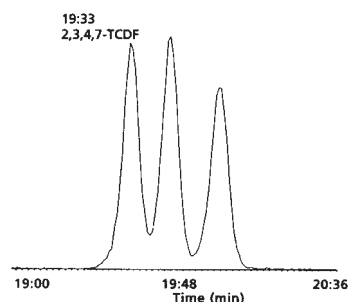
Note the separation between 2,3,7,8-TCDF and 2,3,4,7-TCDF on DB-225 is also easily achievable (and actually a little better!) on DB-225ms.

Carrier: Helium at 12 mL/min
 Oven: 160-250°C at 7°/min
 250°C until compounds elute
 Injection: Splitless, 240°C
 Detector: VG Autospec Ultima

Column: DB-225
 122-2232
 30 m x 0.25 mm, 0.25 µm



Column: DB-225ms
 122-2932
 30 m x 0.25 mm, 0.25 µm



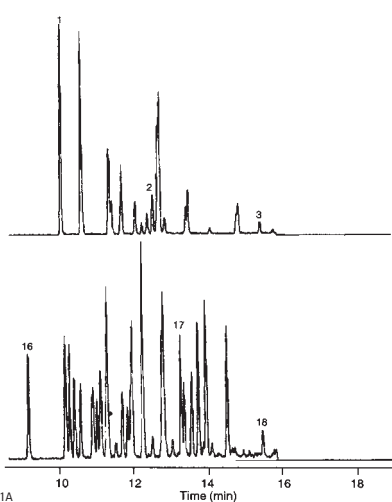
Dioxins and Furans

Column: DB-Dioxin
 122-2461
 60 m x 0.25 mm, 0.15 µm

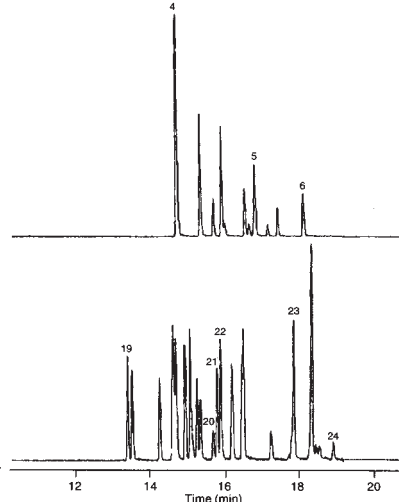
Carrier: Helium at 34.3 cm/sec, measured at 250°C
 Oven: 180°C for 1 min
 180-270°C at 2.5°/min
 270°C for 40 min

1. 1,3,6,8-TCDD
2. 2,3,7,8-TCDD
3. 1,2,8,9-TCDD
4. 1,2,4,6,8-/1,2,4,7,9-PeCDD
5. 1,2,3,7,8 + unknown-PeCDD
6. 1,2,4,8,9-PeCDD
7. 1,2,4,6,7,9-/1,2,4,6,8,9-HeCDD
8. 1,2,3,4,7,8-HeCDD
9. 1,2,3,4,6,9-HeCDD
10. 1,2,3,6,7,8-HeCDD
11. 1,2,3,7,8,9-HeCDD
12. 1,2,3,4,6,7-HeCDD
13. 1,2,3,4,6,7,9-HpCDD
14. 1,2,3,4,6,7,8-HpCDD
15. OcCDD
16. 1,3,6,8-TCDF
17. 2,3,7,8-TCDF
18. 1,2,8,9-TCDF
19. 1,3,4,6,8-PeCDF
20. 1,2,3,4,8-PeCDF
21. 1,2,3,7,8-PeCDF
22. 1,2,3,4,6-PeCDF
23. 2,3,4,7,8-PeCDF
24. 1,2,3,8,9-PeCDF
25. 1,3,4,6,7,9-HeCDF
26. 1,2,3,4,7,8/1,2,4,6,8,9-HeCDF
27. 1,2,3,6,7,8-HeCDF
28. 2,3,4,6,7,8-HeCDF
29. 1,2,3,7,8,9-HeCDF
30. 1,2,3,4,8,9-HeCDF
31. 1,2,3,4,6,7,8-HpCDF
32. 1,2,3,4,7,8,9-HpCDF
33. OcCDF

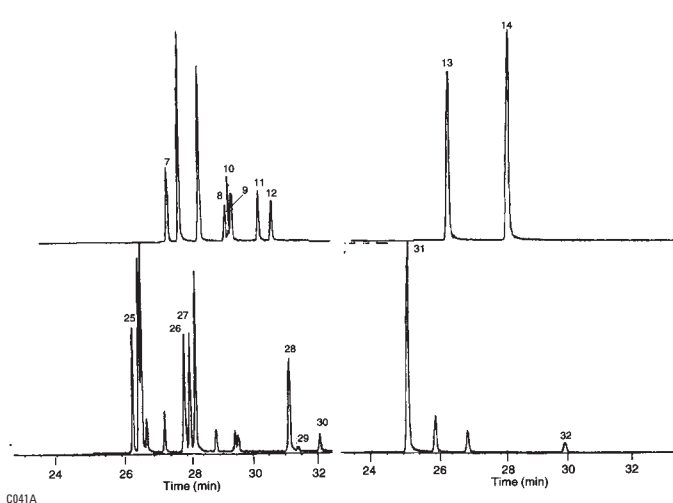
Tetra Isomers



Penta Isomers

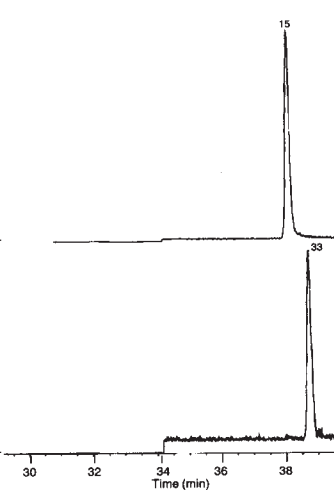


Hexa Isomers



Hepta Isomers

Octa Isomers



GC and GC/MS Applications

Environmental-Semivolatiles

PBDEs by ECD

Column: DB-XLB
15 m x 0.18 mm ID, 0.07 µm
Agilent Technologies custom column

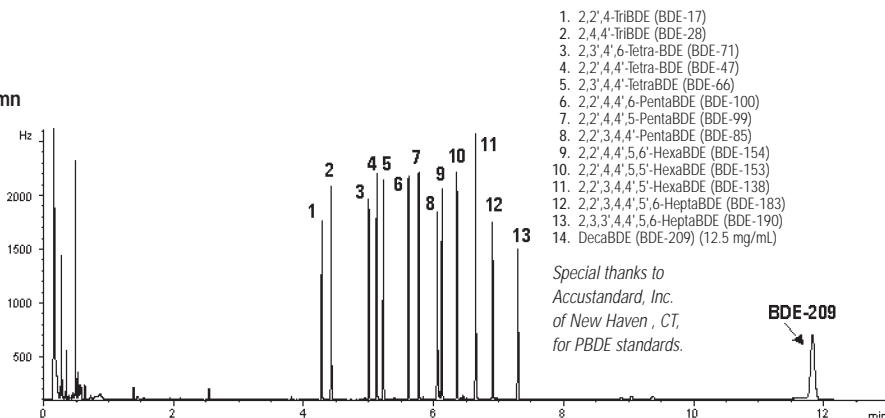
Carrier: Hydrogen at 72 cm/sec at 100°C
 (4.0 mL/min), constant flow mode

Oven: 100°C for 0.5 min
 100°C to 300°C at 30°C/min
 300°C for 5 min

Injection: Split, 250°C
 Split ratio 20:1

Detector: ECD, 300°C
 Peak, Congener (2.5 mg/mL)

Sample: 1 µL



1. 2,2',4-TribDE (BDE-17)
2. 2,4,4'-TriBDE (BDE-28)
3. 2,3',4',6-Tetra-BDE (BDE-71)
4. 2,2',4,4'-Tetra-BDE (BDE-47)
5. 2,3',4,4'-TetraBDE (BDE-66)
6. 2,2',4,4',6-PentaBDE (BDE-100)
7. 2,2',4,4',5-PentaBDE (BDE-99)
8. 2,2',3,4,4'-PentaBDE (BDE-85)
9. 2,2',4,4',5,6'-HexaBDE (BDE-154)
10. 2,2',4,4',5,5'-HexaBDE (BDE-153)
11. 2,2',3,4,4',5'-HexaBDE (BDE-138)
12. 2,2',3,4,4',5',6-HeptaBDE (BDE-183)
13. 2,3,3',4,4',5,6-HeptaBDE (BDE-190)
14. DecaBDE (BDE-209) (12.5 mg/mL)

Special thanks to
 Accustandard, Inc.
 of New Haven, CT,
 for PBDE standards.

Aroclors 1016-1268 (without 1221)

Column: DB-XLB
121-1232
30 m x 0.18 mm, 0.18 µm

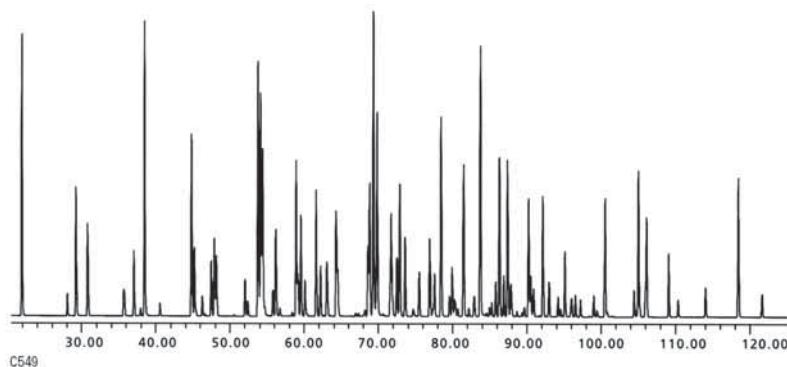
Carrier: Helium at 37 cm/sec, measured at 150°C

Oven: 100°C for 1 min
 100-265°C at 1.2°/min

Injection: Hot On-column, 250°C

Detector: MSD, 340°C transfer line, SIM

Sample: 1 µL in isooctane, 12.5 ppm



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID,
 G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

IUPAC	Retention Time	IUPAC	Retention Time	IUPAC	Retention Time	IUPAC	Retention Time	IUPAC	Retention Time	IUPAC	Retention Time
3	26.03	20	60.10	57	72.03	125	81.18	118	89.71	162	101.00
2	32.69	51	60.36	58	72.78	97	81.48	133	90.17	174	101.25
1	33.92	45	61.48	102	73.18	79	81.87	184	90.67	181	101.94
4	35.61	22	61.87	61	73.22	116	82.12	122	90.73	167	101.95
10	35.74	46	62.44	98	73.69	148	82.63	114	91.05	202	102.58
9	40.70	73	63.60	93	73.83	78	82.78	165	91.17	177	102.70
7	40.85	36	63.97	76	73.97	87	82.85	146	91.26	171	103.36
6	42.15	69	64.03	63	74.03	136	82.94	161	91.66	201	103.39
5	43.11	43	64.08	88	74.33	117	83.33	132	91.86	204	103.47
8	43.64	52	64.57	74	74.68	115	83.48	168	92.22	197	103.64
19	45.84	48	64.85	70	75.15	85	83.54	153	92.28	173	105.18
14	46.58	49	65.24	121	75.40	111	83.89	179	92.93	156	105.30
30	48.01	104	65.62	95	75.45	154	83.96	105	93.48	172	105.56
11	50.08	39	65.80	91	75.55	110	84.44	141	93.90	157	105.72
18	50.25	65	65.85	66	75.65	81	84.67	176	94.08	192	106.05
17	50.60	47	65.86	155	75.83	120	84.93	186	94.75	180	106.68
12	50.85	62	65.87	55	76.58	82	85.61	137	95.11	200	106.76
13	51.69	38	65.96	80	77.19	151	85.89	127	95.16	193	107.01
27	51.74	75	66.23	84	77.48	135	86.21	130	95.41	191	107.69
24	52.08	44	67.36	89	77.52	77	86.47	163	95.76	170	110.82
16	52.95	59	67.95	56	77.69	144	86.69	164	95.77	198	110.90
15	53.46	42	67.98	92	77.78	147	87.25	138	96.35	199	111.22
32	53.70	35	68.52	60	78.45	149	87.53	160	96.50	190	111.48
54	54.87	71	68.89	90	78.64	139	87.82	129	96.58	196	112.14
34	55.33	41	68.93	101	78.78	143	87.83	178	96.87	169	112.22
23	55.54	96	69.31	113	79.37	140	88.20	158	96.99	203	112.33
29	56.14	64	70.13	150	79.43	124	88.29	175	97.74	208	115.39
50	57.51	40	70.22	99	79.47	107	88.69	182	97.78	189	116.61
26	57.60	37	70.33	152	80.10	123	88.81	187	98.18	207	116.62
25	57.98	72	70.34	83	80.57	109	88.93	166	98.85	195	116.65
31	59.42	103	70.74	119	80.64	134	89.02	183	99.04	194	120.33
53	59.43	68	70.90	86	80.87	106	89.04	126	99.87	205	121.34
28	59.79	100	71.75	112	80.89	142	89.27	159	100.21	206	124.75
21	59.84	67	71.99	108	81.13	188	89.54	128	100.37	209	128.32
33	60.05	94	71.99	145	81.15	131	89.62	185	100.70		

GC and GC/MS

GC and GC/MS Applications

Environmental-Semivolatiles

Congeners in DIN Method PCBs

Column: DB-XLB

122-1236

30 m x 0.25 mm, 0.50 μ m

Carrier: Helium at 34.2 cm/sec, measured at 150°C

Oven: 100°C for 1 min
100-320°C at 5.6°/min

Injection: Hot On-column, 250°C
Split flow 100 mL/min

Detector: MSD, 300°C transfer line
SIM of 221.9, 255.9, 291.9, 325.8, 359.8, 395.8, 429.7, 463.7

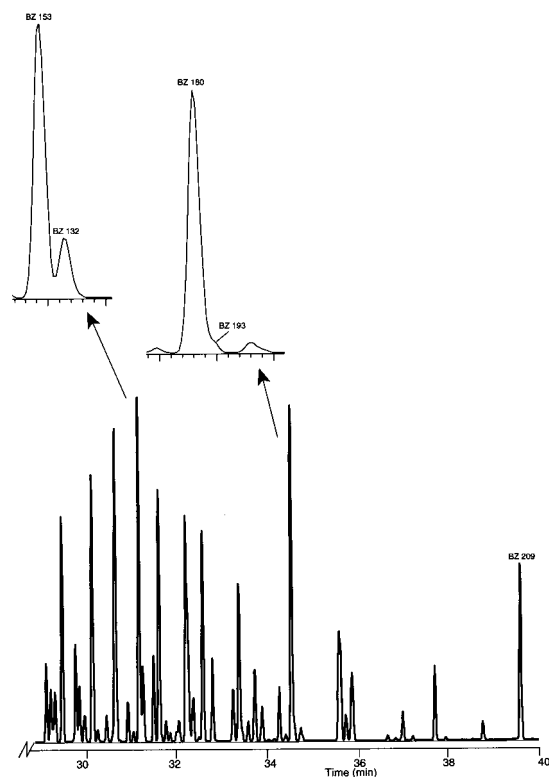
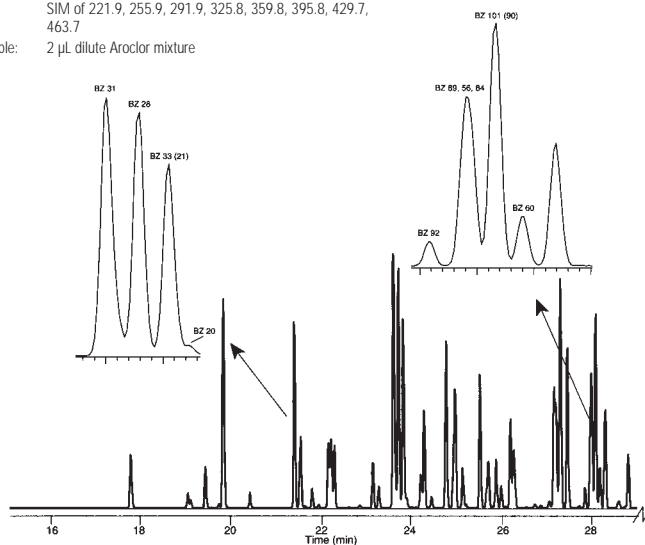
Sample: 2 μ L dilute Aroclor mixture

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730

Syringe: 10 μ L tapered, FN 23-265/42/HP, 5181-1267



Extended Temperature Program Resolving Congeners 52 and 138

Column: DB-XLB

122-1236

30 m x 0.25 mm, 0.50 μ m

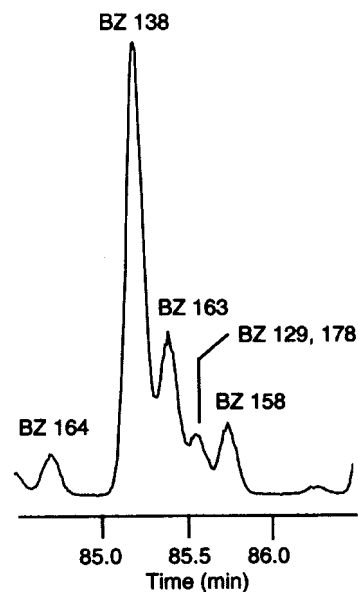
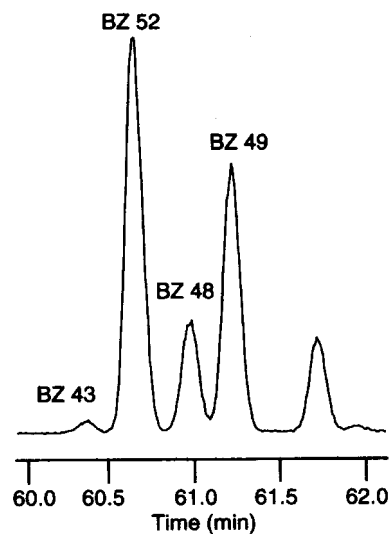
Carrier: Helium at 34.2 cm/sec, measured at 150°C

Oven: 100°C for 1 min
100-275°C at 1.6°/min

Injection: Hot On-column, 250°C
Split flow 100 mL/min

Detector: MSD, 300°C transfer line
SIM of 221.9, 255.9, 291.9, 325.8, 359.8, 395.8, 429.7, 463.7

Sample: 2 μ L dilute Aroclor mixture



GC and GC/MS Applications

Environmental-Semivolatiles

PCBs by EPA Method 8082

Column: DB-35ms
123-3832
30 m x 0.32 mm, 0.25 μ m

Column: DB-XLB
123-1236
30 m x 0.32 mm, 0.50 μ m

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110°C for 0.5 min
110-320°C at 15°C/min
320°C for 5 min

Injection: Splitless, 250°C
30 sec purge activation time

Detector: μ ECD, 350°C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

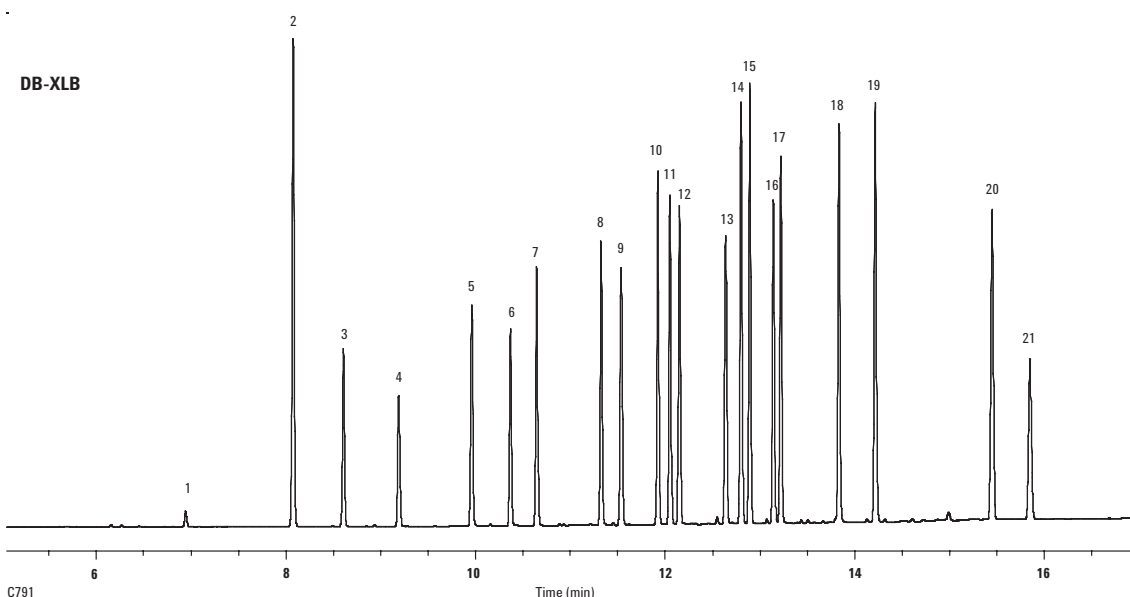
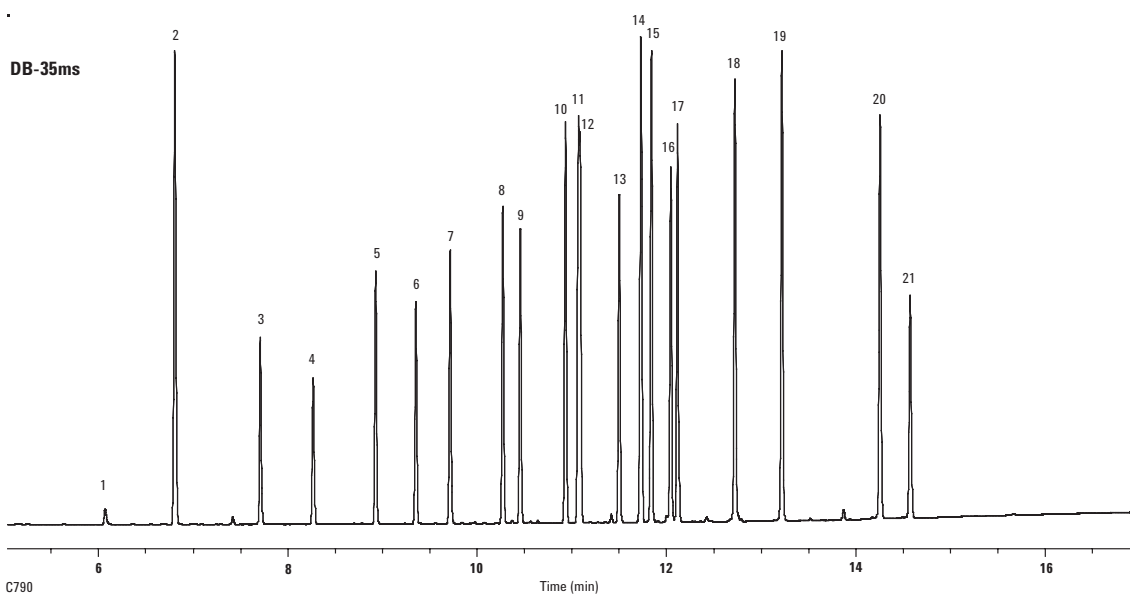
Sample: 50 pg per component

1. IUPAC 1
2. Tetrachloro-m-xylene (IS/SS)
3. IUPAC 5
4. IUPAC 18
5. IUPAC 31
6. IUPAC 52
7. IUPAC 44
8. IUPAC 66
9. IUPAC 101
10. IUPAC 87
11. IUPAC 110
12. IUPAC 151
13. IUPAC 153
14. IUPAC 141
15. IUPAC 137
16. IUPAC 187
17. IUPAC 183
18. IUPAC 180
19. IUPAC 170
20. IUPAC 206
21. Decachlorobiphenyl (IS/SS)

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

IS/SS - Internal Standard/
Surrogate Standard



GC and GC/MS Applications

Environmental-Semivolatiles

Chlordane

Column: DB-35ms
123-3832
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110°C for 0.5 min
110-320°C at 15°C/min
320°C for 5 min

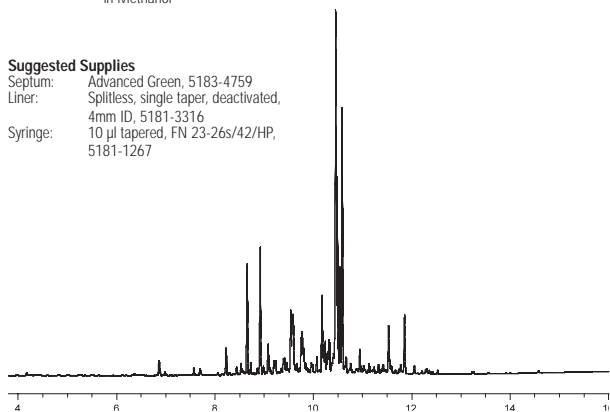
Injection: Splitless, 250°C
30 sec purge activation time

Detector: µECD, 350°C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 1 µg/mL per component
in Methanol

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated,
4mm ID, 5181-3316
Syringe: 10 µl tapered, FN 23-26s/42/HP,
5181-1267



Toxaphene

Column: DB-35ms
123-3832
30 m x 0.32 mm, 0.25 µm

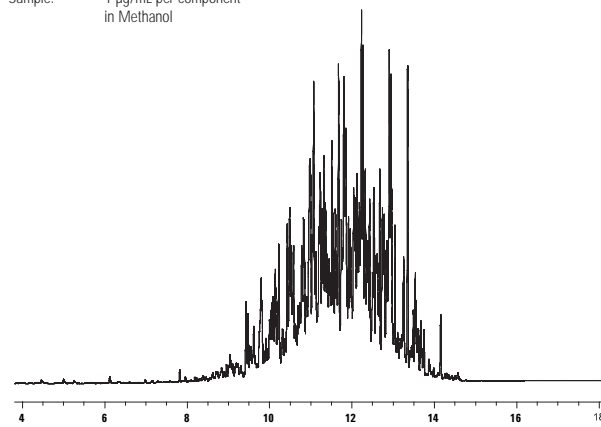
Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110°C for 0.5 min
110-320°C at 15°C/min
320°C for 5 min

Injection: Splitless, 250°C
30 sec purge activation time

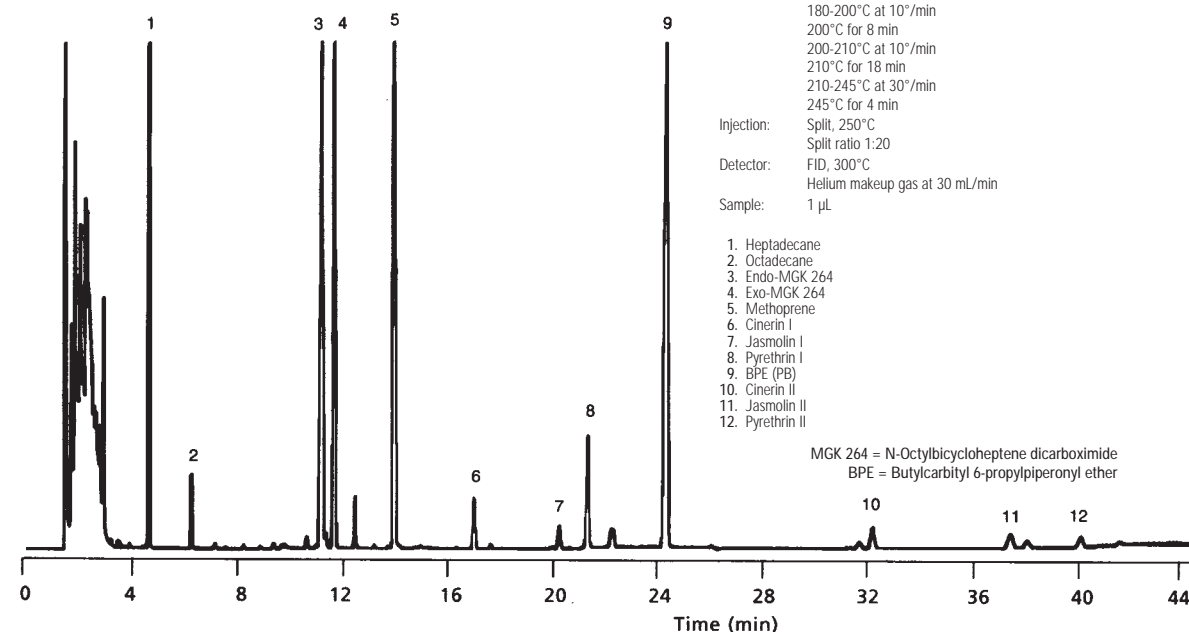
Detector: µECD, 350°C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 1 µg/mL per component
in Methanol



Pyrethrins

*Chromatogram courtesy of Khan Nguyen and
Richard Moorman of Sandoz Agro Inc.*



Column: DB-1
123-1032
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 39 cm/sec, measured at 150°C

Oven: 180°C for 11 min
180-200°C at 10°/min
200°C for 8 min
200-210°C at 10°/min
210°C for 18 min
210-245°C at 30°/min
245°C for 4 min

Injection: Split, 250°C
Split ratio 1:20

Detector: FID, 300°C
Helium makeup gas at 30 mL/min

Sample: 1 µL

GC and GC/MS Applications

Environmental-Semivolatiles

Organotin Compounds I

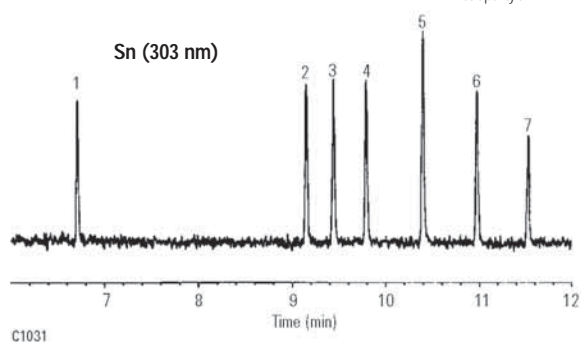
Column: HP-1
19091Z-012
25 m x 0.32 mm, 0.17 μ m

Carrier: Helium, 100 kPa
Oven: 50°C for 1 min
50-260°C at 15°C/min
Injection: Splitless
Detector: AED, 330°C
Sample: 1 μ L

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID,
G1544-80730
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

1. Dimethylpentyltin
2. Tetrabutyltin
3. Methyltripentyltin
4. Tributylpentyltin
5. Dibutylpentyltin
6. Butylpentyltin
7. Tetrapentyltin



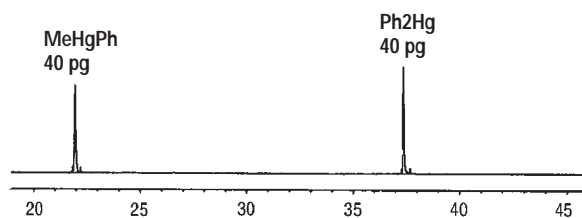
Organomercury Compounds

Column: HP-5
19091J-002
25 m x 0.20 mm, 0.11 μ m

Carrier: Helium, 0.75 mL/min constant flow
Oven: 80°C for 4 min
80-300°C at 5°C/min
Injection: Splitless, 300°C
Detector: AED, 300°C
Tin selective at 303.4 nm
Sample: 1 μ L

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID,
G1544-80730
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267



Organotin Compounds II

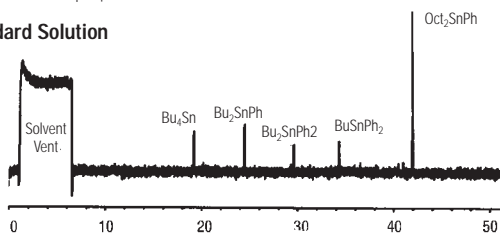
Column: HP-5
19091J-002
25 m x 0.20 mm, 0.11 μ m

Carrier: Helium, 0.75 mL/min constant flow
Oven: 60-360°C at 5°C/min
Injection: Splitless, 300°C
Detector: AED, 300°C
Hg selective at 254 nm
Sample: 1 μ L

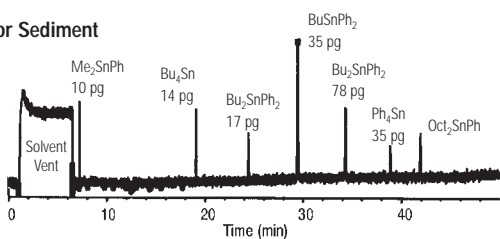
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID,
G1544-80730
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Standard Solution



Harbor Sediment

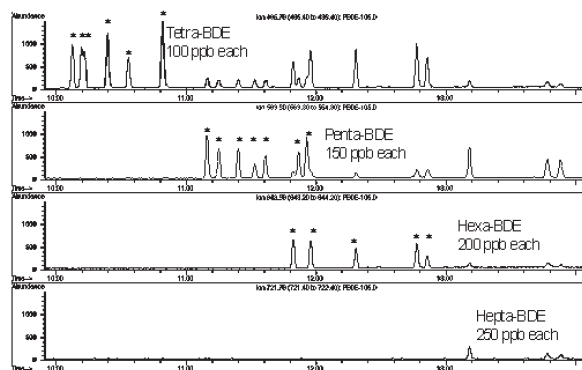


PBDEs

Column: DB-XLB
122-1231
30 m x 0.25 mm, 0.10 μ m

Carrier: Helium at 38 cm/sec at 100°C (1.2 mL/min),
constant flow mode
Oven: 100°C for 1 min; 100°C to 340°C at 20°C/min,
340°C for 12 min
Injection: Cool-on-column, oven-track mode
Detector: Agilent 5973 MSD, 325°C transfer line, EI SIM
(ions monitored: 231.8, 248.0, 327.9, 398.6, 400.5,
405.8, 845.7, 563.6, 643.5, 721.4, 799.3)
Sample: 0.5 μ L

For a complete application note, visit www.agilent.com/chem, click the "Library" link and type in publication number 5989-0094EN



GC and GC/MS Applications

Environmental-Semivolatiles

Semivolatile Compounds, EPA Method 8270

Column: HP-5ms

19091S-133

30 m x 0.25 mm, 0.50 μ m

Carrier: Ramped flow 1.2 mL/min for 0.0 min
Ramp at 99 mL/min to 2.0 mL/min
2.0 mL/min for 0.35 min
Ramp at 10 mL/min to 1.2 mL/min

Oven: 40°C for 1.0 min
40-100°C at 15°C/min
100-240°C at 20°C/min
240-310°C at 10°C/min

Injection: Splitless, 250°C
30 mL/min purge flow at 0.35 min

Detector: 5973 MSD, 310°C transfer line
Scan range 35-500 amu, 3.25 scans/sec

Sample: 1 μ L of 50 ng standard

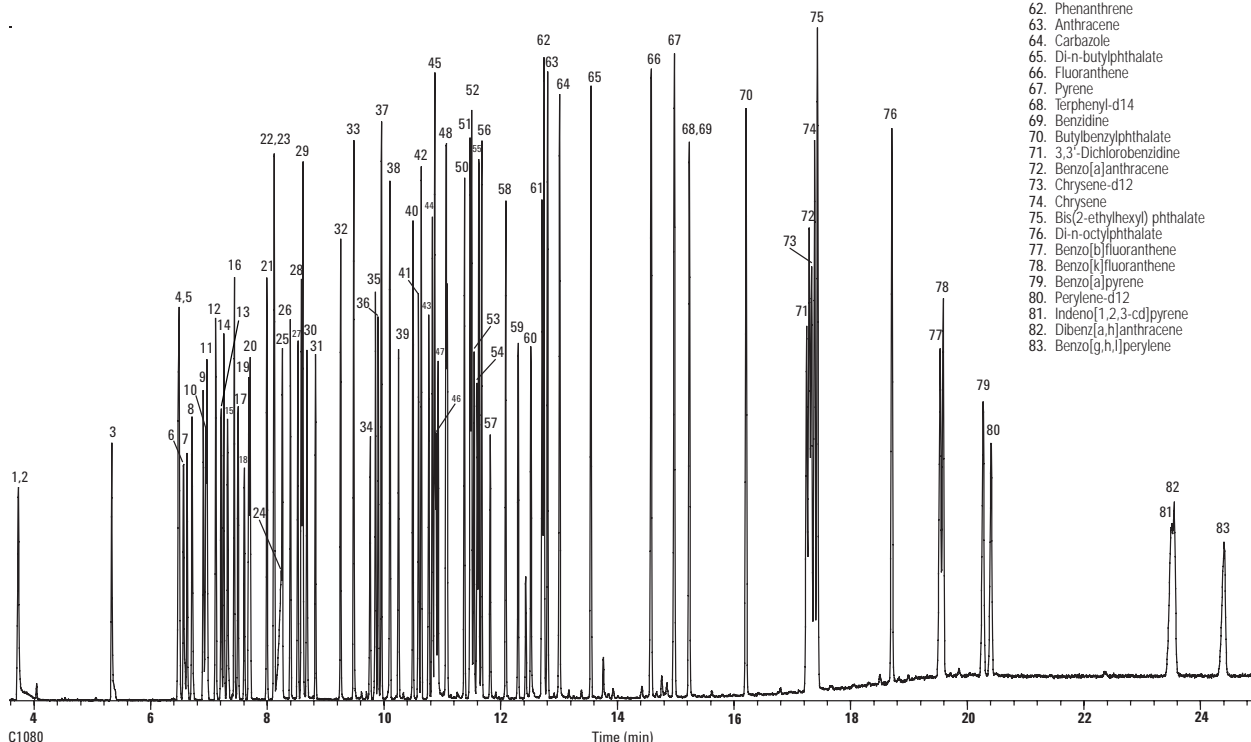
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID,
5181-3316

Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

1. n-Nitrosodimethylamine
2. Pyridine
3. 2-Fluorophenol
4. Phenol-d5
5. Phenol
6. Aniline
7. Bis(2-chloroethyl) ether
8. 2-Chlorophenol
9. 1,3-Dichlorobenzene
10. 1,4-Dichlorobenzene-d4
11. 1,4-Dichlorobenzene
12. Benzyl alcohol
13. 1,2-Dichlorobenzene
14. 2-Methylphenol
15. Bis(2-chloroisopropyl) ether
16. 4-Methylphenol
17. n-Nitroso-di-n-propylamine
18. Hexachloroethane
19. Nitrobenzene-d5
20. Nitrobenzene
21. Isophorone
22. 2-Nitrophenol
23. 2,4-Dimethylphenol
24. Benzoic acid
25. Bis(2-chloroethoxy) methane
26. 2,4-Dichlorophenol
27. 1,2,4-Trichlorobenzene
28. Naphthalene-d8
29. Naphthalene
30. 4-Chloroaniline
31. Hexachlorobutadiene
32. 4-Chloro-3-methylphenol
33. 2-Methylnaphthalene
34. Hexachlorocyclopentadiene
35. 2,4,6-Trichlorophenol
36. 2,4,5-Trichlorophenol
37. 2-Fluorobiphenyl
38. 2-Chloronaphthalene
39. 2-Nitroaniline
40. Dimethylphthalate
41. 2,6-Dinitrotoluene
42. Acenaphthylene
43. 3-Nitroaniline
44. Acenaphthene-d10
45. Acenaphthene
46. 2,4-Dinitrophenol
47. 4-Nitrophenol
48. Dibenzofuran
49. 2,4-Dinitrotoluene
50. Diethylphthalate
51. 4-Chlorophenyl-phenyl ether
52. Fluorene
53. 4-Nitroaniline
54. 4,6-Dinitro-2-methylphenol
55. n-Nitrosodiphenylamine
56. Azobenzene
57. 2,4,6-Tribromophenol
58. 4-Bromophenyl-phenylether
59. Hexachlorobenzene
60. Pentachlorophenol
61. Phenanthrene-d10
62. Phenanthrene
63. Anthracene
64. Carbazole
65. Di-n-butylphthalate
66. Fluoranthene
67. Pyrene
68. Terphenyl-d14
69. Benzidine
70. Butylbenzylphthalate
71. 3,3'-Dichlorobenzidine
72. Benzo[a]anthracene
73. Chrysene-d12
74. Chrysene
75. Bis(2-ethylhexyl) phthalate
76. Di-n-octylphthalate
77. Benzo[b]fluoranthene
78. Benzo[k]fluoranthene
79. Benzo[a]pyrene
80. Perylene-d12
81. Indeno[1,2,3-cd]pyrene
82. Dibenzo[a,h]anthracene
83. Benzo[g,h,i]perylene



A variety of Agilent HP-5ms and DB-5ms columns can be used for 8270 and similar semivolatiles applications. The column shown above was chosen to maximize inertness and robustness to residues with a thicker 0.5 μ m film, but the price paid is a slightly longer run time. An HP-5ms, 30 m x 0.25 mm ID, 0.25 μ m, P/N 19091S-433 would give shorter run times, with slightly less inertness and robustness. A DB-5ms, 30 m x 0.25 mm ID, 0.25 μ m, P/N 122-5532, would give slightly less inertness, but offer better resolution of PAHs such as Benzo[b]fluoranthene and Benzo[k]fluoranthene. A DB-5ms, 20 m x 0.18 mm x 0.18 μ m, P/N 121-5522, can offer significantly reduced run times with a modest loss of inertness.

GC and GC/MS Applications

Environmental-Semivolatiles

EPA Method 525.2

Column: DB-5ms
122-5532

30 m x 0.25 mm, 0.25 µm

Carrier: Helium, at 32 cm/sec, measured at 45°C, constant flow mode

Oven: 45°C for 1 min
45-130°C at 30°/min
130°C for 3 min
130-180°C at 12°/min
180-240°C at 7°/min
240-325°C at 12°/min
325°C for 5 min

Injection: Splitless, 300°C
1.0 min purge activation time
FocusLiner

Detector: MSD, 325°C transfer line
Full scan m/z 45-450

Sample: Composite mixture of
Accustandard
Method 525.2 standards
(M-525.2-SV-ASL,
M-525.2-FS-ASL,
M-525.2-CP-ASL,
M-525.2-NP1-ASL,
M-525.2-NP2-ASL):
target compounds at 2 ng/µL,
iS/SS at 5 ng/µL.

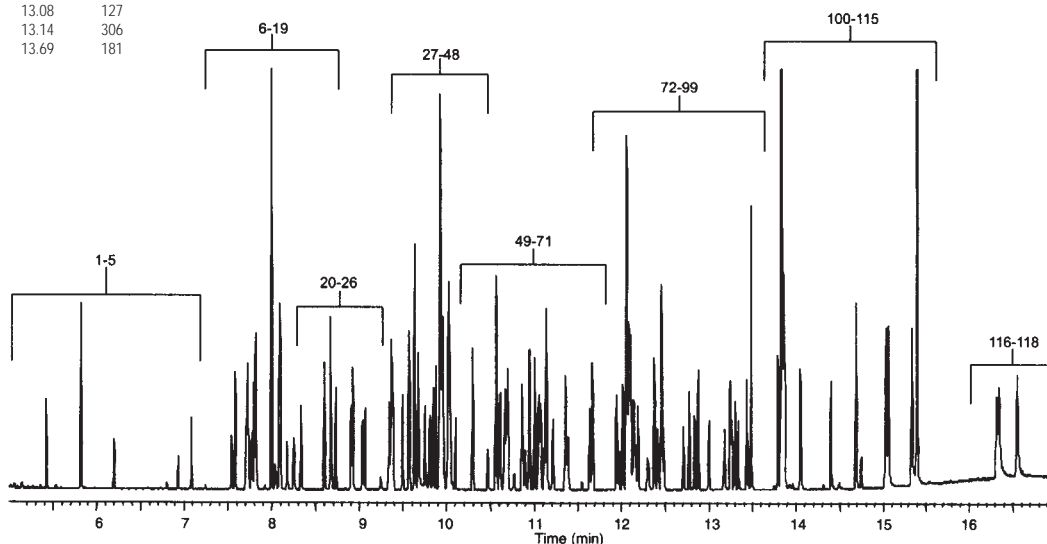
Peak No./Compound	RT	m/z
1. Isophorone	5.85	82
2. 1,3-Dimethyl-2-nitrobenzene (SS)	6.65	134
3. Dichlorvos	7.41	109
4. Hexachlorocyclo-pentadiene	8.87	237
5. EPTC	9.17	128
6. Mevinphos	10.09	127
7. Butylate	10.18	57/146
8. Vernolate	10.42	128
9. Dimethyl phthalate	10.45	163
10. Terrazole (aka Etridazole)	10.47	211/183
11. 2,6-Dinitrotoluene	10.56	165
12. Tillam (aka Pebulate)	10.61	128
13. Acenaphthylene	10.65	152
14. Acenaphthene-d10 (IS #1)	11.00	164
15. Chloroneb	11.17	191
16. 2-Chlorobiphenyl	11.19	188
17. Tebuthiuron	11.37	156
18. 2,4-Dinitrotoluene	11.51	165
19. Molinate	11.68	126
20. Diethyl phthalate	12.21	149
21. Fluorene	12.35	166
22. Propachlor	12.46	120
23. Ethoprop	12.82	158
24. Cycloate	12.86	83/154
25. Chlorpropham	13.08	127
26. Trifluralin	13.14	306
27. α-BHC	13.69	181

Peak No./Compound	RT	m/z
28. 2,3-Dichlorobiphenyl	13.74	222/152
29. Hexachlorobenzene	13.77	284
30. Gesatamine (aka Atraton)	13.99	196/169
31. Prometon	14.14	225/168
32. Atrazine	14.26	200/215
33. Simazine	14.27	201/186
34. β-BHC	14.28	181
35. Pentachlorophenol	14.35	266
36. Propazine	14.35	214/172
37. γ-BHC	14.52	181
38. Terbufos	14.62	57
39. Pronamide	14.69	173
40. Diazinon	14.76	137/179
41. Phenanthrene-d10 (IS #2)	14.85	188
42. Chlorothalonil	14.89	266
43. Phenanthrene	14.92	178
44. Terbacil	15.02	161
45. Methyl paraoxon	15.04	109
46. Disulfoton	15.05	88
47. Anthracene	15.06	178
48. δ-BHC	15.20	181
49. 2,4,5-Trichlorobiphenyl	15.59	256
50. Metribuzin	15.95	198
51. Alachlor	16.14	160
52. Simetryn	16.23	213
53. Ametryn	16.33	227/170
54. Heptachlor	16.36	100
55. Prometryne	16.40	241/184
56. Prebane (aka Terbutryne)	16.72	226/185
57. Bromacil	16.79	205
58. Di-n-butyl phthalate	16.90	149
59. 2,2',4,4'-Tetrachlorobiphenyl	17.02	292
60. Metolachlor	17.11	162
61. Dursban (aka Chlorpyrifos)	17.15	197/97
62. Cyanazine	17.23	225/68
63. Dacthal (aka DCPA methyl ester)	17.27	301
64. Aldrin	17.29	66
65. Triadimefon	17.43	57
66. Diphenamid	17.73	72/167
67. MGK-264 (isomer A)	17.78	164/66
68. MGK-264 (isomer B)	18.11	164
69. Heptachlor epoxide	18.28	81
70. 2,2',3',4',6-Pentachloro-biphenyl	18.34	326
71. Merphos	18.36	209/153
72. γ-Chlordane	18.88	373
73. Tetrachlorvinphos (aka Stifos)	18.95	109

Peak No./Compound	RT	m/z
74. Butachlor	19.03	176/160
75. Pyrene-d10 (SS)	19.13	212
76. Pyrene	19.18	202
77. α-Chlordane	19.21	375/373
78. Endosulfan I	19.22	195
79. trans-Nonachlor	19.28	409
80. Fenamiphos	19.33	303/154
81. Napropamide	19.39	72
82. Tricyclazole	19.61	189
83. p,p'-DDE	19.76	246
84. DEF	19.84	57/169
85. 2,2',4,4',5,6'-Hexa-chlorobiphenyl	19.90	360
86. Dieldrin	19.92	79
87. Carboxin	19.97	143
88. Endrin	20.43	67/81
89. Chlorobenzilate	20.56	139
90. Endosulfan II	20.68	195
91. p,p'-DDD	20.77	235/165
92. Endrin aldehyde	21.01	67
93. Norflurazon	21.36	145
94. Benzyl butyl phthalate	21.49	149
95. Endosulfan sulfate	21.53	272
96. p,p'-DDT	21.61	235/165
97. Hexazinone	21.68	171
98. bis (2-Ethylhexyl) adipate	21.87	129
99. Triphenylphosphate (SS)	21.98	326/325
100. Endrin ketone (breakdown product)	22.52	67/317
101. 2,2',3,3',4,4',6-Hepta-chlorobiphenyl	22.59	394/396
102. Benz[a]anthracene	22.66	228
101. Chrysene-d12 (IS #3)	22.68	240
104. 2,2',3,3',4,5',6,6'-Octa-chlorobiphenyl	22.70	430/428
105. Methoxychlor	22.73	227
106. Chrysene	22.74	228
107. bis(2-Ethylhexyl) phthalate	23.10	149
108. Fenarimol	23.80	139
109. cis-Permethrin	24.38	183
110. trans-Permethrin	24.50	183
111. Benzo[b]fluoranthene	25.06	252
112. Benzo[k]fluoranthene	25.12	252
113. Fluridone	25.66	328
114. Benzo[a]pyrene	25.67	252
115. Perylene-d12 (SS)	25.78	264
116. Indeno[1,2,3-c,d]pyrene	27.63	276
117. Dibenzo[a,h]anthracene	27.69	278
118. Benzo[g,h,i]perylene	28.11	276

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

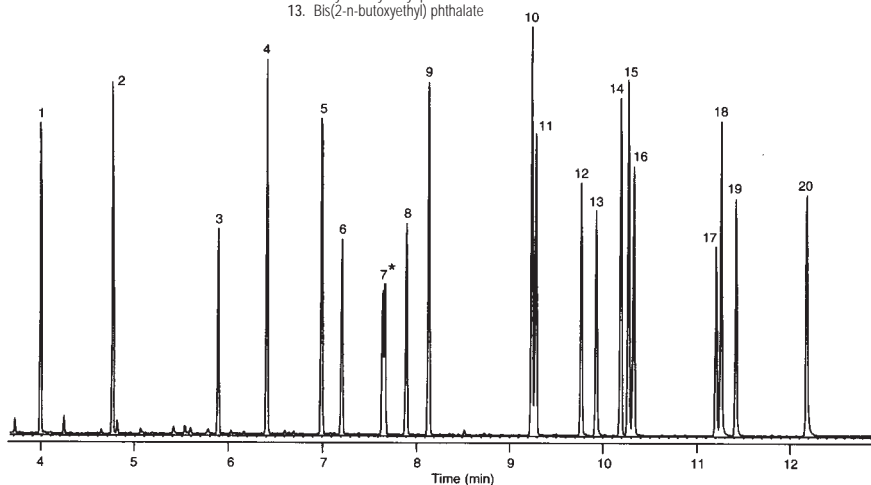
Environmental-Semivolatiles

EPA Method 8061 (Phthalate Esters)

Column: DB-5ms
121-5522
20 m x 0.18 mm, 0.18 µm
Carrier: Helium at 49 cm/sec, measured at 80°C constant flow program
Oven: 80°C for 0.5 min
 80-160°C at 30°/min
 160-320°C at 15°/min
Injection: Splitless, 300°C
 30 sec. purge activation time
Detector: MSD, 325°C transfer line
 Full scan m/z 50-400
Sample: 1 µL of 20 ng/µL
 Method 8061 mixture (Accustandard) in hexane

1. Dimethyl phthalate
2. Diethyl phthalate
3. Benzyl benzoate (IS)
4. Diisobutyl phthalate
5. Di-n-butyl phthalate
6. Bis(4-methoxyethyl) phthalate
7. Bis(4-methyl-2-pentyl) phthalate *
8. Bis(2-ethoxyethyl) phthalate
9. Diamyl phthalate
10. Dihexyl phthalate
11. Butyl benzyl phthalate
12. Hexyl 2-ethylhexyl phthalate
13. Bis(2-n-butoxyethyl) phthalate
14. Dicyclohexyl phthalate
15. Bis(2-ethylhexyl) phthalate
16. Diphenyl phthalate (SS)
17. Diphenyl isophthalate (SS)
18. Di-n-octyl phthalate
19. Dibenzyl phthalate (SS)
20. Dinonyl phthalate

* Two isomers
 IS - Internal Standard
 SS - Surrogate Standard



Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
 Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

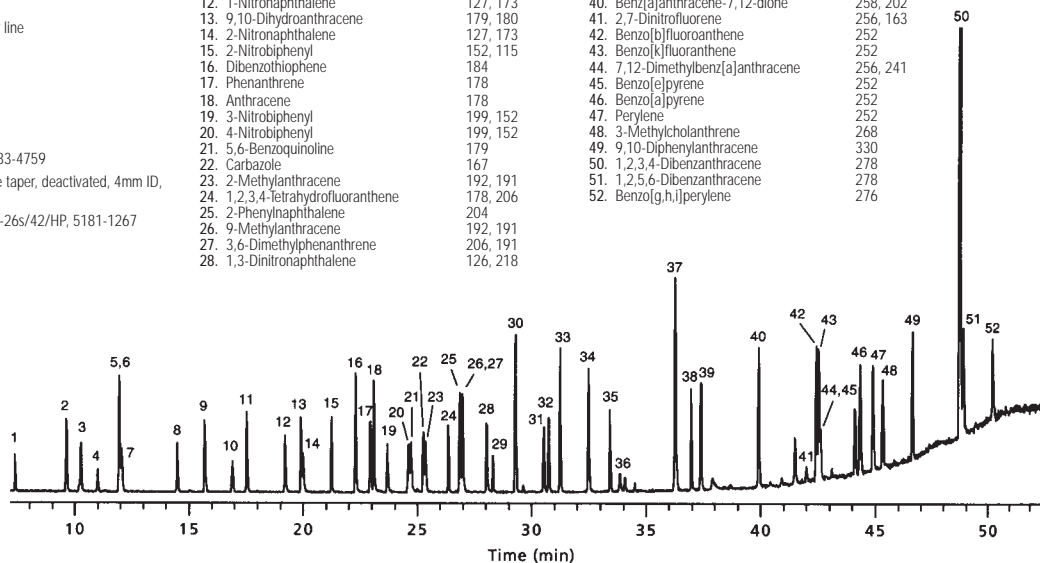
PAHs

Column: DB-17ms
122-4732
30 m x 0.25 mm, 0.25 µm
Carrier: Helium at: 34.1 cm/sec, measured at 150°C
Oven: 95°C for 0.5 min
 95-340°C at 5°/min
 340°C for 5 min
Injection: Split, 300°C
 Split ratio 1:40
Detector: MSD, 340°C transfer line
 Scan 80-330 amu
Sample: 2 µL, PAH standard

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730
 Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

- | | | | |
|------------------------------------|----------|------------------------------------|----------|
| 1. Naphthalene | 128 | 29. 1,5-Dinitronaphthalene | 218, 114 |
| 2. 2-Methylnaphthalene | 142, 141 | 30. Fluoranthene | 202 |
| 3. 1-Methylnaphthalene | 142, 141 | 31. 2,2'-Dinitrophenyl | 198, 139 |
| 4. Azulene | 128 | 32. Pyrene | 202 |
| 5. Acenaphthene | 154 | 33. 2'-Methylfluoranthene | 216, 215 |
| 6. Biphenyl | 154 | 34. 2,3-Benzofluorene | 216, 215 |
| 7. 2,6-Dimethylnaphthalene | 156, 155 | 35. Dodecahydrotriphenylene | 240, 198 |
| 8. Acenaphthalene | 152 | 36. 1-Amino-4-nitronaphthalene | 188, 115 |
| 9. Dibenzofuran | 168, 139 | 37. 9-Phenylanthracene | 254, 253 |
| 10. Dibenzo-p-dioxin | 184 | 38. 1,2-Benzanthracene | 228 |
| 11. Fluorene | 166, 165 | 39. Chrysene | 240 |
| 12. 1-Nitronaphthalene | 127, 173 | 40. Benz[a]anthracene-7,12-dione | 258, 202 |
| 13. 9,10-Dihydroanthracene | 179, 180 | 41. 2,7-Dinitrofluorene | 256, 163 |
| 14. 2-Nitronaphthalene | 127, 173 | 42. Benzo[b]fluoranthene | 252 |
| 15. 2-Nitrophenyl | 152, 115 | 43. Benzo[k]fluoranthene | 252 |
| 16. Dibenzothiophene | 184 | 44. 7,12-Dimethylbenz[a]anthracene | 256, 241 |
| 17. Phenanthrene | 178 | 45. Benzo[e]pyrene | 252 |
| 18. Anthracene | 178 | 46. Benzo[a]pyrene | 252 |
| 19. 3-Nitrophenyl | 199, 152 | 47. Perylene | 252 |
| 20. 4-Nitrophenyl | 199, 152 | 48. 3-Methylcholanthrene | 268 |
| 21. 5,6-Benzoquinoline | 179 | 49. 9,10-Diphenylanthracene | 330 |
| 22. Carbazole | 167 | 50. 1,2,3,4-Dibenzanthracene | 278 |
| 23. 2-Methylanthracene | 192, 191 | 51. 1,2,5,6-Dibenzanthracene | 278 |
| 24. 1,2,3,4-Tetrahydrofluoranthene | 178, 206 | 52. Benzo[g,h,i]perylene | 276 |
| 25. 2-Phenylnaphthalene | 204 | | |
| 26. 9-Methylanthracene | 192, 191 | | |
| 27. 3,6-Dimethylphenanthrene | 206, 191 | | |
| 28. 1,3-Dinitronaphthalene | 126, 218 | | |



The DB-35ms is also an excellent column for PAH analysis.

GC and GC/MS Applications

Environmental-Semivolatiles

Phenols

Column: DB-5ms
122-5532
30 m x 0.25 mm, 0.25 μ m

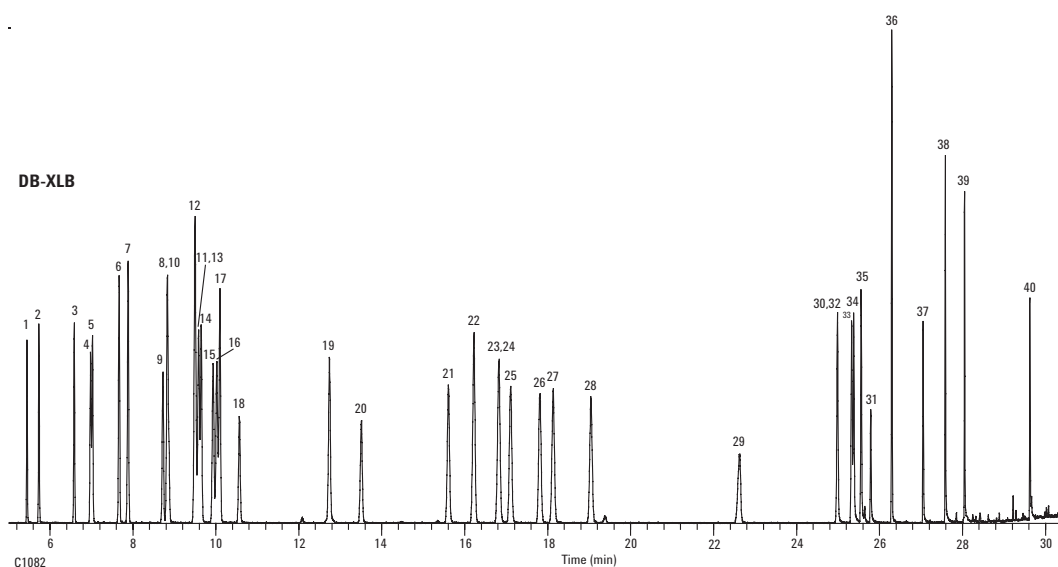
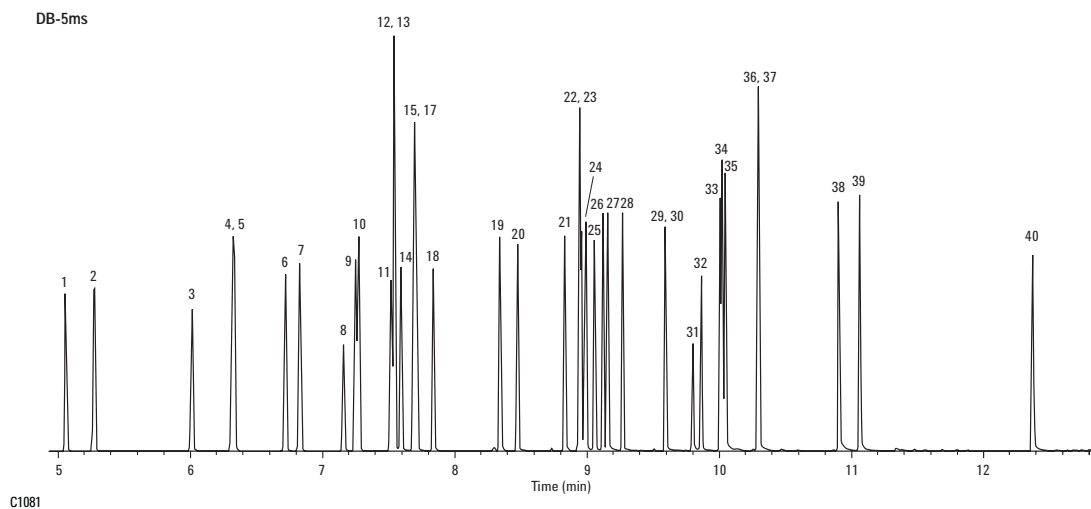
Column: DB-XLB
122-1232
30 m x 0.25 mm, 0.25 μ m

Carrier: He at 1.2 mL/min Constant Flow
Oven: 40°C for 2.00 min
40-100°C at 40°C/min
100°C for 0.50 min
100-140°C at 2°C/min
140-340°C at 30°C/min
Injection: Pulsed Splitless, 200°C
Pulse Pressure & Time: 25.0 psi for 1.00 min
Purge Flow & Time: 50.0 mL/min for 0.25 min
Gas Saver Flow & Time: 20.0 mL/min for 3.00 min
Detector: MSD, 320°C Transfer Line
Quadrupole at 150°C
Source at 230°C

- | | | |
|----------------------------|-----------------------------|------------------------------------|
| 1. Phenol | 14. 2,3-Dichlorophenol | 27. 2,3,6-Trichlorophenol |
| 2. 2-Chlorophenol | 15. 2-Chlorophenol | 28. 3,4,-Dichlorophenol |
| 3. 2-Methylphenol | 16. 4-Chlorophenol | 29. 3-Nitrophenol |
| 4. 4-Methylphenol | 17. 3,4-Dimethylphenol | 30. 2,5-Dinitrophenol |
| 5. 3-Methylphenol | 18. 2,6-Dichlorophenol | 31. 2,4-Dinitrophenol |
| 6. 2-Chloro-5-methylphenol | 19. 4-Chloro-2-methylphenol | 32. 4-Nitrophenol |
| 7. 2,6-Dimethylphenol | 20. 4-Chloro-3-methylphenol | 33. 2,3,5,6-Tetrachlorophenol |
| 8. 2-Nitrophenol | 21. 2,3,5-Trichlorophenol | 34. 2,3,4,5-Tetrachlorophenol |
| 9. 2,4-Dimethylphenol | 22. 2,4-Dibromophenol | 35. 2,3,4,6-Tetrachlorophenol |
| 10. 2,5-Dimethylphenol | 23. 2,4,6-Trichlorophenol | 36. 3,4,5-Trichlorophenol |
| 11. 2,4-Dichlorophenol | 24. 2,4,5-Trichlorophenol | 37. 2-Methyl-4,6-dinitrophenol |
| 12. 2,3-Dimethylphenol | 25. 2,3,4-Trichlorophenol | 38. Pentachlorophenol |
| 13. 2,5-Dichlorophenol | 26. 3,5-Dichlorophenol | 39. Dinoseb |
| | | 40. 2-Cyclohexyl-4,6-dinitrophenol |

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Environmental-Semivolatiles

EPA Method 552.2

Column: DB-35ms
123-3832

30 m x 0.32 mm, 0.25 µm
Column: DB-XLB
123-1236

30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

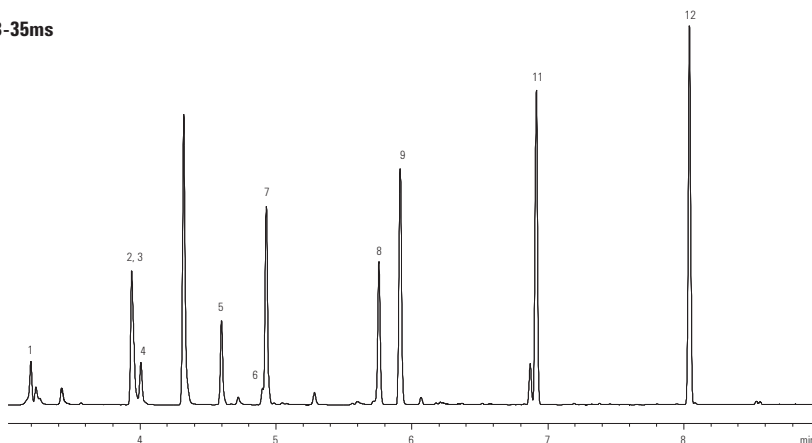
Oven: 40°C for 0.5 min
40-200°C at 15°C/min
200°C for 2 min

Injection: Splitless, 250°C
30 sec purge activation time

Detector: µECD, 350°C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

DB-35ms



Suggested Supplies

Septum: Advanced Green, 5183-4759

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

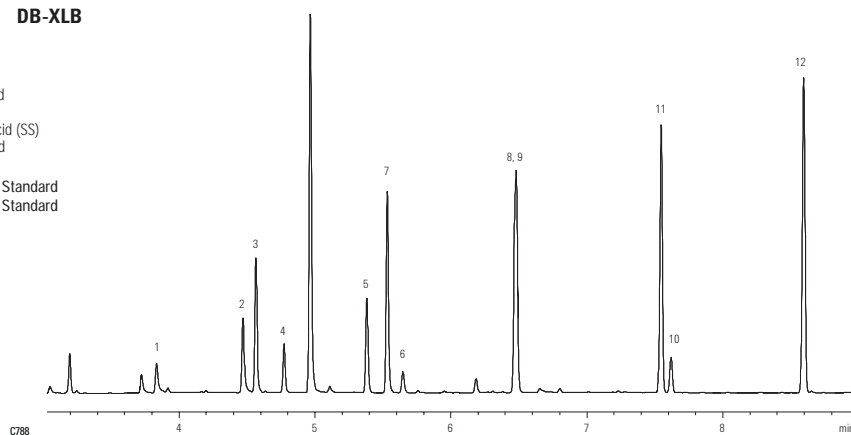
Syringe: 10 µl tapered, FN 23-26S/42/HP, 5181-1267

DB-XLB

1. Chloroacetic acid
2. Bromoacetic acid
3. Dichloroacetic acid
4. Dalapon
5. Trichloroacetic acid
6. 1,2,3-Trichloropropane (IS)

7. Bromochloroacetic acid
8. Bromodichloroacetic acid
9. Dibromoacetic acid
10. 2,3-Dibromopropionic acid (SS)
11. Chlorodibromoacetic acid
12. Tribromoacetic acid

IS - Internal Standard
SS - Surrogate Standard



Environmental-Volatiles

EPA Volatiles by GC/MS (Split Injector)

Column: DB-VRX
122-1564
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 30 cm/sec, measured at 45°C

Oven: 45°C for 10 min
45-190°C at 12°/min
190°C for 2 min
190-225°C at 6°/min
225°C for 1 min

Sampler: Purge and Trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175°C
Desorb: 220°C for 0.6 min

Injection: Split, 110°C
Split flow 30 mL/min

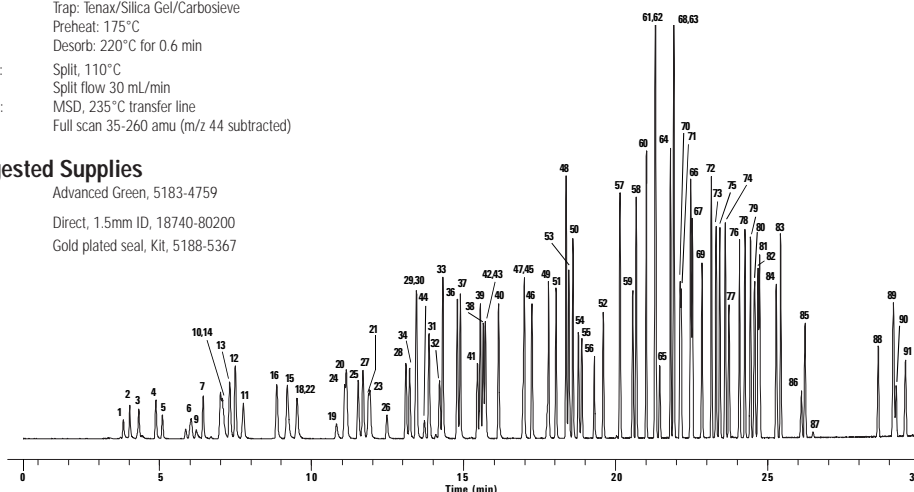
Detector: MSD, 235°C transfer line
Full scan 35-260 amu (m/z 44 subtracted)

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, Kit, 5188-5367



C378b

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethane
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile
15. Methyl-tert-butyl ether
16. trans-1,2-Dichloroethane
17. Hexane
18. 1,1-Dichloroethane
19. 2-Butanone
20. cis-1,2-Dichloroethane
21. 2,2-Dichloropropane
22. Propionitrile
23. Methyl acrylate
24. Methacrylonitrile
25. Bromochloromethane
26. Tetrahydrofuran
27. Chloroform
28. Pentafluorobenzene (IS)
29. 1,1,1-Trichloroethane
30. 1-Chlorobutane
31. 1,1-Dichloropropene
32. Carbon tetrachloride
33. Benzene
34. 1,2-Dichloroethane
35. 2,2-Dimethylhexane
36. Fluorobenzene (IS)
37. 1,4-Difluorobenzene (IS)
38. Trichloroethene
39. 1,2-Dichloropropane
40. Methyl methacrylate
41. Dibromomethane
42. Bromodichloromethane
43. 2-Nitropropane
44. Chloroacetonitrile
45. cis-1,3-Dichloropropene
46. 4-Methyl-2-pentanone
47. 1,1-Dichloro-2-propanone
48. Toluene
49. trans-1,3-Dichloropropene
50. Ethyl methacrylate
51. 1,1,2-Trichloroethane
52. Tetrachloroethane
53. 1,3-Dichloropropane
54. 2-Hexanone
55. Dibromochloromethane
56. 1,2-Dibromoethane
57. 1-Chloro-3-fluorobenzene (IS)
58. Chlorobenzene
59. 1,1,1,2-Tetrachloroethane
60. Ethylbenzene
61. m-Xylene
62. p-Xylene
63. o-Xylene
64. Styrene
65. Bromoform
66. Isopropylbenzene
67. 4-Bromofluorobenzene (SS)
68. 1,1,2,2-Tetrachloroethane
69. Bromobenzene
70. 1,2,3-Trichloropropane
71. trans-1,4-Dichloro-2-butene
72. n-Propylbenzene
73. 2-Chlorotoluene
74. 1,3,5-Trimethylbenzene
75. 4-Chlorotoluene
76. tert-Butylbenzene
77. Pentachloroethane
78. 1,2,4-Trimethylbenzene
79. sec-Butylbenzene
80. 1,3-Dichlorobenzene
81. p-Isopropyltoluene
82. 1,4-Dichlorobenzene
83. n-Butylbenzene
84. 1,2-Dichlorobenzene
85. Hexachloroethane
86. 1,2-Dibromo-3-chloropropane
87. Nitrobenzene
88. 1,2,4-Trichlorobenzene
89. Hexachlorobutadiene
90. Naphthalene
91. 1,2,3-Trichlorobenzene

Column: DB-624
122-1364
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 30 cm/sec, measured at 45°C

Oven: 45°C for 10 min
45-190°C at 12°/min
190°C for 2 min
190-225°C at 6°/min
225°C for 1 min

Sampler: Purge and Trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175°C
Desorb: 220°C for 0.6 min

Injection: Split, 110°C
Split flow 30 mL/min

Detector: MSD, 235°C transfer line
Full scan 35-260 amu (m/z 44 subtracted)

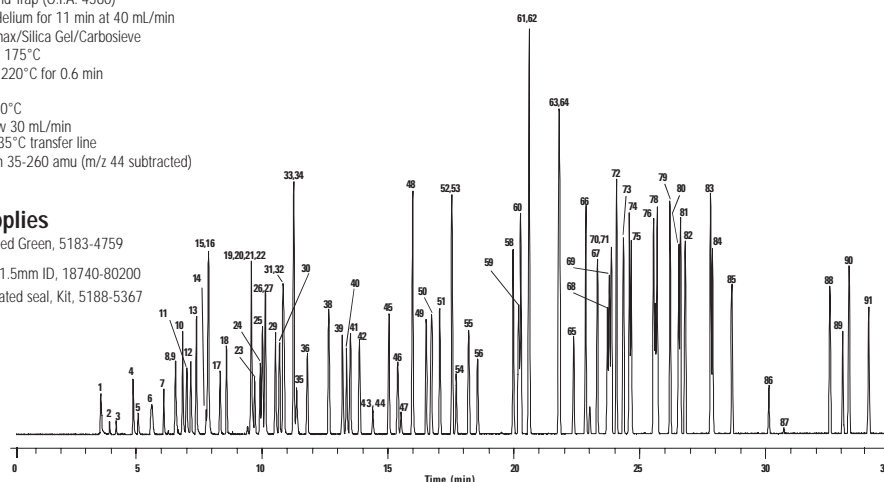
IS - Internal Standard
SS - Surrogate Standard
Note: Some compounds not present
in both chromatograms

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, Kit, 5188-5367



GC and GC/MS Applications

Environmental-Volatiles

High Speed VOC, EPA Method 8260

Column: DB-VRX
121-1524
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven: 45°C for 3.0 minutes
45-190°C at 36°C/min
190-225°C at 20°C/min
225°C for 0.5 min

Sampler: Purge and Trap (Tekmar 3100)

Purge: 11 min

Trap: Vocarb 3000

Preheat: 245°C

Desorb: 250°C for 1min

Bake: 260°C for 10 min

Line & valve: 100°C

Injection: Split, 150°C

Split ratio 60:1

Detector: Agilent 5973 MSD

Scan range: 35-260 amu

Scan rate: 3.25 scans/sec

Quad temperature: 150°C

Source temperature: 200°C

Transfer line temp: 200°C

Sample: 5 mL

• Halogenated and aromatic analytes at 40 ppb

• Internal standards at 20 ppb

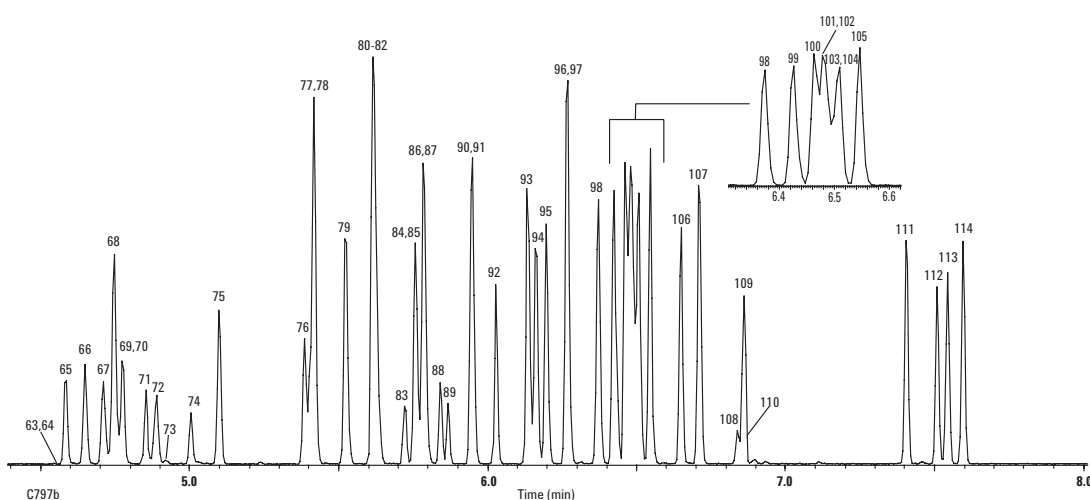
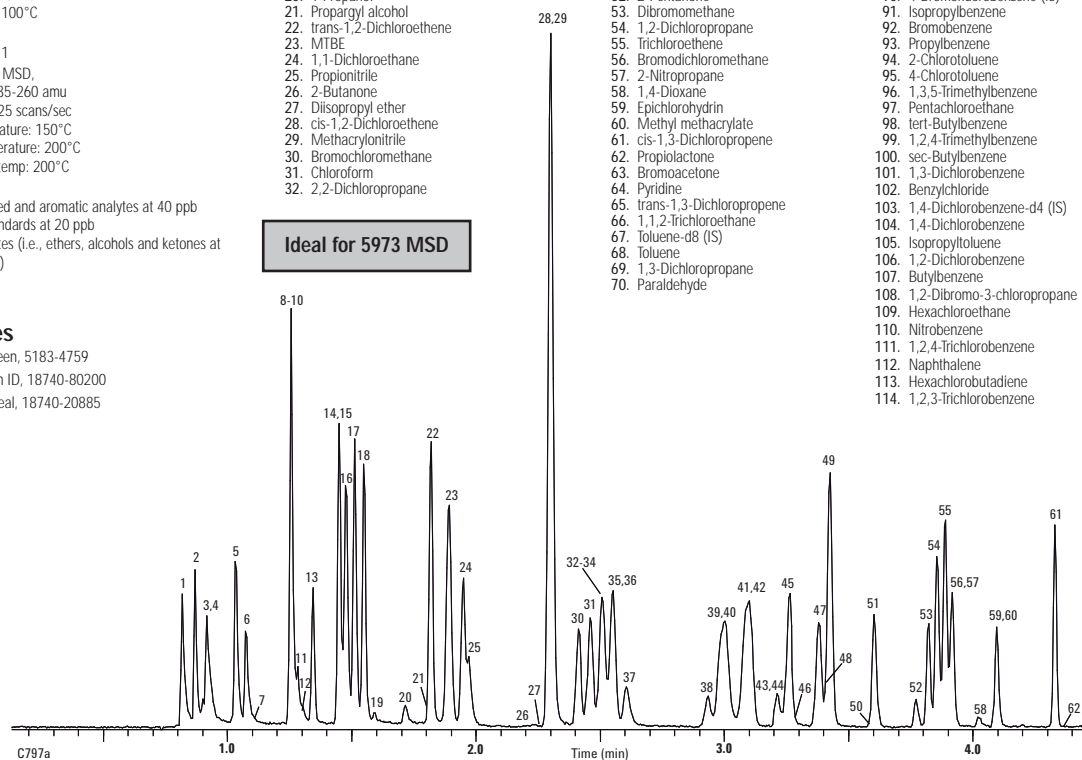
• Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)

1. Dichlorodifluoromethane
2. Chloromethane
3. Hydroxypropionitrile
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Ethanol
8. Acetonitrile
9. Acrolein
10. Trichlorofluoromethane
11. Isopropyl alcohol
12. Acetone
13. Ethyl ether
14. 1,1-Dichloroethane
15. tert-Butyl alcohol
16. Acrylonitrile
17. Methylene chloride
18. Allyl chloride
19. Allyl alcohol
20. 1-Propanol
21. Propargyl alcohol
22. trans-1,2-Dichloroethane
23. MTBE
24. 1,1-Dichloroethane
25. Propionitrile
26. 2-Butanone
27. Diisopropyl ether
28. cis-1,2-Dichloroethane
29. Methacrylonitrile
30. Bromochloromethane
31. Chloroform
32. 2,2-Dichloropropane

33. Ethyl acetate
34. Ethyl-tert-butyl ether
35. Methyl acrylate
36. Dibromofluoromethane (IS)
37. Isobutanol
38. Dichloroethane-d4 (IS)
39. Pentafluorobenzene
40. 1,2-Dichloroethane
41. 1,1,1-Trichloroethane
42. 1-Chlorobutane
43. Crotonaldehyde
44. 2-Chloroethanol
45. 1,1-Dichloropropene
46. 1-Butanol
47. Carbon tetrachloride
48. Chloroacetonitrile
49. Benzene
50. tert-Amylmethyl ether
51. Fluorobenzene (IS)
52. 2-Pentanone
53. Dibromomethane
54. 1,2-Dichloropropane
55. Trichloroethene
56. Bromodichloromethane
57. 2-Nitropropane
58. 1,4-Dioxane
59. Epichlorohydrin
60. Methyl methacrylate
61. cis-1,3-Dichloropropene
62. Propiolactone
63. Bromoacetone
64. Pyridine
65. trans-1,3-Dichloropropene
66. 1,1,2-Trichloroethane
67. Toluene-d8 (IS)
68. Toluene
69. 1,3-Dichloropropane
70. Paraldehyde

71. Ethyl methacrylate
72. Dibromochloromethane
73. 3-Chloropropionitrile
74. 1,2-Dibromoethane
75. Tetrachloroethene
76. 1,1,1,2-Tetrachloroethane
77. 1-Chlorohexane
78. Chlorobenzene
79. Ethylbenzene
80. Bromoform
81. m-Xylene
82. p-Xylene
83. trans-Dichlorobutene
84. 1,3-Dichloro-2-propanol
85. Styrene
86. 1,1,2,2-Tetrachloroethane
87. o-Xylene
88. 1,2,3-Trichloropropane
89. cis-Dichlorobutene
90. 4-Bromofluorobenzene (IS)
91. Isopropylbenzene
92. Bromobenzene
93. Propylbenzene
94. 2-Chlorotoluene
95. 4-Chlorotoluene
96. 1,3,5-Trimethylbenzene
97. Pentachloroethane
98. tert-Butylbenzene
99. 1,2,4-Trimethylbenzene
100. sec-Butylbenzene
101. 1,3-Dichlorobenzene
102. Benzylchloride
103. 1,4-Dichlorobenzene-d4 (IS)
104. 1,4-Dichlorobenzene
105. Isopropyltoluene
106. 1,2-Dichlorobenzene
107. Butylbenzene
108. 1,2-Dibromo-3-chloropropane
109. Hexachloroethane
110. Nitrobenzene
111. 1,2,4-Trichlorobenzene
112. Naphthalene
113. Hexachlorobutadiene
114. 1,2,3-Trichlorobenzene

Ideal for 5973 MSD



GC and GC/MS Applications

Environmental-Volatiles

Extended Analyte List for EPA Method 8021

Column: DB-624
124-1374
75 m x 0.45 mm, 2.55 µm

Column: DB-VRX
124-1574
75 m x 0.45 mm, 2.55 µm

Carrier: Helium at 9 mL/min, measured at 35°C

Oven: 35°C for 12 min
35-60°C at 5°/min
60°C for 1 min
60-200°C at 17°/min
200°C for 5 min

Sampler: Purge and Trap (O.I.A. 4560)

Trap: Vocabr 3000

Preheat: 175°C

Desorb: 260°C for 1 min

Injection: J&W LVI (Low Volume Injector), 150°C

Detector: A: PID (O.I.A. 4430), 200°C
Helium makeup gas at 20 mL/min
B: ELCD (O.I.A. 4420), with NiCat reaction tube
in the halogen mode, 950°C reactor temperature

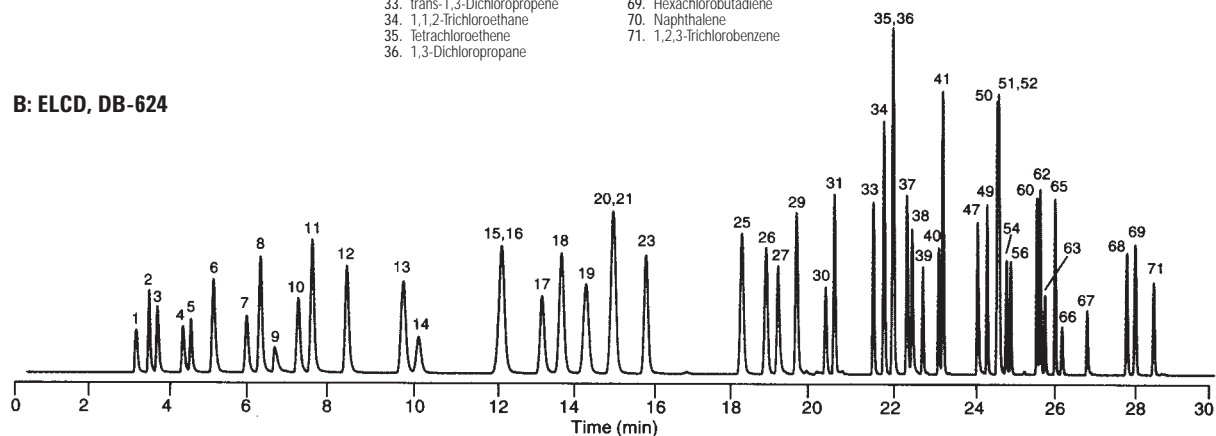
Sample: 20 ppb per component in 5 mL water

- | | |
|-------------------------------|-----------------------------------|
| 1. Dichlorodifluoromethane | 37. Dibromochloromethane |
| 2. Chloromethane | 38. 1,2-Dibromoethane |
| 3. Vinyl chloride | 39. 1-Chloro-3-fluorobenzene (IS) |
| 4. Bromomethane | 40. Chlorobenzene |
| 5. Chloroethane | 41. 1,1,1,2-Tetrachloroethane |
| 6. Trichlorofluoromethane | 42. Ethylbenzene |
| 7. 2-Chloropropane (IS) | 43. m-Xylene |
| 8. 1,1-Dichloroethene | 44. p-Xylene |
| 9. Iodomethane | 45. Styrene |
| 10. Allyl chloride | 46. o-Xylene |
| 11. Methylene chloride | 47. Bromoform |
| 12. trans-1,2-Dichloroethene | 48. Isopropylbenzene |
| 13. 1,1-Dichloroethane | 49. cis-1,4-Dichlorobutene |
| 14. Chloroprene | 50. 1,1,2,2-Tetrachloroethane |
| 15. cis-1,2-Dichloroethene | 51. Bromobenzene |
| 16. 2,2-Dichloropropane | 52. 1,2,3-Trichloropropane |
| 17. Bromochloromethane | 53. n-Propylbenzene |
| 18. Chloroform | 54. 2-Chlorotoluene |
| 19. 1,1,1-Trichloroethane | 55. 1,3,5-Trimethylbenzene |
| 20. Carbon tetrachloride | 56. 4-Chlorotoluene |
| 21. 1,1-Dichloropropene | 57. tert-Butylbenzene |
| 22. Benzene | 58. 1,2,4-Trimethylbenzene |
| 23. 1,2-Dichloroethane | 59. sec-Butylbenzene |
| 24. Fluorobenzene (IS) | 60. 1,3-Dichlorobenzene |
| 25. Trichloroethene | 61. p-Isopropyltoluene |
| 26. 1,2-Dichloropropane | 62. 1,4-Dichlorobenzene |
| 27. Dibromomethane | 63. Benzyl chloride |
| 28. Trifluorotoluene (IS) | 64. n-Butylbenzene |
| 29. Bromodichloromethane | 65. 1,2-Dichlorobenzene |
| 30. 2-Chloroethyl vinyl ether | 66. Bis(2-chloroisopropyl) ether |
| 31. cis-1,3-Dichloropropene | 67. 1,2-Dibromo-3-chloropropane |
| 32. Toluene | 68. 1,2,4-Trichlorobenzene |
| 33. trans-1,3-Dichloropropene | 69. Hexachlorobutadiene |
| 34. 1,1,2-Trichloroethane | 70. Naphthalene |
| 35. Tetrachloroethene | 71. 1,2,3-Trichlorobenzene |
| 36. 1,3-Dichloropropane | |

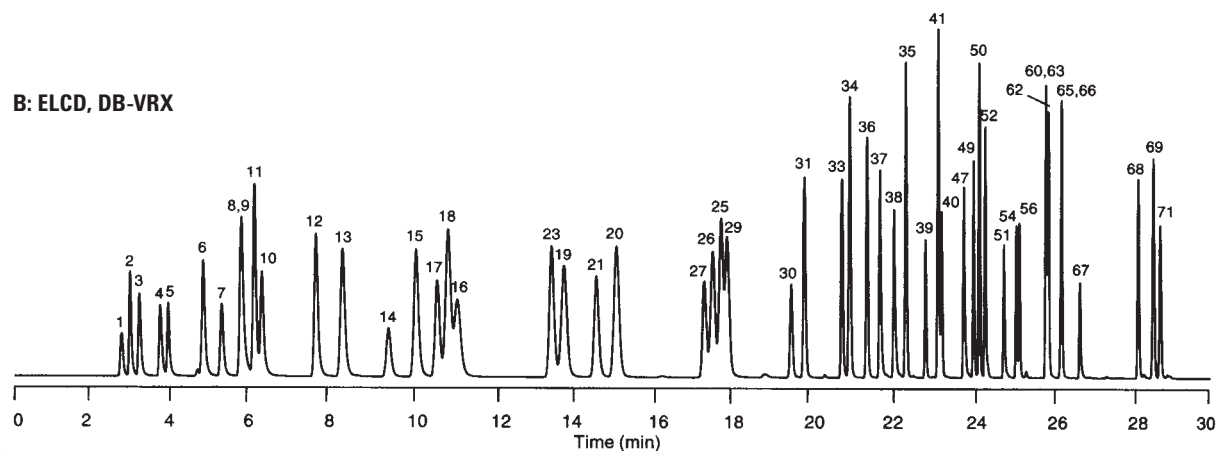
Suggested Supplies

Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885
Syringe: Advanced Green, 5183-4759

B: ELCD, DB-624



B: ELCD, DB-VRX



C432a

GC and GC/MS Applications

Environmental-Volatiles

Fast VOC Analysis

Column: DB-624
121-1324
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 37 cm/sec, (constant flow mode)

Oven: 35°C for 4 min
35-200°C at 15°/min
200°C for 0.1 min
60-200°C at 17°/min

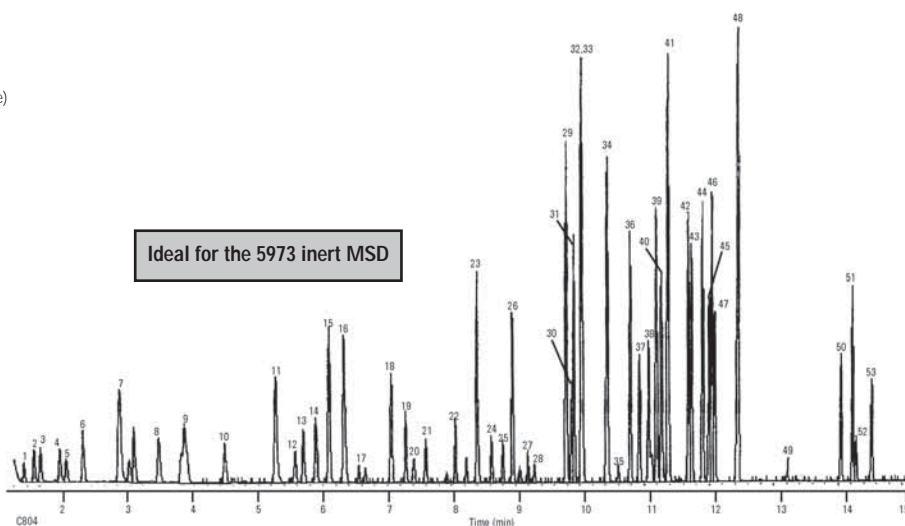
Sampler: Purge and trap (Tekmar LSC 3000)
Purge: Helium for 11 min at 50 mL/min
Trap:
Preheat: 250°C
Desorb: 260°C for 2 min
Line & valve: 100°C

Detector: MSD, 250°C transfer line
Full scan 35 -260 amu
3.25 scans per second

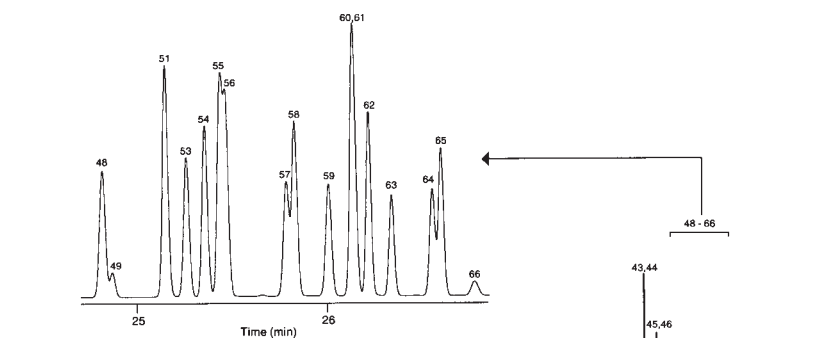
Sample: 10 ppb per component in 25 mL water

Suggested Supplies

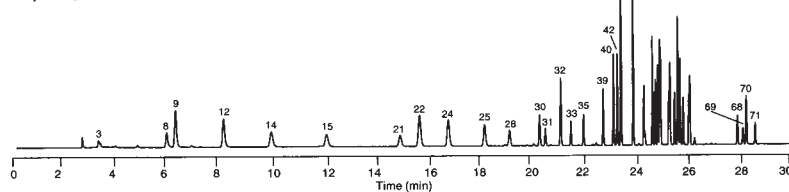
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



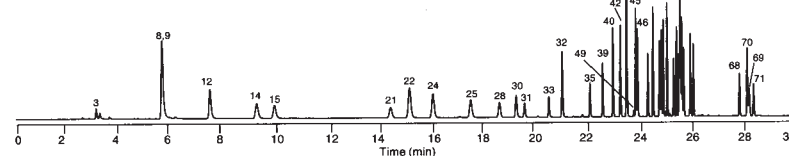
1. Dichlorofluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene chloride
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. Bromochloromethane
13. Chloroform
14. 1,1,1-Trichloroethane
15. Carbon tetrachloride
16. Benzene
17. Fluorobenzene
18. Trichloroethene
19. 1,2-Dichloropropane
20. Dibromomethane
21. Bromodichloromethane
22. cis-1,3-Dichloropropene
23. Toluene
24. trans-1,3-Dichloropropene
25. 1,1,2-Trichloroethane
26. Tetrachloroethene
27. Dibromochloromethane
28. 1,2-Dibromomethane
29. Chlorobenzene
30. 1,1,1,2-Tetrachloroethane
31. Ethylbenzene
32. m-Xylene
33. p-Xylene
34. o-Xylene
35. Bromoform
36. Isopropylbenzene
37. Bromofluorobenzene
38. Bromobenzene
39. n-Propylbenzene
40. 2-Chlorotoluene
41. 1,3,5-Trimethylbenzene
42. tert-Butylbenzene
43. 1,2,4-Trimethylbenzene
44. sec-Butylbenzene
45. 1,3-Dichlorobenzene
46. Isopropyltoluene
47. 1,4-Dichlorobenzene
48. 1,2-Dichlorobenzene
49. 1,2-Dibromo-3-chloropropane
50. 1,2,4-Trichlorobenzene
51. Hexachlorobutadiene
52. Naphthalene
53. 1,2,3-Trichlorobenzene



A: PID, DB-624



A: PID, DB-VRX



C432b

GC and GC/MS Applications

Environmental-Volatiles

EPA Method 504 by GC/MS I

Column: DB-VRX
122-1534
30 m x 0.25 mm, 1.40 µm

Oven: 40°C for 0.5 min
40-200°C at 10°/min

Injection: Splitless, 200°C
12 sec purge activation time

Detector: MSD, 220°C transfer line, SIM

Sample: 25 pg on-column of each component

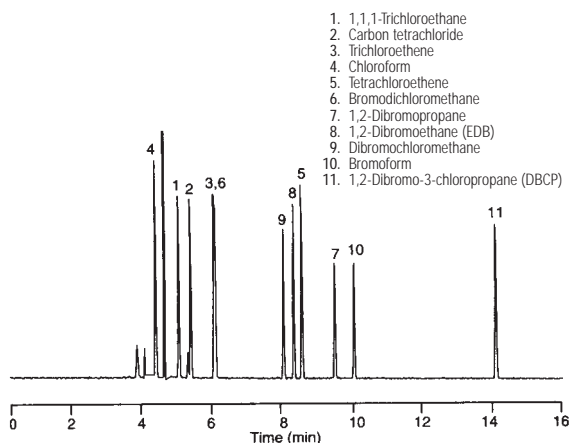
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



EPA Method 504 by GC/MS II

Column: DB-624
122-1334
30 m x 0.25 mm, 1.40 µm

Oven: 40°C for 0.5 min
40-200°C at 10°/min

Injection: Splitless, 200°C
12 sec purge activation time

Detector: MSD, 220°C transfer line, SIM

Sample: 25 pg on-column of each component

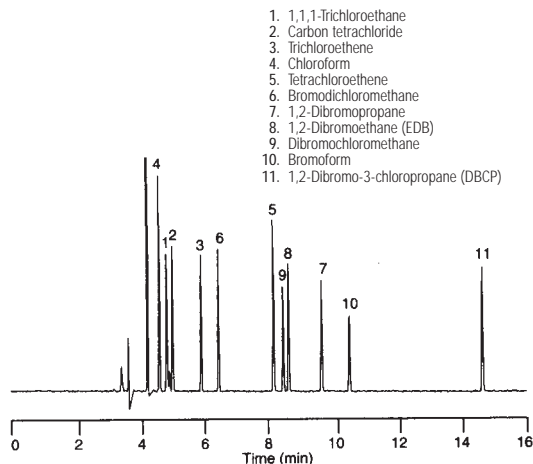
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



EPA Method 551

Column: DB-1
122-1033
30 m x 0.25 mm, 1.00 µm

Carrier: Helium at 24.8 cm/sec, measured at 150°C

Oven: 35°C for 9 min
35-40°C at 10°/min
40°C for 3 min
40-150°C at 6°/min
150°C for 1 min

Injection: Splitless, 200°C
15 sec purge activation time

Detector: ECD, 300°C

Sample: 1 µL of 50 pg/µL, AccuStandard

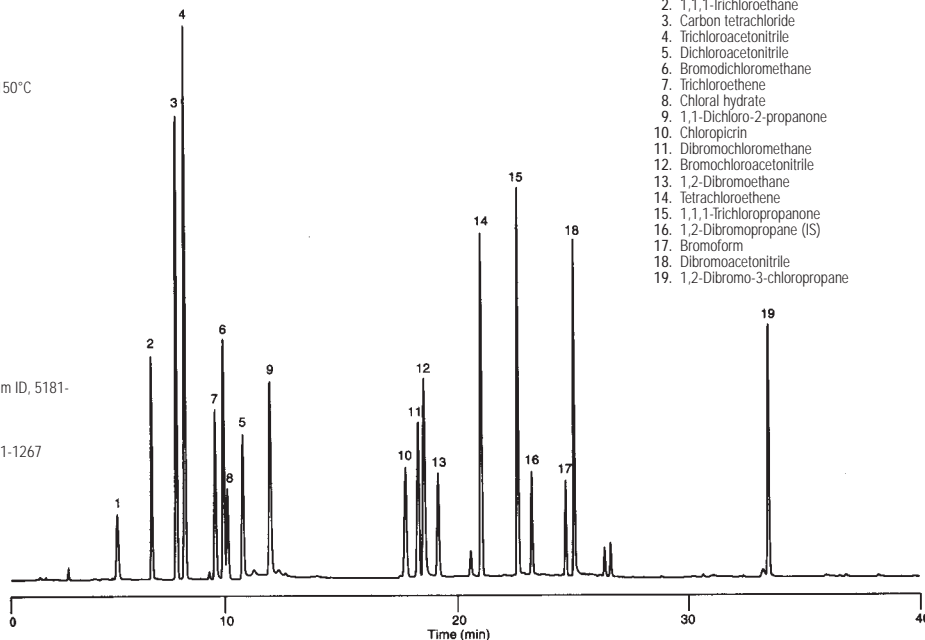
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Environmental-Volatiles

EPA Method 551.1

Column: DB-5ms
122-5533
30 m x 0.25 mm, 1.00 µm

Carrier: Helium at 35 cm/sec, measured at 150°C

Oven: 35°C for 9 min
35-40°C at 10°/min
40°C for 3 min
40-150°C at 15°/min
150°C for 5 min

Injection: Splitless, 200°C
0.1 min purge activation time

Detector: ECD, 325°C

Sample: 1 mL of 0.5-10 ng/mL

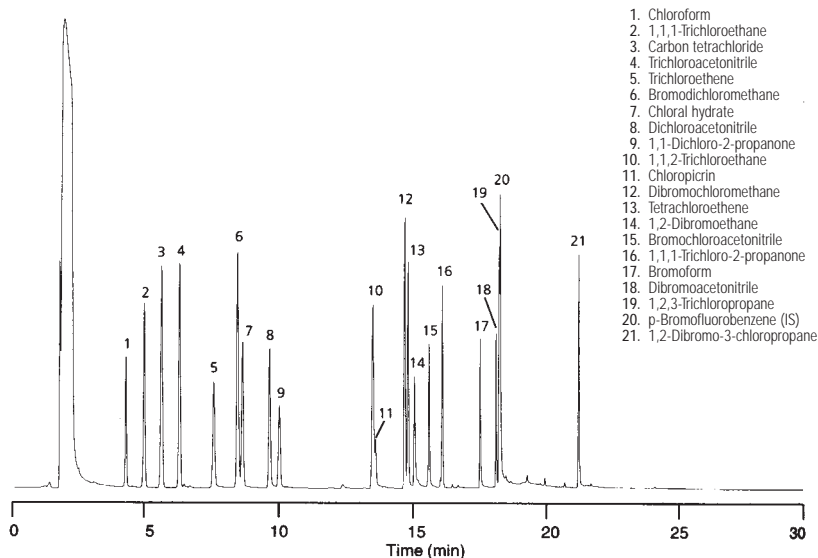
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



European Red List Volatiles

Column: DB-5.625
122-5632
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 35 cm/sec, measured at 40°C

Oven: 40°C for 2 min
40-140°C at 12°/min

Injection: Split, 250°C
Split ratio 1:50

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of headspace of neat mixture

Column: DB-624
122-1334
30 m x 0.25 mm, 1.40 µm

Carrier: Helium at 35 cm/sec, measured at 40°C

Oven: 40°C for 2 min
40-140°C at 12°/min

Injection: Split, 250°C
Split ratio 1:50

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

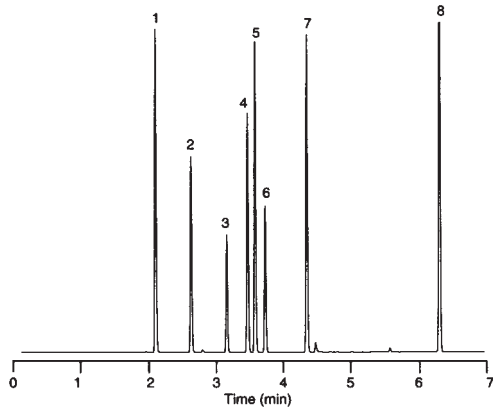
Sample: 1 µL of headspace of neat mixture

Suggested Supplies

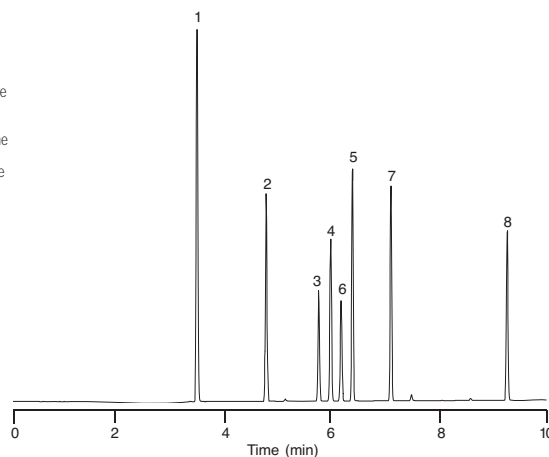
Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, 18740-20885



C307



C308

GC and GC/MS Applications

Environmental-Air Analysis

Environmental-Air Analysis

EPA Air Analysis Compendium Method TO-14 Standard

Column: **DB-1**

123-1063

60 m x 0.32 mm, 1.00 µm

Carrier: Helium at 25 cm/sec measured off of CO₂ at 35°C
constant flow mode

Oven: 35°C for 5 min
35-120°C at 5°/min
120-220°C at 30°/min
220°C for 5 min

Injection: Entech 7100 cryogenic sample preconcentrator

Detector: MSD

Full scan of m/z 40-250

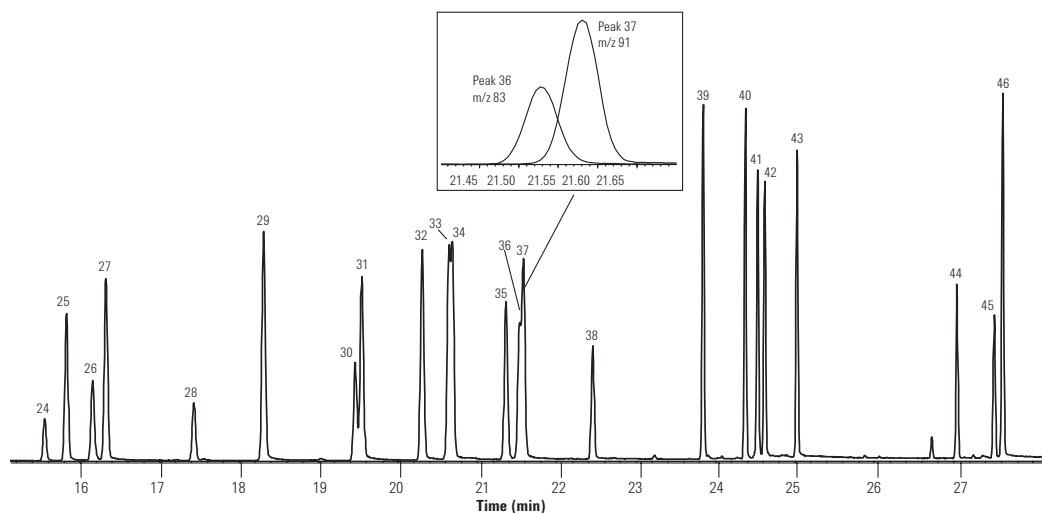
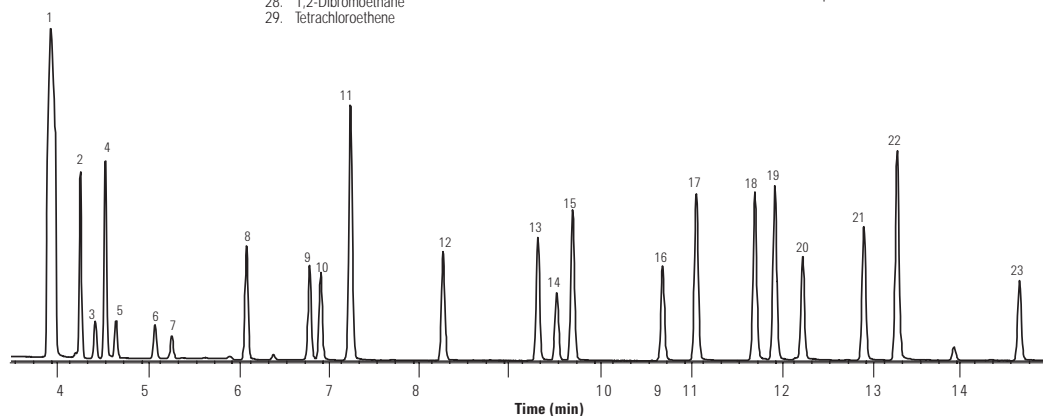
Sample: 400 mL of a 10 ppbV TO-14 standard
and 100 mL of a 20 ppbV IS/SS standard

- | | |
|---|---------------------------------------|
| 1. CO ₂ | 30. Chlorobenzene-d ₅ (SS) |
| 2. Freon 12 (Dichlorodifluoromethane) | 31. Chlorobenzene |
| 3. Chloromethane | 32. Ethylbenzene |
| 4. Freon 114 (1,2-Dichloro-1,1,2,2-tetrafluoroethane) | 33. m-Xylene |
| 5. Vinyl chloride | 34. p-Xylene |
| 6. Bromomethane | 35. Styrene |
| 7. Chloroethane | 36. 1,1,2,2-Tetrachloroethane |
| 8. Freon 11 (Trichlorofluoromethane) | 37. o-Xylene |
| 9. 1,1-Dichloroethene | 38. 4-Bromofluorobenzene (SS) |
| 10. Methylene chloride | 39. 1,3,5-Trimethylbenzene |
| 11. Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane) | 40. 1,2,4-Trimethylbenzene |
| 12. 1,1-Dichloroethane | 41. 1,3-Dichlorobenzene |
| 13. cis-1,2-Dichloroethene | 42. 1,2-Dichlorobenzene |
| 14. Bromochloromethane (IS) | 43. 1,4-Dichlorobenzene |
| 15. Chloroform | 44. 1,2,4-Trichlorobenzene |
| 16. 1,2-Dichloroethane | 45. 1,2-Dibromobenzene (IS) |
| 17. 1,1,1-Trichloroethane | 46. Hexachloro-1,3-butadiene |
| 18. Benzene | |
| 19. Carbon tetrachloride | |
| 20. 1,4-Difluorobenzene (IS) | |
| 21. 1,2-Dichloropropane | |
| 22. Trichloroethene | |
| 23. cis-1,3-Dichloropropene | |
| 24. trans-1,3-Dichloropropene | |
| 25. 1,1,2-Trichloroethane | |
| 26. Toluene-d ₈ (SS) | |
| 27. Toluene | |
| 28. 1,2-Dibromoethane | |
| 29. Tetrachloroethene | |

Agilent wishes to thank Entech Instruments for providing this chromatogram.

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



GC and GC/MS Applications

Environmental-Air Analysis

EPA Air Analysis Method TO-15 (1 ppbV Standard)

Column: DB-5ms
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min
Oven: 35°C for 5 min
35-140°C at 6°C/min
140-220°C at 15°C/min
220°C for 3 min

Sampler: Entech 7100 cryogenic sample preconcentrator
Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV

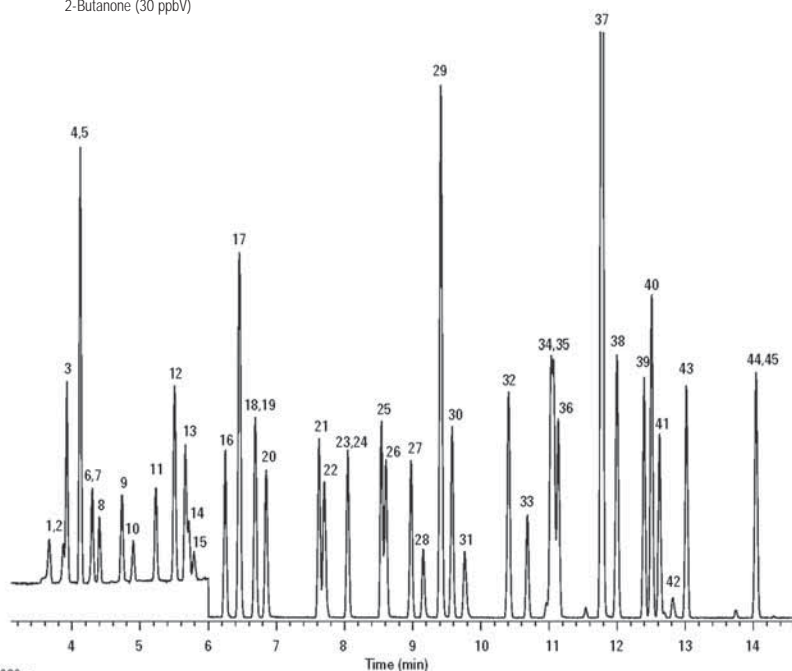
Sample: 400 mL sample load,
All compounds at 10 ppbV except
Formaldehyde (50 ppbV), Acetaldehyde (20 ppbV),
Propanal (20 ppbV), Acetone (30 ppbV),
2-Butanone (30 ppbV)

Suggested Supplies

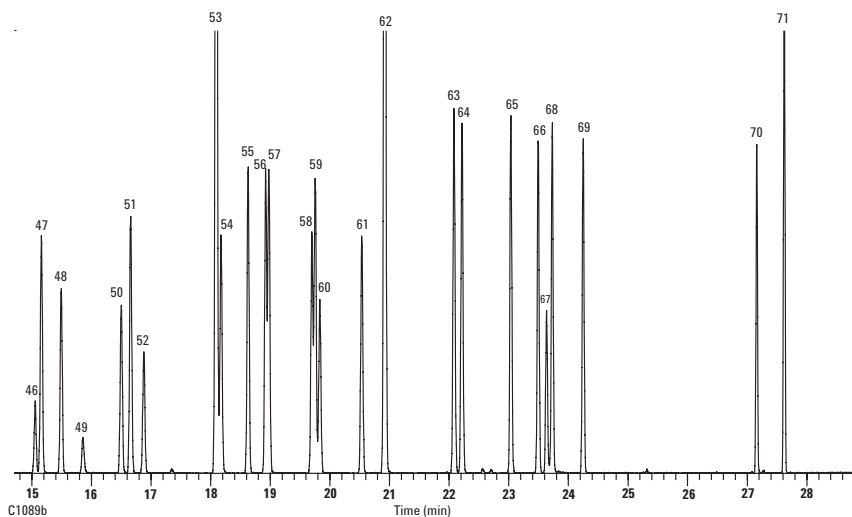
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Quantitation Ion

1. Formaldehyde	30
2. Propene	41
3. Dichlorodifluoromethane	85
4. Chloromethane	50
5. Dichlorotetrafluoroethane	85
6. Acetaldehyde	29
7. Vinyl chloride	62
8. 1,3-Butadiene	39
9. Bromomethane	94
10. Chloroethane	64
11. Bromoethene	106
12. Trichlorofluoromethane	101
13. Acetone	58
14. Propanal	29
15. Isopropyl alcohol	45
16. 1,1-Dichloroethene	61
17. 1,1,2-Trichloro-1,2,2-trifluoroethane	101
18. Methylene chloride	49
19. 3-Chloro-1-propene (Allyl chloride)	76
20. Carbon disulfide	76
21. trans-1,2-Dichloroethene	96
22. tert-Butyl methyl ether (MTBE)	73
23. 1,1-Dichloroethane	63
24. Vinyl acetate	43
25. 2-Butanone (MEK)	72
26. n-Hexane	57
27. cis-1,2-Dichloroethene	96
28. Ethyl acetate	43
29. Bromochloromethane (IS)	128
30. Chloroform	83
31. Tetrahydrofuran	42
32. 1,1,1-Trichloroethane	97
33. 1,2-Dichloroethane	62
34. Benzene	78
35. Carbon tetrachloride	117
36. Cyclohexane	56
37. 1,4-Difluorobenzene (IS)	114
38. 2,2,4-Trimethylpentane (Isooctane)	57
39. n-Heptane	41
40. Trichloroethene	130
41. 1,2-Dichloropropane	63
42. 1,4-Dioxane	88
43. Bromodichloromethane	83
44. 4-Methyl-2-pentanone (MIBK)	43
45. cis-1,3-Dichloropropene	75
46. trans-1,3-Dichloropropene	75
47. Toluene	91
48. 1,1,2-Trichloroethane	97
49. 2-Hexanone	43
50. Dibromochloromethane	129
51. Tetrachloroethene	166
52. 1,2-Dibromoethane	107
53. Chlorobenzene-d5 (IS)	117
54. Chlorobenzene	112
55. Ethylbenzene	91
56. m-Xylene	91
57. p-Xylene	91
58. Styrene	104
59. o-Xylene	91
60. Bromoform	173
61. 1,1,2,2-Tetrachloroethane	83
62. 4-Bromofluorobenzene	95
63. 4-Ethyltoluene	105
64. 1,3,5-Trimethylbenzene	105
65. 1,2,4-Trimethylbenzene	105
66. 1,3-Dichlorobenzene	146
67. Benzyl chloride	91
68. 1,4-Dichlorobenzene	146
69. 1,2-Dichlorobenzene	146
70. 1,2,4-Trichlorobenzene	180
71. Hexachlorobutadiene	225



C1089-a



C1089b

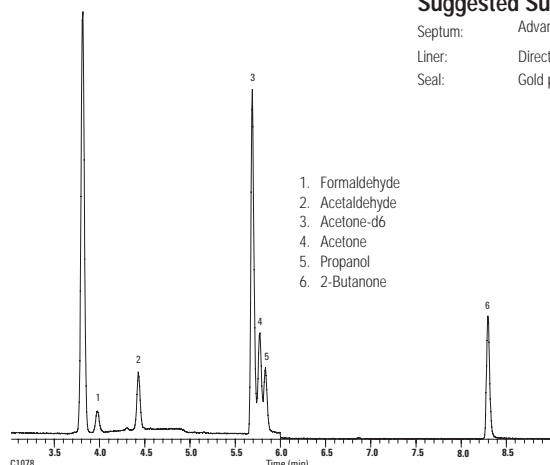
Agilent wishes to thank Entech Instruments
for providing this chromatogram.

GC and GC/MS Applications Environmental-Air Analysis

Formaldehyde, 50ppb

Column: DB-5ms
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min
Oven: 35°C for 5 min
35-85°C at 10°C/min
Sampler: Entech 7100 cryogenic sample preconcentrator
Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV
Sample: 100 cc 50 ppb Formaldehyde/20 ppb others



Suggested Supplies

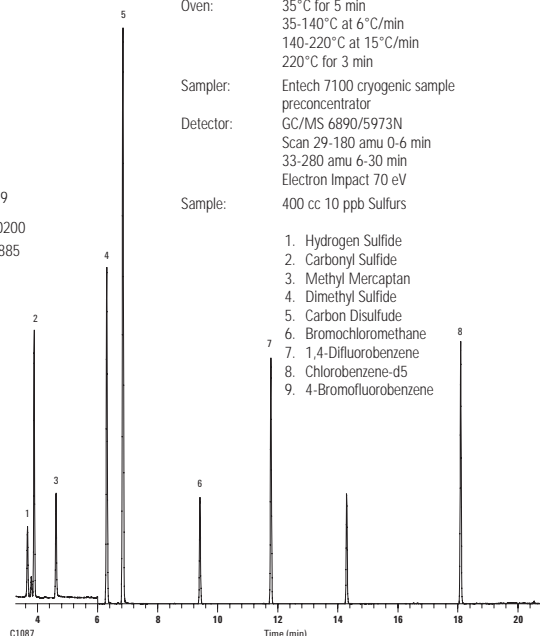
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Formaldehyde
2. Acetaldehyde
3. Acetone-d6
4. Acetone
5. Propanol
6. 2-Butanone

Sulfur in Air

Column: DB-5ms
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min
Oven: 35°C for 5 min
35-140°C at 6°C/min
140-220°C at 15°C/min
220°C for 3 min
Sampler: Entech 7100 cryogenic sample preconcentrator
Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV
Sample: 400 cc 10 ppb Sulfurs



1. Hydrogen Sulfide
2. Carbonyl Sulfide
3. Methyl Mercaptan
4. Dimethyl Sulfide
5. Carbon Disulfide
6. Bromochloromethane
7. 1,4-Difluorobenzene
8. Chlorobenzene-d5
9. 4-Bromofluorobenzene

Agilent wishes to thank Entech Instruments for providing this chromatogram.

Agilent wishes to thank Entech Instruments for providing this chromatogram.

C₁ and C₂ Halocarbons (Freons)

Column: GS-GasPro
113-4362
60 m x 0.32 mm

Carrier: Helium at 35 cm/sec, constant velocity
Oven: 40°C for 2 min,
40-120°C at 10°/min
120°C for 3 min
120-200°C at 10°/min
Injection: Splitless, 250°C
0.20 min purge activation time

Detector: MSD, 280°C,
full scan 45-180 amu
Sample: 1.0 µL of 100 ppm mixture
of Accustandard M-REF &
M-REF-X in methanol

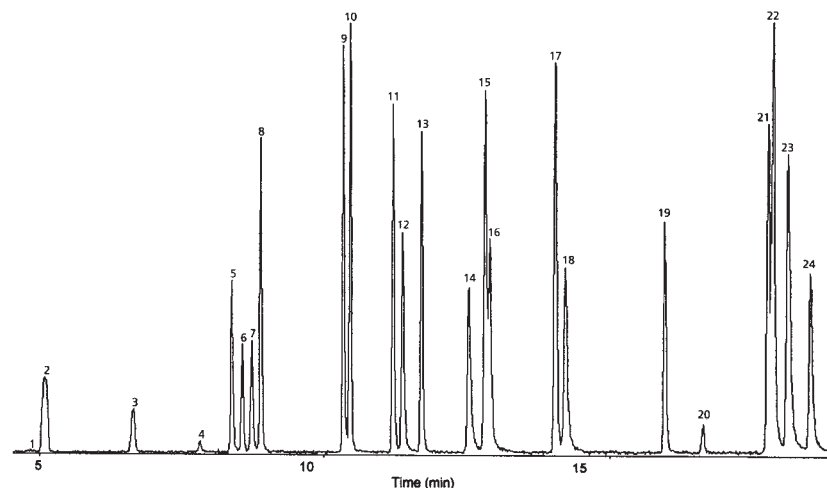
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Freon

- | | |
|--|-------|
| 1. Chlorotrifluoromethane* | 13 |
| 2. Trifluoromethane | 23 |
| 3. Bromotrifluoromethane | 13B1 |
| 4. Chloropentafluoroethane | 115 |
| 5. Pentafluoroethane | 125 |
| 6. 1,1,1-Trifluoroethane | 143a |
| 7. Dichlorodifluoromethane | 12 |
| 8. Chlorodifluoromethane | 22 |
| 9. 1,1,1,2-Tetrafluoroethane | 134a |
| 10. Chloromethane | 40 |
| 11. 1,1,2,2-Tetrafluoroethane | 134 |
| 12. Bromochlorodifluoromethane | 12B1 |
| 13. 1,1-Difluoroethane | 152a |
| 14. 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 114 |
| 15. 2-Chloro-1,1,1,2-tetrafluoroethane | 124 |
| 16. 1-Chloro-1,1-difluoroethane | 142b |
| 17. Dichlorofluoromethane | 21 |
| 18. Trichlorofluoromethane | 11 |
| 19. Chloroethane | 160 |
| 20. Dichloromethane | |
| 21. 1,1-Dichloro-1-fluoroethane | 141b |
| 22. 2,2-Dichloro-1,1,1-trifluoroethane | 123 |
| 23. 1,1,2-Trichloro-1,2,2-trifluoroethane | 113 |
| 24. 1,2-Dibromo-1,1,2,2-tetrafluoroethane | 114B2 |

*Peak not shown



GC and GC/MS Applications

Environmental-Air Analysis

N₂O I

Column: HP-PLOT Q
19095P-Q04
30 m x 0.53 mm, 40.00 μm

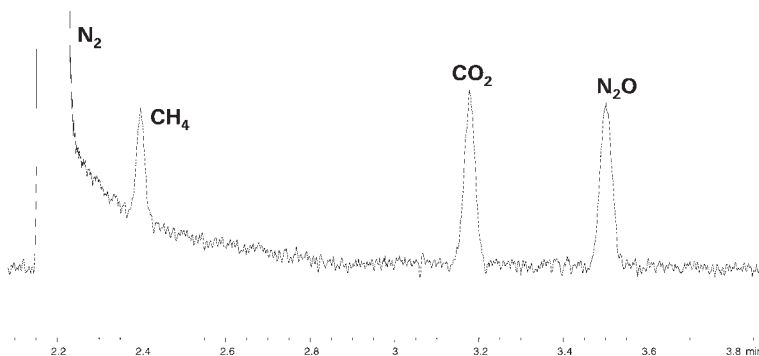
Carrier: Helium, 5 psi (approximately 8 mL/min)

Oven: 35°C isothermal

Injection: Split ratio 1:3

Detector: TCD, 200°C

Sample: 250 μL injected
approximately 200 ppmV methane
200 ppmV CO₂
250 ppmV N₂O (nitrogen balance gas)



N₂O II

Column: HP-PLOT Molesieve
19095P-MS6
30 m x 0.53 mm, 25.00 μm

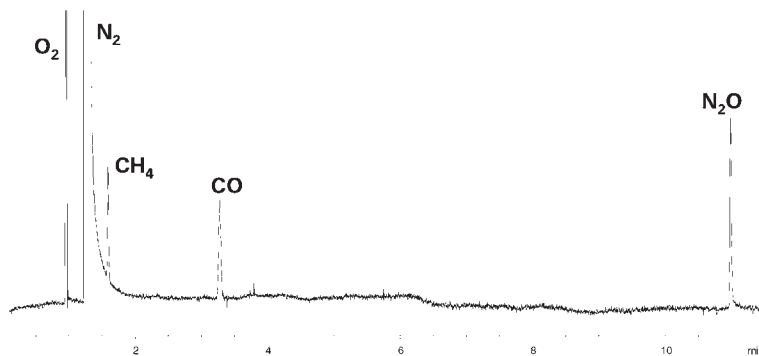
Carrier: Helium, 6 psi (approximately 10 mL/min)

Oven: 50°C (5 min), 25°C/min to 200°C and hold

Injection: Split ratio 1:4

Detector: TCD, 250°C

Sample: 250 μL injected
approximately 200 ppmV methane
200 ppmV CO₂
250 ppmV N₂O (nitrogen balance gas)



N₂O III

Column: GS-CarbonPLOT
113-3133
30 m x 0.32 mm, 3.00 μm

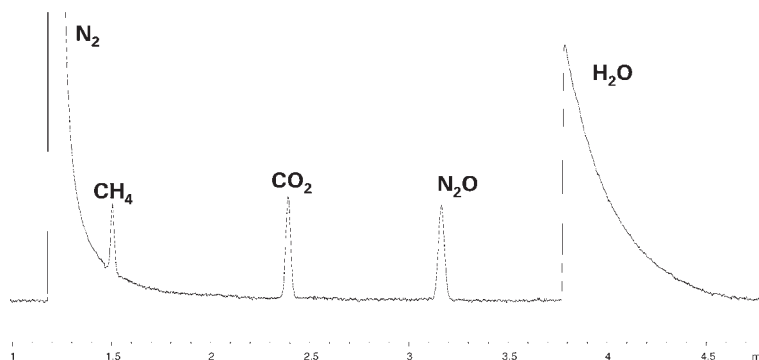
Carrier: Helium, 12 psi (approximately 3 mL/min)

Oven: 35°C isothermal

Injection: Split ratio 1:4

Detector: TCD, 200°C

Sample: 250 μL injected
approximately 200 ppmV methane
200 ppmV CO₂
250 ppmV N₂O (nitrogen balance gas)



GC and GC/MS Applications

Food, Flavors and Fragrances

Food, Flavors and Fragrances

Fragrance Allergens

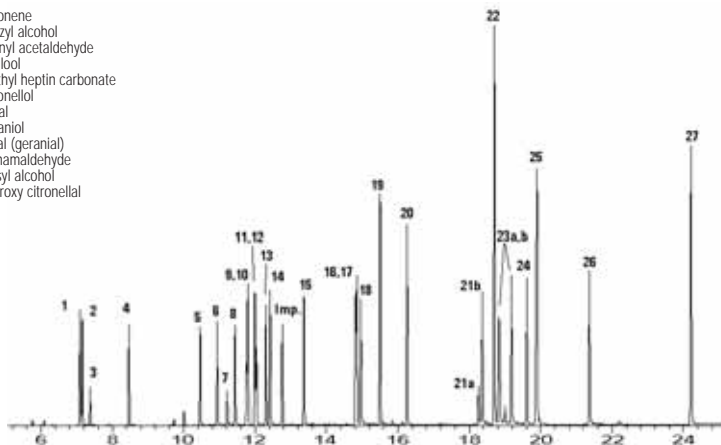
Column: HP-5ms
19091S-433
30 m x 0.25 mm, 0.25 μm

Carrier: Helium, 1.2 mL/min,
 constant pressure of 70 kPa
Oven: 50°C - 1 min - 8°C/min - 250°C,
 250-300°C @ 35°C/min
 300°C Hold, 5 min
 5973N MSD in scan (40-350 amu)

Injection: Solvent Delay, 3.0 min
 Split, 250°C
 Split ratio 1:50

Sample: 1 μL, 50 ppm standard

1. Limonene
2. Benzyl alcohol
3. Phenyl acetaldehyde
4. Linalool
5. Methyl heptin carbonate
6. Citronellol
7. Neral
8. Geraniol
9. Citral (geranial)
10. Cinnamaldehyde
11. Anisyl alcohol
12. Hydroxy citronellal



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Fusel Oil Standard & Brandy Sample

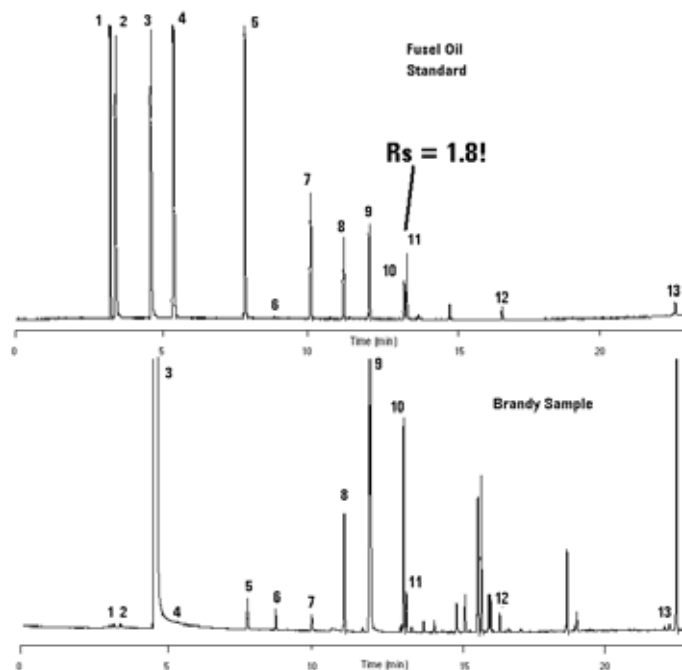
Column: DB-624
122-1364
60 m x 0.25 mm, 1.40 μm

Carrier: H2, 50 cm/sec, Constant
Oven: 40°C for 5 min
 10°C/min to 250°C
Detector: FID, 300°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

1. Acetaldehyde
2. Methanol
3. Ethanol
4. Acetone
5. 1-propanol
6. Ethyl acetate
7. Isobutanol
8. 1-butanol
9. 3-pentanol (IS)
10. 3-methyl-butanol (isoamyl alcohol)
11. 2-methyl-butanol (active amyl alcohol)
12. Hexanol
13. Phenylethanol



GC and GC/MS

GC and GC/MS Applications

Food, Flavors and Fragrances

Fragrance Reference Standard I

Column: DB-1
122-1032
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 25 cm/sec, measured at 150°C
Oven: 40°C for 1 min
 40-290°C at 5°/min

Injection: Split, 250°C
 Split ratio 1:50

Detector: MSD, 300°C transfer line

Sample: 1 μ L of a 1:20 dilution of neat sample in acetone

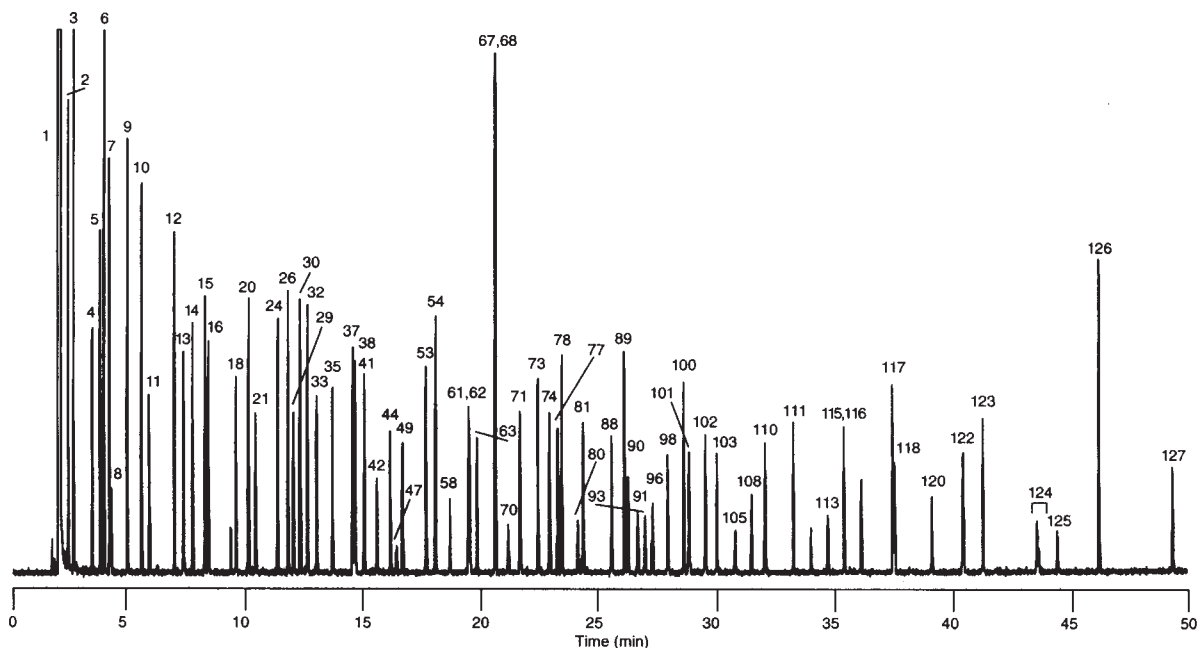
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Many thanks to Carl Frey, Manager of Analytical Services, Dragoco, and Kevin Myung, Director of Flavor and Perfumery Research, Bush Boake Allen, Inc. for contributing to this work.

1. Acetone
2. 2,3-Butanedione (diacetyl)
3. Ethyl acetate
4. 2,3-Pentanedione (acetyl propionyl)
5. Ethyl propionate
6. Methyl butyrate
7. 3-Methylbutyl alcohol
8. 2-Methylbutyl alcohol
9. Isobutyl acetate
10. Ethyl butyrate
11. Furfural
12. Ethyl isovalerate
13. Hexanol
14. Allyl butyrate
15. Ethyl pentanoate
16. Hexylene glycol
17. α -Thujone
18. Benzaldehyde
19. α -Pinene
20. Camphene
21. 3,5,5-trimethylhexanol
22. Sabinene
23. β -Pinene
24. Ethyl hexanoate

25. Myrcene
26. Hexyl acetate
- cis-Linalool oxide
- Methyl benzoate
- trans-Linalool oxide
28. Methyl-cresol
29. Benzyl alcohol
30. para-Cymene
31. 1,8-Cineol
32. Limonene
33. 2,6-Dimethylhept-5-enal
34. γ -Terpinene
35. Octanol
37. Ethyl heptanoate
38. Linalool
39. Benzene ethanol
41. Rose oxide, cis-rose
42. Rose oxide, trans-rose
43. Camphor
44. Citronellal
45. Benzyl acetate
46. Menthone
47. Isoborneol
48. Isomenthone
49. Borneol
51. Terpinen-4-ol
52. α -Ierpineol
53. Ethyl octanoate
54. Octyl acetate
56. Fenchyl acetate
57. Citronellol
58. Neral
59. Carvonel
- Phenylethyl acetate
60. Geraniol
61. Linalyl acetate
62. Geranial
63. Hydroxycitronellal
64. Citronellyl formate
66. Bornyl acetate
67. Vertenex (isomer 1)
68. Ethyl nonanoate
69. Geranyl formate
70. Vertenex (isomer 2)
71. γ -Nonalactone
72. Citronellyl acetate
73. Neryl acetate
74. Geranyl acetate
76. Diphenyl oxide
78. Ethyl decanoate
79. α -Copaene
80. Florazone (isomer 1)
81. Florazone (isomer 2)
82. β -Caryophyllene
83. Citronellyl propionate
85. 3,7-Gualadiene
88. Dodecanol
89. Ethyl undecanoate
90. Eugenyl acetate
91. Frambione (raspberry ketone)
93. Isoamyl salicylate
94. δ -Cadinene
95. cis-Nerolidol
96. Rosatol (rosetone)
- Geranyl butyrate
97. trans-Nerolidol
98. n-Amyl salicylate
99. Phenylethyl tiglate
100. Ethyl dodecanoate
101. Benzophenone
102. Dibenzyl ether
103. γ -Dodecalactone
104. Citronellyl tiglate
105. Evernlyl
106. Geranyl tiglate
107. Geranyl-2-methyl valerate
108. Celestocide
109. Hepladec-1-ene
110. Benzyl benzoate
111. Ethyl tetradecanoate
112. Benzyl salicylate
113. Tonalid
114. Nonadec-1-ene
115. Isopropylmyristate
116. Ethyl pentadecanoate
- Nonadecane
117. Ethyl hexadecanoate
118. Musk T (ethylene brassylate)
119. Eicosane
120. Cinnamyl phenyl acetate
121. Heneicosane
122. Phenyl ethyl cinnamate
123. Ethyl octadecanoate
124. Herculyn D (tetrahydro & dihydro methyl abietate)
125. Cinnamyl cinnamate
126. Cetearyl octanoate
127. Cetearyl decanoate



GC and GC/MS Applications

Food, Flavors and Fragrances

Fragrance Reference Standard II

Column: DB-WAX
122-7032
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 25 cm/sec,
measured at 150°C
Oven: 45°C for 2 min
45-250°C at 3°/min
250°C for 34 min
Injection: Split, 250°C
Split ratio 1:50
Detector: MSD, 250°C transfer line
Sample: 1 μ L of a 1:20 dilution of neat sample in acetone

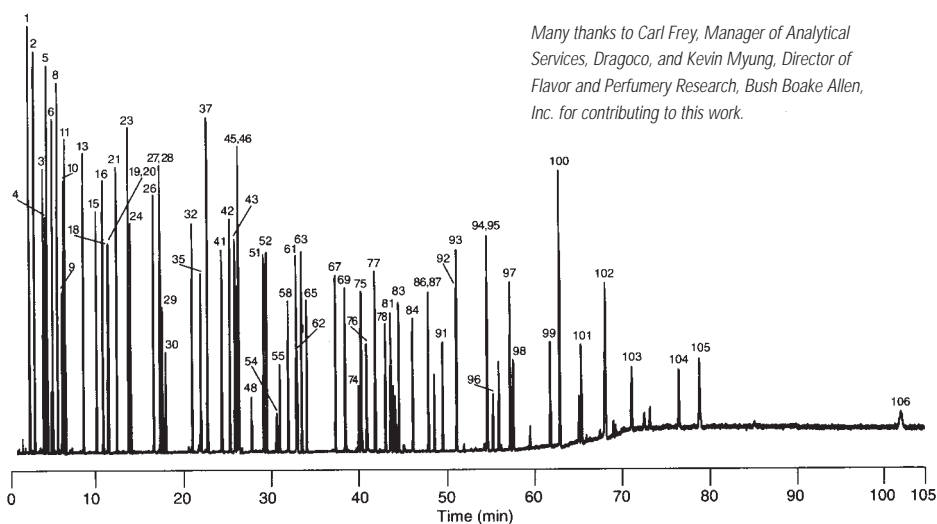
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

1. Acetone
2. Ethyl acetate
3. Ethyl propionate
4. 2,3-Butanedione (diacetyl)
5. Methyl butyrate
6. Isobutyl acetate
7. α -Pinene
8. Ethyl butyrate
9. 2,3-Pentanedione (acetyl propionyl)
10. Camphene
11. Ethyl isovalerate
12. β -Pinene
13. Ethyl pentanoate
14. Myrcene
15. Allyl butyrate
16. Limonene
17. 1,8-Cineol
18. 3,5,5-Trimethylhexanol
19. 3-Methylbutyl alcohol
20. 2-Methylbutyl alcohol
21. Ethyl hexanoate
22. γ -Terpinene
23. p-Cymene
24. Hexyl acetate
25. Terpinolene
26. Ethyl heptanoate
27. 2,6-Dimethylhept-5-enal (MelonalTM)
28. Rose oxide, cis-rose
29. Hexanol
30. Rose oxide, trans-rose
31. Methyl-para-cresol
32. Ethyl octanoate
33. cis-Linalool oxide
34. Menthone
35. Furfural
36. trans-Linalool oxide
37. Octyl acetate
38. Isomenthone

39. α -Copaene
40. Camphor
41. Benzaldehyde
42. Ethyl nonanoate
43. Linalool
44. Linalyl acetate
45. Vertenex (isomer 1)
46. Octanol
47. β -Caryophyllene
48. Vertenex (isomer 2)
49. Terpinen-4-ol
50. Methyl benzoate
51. Hexylene glycol
52. Ethyl decanoate
53. Citronellyl acetate
54. Isoborneol
55. Neral
56. α -Terpineol
57. Geranyl formate
58. Borneol
59. β -Bisabolene
60. Benzyl acetate
61. Neryl acetate
62. Geraniol
63. Ethyl undecanoate
64. δ -Cadinene
65. Geranyl acetate
66. Citronellol
67. Ethyl dodecanoate
68. Geraniol
69. Benzyl alcohol
70. Geranyl butyrate

71. Nonadecane
72. Benzene ethanol
73. Nonadec-1-ene
74. Florazone (isomer 1)
75. Florazone (isomer 2)
76. Hydroxycitronellal
77. Dodecanol
78. Diphenyl oxide
79. Citronellyl tiglate
80. Eugenyl methyl ether
81. γ -Nonalactone
83. Ethyl tetradecanoate
84. n-Amyl salicylate
85. Geranyl tiglate
86. Ethyl pentadecanoate
87. Isopropylmyristate
90. Phenylethyl tiglate
91. Rosatol (rosetone)
92. Eugenyl acetate
93. Ethyl hexadecanoate
94. γ -Dodecalactone
95. Dibenzyl ether
96. Tonalid
97. Ethyl octadecanoate
98. Benzophenone
99. Benzyl benzoate
100. Cetearyl octanoate
101. Musk T (ethylene brassylate)
102. Cetearyl decanoate
103. Frambione (raspberry ketone)
104. Cinnamyl phenyl acetate
105. Phenyl ethyl cinnamate
106. Cinnamyl cinnamate



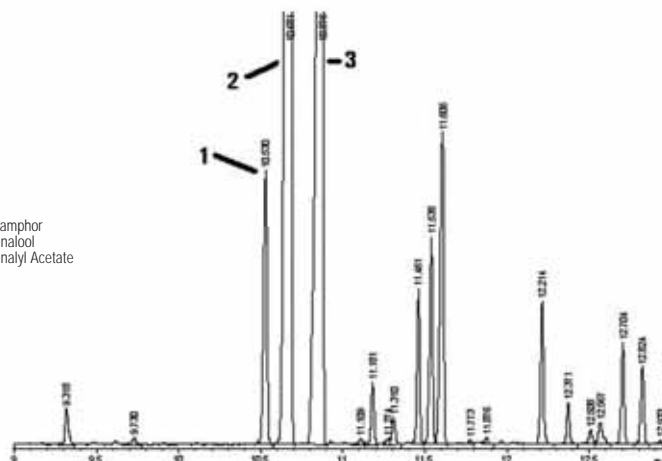
Many thanks to Carl Frey, Manager of Analytical Services, Dragoco, and Kevin Myung, Director of Flavor and Perfumery Research, Bush Boake Allen, Inc. for contributing to this work.

Lavender Oil Spiked with Camphor

Column: DB-WAX
127-7023FF
20 m x 0.10 mm, 0.20 μ m

Carrier: H2, 38 psi, 0.33 min, 5 psi/min to 45 psi, hold
Oven: 50°C, 0.33 min
10°C/min to 200°C
200°C hold until last peak elutes
Injection: Split, 250°C
Split ratio 1:650
Detector: FID, 250°C
Sample: Column + make-up (N2) in constant flow
0.5 μ L

1. Camphor
2. Linalool
3. Linalyl Acetate



Special thanks to Mr. Marin, MANE, France

GC and GC/MS Applications

Food, Flavors and Fragrances

Perfume

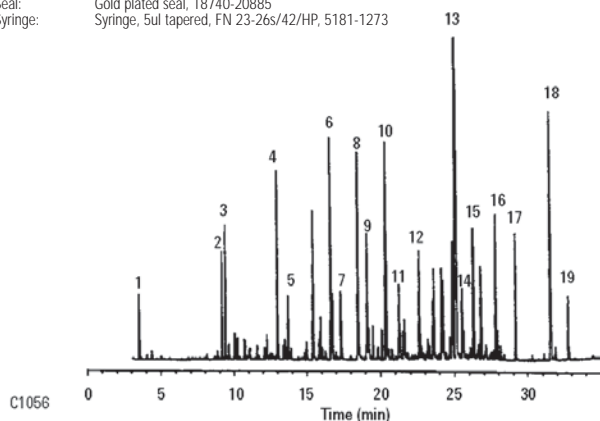
Column: HP-INNOWax
19091N-133
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium, 30 cm/sec
0.9 mL/min constant flow
80°C for 1 min
Oven: 80-250°C at 5°C/min
250°C for 2 min
Injection: Split, 250°C
Split ratio 20:1
Detector: MSD, 280°C

1. Limonene
2. Linalool
3. Linalyl acetate
4. Benzyl acetate
5. Citronellol
6. Benzene ethanol
7. α -Methyl Ionone
8. Carvocol and geraiol
9. Isoamyl salicylate
10. n-Amyl salicylate
11. Commamyl acetate
12. Acetylcdrene
13. Diethyl phthalate
14. Tonalid
15. Coumarin
16. Musk xylene
17. Benzyl benzoate
18. Benzyl salicylate
19. Musk ketone

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Flavor Mixture

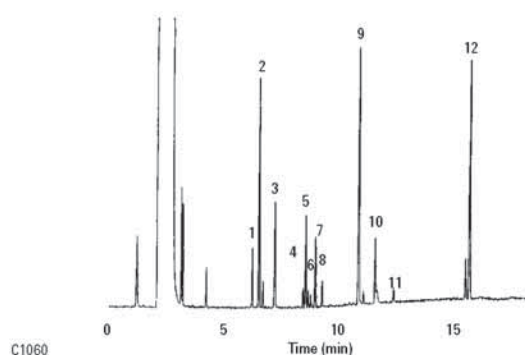
Column: ULTRA 2
19091B-112
25 m x 0.32 mm, 0.52 μ m

Carrier: Helium, 90 kPa., 2.2 mL/min constant flow
80°C for 1 min
80-210°C at 8°C/min
210°C for 2 min
Injection: Split, 250°C
Split ratio 20:1
Detector: IRD, 280°C
Wide Band MCT, 550 to 4000 cm-1

1. Fenchone
2. Thujone
3. Benzaldehyde
4. trans-Carveol
5. Farnesol
6. cis-Carveol
7. trans-Geraniol
8. Citral
9. Eugenol
10. Vanillin
11. trans-Isoeugenol
12. trans-Citronellyl tiglate
13. cis-Citronellyl tiglate

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glsvl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

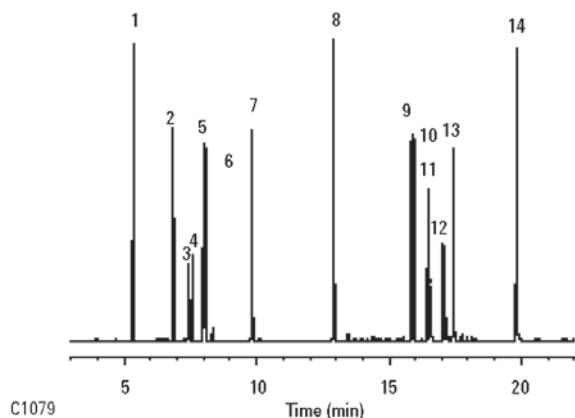


Chiral Compounds in Essential Oils and Fragrances

Column: HP-Chiral β
19091G-B233
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen, 39 cm/sec, Constant pressure
65°C for 1 min
65-170°C at 5°C/min
Injection: Split, 250°C
Split ratio 30:1
Detector: FID, 300°C
Sample: 1 μ l
0.25 ng/ μ l each analyte in Hexane

1. 1,2-Dimethylbenzene
2. Myrcene
3. (-)-Camphene
4. (+)-Camphene
5. (+)- β -Pinene
6. 1S-(-)- β -Pinene
7. Cineole
8. (+)-Citronellal
9. 1S,2R,5S-(+)-Menthol
10. 1R,2S,5R-(-)-Menthol
11. α -Terpineol
12. (+/-)-Isoborneol
13. (+)-Borneol
14. trans-Cinnamaldehyde

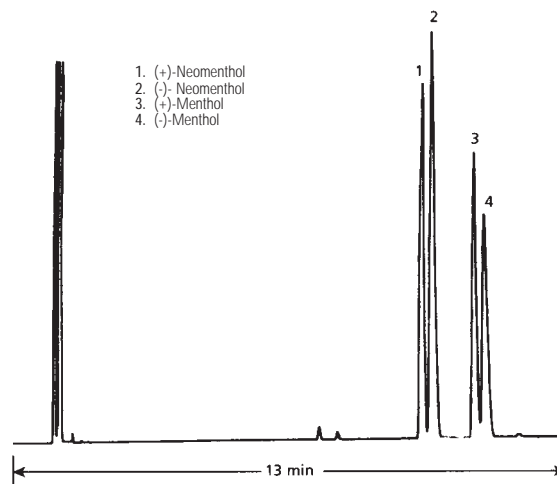


Menthol

Column: Cyclodex-B
112-2532
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen, 55 cm/sec
105°C isothermal
Injection: Split, 250°C
Split ratio 1:100
Detector: FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
1 μ l of 1 μ g/ μ l each chloroform

1. (+)-Neomenthol
2. (-)-Neomenthol
3. (+)-Menthol
4. (-)-Menthol



GC and GC/MS Applications

Food, Flavors and Fragrances

Garlic Oil

Column: DB-XLB
122-1236
30 m x 0.25 mm, 0.50 μ m

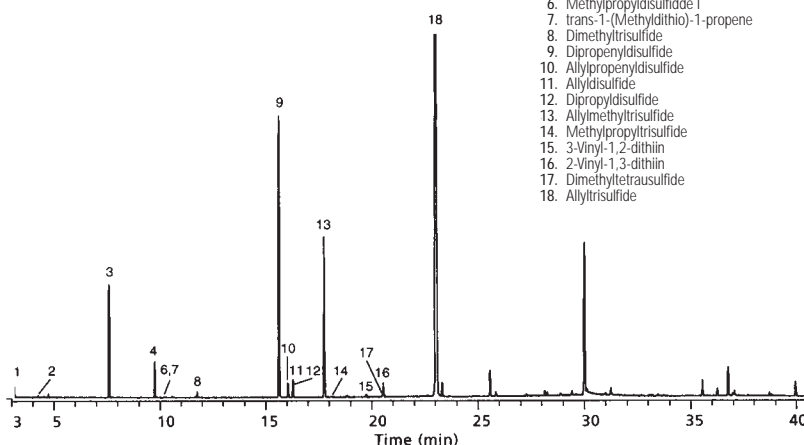
Carrier: Helium at 41 cm/sec, measured at 45°C
Oven: 160-2535-1
45°C for 3 min
45-240°C at 5°/min

Injection: 240°C for 3 min
Hot On-column, 100°C

Detector: Split flow 108 mL/min
MSD, 200°C transfer line

Sample: full scan 35-215 amu
1.2 μ L dichloromethane plug
with 1.2 μ L of 1.0 mg/mL sample
of garlic oil in dichloromethane

1. Allylmethylsulfide
2. Methylsulfide
3. Allylsulfide
4. Allylmethylsulfide
5. cis-1-(Methylthio)-1-propene
6. Methylpropylsulfide I
7. trans-1-(Methylthio)-1-propene
8. Dimethyltrisulfide
9. Dipropylsulfide
10. Allylpropylsulfide
11. Allylsulfide
12. Dipropylsulfide
13. Allylmethyltrisulfide
14. Methylpropyltrisulfide
15. 3-Vinyl-1,2-dithiin
16. 2-Vinyl-1,3-dithiin
17. Dimethyltetrasulfide
18. Allyltrisulfide



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Lemon Oil

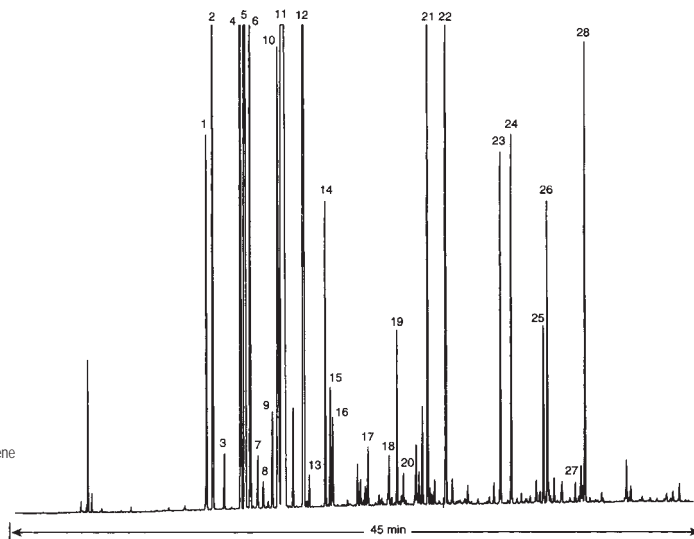
Column: DB-5
127-5022
20 m x 0.10 mm, 0.10 μ m

Carrier: Hydrogen at 60 cm/sec, measured at 40°C
Oven: 40°C for 3 min
40-185°C at 30°/min

Injection: 185°C for 3 min
Split, 275°C

Detector: Split ratio 1:275
Nitrogen makeup gas at 30 mL/min

1. α -Thujone
2. β -Thujone
3. Camphene
4. Sabinene
5. β -Pinene
6. Myrcene
7. Octanal
8. α -Phellandrene
9. α -Terpinene
10. r-Cymene
11. δ -Limonene
12. γ -Terpinene
13. Octanol
14. Terpinolene
15. Linalool
16. Nonanal
17. Citronellal
18. Terpinen-4-ol
19. α -Terpineol
20. Decanal
21. Neral
22. Geranial
23. Nerylacetate
24. Geranylacetate
25. β -Caryophyllene
26. trans- α -Bergamotene
27. α -Humulene
28. β -Bisabolene



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Cold-Pressed Orange Oil

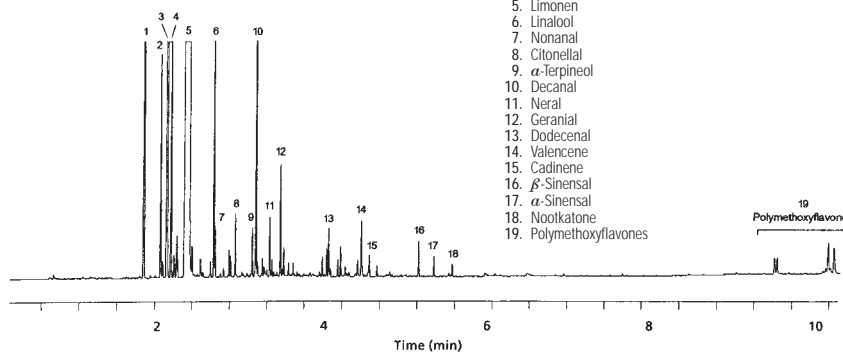
Column: DB-5
127-5022
20 m x 0.10 mm, 0.10 μ m

Carrier: Hydrogen at 60 cm/sec, measured at 70°C
Oven: 70°C for 1 min
70-250°C at 30°/min
250-310°C at 20°/min

Injection: 310°C for 2 min
Split, 275°C

Detector: Split ratio 1:275
FID, 350°C
Nitrogen makeup gas at 30 mL/min

1. α -Pinene
2. Sabinene
3. Myrcene
4. Octanal
5. Limonene
6. Linalool
7. Nonanal
8. Citronellal
9. α -Terpineol
10. Decanal
11. Neral
12. Geranial
13. Dodecalen
14. Valencene
15. Cadinene
16. β -Sinensal
17. α -Sinensal
18. Nootkatone
19. Polymethoxyflavones



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Chromatogram courtesy of Tastemaker

GC and GC/MS Applications

Food, Flavors and Fragrances

Peppermint Oil

Column: DB-WAX
122-7062

60 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 25 cm/sec (0.73 mL/min)

Oven: 75°C for 8 min
75-200°C at 4°/min

200°C for 5 min

Injection: Split, 270°C

Split ratio 1:150

Detector: FID, 270°C

Sample: Nitrogen makeup gas at 30 mL/min

1 μ L neat

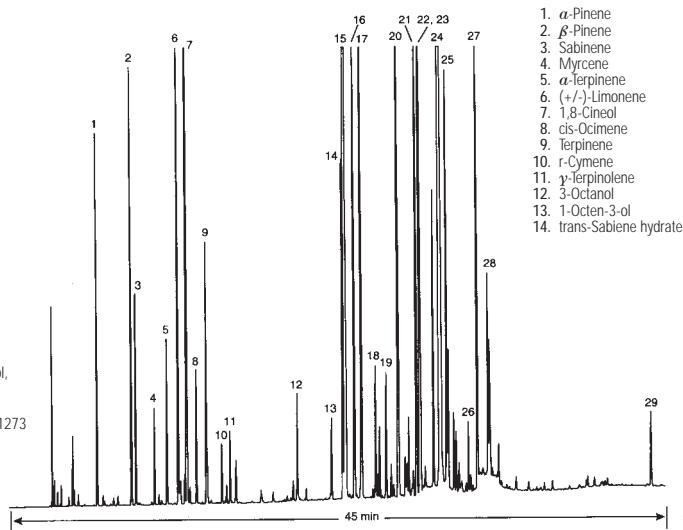
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool,
5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Thanks to:
Mr. William Faas of A.M. Todd Company for providing the sample and assisting with peak identification.

Spearmint Oil (Western)

Column: DB-WAX
122-7062

60 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 25 cm/sec (0.73 mL/min)

Oven: 75°C for 8 min
75-200°C at 4°/min

200°C for 5 min

Injection: Split, 270°C

Split ratio 1:150

Detector: FID, 270°C

Sample: Nitrogen makeup gas at 30 mL/min

1 μ L neat

Suggested Supplies

Septum: Advanced Green, 5183-4759

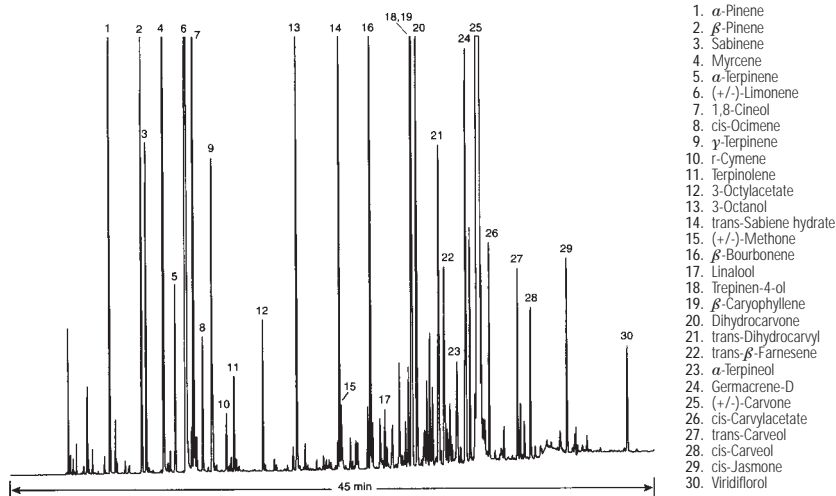
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Thanks to:

Mr. William Faas of A.M. Todd Company for providing the sample and assisting with peak identification.



Ylang Ylang Oil

Column: DB-XLB
122-1232

30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 34 cm/sec, measured at 50°C

Oven: 50°C for 1 min

50-250°C at 3.5°/min

Injection: Split, 250°C

Split ratio 1:125

Detector: MSD, 310°C transfer line

full scan at m/z 35-550

Sample: 1 μ L of 10% oil in methylene chloride

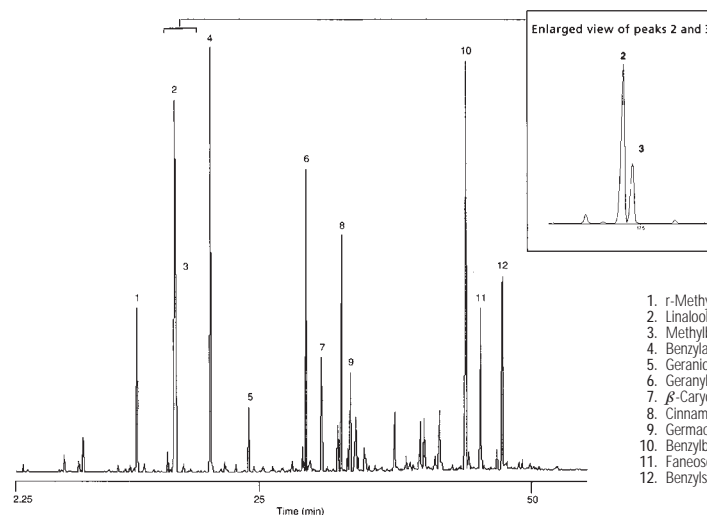
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool,
5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



GC and GC/MS Applications

Food, Flavors and Fragrances

Rosemary Oil

Column: Cyclosil-B
112-6632

30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen at 40 cm/sec, measured at 60°C

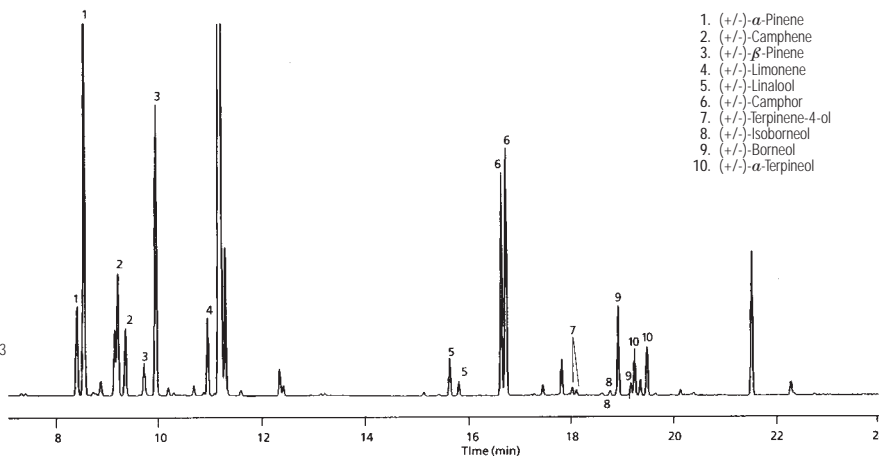
Oven: 55°C for 1 min
50-180°C at 5°/min

Injection: Split, 250°C

Split ratio 50:1

Detector: FID, 340°C

1. (+/-)- α -Pinene
2. (+/-)-Camphene
3. (+/-)- β -Pinene
4. (+/-)-Limonene
5. (+/-)-Linalool
6. (+/-)-Camphor
7. (+/-)-Terpinene-4-ol
8. (+/-)-Isoborneol
9. (+/-)-Borneol
10. (+/-)- α -Terpineol



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Citrus Flavored Carbonated Beverage (Soda)

Column: Cyclosil-B
112-6632

30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 37 cm/sec, measured at 40°C

Oven: 40-190°C at 2 min

Sampler: Headspace
no stir, NaCl 1g/10 mL sample

Adsorption: 27°C for 68 min

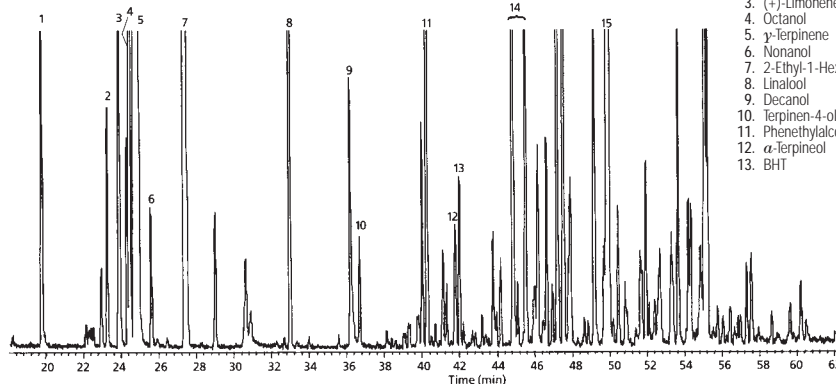
Desorption: 250°C for 15 min

Split, 1:5

Injection: Ployacrylate fiber, 85 μ m

Detector: MSD, 280°C transfer line

1. (-)-Limonene
2. p-Cymene
3. (+)-Limonene
4. Octanol
5. γ -terpinene
6. Nonanol
7. 2-Ethyl-1-Hexanol
8. Linalool
9. Decanol
10. Terpinen-4-ol
11. Phenethylalcohol
12. α -Terpineol
13. BHT



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Alcohol Beverage Standard

Column: HP-FFAP
19091F-105

50 m x 0.20 mm, 0.30 μ m

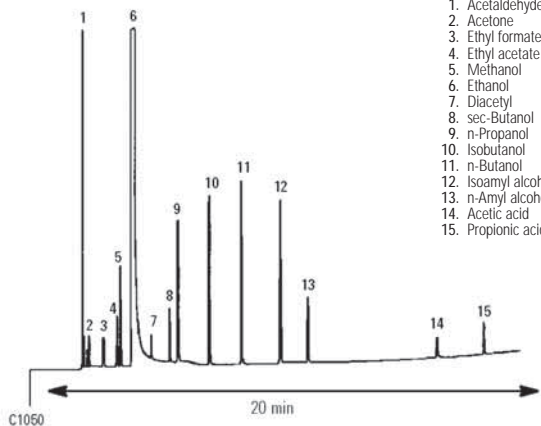
Carrier: Hydrogen

Oven: 60°C for 4 min
60-200°C at 6°C/min

200°C for 2 min

Detector: FID

1. Acetaldehyde
2. Acetone
3. Ethyl formate
4. Ethyl acetate
5. Methanol
6. Ethanol
7. Diacetyl
8. sec-Butanol
9. n-Propanol
10. Isobutanol
11. n-Butanol
12. Isoamyl alcohol
13. n-Amyl alcohol
14. Acetic acid
15. Propionic acid



Bourbon

Column: HP-INNOWax
19091N-133

30 m x 0.25 mm, 0.25 μ m

Carrier: Helium, 33 cm/sec, 15.5 psi (35°C)

1.5 mL/min constant flow

Oven: 35°C for 5 min

35-150°C at 5°C/min

150-250°C at 20°C/min

250°C for 2 min

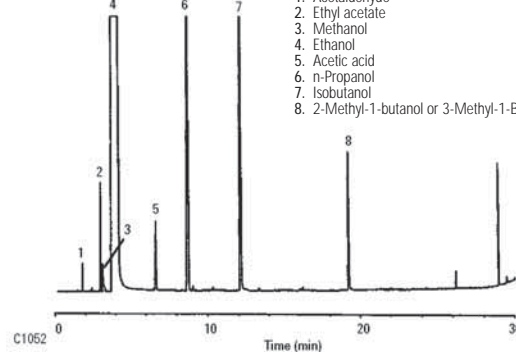
Injection: Split, 220°C

Split ratio 25:1

Detector: FID 280°C

Sample: 1 μ L

1. Acetaldehyde
2. Ethyl acetate
3. Methanol
4. Ethanol
5. Acetic acid
6. n-Propanol
7. Isobutanol
8. 2-Methyl-1-butanol or 3-Methyl-1-Butanol



GC and GC/MS Applications

Food, Flavors and Fragrances

Alditol Acetates

Column: DB-225
122-2231
30 m x 0.25 mm, 0.15 µm

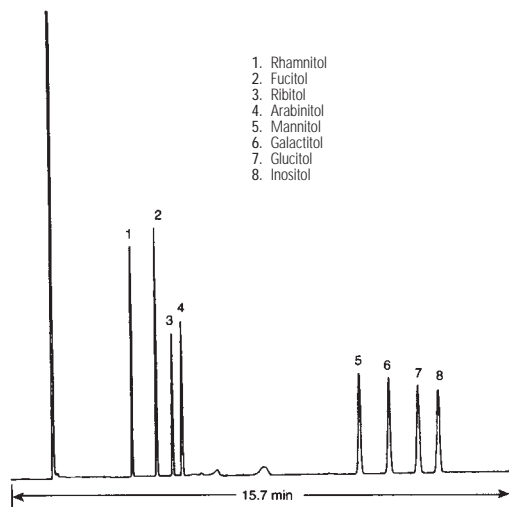
Carrier: Hydrogen a 36.5 cm/sec

Oven: 220°C isothermal

Injection: Split, 225°C

Detector: Split ratio 1:50
FID, 250°C

Sample: Nitrogen makeup gas at 30 mL/min
1 µL



Strawberry Syrup

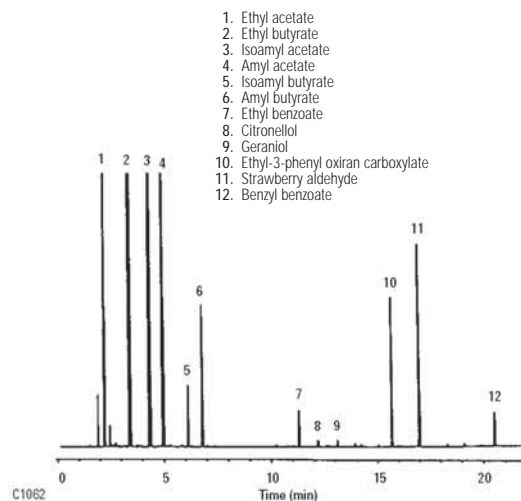
Column: HP-INNOWax
19091N-213
30 m x 0.32 mm, 0.50 µm

Carrier: Helium, 40 cm/sec, 11.7 psi (60°C)

Oven: 2.5 mL/min constant flow
60°C for 1 min
60-250°C at 10°C/min
250°C for 2 min

Injection: Split, 220°C

Detector: Split ratio 60:1
FID 275°C



GC and GC/MS

Sulfur and Selenium in Garlic by Headspace

Column: HP-INNOWax
19091N-116
60 m x 0.32 mm, 0.25 µm

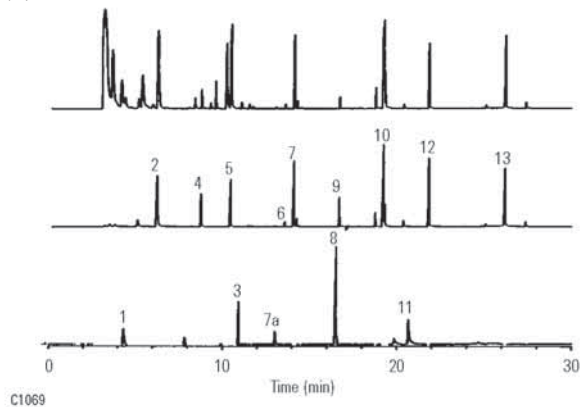
Carrier: A: Helium, 28 cm/sec, 18 psi (35°C), 1.2 mL/min constant flow
B: Helium, 28 cm/sec, 5.6 psi (35°C), 1.2 mL/min constant flow

Oven: 35°C for 3 min
35-230°C at 5°C/min
230°C for 5 min

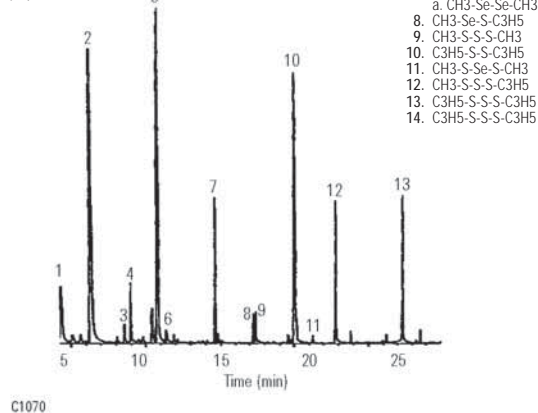
Injection: Splitless, SI inlet, 140°C

Detector: A: AED 190°C
B: MSD 230°C

(A) AED



(B) MSD



GC and GC/MS Applications

Food, Flavors and Fragrances

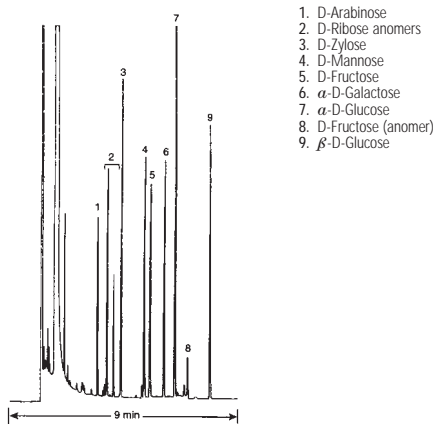
TMS Sugars

Column: DB-1701
122-0732
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen at 40 cm/sec
Oven: 180°C for 2 min
180-200°C at 5°/min
Injection: Split, 225°C
Split ratio 1:50
Detector: FID, 250°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



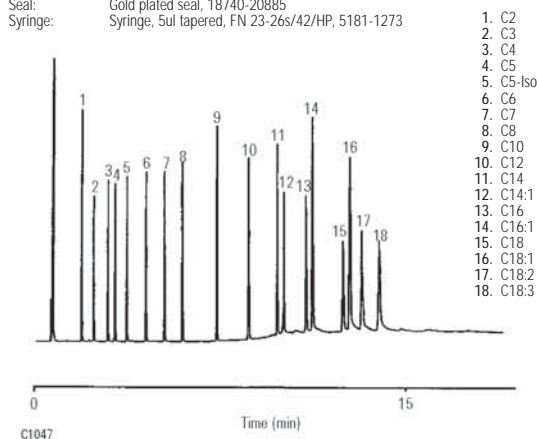
Free Fatty Acids

Column: HP-INNOWax
19091N-133
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium 42 cm/sec, 24 psi (120°C)
1.8 mL/min constant flow
Oven: 120°C for 1 min
120-250°C at 10°/min
250°C for 5 min
Injection: Split, 250°C
Split ratio 40:1
Detector: FID 280°C
Sample: 1 μ L
0.05 to 0.11% each in methylene chloride

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



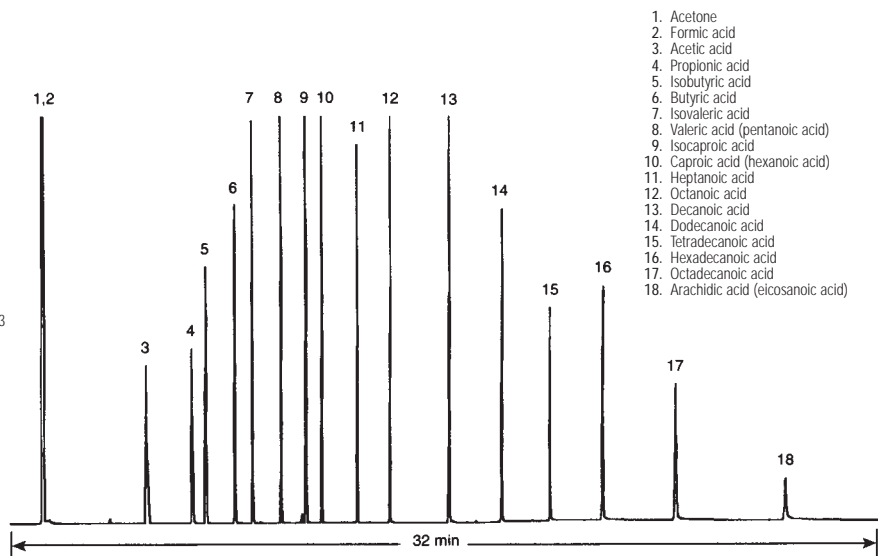
Organic Acids

Column: DB-FFAP
122-3232
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 40 cm/sec, measured at 100°C
Oven: 100°C for 5 min
100-250°C at 10°/min
250°C for 12 min
Injection: Split, 250°C
Split ratio 1:50
Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



GC and GC/MS Applications

Food, Flavors and Fragrances

Bacterial Fatty Acid Methyl Esters

Column: DB-5
122-5032
30 m x 0.25 mm, 0.25 µm

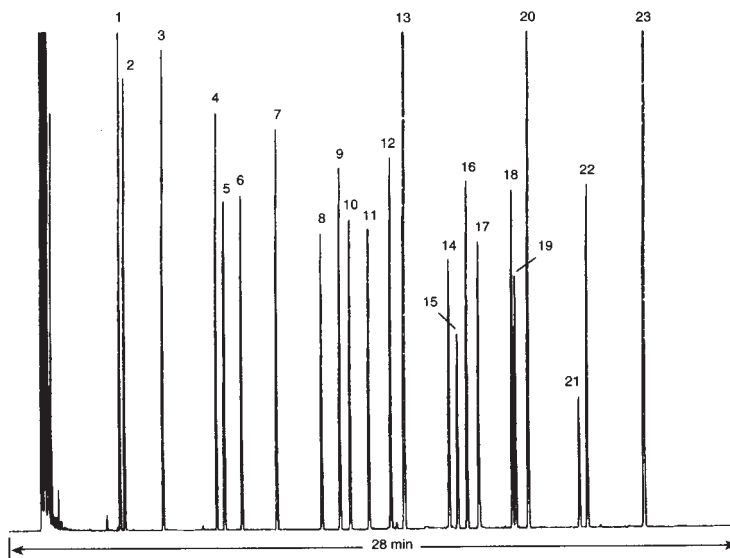
Carrier: Hydrogen at 42 cm/sec
Oven: 150°C for 4 min
 150-250°C at 4°/min

Injection: Split ratio 1:100
Detector: FID
 Nitrogen makeup gas at 30 mL/min

- | | |
|---------------------|---|
| 1. C11:0 | Methylundecanoate |
| 2. 2-OH C10:0 | Methyl 2-hydroxydecanoate |
| 3. C12:0 | Methyl laurate |
| 4. C13:0 | Methyl tridecanoate |
| 5. 2-OH C12:0 | Methyl 2-hydroxydodecanoate |
| 6. 3-OH C12:0 | Methyl 3-hydroxydodecanoate |
| 7. C14:0 | Methyl myristate |
| 8. 12-Me C14:0 | Methyl 12-methyltetradecanoate |
| 9. C15:0 | Methyl pentadecanoate |
| 10. 2-OH C14:0 | Methyl 2-hydroxytetradecanoate |
| 11. 3-OH C14:0 | Methyl 3-hydroxytetradecanoate |
| 12. C16:1 | Methyl palmitoleate |
| 13. C16:0 | Methyl palmitate |
| 14. 14-Me C16:0 | Methyl 14-methylhexadecanoate |
| 15. 9,10-diMe C16:0 | Methyl cis-9,10-methyl hexadecanoate |
| 16. C17:0 | Methyl heptadecanoate |
| 17. 2-OH C16:0 | Methyl 2-hydroxyhexadecanoate |
| 18. C18:1 | Methyl oleate |
| 19. C18:1 | Methyl elaidate |
| 20. C18:0 | Methyl stearate |
| 21. 9,10-diMe C18:0 | Methyl cis-9,10-methylene octadecanoate |
| 22. C19:0 | Methyl nonadecanoate |
| 23. C20:0 | Methyl arachidate |

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



FAMES

Column: DB-23
122-2362
60 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 43 cm/sec
 Constant pressure mode

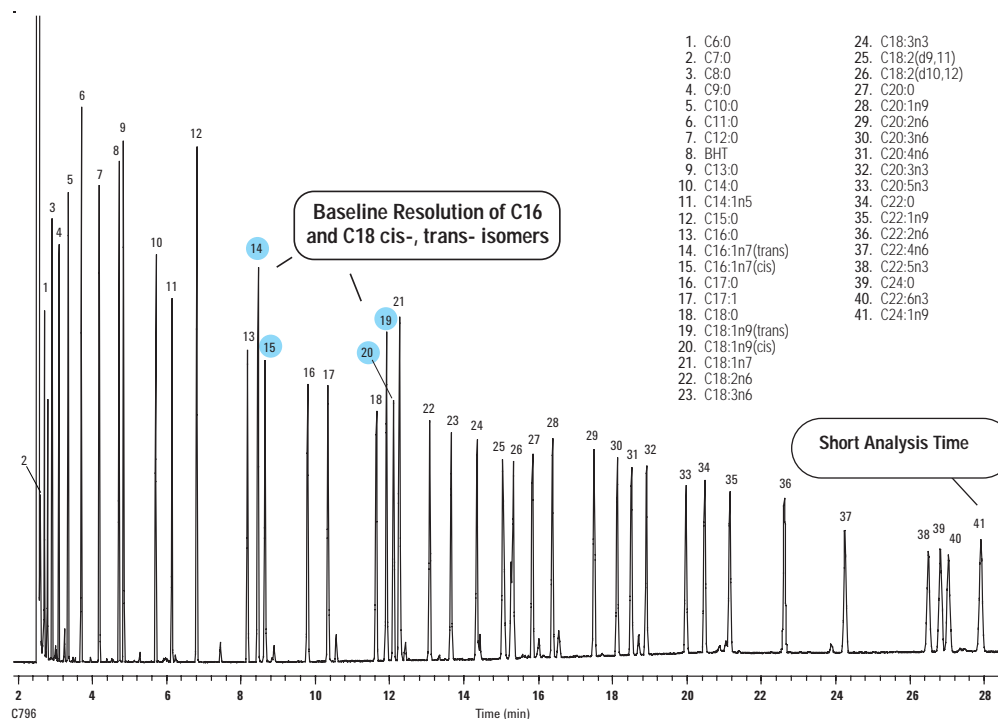
Oven: 130°C for 1.0 min
 130-170°C at 6.5°C/min
 170-215°C at 2.75°C/min
 215°C for 12 min
 215-230°C at 40°C/min
 230°C for 3 min

Injection: Split, 270°C
Detector: Split ratio 50:1
 FID, 280°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Chromatogram provided courtesy of Steve Watkins and Jeremy Ching, FAME Analytics, <http://www.fameanalytics.com>



GC and GC/MS Applications

Food, Flavors and Fragrances

Polyunsaturated Fatty Acid Methyl Esters

Column: HP-INNOWax
19091N-213
30 m x 0.32 mm, 0.50 μ m

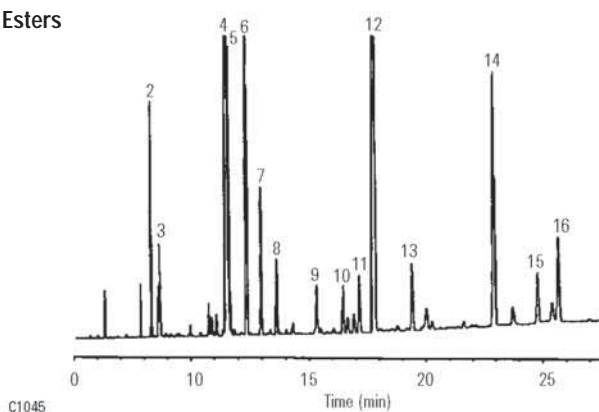
Carrier: Helium, 30 cm/sec, 10.7 psi (150°C)
1.5 mL/min constant flow

Oven: 150°C for 1 min
150-200°C at 15°C/min
200-250°C at 2°C/min

Injection: 250°C for 5 min
Split, 220°C
Split ratio 60:1

Detector: FID, 275°C

Sample: 0.5 μ L



1. C14:0
2. C16:0
3. C16:1w7
4. C18:0
5. C18:1w9
6. C18:1w7
7. C18:2w6
8. C18:3w3
9. C20:1w9
10. C20:2w6
11. C20:3w6
12. C20:4w6
13. C20:5w3
14. C22:4w6
15. C22:5w3
16. C22:6w3

Suggested Supplies

Septum: Advanced Green, 5183-4759
Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Resolution of Critical C18:1 positional FAME isomers

Column: HP-88
112-88A7
100 m x 0.25 mm, 0.20 μ m

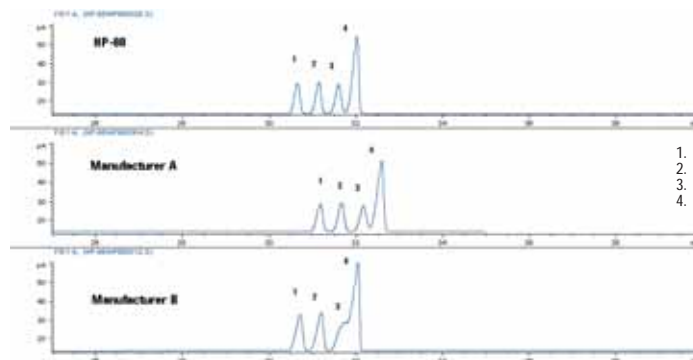
Carrier: Hydrogen, 35 cm/sec

Oven: 155°C isothermal

Injection: Split ratio 1:100

Detector: FID, 250°C

Sample: N2 makeup
1 mL



1. Trans-9, 18:1
2. Trans-11, 18:1
3. Trans-12, 18:1
4. cis-9, 18:1

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

FAME Standard I

Column: DB-WAX
127-7012
10 m x 0.10 mm, 0.10 μ m

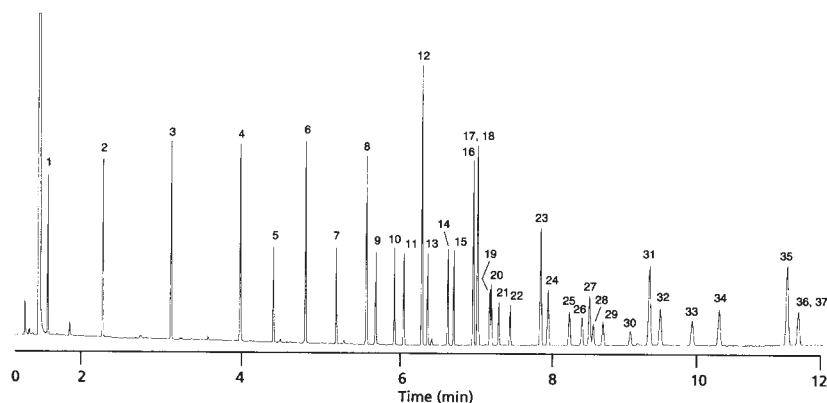
Carrier: Hydrogen at 77 cm/sec, measured at 40°C

Oven: 40-195°C at 25°/min
195-205°C at 3°/min
205-230°C at 8°/min
230°C for 1 min

Injection: Split, 250°C
Split ratio 1:30

Detector: FID, 250°C

1. Butyric acid methyl ester (C4:0)
2. Caproic acid methyl ester (C6:0)
3. Caprylic acid methyl ester (C8:0)
4. Capric acid methyl ester (C10:0)
5. Undecanoic acid methyl ester (C11:0)
6. Lauric acid methyl ester (C12:0)
7. Tridecanoic acid methyl ester (C13:0)
8. Myristic acid methyl ester (C14:0)
9. Myristoleic acid methyl ester (C14:1)
10. Pentadecanoic acid methyl ester (C15:0)
11. cis-10-Pentadecenoic acid methyl ester (C15:1)
12. Palmitic acid methyl ester (C16:0)
13. Palmitoleic acid methyl ester (C16:1)
14. Heptadecanoic acid methyl ester (C17:0)
15. cis-10-Heptadecenoic acid methyl ester (C17:1)
16. Stearic acid methyl ester (C18:0)
17. Oleic acid methyl ester (C18:1n9c)
18. Elaidic acid methyl ester (C18:1n9t)
19. Linoleic acid methyl ester (C18:2n6c)
20. Linolelaidic acid methyl ester (C18:2n6t)
21. γ -Linolenic acid methyl ester (C18:3n6)
22. Linolenic acid methyl ester (C18:3n3)
23. Arachidic acid methyl ester (C20:0)
24. cis-11-Eicosenoic acid methyl ester (C20:1)
25. cis-11,14-Eicosadienoic acid methyl ester (C20:2)
26. cis-8,11,14-Eicosatrienoic acid methyl ester (C20:3n6)
27. Heneicosanoic acid methyl ester (C21:0)
28. cis-11,14,17-Eicosatrienoic acid methyl ester (C20:3n3)
29. Arachidonic acid methyl ester (C20:4n6)
30. cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester (C20:5n3)
31. Behenic acid methyl ester (C22:0)
32. Erucic acid methyl ester (C22:1n9)
33. cis-13,16-Docosadienoic acid methyl ester (C22:2)
34. Tricosanoic acid methyl ester (C23:0)
35. Lignoceric acid methyl ester (C24:0)
36. cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester (C22:6n3)
37. Nervonic acid methyl ester (C24:1)



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

GC and GC/MS Applications

Food, Flavors and Fragrances

FAME Standard II

Column: DB-225
127-2222

20 m x 0.10 mm, 0.10 µm

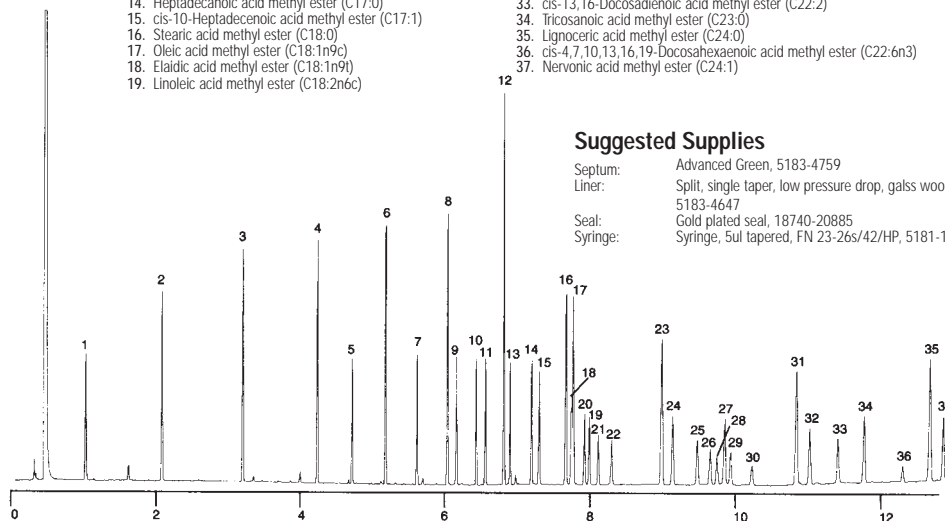
Carrier: Hydrogen at 59.3 cm/sec,
measured at 35°C

Oven: 35° for 0.5 min
35-195°C at 25°/min
195-205°C at 3°/min
205-230°C at 8°/min

Injection: 230°C for 1 min
Split, 250°C

Detector: Split ratio 1:30
FID, 250°C

1. Butyric acid methyl ester (C4:0)
2. Caproic acid methyl ester (C6:0)
3. Caprylic acid methyl ester (C8:0)
4. Capric acid methyl ester (C10:0)
5. Undecanoic acid methyl ester (C11:0)
6. Lauric acid methyl ester (C12:0)
7. Tridecanoic acid methyl ester (C13:0)
8. Myristic acid methyl ester (C14:0)
9. Myristoleic acid methyl ester (C14:1)
10. Pentadecanoic acid methyl ester (C15:0)
11. cis-10-Pentadecenoic acid methyl ester (C15:1)
12. Palmitic acid methyl ester (C16:0)
13. Palmitoleic acid methyl ester (C16:1)
14. Heptadecanoic acid methyl ester (C17:0)
15. cis-10-Heptadecenoic acid methyl ester (C17:1)
16. Stearic acid methyl ester (C18:0)
17. Oleic acid methyl ester (C18:1n9c)
18. Elaidic acid methyl ester (C18:1n9t)
19. Linoleic acid methyl ester (C18:2n6c)
20. Linolelaidic acid methyl ester (C18:2n6t)
21. γ-Linolenic acid methyl ester (C18:3n6)
22. Linolenic acid methyl ester (C18:3n3)
23. Arachidic acid methyl ester (C20:0)
24. cis-11-Eicosenoic acid methyl ester (C20:1)
25. cis-11,14-Eicosadienoic acid methyl ester (C20:2)
26. cis-8,11,14-Eicosatrienoic acid methyl ester (C20:3n6)
27. Heneicosanoic acid methyl ester (C21:0)
28. cis-11,14,17-Eicosatrienoic acid methyl ester (C20:3n3)
29. Arachidonic acid methyl ester (C20:4n6)
30. cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester (C20:5n3)
31. Behenic acid methyl ester (C22:0)
32. Erucic acid methyl ester (C22:1n9)
33. cis-13,16-Docosadienoic acid methyl ester (C22:2)
34. Tricosanoic acid methyl ester (C23:0)
35. Lignoceric acid methyl ester (C24:0)
36. cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester (C22:6n3)
37. Nervonic acid methyl ester (C24:1)



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

Canola Oil Margarine Partially Hydrogenated FAMES AOCS Method 1c-89

Column: DB-23
122-2362

60 m x 0.25 mm, 0.25 µm

Carrier: Helium at 15 cm/sec (0.44 mL/min),
measured at 150°C

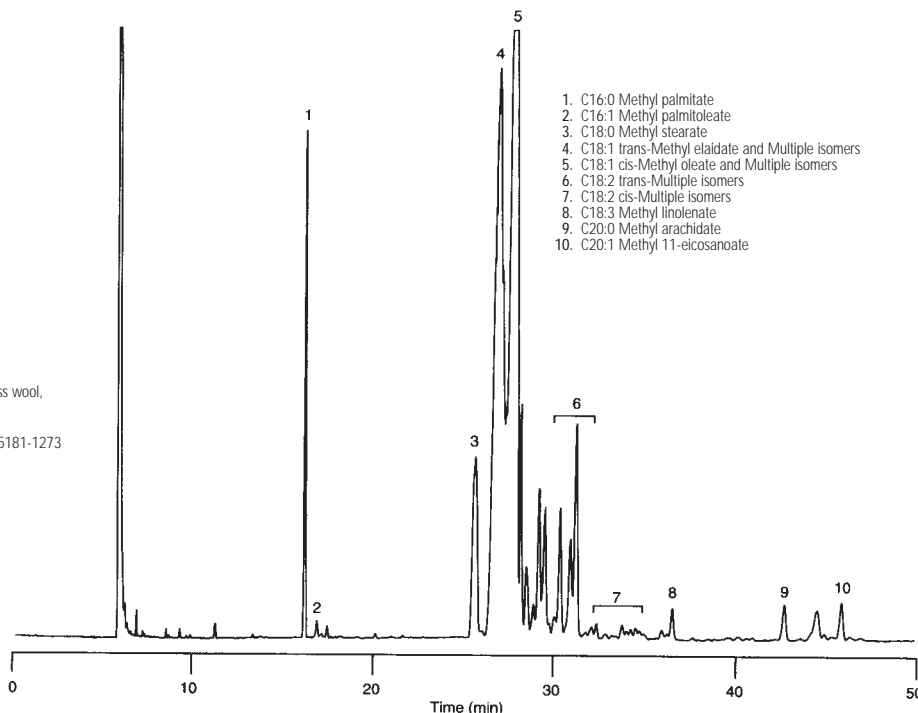
Oven: 150-200°C at 1.3°/min
200°C for 10 min

Injection: Split, 210°C

Detector: Split 1:100
FID, 210°C

Sample: 1 µL

1. C16:0 Methyl palmitate
2. C16:1 Methyl palmitoleate
3. C18:0 Methyl stearate
4. C18:1 trans-Methyl elaidate and Multiple isomers
5. C18:1 cis-Methyl oleate and Multiple isomers
6. C18:2 trans-Multiple isomers
7. C18:2 cis-Multiple isomers
8. C18:3 Methyl linolenate
9. C20:0 Methyl arachidate
10. C20:1 Methyl 11-eicosanoate



Suggested Supplies

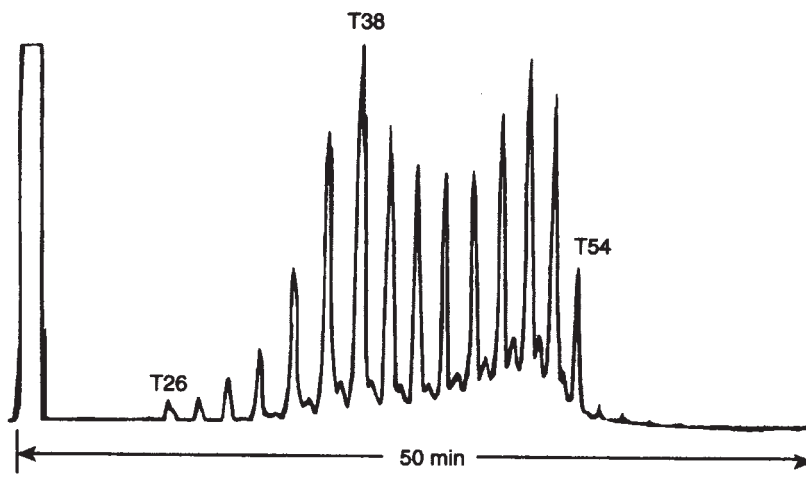
Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

GC and GC/MS Applications

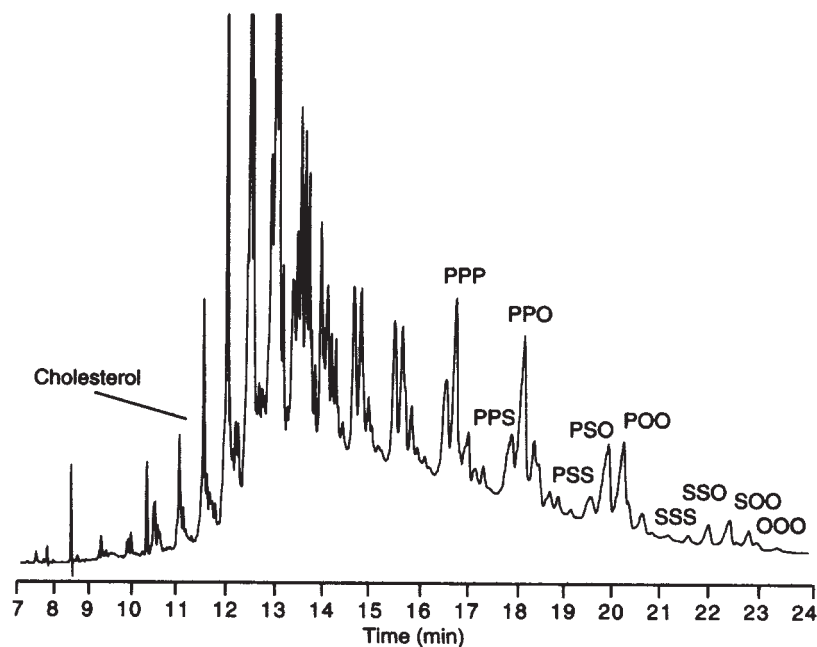
Food, Flavors and Fragrances

Butter Triglycerides

Column: DB-5ht
 123-5731
 30 m x 0.32 mm, 0.10 μ m
Carrier: Hydrogen at 55 cm/sec, measured at 250°C
Oven: 35-250°C at 70°/min
 250-400°C at 5°/min
 400°C for 20 min
Injection: Cool On-column
Detector: FID, 400°C
 Nitrogen makeup gas at 30 mL/min
 Baseline Corrected
Sample: 1 μ L of 9 μ g/ μ L in toluene
 (approx. 1% w/w solution)



Column: DB-17ht
 123-1831
 30 m x 0.32 mm, 0.15 μ m
Carrier: Hydrogen at 40 cm/sec
Oven: 250-365°C at 5°/min
 365°C for 1 min
Injection: Cool On-column
Detector: FID, 400°C
 Nitrogen makeup gas at 30 mL/min
 Baseline Corrected
Sample: 1 μ L of 9 μ g/ μ L in toluene
 (approx. 1% w/w solution)



GC and GC/MS Applications

Industrial Chemicals

Industrial Chemicals

Alcohols I

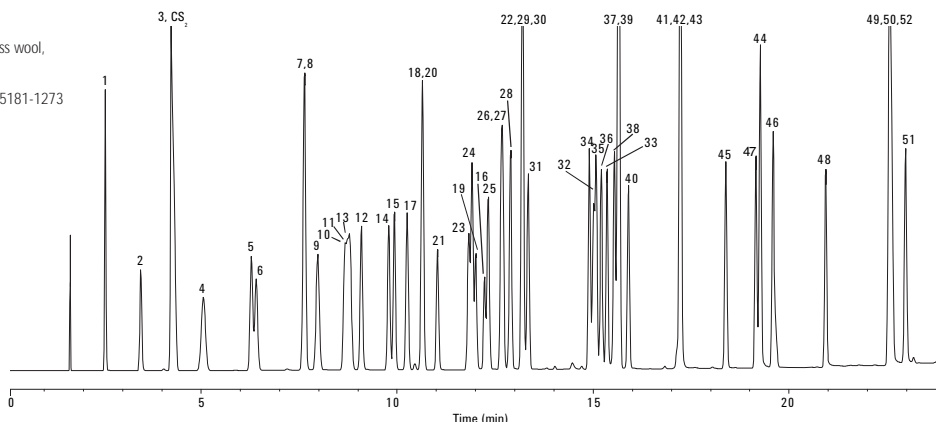
Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
 measured at 40°C
 Oven: 40-260°C at 10°C/min
 260°C for 3 min
 Injection: Split, 250°C
 Split ratio 1:10
 Detector: FID, 300°C
 Sample: Nitrogen makeup gas at 30 mL/min
 1 µL of 0.01-0.05% each solvent in CS₂

- | | | |
|---------------------------------|--------------------|--|
| 1. Acetaldehyde | 17. Cyclopentanone | 33. Ethanol |
| 2. Acrolein | 18. 2-Hexanone | 34. Isopropanol |
| 3. Acetone | 19. Hexanal | 35. tert-Butanol |
| 4. Propionaldehyde | 20. Furfural | 36. 2-Propen-1-ol (allyl alcohol) |
| 5. Isobutyraldehyde | 21. 4-Heptanone | 37. 1-Propanol |
| 6. Methacrolein | 22. 3-Heptanone | 38. 2-Propyn-1-ol (propargyl alcohol) |
| 7. Butyraldehyde | 23. 2-Heptanone | 39. sec-Butanol |
| 8. 2-Butanone (MEK) | 24. Cyclohexanone | 40. 2-Methyl-3-buten-2-ol |
| 9. Crotonaldehyde | 25. Heptanal | 41. Isobutanol |
| 10. 3-Methyl-2-butanone | 26. Benzaldehyde | 42. 2-Methoxyethanol (methyl Cellosolve) |
| 11. 2-Pentanone | 27. Octyl aldehyde | 43. 3-Buten-1-ol |
| 12. 3-Pentanone | 28. o-Tolualdehyde | 44. 2-Methyl-2-butanol (tert-amyl alcohol) |
| 13. Valeraldehyde (pentanal) | 29. m-Tolualdehyde | 45. 1-Butanol |
| 14. 4-Methyl-2-pentanone (MIBK) | 30. p-Tolualdehyde | 46. 2-Buten-1-ol (crotyl alcohol) |
| 15. 2-Methyl-3-pentanone | 31. Nonyl aldehyde | 47. Ethylene glycol |
| 16. 3-Hexanone | 32. Methanol | 48. 1-Penten-3-ol |
| | | 49. 2-Pentanol |
| | | 50. Glycidol |
| | | 51. 3-Pentanol |
| | | 52. 2-Ethoxyethanol (Cellosolve) |

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Split, single taper, low pressure drop, galss wool,
 5183-4647
 Seal: Gold plated seal, 18740-20885
 Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Alcohols II

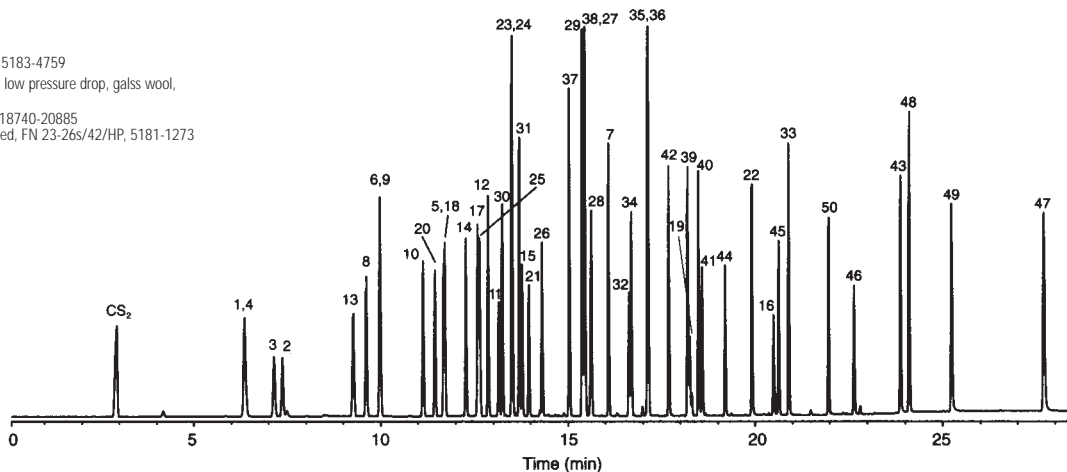
Column: **DB-WAXetr**
123-7354
50 m x 0.32 mm, 1.00 µm

Carrier: Helium at 50 cm/sec,
 measured at 40°C
 Oven: 40-230°C at 10°C/min
 230°C for 5 min
 Injection: Split, 250°C
 Split ratio 1:5
 Detector: FID, 250°C
 Sample: Nitrogen makeup gas at 35 mL/min
 1 µL of 0.15%
 each solvent in CS₂

- | | | |
|--|--|--|
| 1. Methanol | 18. 2-Pentanol | 35. cis-2-Hexen-1-ol |
| 2. Ethanol | 19. Glycidol | 36. Cyclohexanol |
| 3. Isopropanol | 20. 3-Pentanol | 37. 3-Heptanol |
| 4. tert-Butanol | 21. 2-Ethoxyethanol (Cellosolve) | 38. 2-Heptanol |
| 5. 2-Propen-1-ol (allyl alcohol) | 22. Propylene glycol | 39. 2-Butoxyethanol (butyl Cellosolve) |
| 6. 1-Propanol | 23. 3-Methyl-1-butanol (isoamyl alcohol) | 40. cis-4-Hepten-1-ol |
| 7. 2-Propyn-1-ol (propargyl alcohol) | 24. 2-Methyl-1-butanol (active amyl alcohol) | 41. trans-2-Hepten-1-ol |
| 8. sec-Butanol | 25. 4-Methyl-2-pentanol | 42. 1-Heptanol |
| 9. 2-Methyl-3-buten-2-ol | 26. 1-Pentanol | 43. Benzyl alcohol |
| 10. Isobutanol | 27. 2-Penten-1-ol | 44. 2-Ethyl-1-hexanol |
| 11. 2-Methoxyethanol (methyl Cellosolve) | 28. 3-Methyl-2-buten-1-ol | 45. 1-Octanol |
| 12. 3-Buten-1-ol | 29. Cyclopentanol | 46. 1-Nonanol |
| 13. 2-Methyl-2-butanol (tert-amyl alcohol) | 30. 3-Hexanol | 47. 2-Phenoxyethanol |
| 14. 1-Butanol | 31. 2-Hexanol | 48. a-Ethylphenethyl alcohol |
| 15. 2-Buten-1-ol (crotyl alcohol) | 32. 4-Hydroxy-4-methyl-2-pentanone | 49. b-Ethylphenethyl alcohol |
| 16. Ethylene glycol | 33. Furfuryl alcohol | 50. 1-Decanol |
| 17. 1-Penten-3-ol | 34. cis-3-Hexen-1-ol | |

Suggested Supplies

Septum: Advanced Green, 5183-4759
 Liner: Split, single taper, low pressure drop, galss wool,
 5183-4647
 Seal: Gold plated seal, 18740-20885
 Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



GC and GC/MS Applications Industrial Chemicals

Alcohols III

Column: HP-INNOWax
19095N-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium, 29 cm/sec, 3.0 psi (45°C)
Oven: 45°C for 1 min

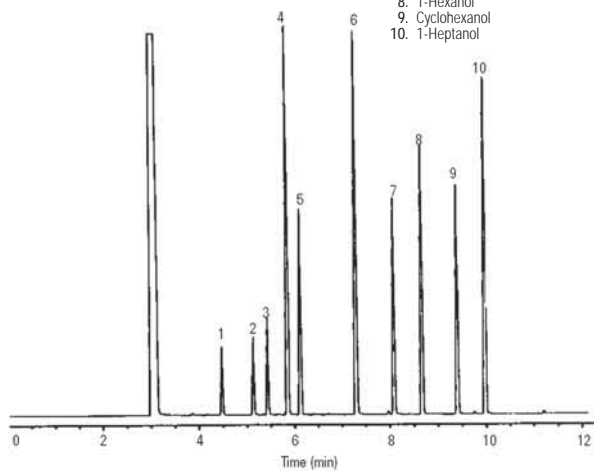
45-150°C at 10°C/min
4 mL/min constant flow

Injection: Split, 250°C
Split ratio 25:1

Detector: FID 250°C

Sample: 1 µL

1. 1-Propanol
2. iso-Butanol
3. 3-Methyl-3-pentanol
4. 1-Butanol
5. 4-Methyl-2-pentanol
6. 1-Pentanol
7. 2-Ethyl-1-Butanol
8. 1-Hexanol
9. Cyclohexanol
10. 1-Heptanol



C817

Ethoxyethanol

Column: HP-FFAP
19095F-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium, 10 mL/min
Oven: 60°C for 1 min

60-100°C at 5°C/min
100-210°C at 10°C/min

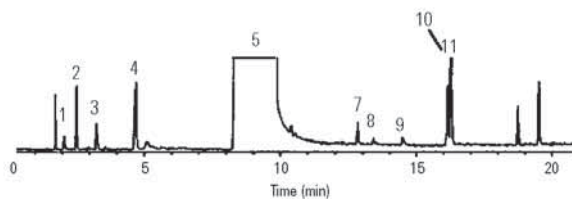
Injection: Split ratio 10:1

Detector: TCD

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

1. Ethylene oxide
2. Ethyl formate
3. Ethyl alcohol
4. Water
5. 2-Ethoxyethanol
6. 2-Ethoxyethyl acetate
7. Hydroxy acetate
8. Acetic acid
9. Formic acid
10. Ethylene glycol/monoformate
11. Ethylene glycol/monoacetate



C845

Organic Acids

Column: DB-WAXetr
125-7332
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 37 cm/sec,
measured at 40°C

Oven: 125°C for 5 min
125-180°C at 15°C/min

180°C for 12 min

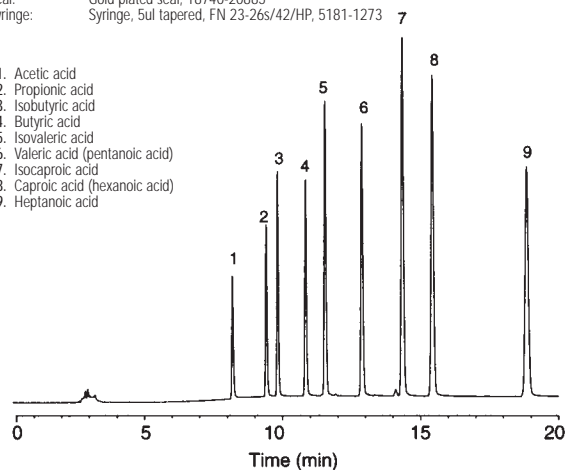
Injection: Split, 250°C

Detector: FID, 250°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. Butyric acid
5. Isovaleric acid
6. Valeric acid (pentanoic acid)
7. Isocaproic acid
8. Caproic acid (hexanoic acid)
9. Heptanoic acid



Free Organic Acids/C4-C5 Isomers

Column: HP-INNOWax
19091N-133
30 m x 0.25 mm, 0.25 µm

Carrier: Helium 42 cm/sec, 24 psi (120°C)

1.8 mL/min constant flow
110°C for 1 min

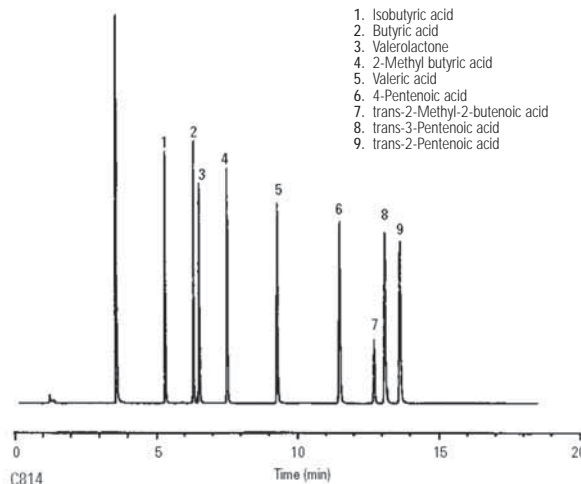
110-133 at 2°C/min
133-160°C at 3°C/min

Injection: Split, 250°C
Split ratio 40:1

Detector: FID 300°C

Sample: 1 µL

1. Isobutyric acid
2. Butyric acid
3. Valerolactone
4. 2-Methyl butyric acid
5. Valeric acid
6. 4-Pentenoic acid
7. trans-2-Methyl-2-butenic acid
8. trans-3-Pentenoic acid
9. trans-2-Pentenoic acid



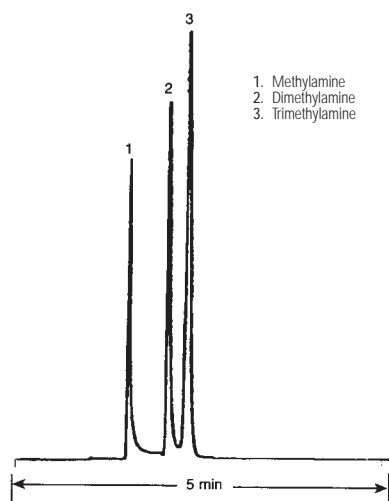
C814

GC and GC/MS Applications

Industrial Chemicals

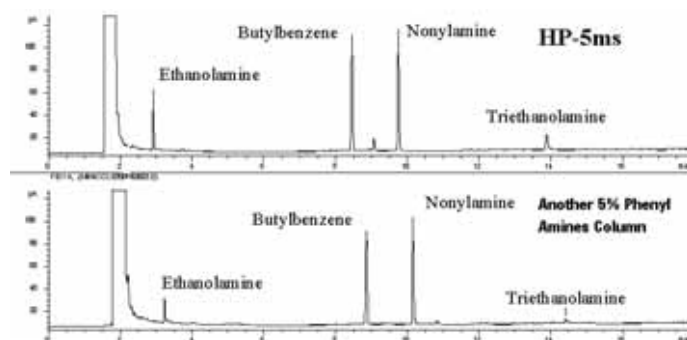
Volatile Amines

Column: DB-1
125-1035
30 m x 0.53 mm, 5.00 μ m
Oven: 30°C isothermal
Sampler: Headspace
Injection: Split ratio 1:10
Detector: FID
Nitrogen makeup gas at 30 mL/min



Trace Active Amines, 10 ng on-column

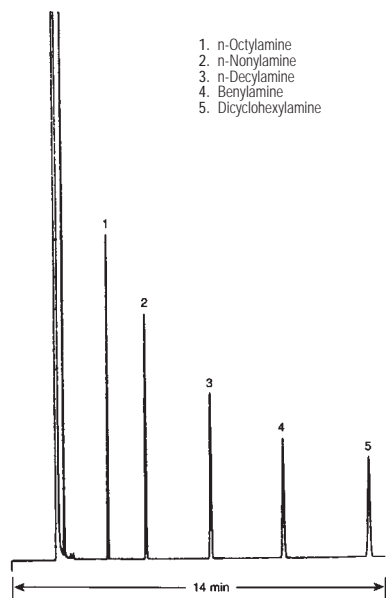
Column: HP-5ms
19091S-213
30 m x 0.32 mm, 1.00 μ m
Carrier: Helium, constant pressure 9.79 psi
Oven: 75°C for 0.5 min
75-250°C at 10°C/min
250-320°C at 25°C/min
320°C for 5 min
Injection: On-column
Oven tracking mode
Detector: FID 300°C
Sample: 0.5 μ L of each standard in methanol



GC and GC/MS

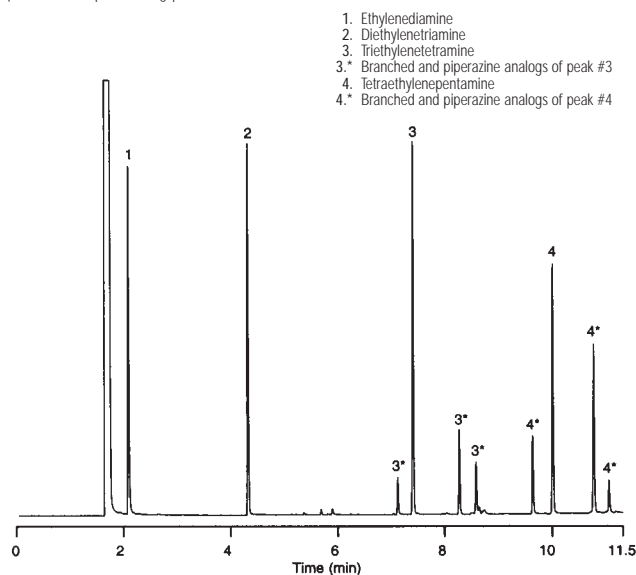
Primary Amines

Column: CAM
112-2132
30 m x 0.25 mm, 0.25 μ m
Carrier: Hydrogen at 40 cm/sec
Oven: 110°C isothermal
Injection: Split
Detector: FID
Nitrogen makeup gas at 30 mL/min



Polyethyleneamines

Column: DB-5ms
122-5536
30 m x 0.25 mm, 0.50 μ m
Carrier: Helium at 30 cm/sec, measured at 100°C
Oven: 100°C for 1 min
100-320°C at 20°C/min
Injection: Split, 250°C
Split ratio 1:50
Detector: FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
1 μ L of 100 ng/ μ L standard in methanol



Amines and Nitriles

Column: DB-5ms
122-5536
30 m x 0.25 mm, 0.50 μ m

Carrier: Helium at 22 cm/sec, measured at 40°C
Oven: 40°C for 1 min
40-260°C at 10°C/min

Injection: Split, 250°C
Split ratio 1:50

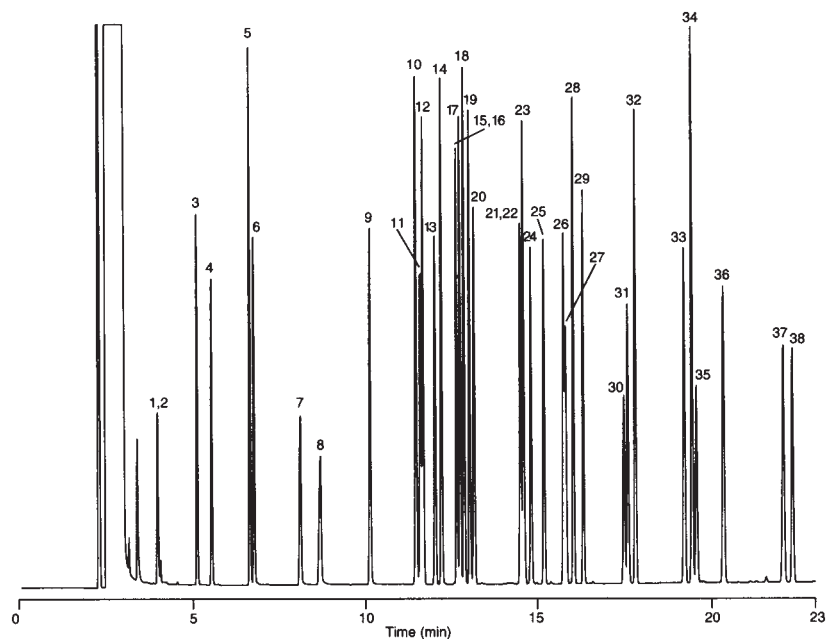
Detector: FID, 300°C

Sample: Nitrogen makeup gas at 30 mL/min
1 μ L of 100 ng/ μ L standard in methanol

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

- | | |
|-----------------------------|--------------------------|
| 1. Diethylamine | 20. 2-Cyanopyridine |
| 2. Propionitrile | 21. 2-Chloroaniline |
| 3. Diisopropylamine | 22. n-Nonylamine |
| 4. Triethylamine | 23. 2,4-Dimethylaniline |
| 5. Pyridine | 24. 4-Chlorobenzonitrile |
| 6. Pyrimidine | 25. 2,6-Dimethylaniline |
| 7. Pyrazole | 26. 3-Chloroaniline |
| 8. Acrylamide | 27. 4-Chloroaniline |
| 9. Pyridazine | 28. N,N-Diethylaniline |
| 10. Aniline | 29. n-Decylamine |
| 11. 3-Bromopyridine | 30. 4-Bromoaniline |
| 12. Benzonitrile | 31. 3,4-Diaminotoluene |
| 13. 3-Cyanopyridine | 32. 2,6-Diethylaniline |
| 14. Benzylamine | 33. 2-Nitroaniline |
| 15. n-Octylamine | 34. Dicyclohexylamine |
| 16. 1-Methyl-2-pyrrolidine | 35. 3,4-Dichloroaniline |
| 17. N,N-Dimethylbenzylamine | 36. 3-Nitroaniline |
| 18. Phenylethylamine | 37. 4-Nitroaniline |
| 19. N-Benzylmethylamine | 38. Diphenylaniline |

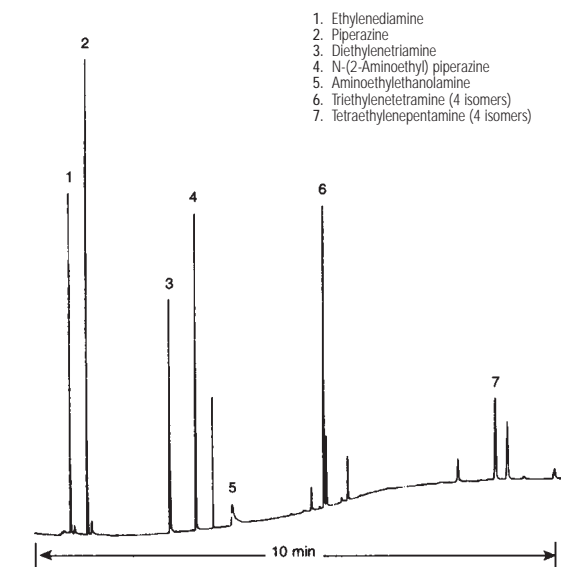


Amines in Water

Column: CAM
112-2132
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen at 38 cm/sec
Oven: 120-220°C at 10°C/min

Injection: Split
Detector: FID
Nitrogen makeup gas at 30 mL/min



1. Ethylenediamine
2. Piperazine
3. Diethylenetriamine
4. N-(2-Aminoethyl) piperazine
5. Aminoethylethanolamine
6. Triethylenetetramine (4 isomers)
7. Tetraethylenepentamine (4 isomers)

Aldehydes and Acids

Column: HP-INNOWax
19091N-213
30 m x 0.32 mm, 0.50 μ m

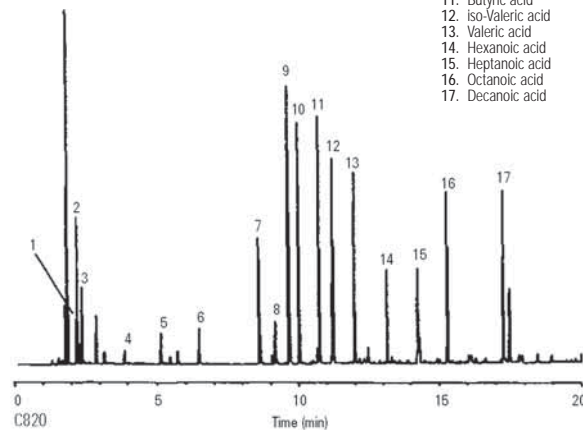
Carrier: Helium, 40 cm/sec, 11.7 psi (60°C)
Oven: 60°C for 1 min
60-250°C at 10°C/min
2.5 mL/min constant flow

Injection: Split, 250°C
Split ratio 40:1

Detector: FID 275°C
Sample: 0.5 μ L

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



1. Butanal
2. 2-Methyl butanal
3. Pentanal
4. Hexanal
5. Heptanal
6. Octanal
7. Acetic acid
8. Decanal
9. Propanoic acid
10. iso-Butyric acid
11. Butyric acid
12. iso-Valeric acid
13. Valeric acid
14. Hexanoic acid
15. Heptanoic acid
16. Octanoic acid
17. Decanoic acid

GC and GC/MS Applications

Industrial Chemicals

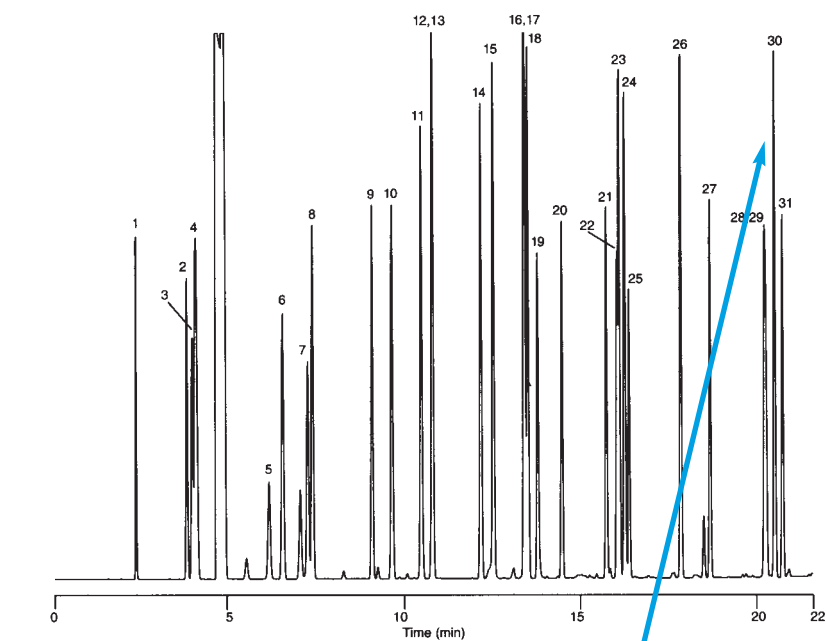
Aldehydes and Ketones

Column: DB-1
123-1034
30 m x 0.32 mm, 3.00 µm
Carrier: Helium at 32 cm/sec,
 measured at 40°C
Oven: 40°C for 5 min
 40-210°C at 10°C/min
 40°C for 5 min
Injection: Split, 250°C
Detector: Split ratio 1:100
 FID, 300°C
 Nitrogen makeup gas at 30 mL/min

Suggested Supplies

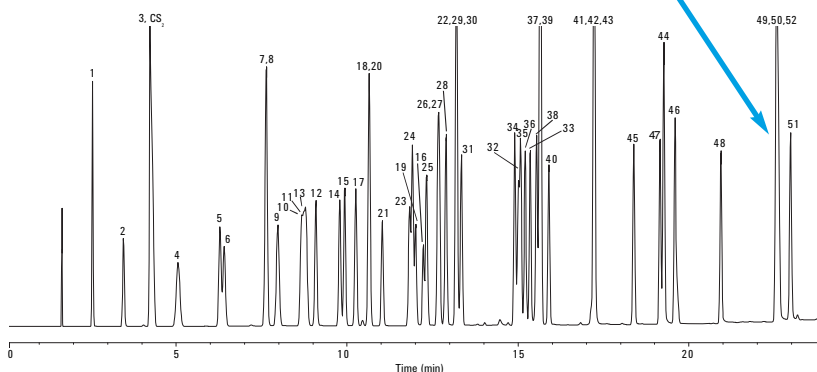
Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5µl tapered, FN 23-26s/42/HP, 5181-1273

1. Acetaldehyde
2. Acrolein
3. Acetone
4. Propionaldehyde
5. Isobutyraldehyde
6. Methacrolein
7. Butyraldehyde
8. 2-Butanone (MEK)
9. Crotonaldehyde
10. 3-Methyl-2-butanone
11. 2-Pentanone
12. 3-Pentanone
13. Valeraldehyde (pentanal)
14. 4-Methyl-2-pentanone (MIBK)
15. 2-Methyl-3-pentanone
16. 3-Hexanone
17. Cyclopentanone
18. 2-Hexanone
19. Hexanal
20. Furfural
21. 4-Heptanone
22. 3-Heptanone
23. 2-Heptanone
24. Cyclohexanone
25. Heptanal
26. Benzaldehyde
27. Octyl aldehyde
28. o-Tolualdehyde
29. m-Tolualdehyde
30. p-Tolualdehyde
31. Nonyl aldehyde



DB-1 provides the best overall resolution;
 however, DB-WAX provides better
 resolution of o- and m-tolualdehyde.

Column: DB-WAX
123-7033
30 m x 0.32 mm, 0.50 µm
Carrier: Helium at 32 cm/sec,
 measured at 40°C
Oven: 40°C for 5 min
 40-210°C at 10°C/min
 40°C for 5 min
Injection: Split, 250°C
Detector: Split ratio 1:100
 FID, 300°C
 Nitrogen makeup gas at 30 mL/min



GC and GC/MS Applications Industrial Chemicals

Formaldehyde Underivatized

Column: DB-WAX
123-7033
30 m x 0.32 mm, 0.50 μ m

Carrier: Helium at 36 cm/sec,
measured at 35°C

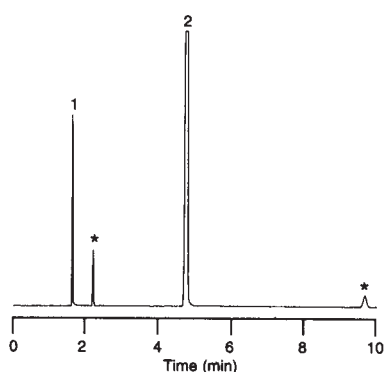
Oven: 35°C isothermal

Injection: Split, 200°C

Split ratio: 1:100

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

1. Formaldehyde
2. Methanol
- * Formaldehyde by-products



DNPH Derivative

Column: DB-1
123-1012
15 m x 0.32 mm, 0.25 μ m

Carrier: Helium at 35 cm/sec,
measured at 150°C

Oven: 150-250°C at 20°C/min

Injection: Split, 300°C

Split ratio: 1:100

Detector: ECD, 375°C
Nitrogen makeup gas at 35 mL/min

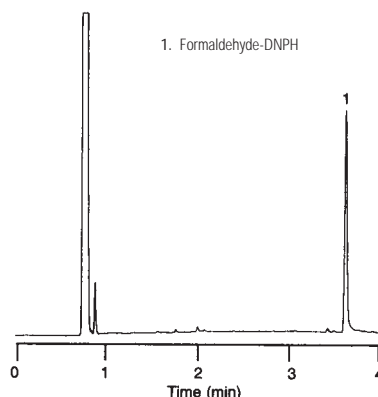
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267



PFBHA Derivative

Column: DB-1
123-1012
15 m x 0.32 mm, 0.25 μ m

Carrier: Helium at 40 cm/sec,
measured at 60°C

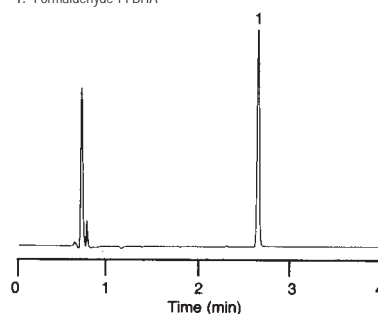
Oven: 60-100°C at 10°C/min

Injection: Split, 250°C

Split ratio: 1:100

Detector: FID, 375°C
Nitrogen makeup gas at 35 mL/min

Suggested Supplies



Aromatics I

Column: DB-1
125-1034
30 m x 0.53 mm, 3.00 μ m

Carrier: Helium at 30 cm/sec,
measured at 40°C

Oven: 40°C for 5 min
40-260°C at 10°C/min

Injection: Split, 250°C

Split ratio: 1:10

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

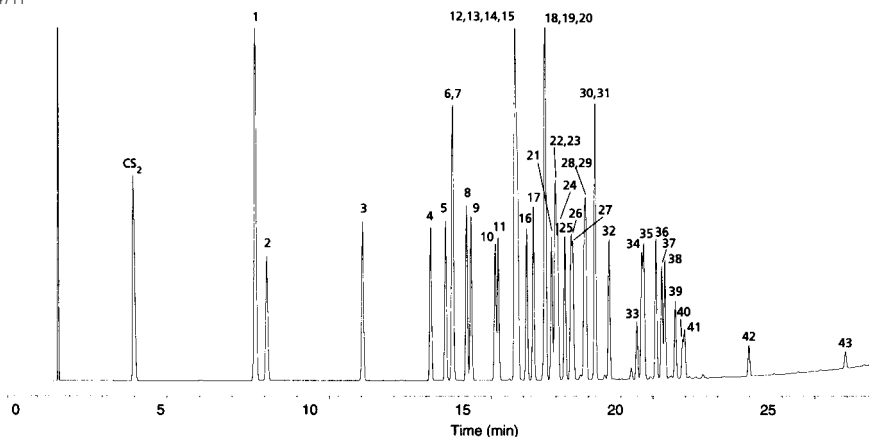
Septum: Advanced Green, 5183-4759

Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

- | | | |
|---|--|--------------------------------|
| 1. Benzene | 20. 4-Methylstyrene | 39. 4-Nitrotoluene |
| 2. Fluorobenzene | 21. 1,3-Dichlorobenzene | 40. 1,2,3-Trichlorobenzene |
| 3. Toluene | 22. 1,4-Dichlorobenzene | 41. 1-Chloro-4-nitrobenzene |
| 4. Chlorobenzene | 23. Isobutylbenzene | 42. 1,2,4,5-Tetrachlorobenzene |
| 5. Ethylbenzene | 24. sec-Butylbenzene | 43. Pentachlorobenzene |
| 6. m-Xylene | 25. 1,2,3-Trimethylbenzene (hemimellitene) | |
| 7. p-Xylene | 26. 1,2-Dichlorobenzene | |
| 8. Styrene | 27. Iodobenzene | |
| 9. o-Xylene | 28. Styrene oxide | |
| 10. Isopropylbenzene (cumene) | 29. Butylbenzene | |
| 11. Bromobenzene | 30. 4-Chlorostyrene | |
| 12. Propylbenzene | 31. Nitrobenzene | |
| 13. 2-Chlorotoluene | 32. 4-tert-Butyltoluene | |
| 14. 3-Chlorotoluene | 33. 1,3,5-Trichlorobenzene | |
| 15. 4-Chlorotoluene | 34. 2-Nitrotoluene | |
| 16. 1,3,5-Trimethylbenzene (mesitylene) | 35. 1,3-Diisopropylbenzene | |
| 17. α -Methylstyrene | 36. 1,4-Diisopropylbenzene | |
| 18. tert-Butylbenzene | 37. 1,2,4-Trichlorobenzene | |
| 19. 1,2,4-Trimethylbenzene (pseudocumene) | 38. 3-Nitrotoluene | |



GC and GC/MS Applications

Industrial Chemicals

Aromatics II

Column: DB-WAX

125-7032

30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 30 cm/sec, measured at 40°C

Oven: 40°C for 5 min

40-230°C at 10°C/min

230°C for 7 min

Injection: Split, 250°C

Split ratio 1:10

Detector: FID, 300°C

Nitrogen makeup gas at 30 mL/min

Suggested Supplies

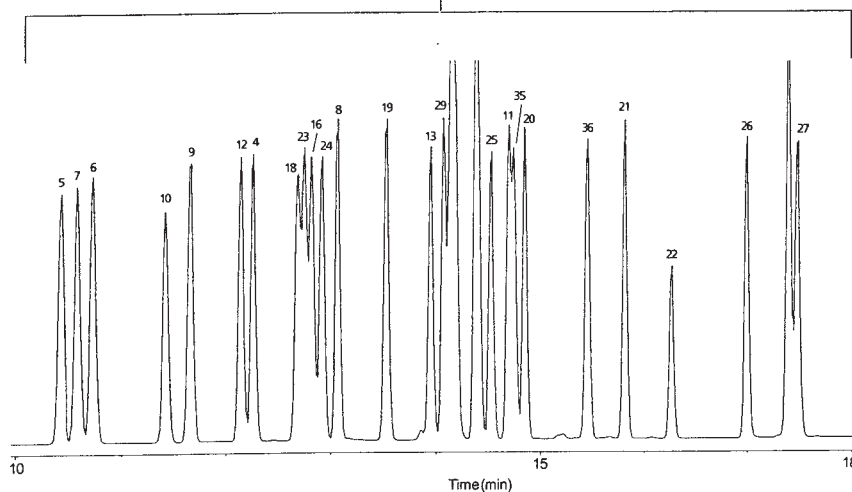
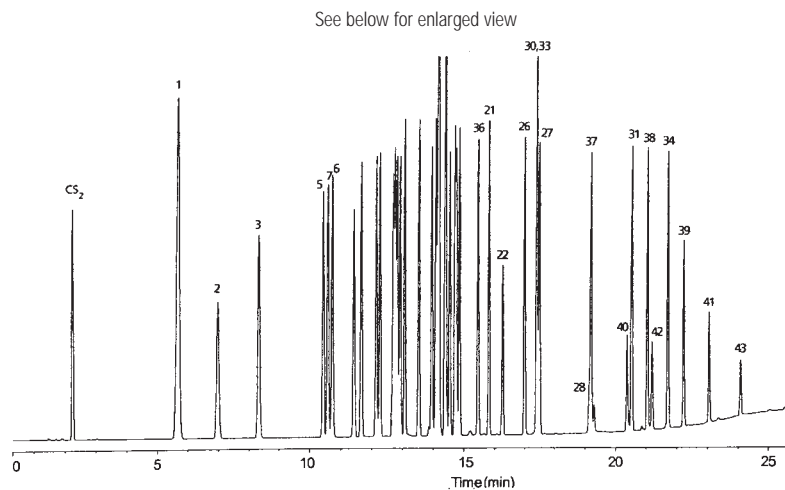
Septum: Advanced Green, 5183-4759

Liner: Lnr.gen purp split/splits, tpr.glswl, deac, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

1. Benzene
2. Fluorobenzene
3. Toluene
4. Chlorobenzene
5. Ethylbenzene
6. m-Xylene
7. p-Xylene
8. Styrene
9. o-Xylene
10. Isopropylbenzene (cumene)
11. Bromobenzene
12. Propylbenzene
13. 2-Chlorotoluene
14. 3-Chlorotoluene
15. 4-Chlorotoluene
16. 1,3,5-Trimethylbenzene (mesitylene)
17. α-Methylstyrene
18. tert-Butylbenzene
19. 1,2,4-Trimethylbenzene (pseudocumene)
20. 4-Methylstyrene
21. 1,3-Dichlorobenzene
22. 1,4-Dichlorobenzene
23. Isobutylbenzene
24. sec-Butylbenzene
25. 1,2,3-Trimethylbenzene (hemimellitene)
26. 1,2-Dichlorobenzene
27. Iodobenzene
28. Styrene oxide (peak not shown)
29. Butylbenzene
30. 4-Chlorostyrene
31. Nitrobenzene
32. 4-tert-Butyltoluene
33. 1,3,5-Trichlorobenzene
34. 2-Nitrotoluene
35. 1,3-Diisopropylbenzene
36. 1,4-Diisopropylbenzene
37. 1,2,4-Trichlorobenzene
38. 3-Nitrotoluene
39. 4-Nitrotoluene
40. 1,2,3-Trichlorobenzene
41. 1-Chloro-4-nitrobenzene
42. 1,2,4,5-Tetrachlorobenzene
43. Pentachlorobenzene



Impurities in Styrene

Column: DB-WAXetr

123-7363

60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 29.4 cm/sec, measured at 70°C

Oven: 80°C Isothermal

Injection: Split, 230°C

Split ratio 1:150

Detector: FID, 240°C

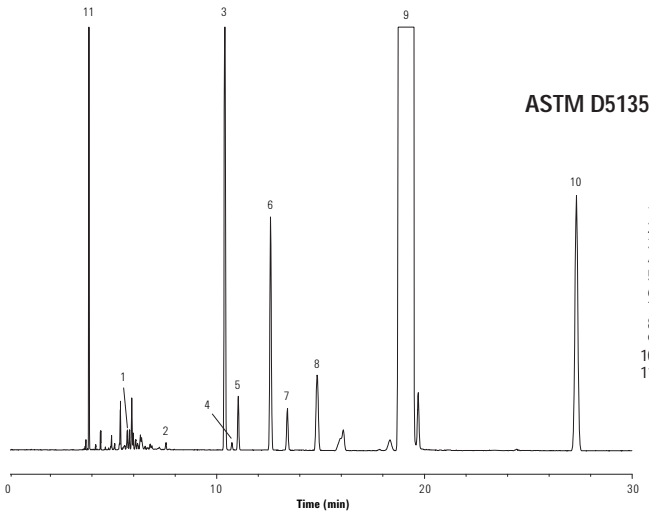
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



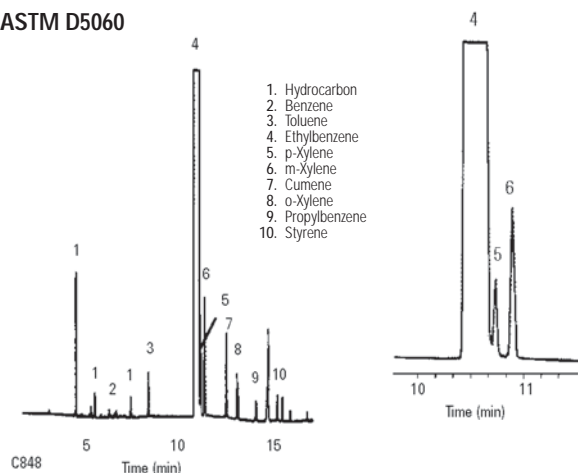
1. Benzene
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. Isopropylbenzene
7. o-Xylene
8. n-Propylbenzene
9. Styrene
10. α-Methylstyrene
11. Heptane (IS)

GC and GC/MS Applications Industrial Chemicals

Impurities in Ethylbenzene

Column: HP-INNOWax
19091N-216
60 m x 0.32 mm, 0.50 μ m
Carrier: Helium, 32 cm/sec, 19.9 psi (60°C)
2.5 mL/min constant flow
Oven: 60°C for 1 min
60-92°C at 4°C/min
92°C for 4.5 min
92-220°C at 20°C/min
Injection: Split, 220°C
Split ratio 100:1
ASTM Method D5060
Detector: FID 270°C
Sample: 0.5 μ L
Neat, 99%+

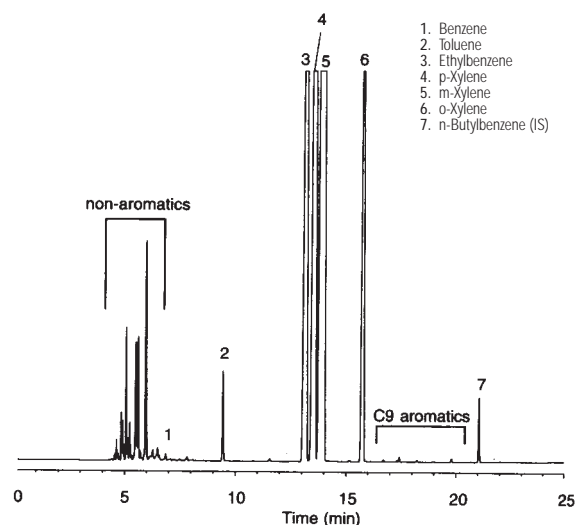
ASTM D5060



Impurities in Mixed Xylenes

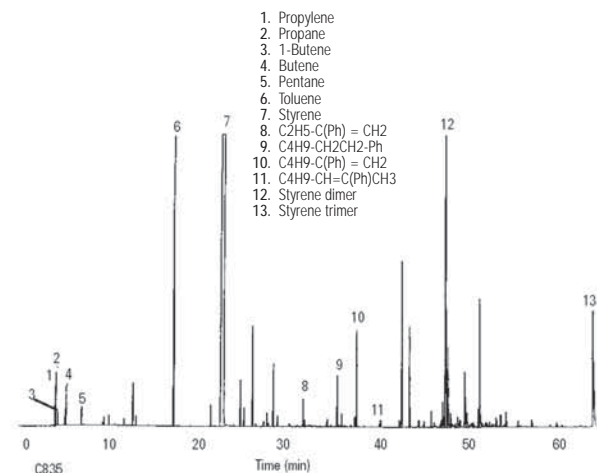
Column: DB-WAXetr
123-7362
60 m x 0.32 mm, 0.25 μ m
Carrier: Helium at 20 cm/sec,
measured at 145°C
Oven: 60°C for 10 min
60-150°C at 5°C/min
150°C for 10 min
Injection: Split, 230°C
Split ratio 1:150
Detector: FID, 240°C

ASTM D2360



Pyrolysates of Polystyrene

Column: ULTRA 1
19091A-105
50 m x 0.20 mm, 0.33 μ m
Carrier: Helium, 30 psi, 12 mL/min
Oven: 0-280 at 5°C/min
Injection: Split, 280°C
Split ratio 30:1
Pyrolyzer 600°C
Detector: FID 300°C
Sample: 100 mg pyrolyzed

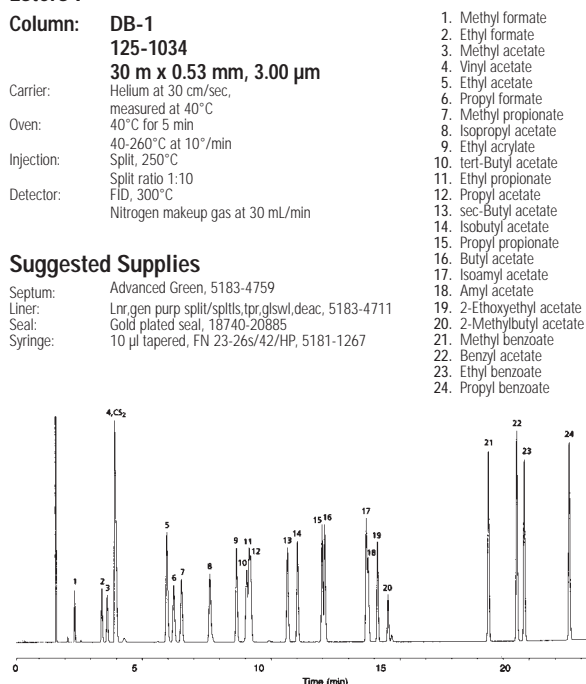


Esters I

Column: DB-1
125-1034
30 m x 0.53 mm, 3.00 μ m
Carrier: Helium at 30 cm/sec,
measured at 40°C
40°C for 5 min
40-260°C at 10°C/min
Injection: Split, 250°C
Split ratio 1:10
Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr gen purp split/split/s, tpr, gtswl, deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

Industrial Chemicals

Esters II

Column: DB-624
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40°C

Oven: 40°C for 5 min
40-260°C at 10°/min
260°C for 3 min

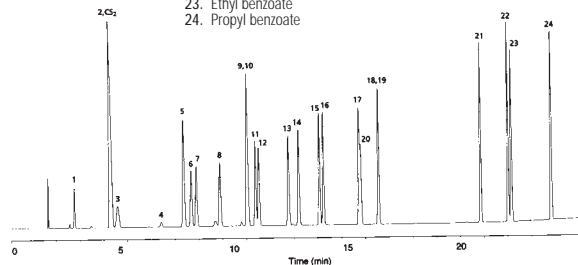
Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts,tpr.glswl,deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

- | | |
|------------------------|---------------------------|
| 1. Methyl formate | 12. Propyl acetate |
| 2. Ethyl formate | 13. sec-Butyl acetate |
| 3. Methyl acetate | 14. Isobutyl acetate |
| 4. Vinyl acetate | 15. Propyl propionate |
| 5. Ethyl acetate | 16. Butyl acetate |
| 6. Propyl formate | 17. Isoamyl acetate |
| 7. Methyl propionate | 18. Amyl acetate |
| 8. Isopropyl acetate | 19. 2-Ethoxyethyl acetate |
| 9. Ethyl acrylate | 20. 2-Methylbutyl acetate |
| 10. tert-Butyl acetate | 21. Methyl benzoate |
| 11. Ethyl propionate | 22. Benzyl acetate |
| | 23. Ethyl benzoate |
| | 24. Propyl benzoate |



Esters III

Column: HP-INNOWax
19095N-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium 29 cm/sec, 3.0 psi (45°C)
4 mL/min constant flow

Oven: 45°C for 1 min
45-200°C at 5°C/min

Injection: Split, 250°C

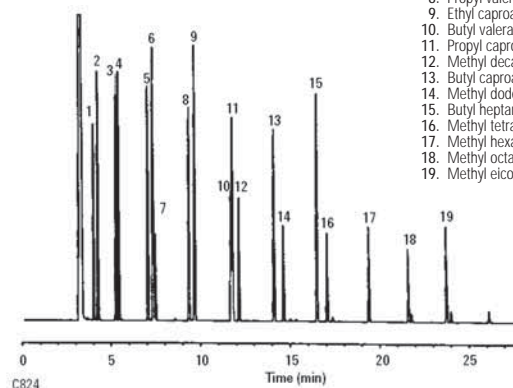
Detector: Split ratio 25:1
FID 250°C

Sample: 1 µl

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts,tpr.glswl,deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

1. Ethyl propionate
2. Propyl acetate
3. Ethyl butyrate
4. Propyl propionate
5. Propyl butyrate
6. Ethyl valerate
7. Butyl propionate
8. Propyl valerate
9. Ethyl caproate
10. Butyl valerate
11. Propyl caproate
12. Methyl decanoate
13. Butyl caproate
14. Methyl dodecanoate
15. Butyl heptanoate
16. Methyl tetradecanoate
17. Methyl hexadecanoate
18. Methyl octadecanoate
19. Methyl eicosanoate



Ethers

Column: DB-624
125-1334
30 m x 0.53 mm, 3.00 µm

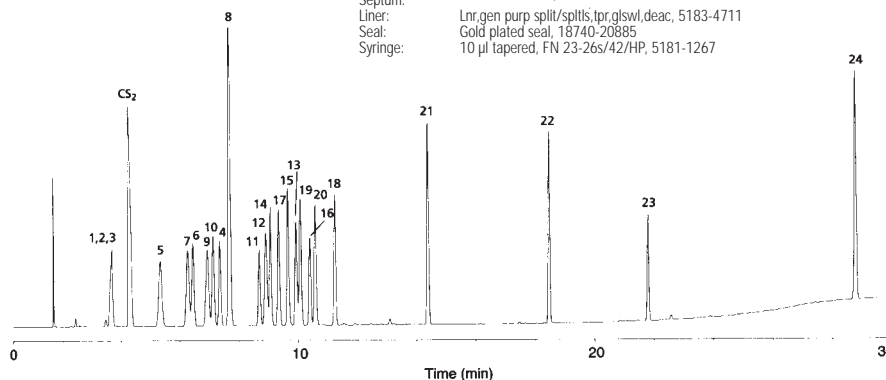
Carrier: Helium at 30 cm/sec,
measured at 40°C

Oven: 40°C for 5 min
40-260°C at 10°/min
260°C for 3 min

Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 30 mL/min

1. Furan
2. Ethyl vinyl ether
3. Ethyl ether
4. 1,3-Dioxalane
5. Methyl-tert-butyl ether (MTBE)
6. Allyl ethyl ether
7. Isopropyl ether
8. Tetrahydrofuran (THF)
9. tert-Amyl methyl ether
10. Butyl methyl ether
11. Glyme (propylene glycol dimethyl ether)
12. tert-Amyl methyl ether
13. Diglyme (diethylene glycol dimethyl ether)
14. Propyl ether
15. Allyl ether
16. 1,4-Dioxane
17. Butyl ethyl ether
18. Epichlorohydrin
19. Tetrahydropyran
20. Acetal (acetaldehyde diethyl acetal)
21. Butyl ether
22. Pentyl ether
23. Triglyme (triethylene glycol dimethyl ether)
24. Benzyl ether



Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts,tpr.glswl,deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

GC and GC/MS Applications Industrial Chemicals

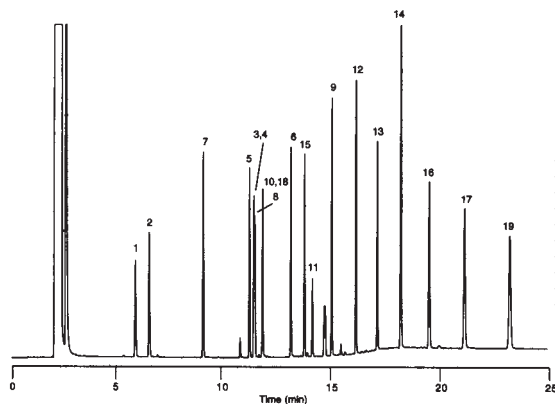
Glycols I

Column: DB-WAX
124-7032
30 m x 0.45 mm, 0.85 µm

Carrier: Helium at 35 cm/sec,
measured at 50°C
Oven: 50°C for 2 min
50-220°C at 10°/min
Injection: Megabore Direct, 250°C
Detector: FID, 280°C
Sample: Nitrogen makeup gas at 30 mL/min
1 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splits, tpr.glswl/deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



1. Ethylene glycol monomethyl ether
2. Ethylene glycol monoethyl ether
3. 1,3-Propanediol
4. 1,2-Propanediol (propylene glycol)
5. 2,3-Butanediol
6. 1,3-Butanediol
7. Ethylene glycol monobutyl ether
8. Diethylene glycol monomethyl ether
9. 1,4-Butanediol
10. Diethylene glycol monoethyl ether
11. Dipropylene glycol
12. 1,5-Pentanediol
13. 1,6-Hexanediol
14. 1,7-Heptanediol
15. Diethylene glycol monobutyl ether
16. 1,8-Octanediol
17. 1,9-Nonanediol
18. Ethylene glycol
19. 1,10-Decanediol

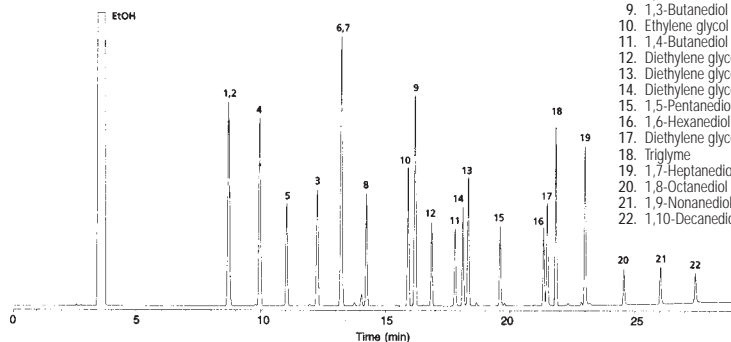
Glycols II

Column: DB-624
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40°C
Oven: 40°C for 5 min
40-260°C at 10°/min
260°C for 3 min
Injection: Split, 250°C
Split ratio 1:10
Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, dual taper, deactivated, 4mm ID,
G1544-80700
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



1. Ethylene glycol monomethyl ether
2. Glyme
3. Ethylene glycol
4. Diglyme
5. Ethylene glycol monoethyl ether
6. 1,3-Propanediol
7. 1,2-Propanediol (propylene glycol)
8. 2,3-Butanediol
9. 1,3-Butanediol
10. Ethylene glycol monobutyl ether
11. 1,4-Butanediol
12. Diethylene glycol monomethyl ether
13. Diethylene glycol
14. Diethylene glycol monoethyl ether
15. 1,5-Pentanediol
16. 1,6-Hexanediol
17. Diethylene glycol monobutyl ether
18. Triglyme
19. 1,7-Heptanediol
20. 1,8-Octanediol
21. 1,9-Nonanediol
22. 1,10-Decanediol

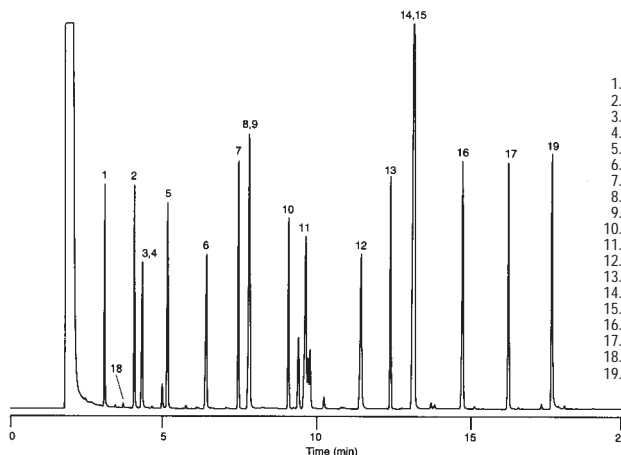
Glycols III

Column: DB-1
124-1032
30 m x 0.45 mm, 1.27 µm

Carrier: Helium at 35 cm/sec,
measured at 50°C
Oven: 50°C for 2 min
50-260°C at 10°/min
Injection: Split, 250°C
Detector: FID, 280°C
Sample: Nitrogen makeup gas at 30 mL/min
1 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, dual taper, deactivated, 4mm ID,
G1544-80700
Seal: Gold plated seal, 18740-20885
Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



1. Ethylene glycol monomethyl ether
2. Ethylene glycol monoethyl ether
3. 1,3-Propanediol
4. 1,2-Propanediol
5. 2,3-Butanediol
6. 1,3-Butanediol
7. Ethylene glycol monobutyl ether
8. Diethylene glycol monomethyl ether
9. 1,4-Butanediol
10. Diethylene glycol monoethyl ether
11. Dipropylene glycol
12. 1,5-Pentanediol
13. 1,6-Hexanediol
14. 1,7-Heptanediol
15. Diethylene glycol monobutyl ether
16. 1,8-Octanediol
17. 1,9-Nonanediol
18. Ethylene glycol
19. 1,10-Decanediol

GC and GC/MS Applications

Industrial Chemicals

Triethylene Glycol and Impurities

Column: DB-1
124-1032
30 m x 0.45 mm, 1.27 μ m

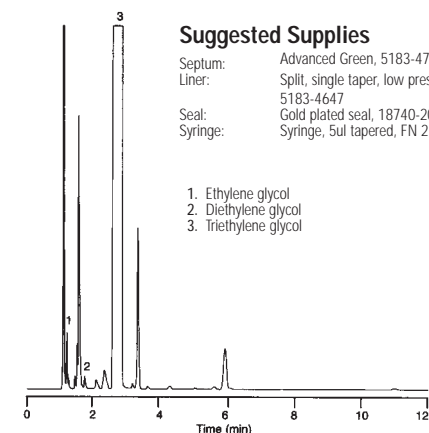
Carrier: Helium at 35 cm/sec,
measured at 50°C

Oven: 170°C isothermal

Injection: Split, 250°C

Detector: FID, 280°C

Sample: Nitrogen makeup gas at 30 mL/min
0.5 μ L



Ethylene Glycol Mixture

Column: ULTRA 1
19091A-101
12 m x 0.20 mm, 0.33 μ m

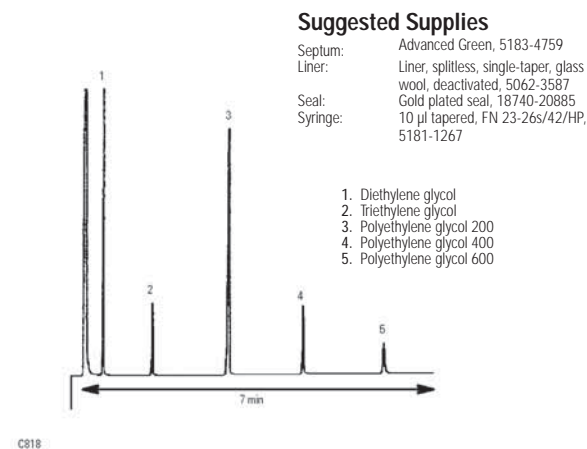
Carrier: Helium, 25 cm/sec
100°C for 0.5 min

Oven: 100-200°C at 20°C/min

Injection: Split, 250°C

Detector: FID, 250°C

Sample: 1 μ L



Glycols/Diols

Column: HP-1
19095Z-023
30 m x 0.53 mm, 0.88 μ m

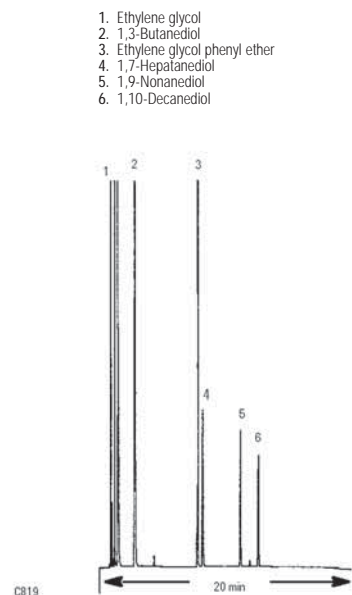
Carrier: Helium

Oven: 50°C for 3 min
50-180°C at 8°C/min

Injection: On-column

Detector: FID 250°C

Sample: 1 μ L



Halogenated Hydrocarbons I

Column: DB-624
123-1334
30 m x 0.32 mm, 1.80 μ m

Carrier: Helium at 35 cm/sec

Oven: 35°C for 5 min
35-245°C at 10°C/min

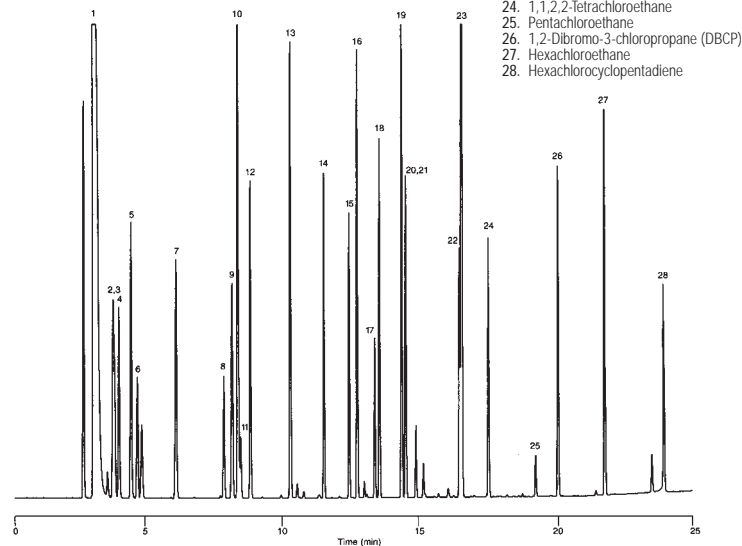
Injection: Split, 250°C

Detector: FID, 300°C

Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr. gen purp split/split/splr glswl deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications Industrial Chemicals

Halogenated Hydrocarbons II

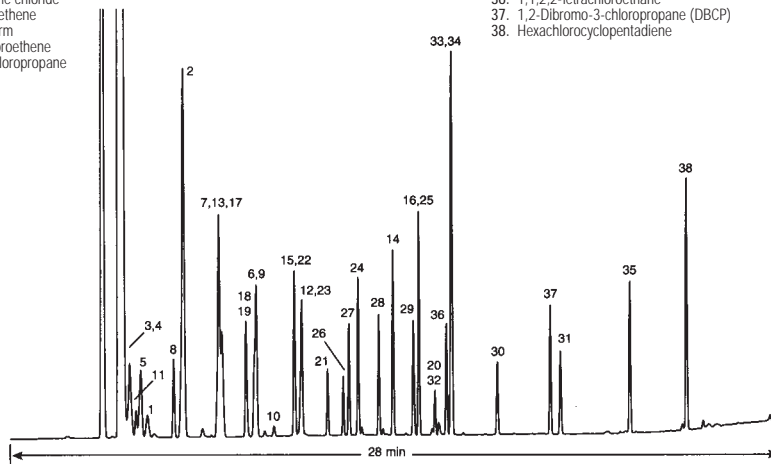
Column: DB-1
123-1034
30 m x 0.32 mm, 3.00 μ m

Carrier: Helium at 35 cm/sec, measured at 35°C
Oven: 35°C for 5 min
35-245°C at 10°/min
245°C for 2 min
Injection: Split, 250°C
Detector: Split ratio 1:100
FID, 300°C
Sample: Nitrogen make-up gas at 30 mL/min
In pentane

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

- | | | |
|---|-----------------------------|--|
| 1. 1,1,2-Trichlorotrifluoroethane (Freon-113) | 16. 1-Chlorohexane | 26. trans-1,3-Dichloropropene |
| 2. 1,1-Dichloroethene | 17. Bromochloromethane | 27. 1,1,2-Trichloroethane |
| 3. Bromoethane (ethyl bromide) | 18. 1,1-Dichloroethane | 28. 1,2-Dibromoethane (EDB) |
| 4. Iodomethane | 19. 1,2-Dichloroethane | 29. 1,1,1,2-Tetrachloroethane |
| 5. 3-Chloropropene (allyl chloride) | 20. Iodoform | 30. Pentachloroethane |
| 6. 1-Chlorobutane | 21. cis-1,3-Dichloropropene | 31. Hexachloroethane |
| 7. 2,2-Dichloropropane | 22. Dibromomethane | 32. Bromoform |
| 8. trans-1,2-Dichloroethene | 23. Bromodichloromethane | 33. trans-1,4-Dichloro-2-butene |
| 9. 1,1,1-Trichloroethane | 24. 1,3-Dichloropropane | 34. 1,2,3-Trichloropropane |
| 10. Carbon tetrachloride | 25. 1,1-Dichloropropane | 35. Hexachlorobutadiene |
| 11. Methylene chloride | | 36. 1,1,2,2-Tetrachloroethane |
| 12. Trichloroethene | | 37. 1,2-Dibromo-3-chloropropane (DBCP) |
| 13. Chloroform | | 38. Hexachlorocyclopentadiene |
| 14. Tetrachloroethene | | |
| 15. 1,2-Dichloropropane | | |



Chlorinated Isooctane

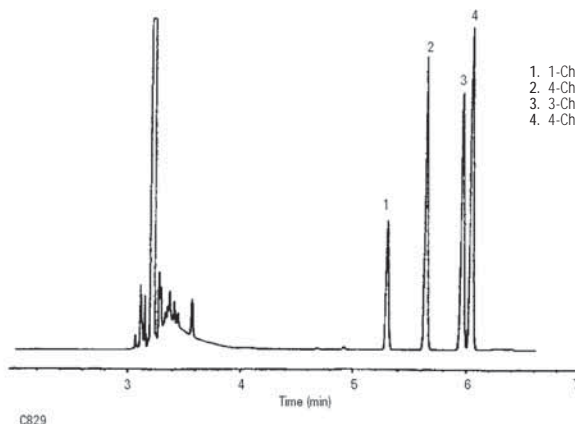
Column: HP-INNOWax
19091N-136
60 m x 0.25 mm, 0.25 μ m

Carrier: Helium, 33 cm/sec, 35.7 psi (80°C) 2 mL/min
Oven: 80°C isothermal
Injection: Split, 250°C
Detector: Split ratio 150:1
FID 300°C
Sample: Monochloro isomers, 0.5 μ l

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

- 1-Chloro isooctane
- 4-Chloromethyl 2,2'-dimethyl pentane
- 3-Chloro isooctane
- 4-Chloro isooctane



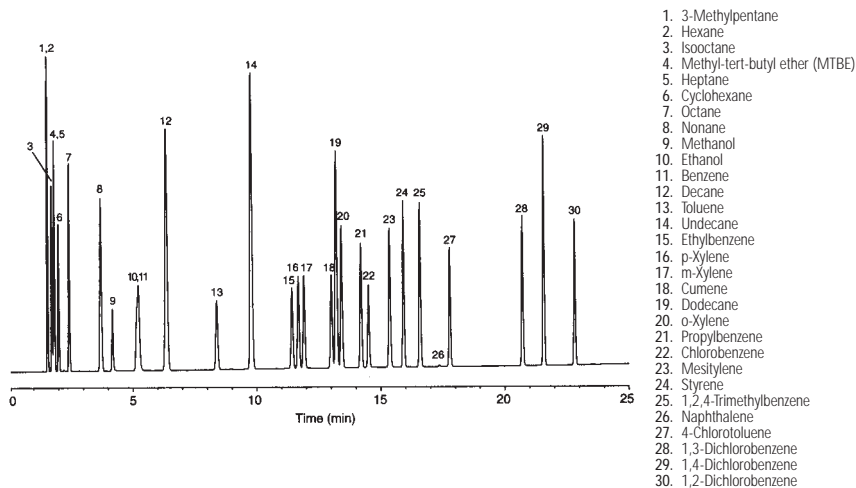
Solvents I

Column: DB-WAXetr
125-7332
30 m x 0.53 mm, 1.00 μ m

Carrier: Helium at 30 cm/sec,
measured at 40°C
Oven: 40°C for 5 min
40-140°C at 5°/min
Injection: Split, 250°C
Detector: FID, 250°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267



1. 3-Methylpentane
2. Hexane
3. Isooctane
4. Methyl-tert-butyl ether (MTBE)
5. Heptane
6. Cyclohexane
7. Octane
8. Nonane
9. Methanol
10. Ethanol
11. Benzene
12. Decane
13. Toluene
14. Undecane
15. Ethylbenzene
16. p-Xylene
17. m-Xylene
18. Cumene
19. Dodecane
20. o-Xylene
21. Propylbenzene
22. Chlorobenzene
23. Mesitylene
24. Styrene
25. 1,2,4-Trimethylbenzene
26. Naphthalene
27. 4-Chlorotoluene
28. 1,3-Dichlorobenzene
29. 1,4-Dichlorobenzene
30. 1,2-Dichlorobenzene

GC and GC/MS Applications

Industrial Chemicals

Solvents II

Column: DB-WAXetr
123-7354
50 m x 0.32 mm, 1.00 µm

Carrier: Helium at 35.2 cm/sec, measured at 50°C
Oven: 50°C for 5 min

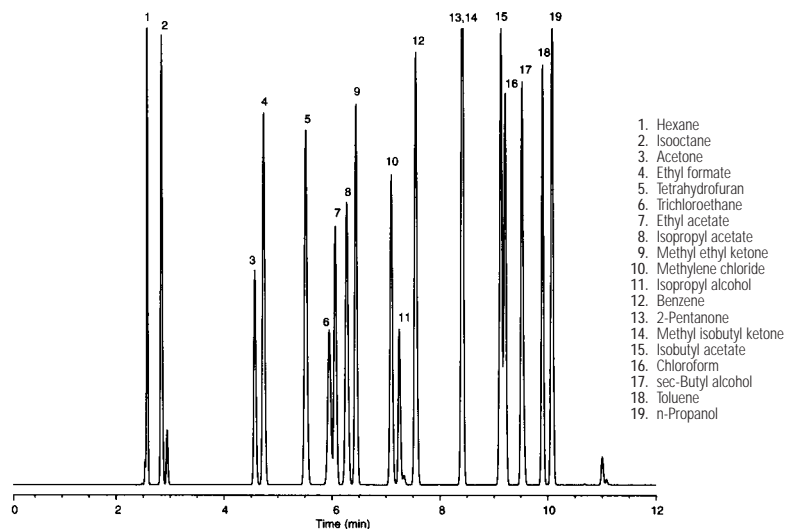
Injection: Split, 250°C

Split ratio: 1:100

Detector: FID, 280°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splits, tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



Solvents III

Column: DB-200
122-2033
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 31 cm/sec
Oven: 45°C for 7 min

Injection: Split, 250°C

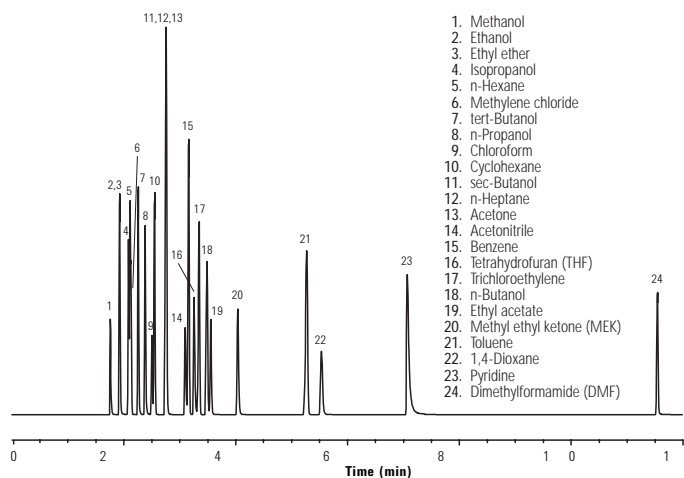
Split ratio: 1:100

Detector: FID, 300°C

Sample: Nitrogen makeup gas at 30 mL/min
0.5 µL of 0.5-1.0 µg/µL standard in water

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Solvents IV

Column: HP-1
19091Z-205
50 m x 0.20 mm, 0.50 µm

Carrier: Helium, 30 psi
Oven: 70-200°C at 5°C/min

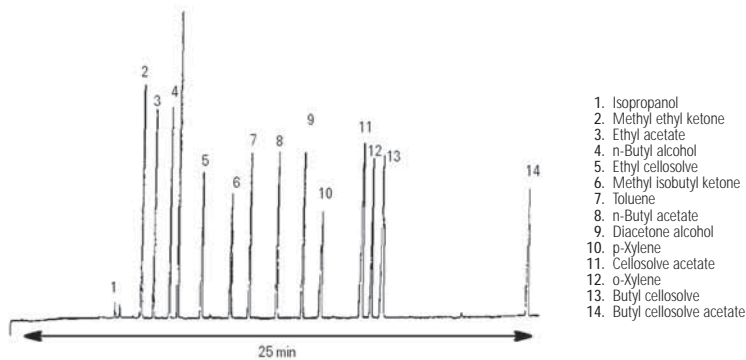
Injection: Split

Detector: TCD

Sample: 1 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



C847

GC and GC/MS Applications Industrial Chemicals

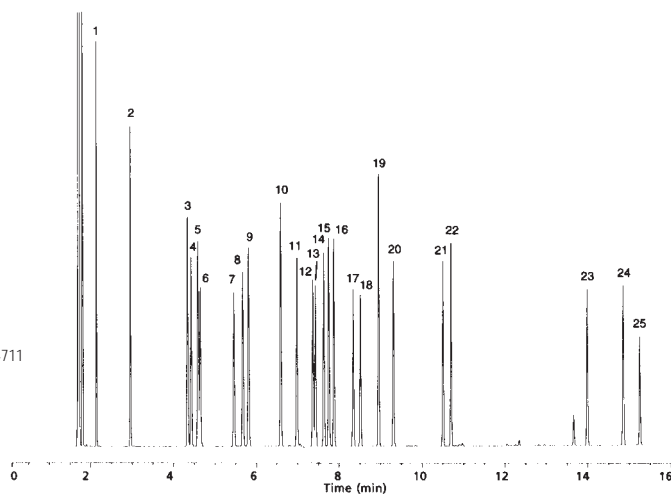
Aromatic Solvents

Column: DB-200
122-2032
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec
Oven: 50°C for 5 min
50-160°C at 10°/min
Injection: Split, 250°C
Split ratio 1:100
Detector: FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
0.5 µL of 0.5 µg/µL
standard in hexane

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/split/s, tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Benzene
2. Toluene
3. Ethylbenzene
4. Chlorobenzene
5. p-Xylene
6. m-Xylene
7. o-Xylene
8. Styrene
9. Isopropylbenzene
10. n-Propylbenzene
11. 2-Chlorotoluene
12. 3-Chlorotoluene
13. 4-Chlorotoluene
14. tert-Butylbenzene
15. sec-Butylbenzene
16. Isobutylbenzene
17. 1,3-Dichlorobenzene
18. 1,4-Dichlorobenzene
19. n-Butylbenzene
20. 1,2-Dichlorobenzene
21. 1,3-Diisopropylbenzene
22. 1,4-Diisopropylbenzene
23. 2-Nitrotoluene
24. 3-Nitrotoluene
25. 4-Nitrotoluene

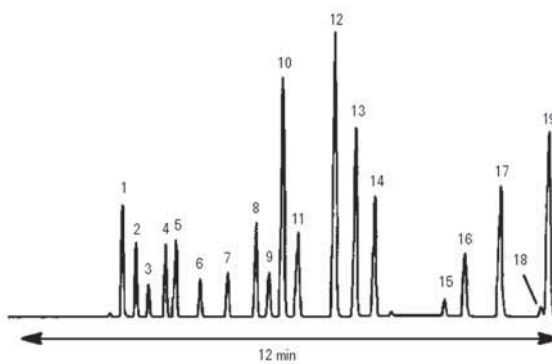
Common Industrial Solvents

Column: HP-1
19091Z-212
25 m x 0.32 mm, 1.05 µm

Carrier: Helium, 35 kPa
Oven: 30-140°C at 10°C/min
Injection: Split ratio 200:1
Detector: IRD, 200°C
Sample: 1 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5µL tapered, FN 23-26s/42/HP, 5181-1273



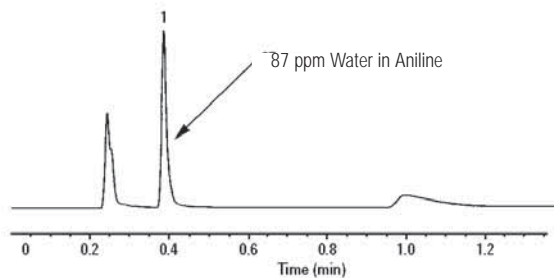
1. Methanol
2. Methyl formate
3. Ethanol
4. Acetone
5. Isopropanol
6. Dichloromethane
7. n-Propanol
8. Methyl ethyl ketone
9. sec-Butanol
10. Ethyl acetate
11. Isobutanol
12. Isopropyl acetate
13. Nitropropane
14. 1,4-Dioxane
15. Toluene
16. Mesityl oxide
17. Diacetone-alcohol
18. m-Xylene
19. Cyclohexanone

C839

Rapid Analysis of Water in Organic Solvents

Column: HP-INNOWax
19095N-121
15 m x 0.53 mm, 1.00 µm

Carrier: 15 mL/min helium
constant flow mode
Oven: 100°C for 1.5 min
Post temp: 175°C (2.5 min)
Injection: Purge packed, 240°C
Detector: TCD, 240°C
Sample: 0.5 µL, 87 ppm Water in Aniline



C846

GC and GC/MS Applications

Industrial Chemicals

Nitrogen Based Solvents I

Column: DB-1
125-1034
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40°C

Oven: 40°C for 5 min
40-260°C at 10°/min

Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 30 mL/min

1. Acetonitrile
2. Acrolein
3. Acrylonitrile
4. Propionitrile
5. Methacrolein
6. Methacrylonitrile
7. Triethylamine
8. Ethyl acrylate
9. Pyridine
10. DMF (dimethylformamide)
11. DMSO (dimethyl sulfoxide)
12. Benzonitrile
13. 1-Methyl-2-pyrrolidinone

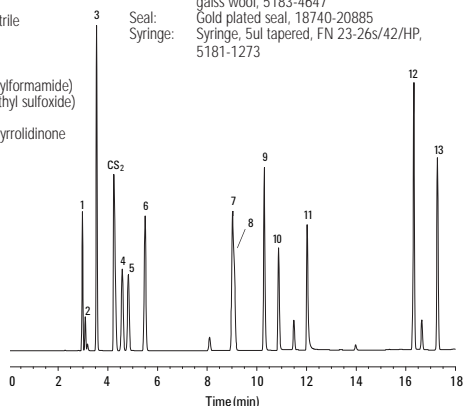
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Nitrogen Based Solvents II

Column: DB-624
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40°C

Oven: 40°C for 5 min
40-260°C at 10°/min
260°C for 3 min

Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 30 mL/min

1. Acetonitrile
2. Acrolein
3. Acrylonitrile
4. Propionitrile
5. Methacrolein
6. Methacrylonitrile
7. Triethylamine
8. Ethyl acrylate
9. Pyridine
10. DMF (dimethylformamide)
11. DMSO (dimethyl sulfoxide)
12. Benzonitrile
13. 1-Methyl-2-pyrrolidinone

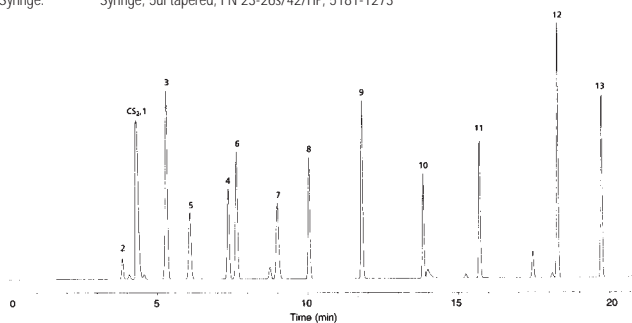
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



Acrylate Impurities I

Column: DB-200
125-2032
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 34.5 cm/sec
measured at 35°C

Oven: 35°C for 5 min,
35 - 200°C at 10°/min

Injection: Split, 230°C

Detector: Split ratio 1:10
FID, 250°C

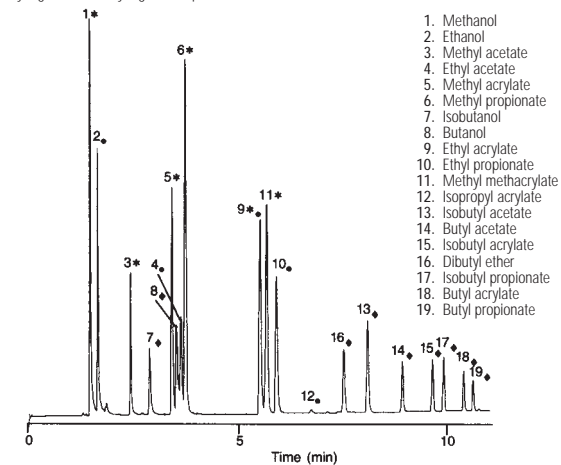
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



1. Methanol
2. Ethanol
3. Methyl acetate
4. Ethyl acetate
5. Methyl acrylate
6. Methyl propionate
7. Isobutanol
8. Butanol
9. Ethyl acrylate
10. Ethyl propionate
11. Methyl methacrylate
12. Isopropyl acrylate
13. Isobutyl acetate
14. Butyl acetate
15. Isobutyl acrylate
16. Dibutyl ether
17. Isobutyl propionate
18. Butyl acrylate
19. Butyl propionate

Acrylate Impurities II

Column: DB-1701
125-0732
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 36.8 cm/sec
measured at 35°C

Oven: 35°C for 5 min,
35-200°C at 10°/min

Injection: Split, 230°C

Detector: Split ratio 1:10
FID, 250°C

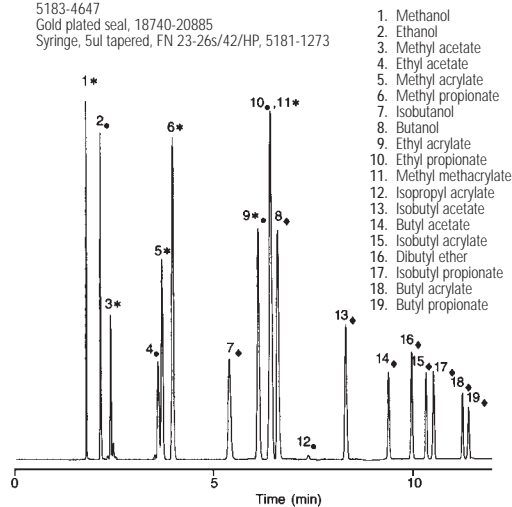
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Split, single taper, low pressure drop, galss wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



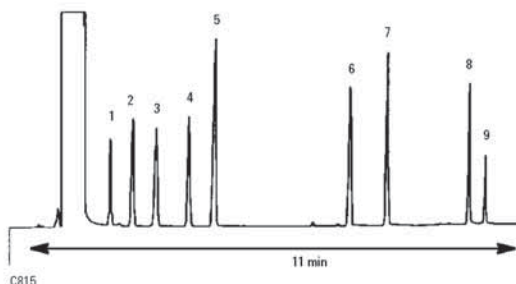
1. Methanol
2. Ethanol
3. Methyl acetate
4. Ethyl acetate
5. Methyl acrylate
6. Methyl propionate
7. Isobutanol
8. Butanol
9. Ethyl acrylate
10. Ethyl propionate
11. Methyl methacrylate
12. Isopropyl acrylate
13. Isobutyl acetate
14. Butyl acetate
15. Isobutyl acrylate
16. Dibutyl ether
17. Isobutyl propionate
18. Butyl acrylate
19. Butyl propionate

GC and GC/MS Applications Industrial Chemicals

Acrylates

Column: HP-FFAP
19095F-121
10 m x 0.53 mm, 1.00 µm

Carrier: Hydrogen
Oven: 35°C for 1 min
35-60°C at 10°C/min
60-160°C at 15°C/min
Injection: On-column
Detector: FID
Sample: 1 µL

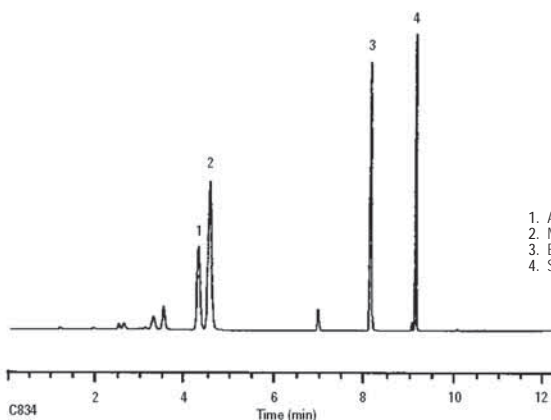


1. Methyl methacrylate
2. Ethyl methacrylate
3. sec-Butyl methacrylate
4. Allyl acrylate
5. n-Butyl acrylate
6. Hexyl methacrylate
7. Cyclohexyl methacrylate
8. Hydroxypropyl acrylate
9. Unknown

Monomers in Latex Paint by Headspace

Column: HP-INNOWax
19095N-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium, 45.5 cm/sec (40°C)
6 mL/min constant flow
Oven: 40°C for 5 min
40-90°C at 15°C/min
90-200°C at 30°C/min
Sampler: Headspace
Injection: Split, 220°C
Split ratio 10:1
Detector: FID, 300°C
Sample: 1 mL
0.200 gm sample with 1 gram
sodium sulfate in 5 mL water



1. Acrylonitrile
2. Methyl acrylate
3. Butyl acrylate
4. Styrene

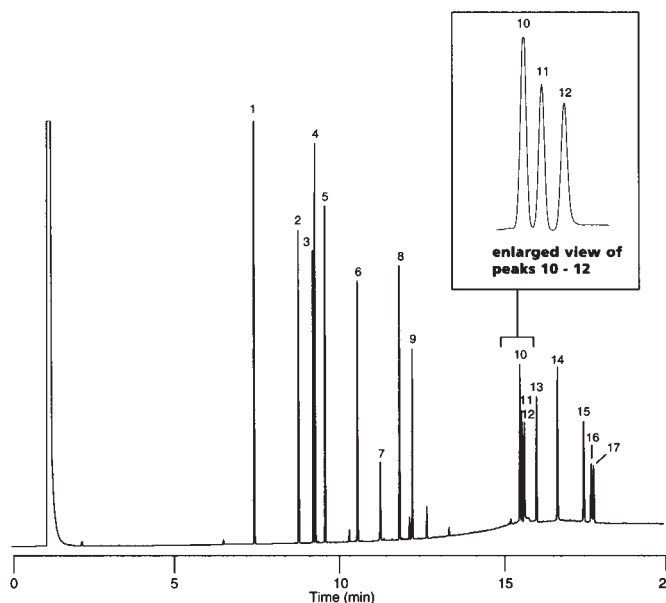
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Anilines

Column: DB-35ms
128-3822
25 m x 0.20 mm, 0.33 µm

Carrier: Helium at 35 cm/sec,
measured at 50°C
Oven: 50°C for 2 min
50-340°C at 20°C/min
340°C for 10 min
Injection: Splitless, 280°C
0.50 min purge activation time
Detector: FID, 320°C
Nitrogen makeup gas at 30 mL/min
Sample: 1 µL of 5 ng
on-column per component



1. o-Toluidine
2. 4-Chloroaniline
3. 2-Methoxy-5-methylaniline
4. 2,4,5-Trimethylaniline
5. 4-Chloro-2-methylaniline
6. 2,4-Diaminotoluene
7. 2,4-Diaminoanisole
8. 2-Aminonaphthalene
9. 2-Methyl-5-nitroaniline
10. 4,4'-Oxydianiline
11. 4,4'-Methylenedianiline
12. Benzidine
13. 2-Aminoazotoluene
14. o-Tolidine
15. 4,4'-Thiodianiline
16. 3,3'-Dimethoxybenzidine
17. 3,3'-Dichlorobenzidine

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

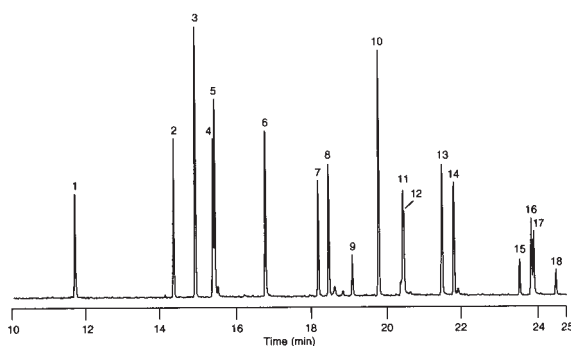
GC and GC/MS Applications

Industrial Chemicals

Substituted Anilines

Column: DB-5ms
122-5536
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 33.3 cm/sec,
measured at 150°C
Oven: 40°C for 5 min
40-290°C at 12°/min
290°C for 10 min
Injection: Splitless, 250°C
30 sec purge activation time
Detector: MSD, 325°C transfer line
Sample: 1 µL of 25 ng/µL standard



	m/z
1. Aniline	93
2. 2-Chloroaniline	127
3. 2,6-Dimethylaniline	121
4. 3-Chloroaniline	127
5. 4-Chloroaniline	127
6. 4-Bromoaniline	171
7. 2-Nitroaniline	138
8. 3,4-Dichloroaniline	161
9. 3-Nitroaniline	65
10. 2,4,5-Trichloroaniline	195
11. 4-Chloro-2-nitroaniline	172
12. 4-Nitroaniline	138
13. 2-Chloro-4-nitroaniline	172
14. 2,6-Dichloro-4-nitroaniline	176
15. 2-Chloro-4,6-dinitroaniline	217
16. 2,6-Dibromo-4-nitroaniline	266
17. 2,4-Dinitroaniline	183
18. 2-Bromo-4,6-dinitroaniline	261

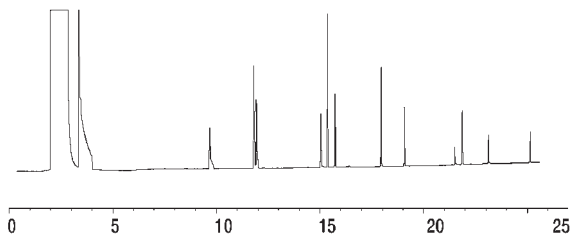
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID,
5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Phenols I

Column: HP-5ms
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 33 cm/sec, constant flow
Oven: 35°C for 5 min
35-220°C at 8°/min
Injection: Splitless, 250°C
Detector: FID, 300°C
Sample: 1 µL
20 µg/mL phenols in methylene chloride



1. Phenol
2. 2-Chlorophenol
3. 2-Nitrophenol
4. 2,4-Dimethylphenol
5. 2,4-Dichlorophenol
6. 4-Chloro-3-methylphenol
7. 2,4,6-Trinitrophenol
8. 2,4-Dinitrophenol
9. 4-Nitrophenol
10. 2-Methyl-4,6-dinitrophenol
11. Pentachlorophenol

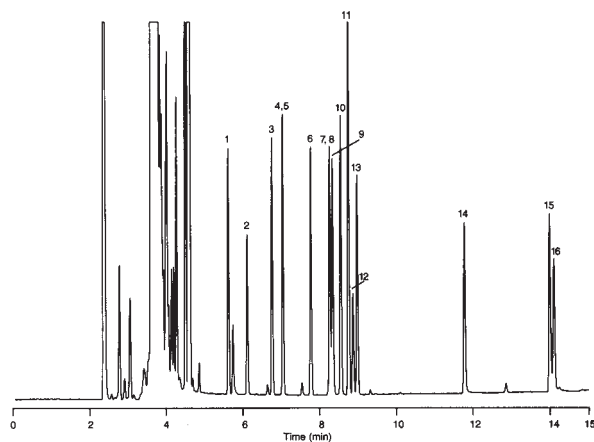
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID,
G1544-80730
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Phenols II

Column: DB-5ms
122-5536
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 22 cm/sec,
measured at 100°C
Oven: 100°C for 1 min
100-270°C at 10°/min
Injection: Split, 250°C
Detector: Split ratio 1:50
FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
1 µL of 50 ng/µL standard
in toluene/p-xylene



1. Phenol
2. 2-Chlorophenol
3. o-Cresol
4. m-Cresol
5. p-Cresol
6. 2,6-Xylenol
7. 2,4-Xylenol
8. 2,5-Xylenol
9. 2-Nitrophenol
10. 3,5-Xylenol
11. 2,3-Xylenol
12. 2,4-Dichlorophenol
13. 3,4-Xylenol
14. 2,4,6-Trichlorophenol
15. 2,4-Dinitrophenol
16. 1-Naphthol

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID,
G1544-80730
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

GC and GC/MS Applications Industrial Chemicals

Phenols III

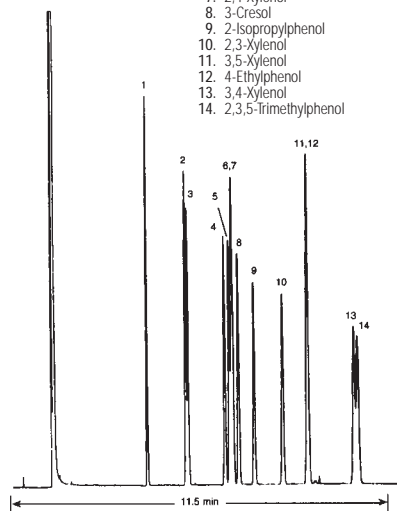
Column: DB-WAX
122-7032
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen at 43 cm/sec
Oven: 165°C isothermal
Injection: Split, 250°C
Detector: Split ratio 1:50
FID, 300°C
Nitrogen makeup gas at 30 mL/min

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool,
5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

1. 2,6-Xylenol
2. 2-Cresol
3. Phenol
4. 2-Ethylphenol
5. 2,5-Xylenol
6. 4-Cresol
7. 2,4-Xylenol
8. 3-Cresol
9. 2-Isopropylphenol
10. 2,3-Xylenol
11. 3,5-Xylenol
12. 4-Ethylphenol
13. 3,4-Xylenol
14. 2,3,5-Trimethylphenol



Halocarbons

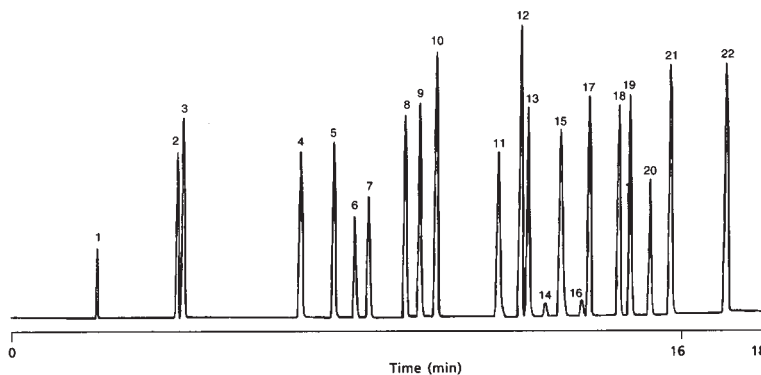
Column: GS-GasPro
113-4332
30 m x 0.32 mm

Carrier: Helium at 30 cm/sec
Oven: 130°C for 4 min
130-225°C at 10°/min
Injection: 225°C Hold
Split, 250°C
Detector: Split ratio 1:67
FID, 250°C
Sample: 1 μ l

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

1. CH₄
2. CHClF₂ (Freon 22)
3. CCl₂F₂ (Freon 12)
4. ClCF₂CF₂Cl (Freon 114)
5. CHCl₂F (Freon 21)
6. CCl₃F (Freon 11)
7. CF₂Br₂ (Freon 12B2)
8. CH₃I
9. CH₂Cl₂
10. trans-ClCH=CHCl
11. CF₃CCl₃ (Freon 113)
12. cis-ClCH=CHCl
13. CHCl₃
14. ? from CCl₄
15. CCl₄
16. ? from CCl₄
17. CH₃CH₂I
18. CH₂Br₂
19. CHCl₂Br
20. C₄F₉I
21. CHClBr₂
22. CH₃CH₂CH₂I

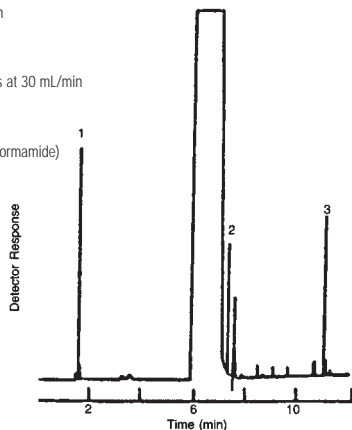


Ethylene Oxide

Column: DB-WAX
122-7032
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 1 mL/min
Oven: 60°C for 2 min
60-180°C at 16°/min
Injection: Split, 250°C
Detector: Split ratio 1:50
FID, 300°C
Nitrogen makeup gas at 30 mL/min

1. Ethylene oxide
2. 2-Chloroethanol
3. Ethylene glycol (solvent: Dimethylformamide)



(Courtesy of
J. Chromatogr. Sci.,
28:97 [1990])

Halothane

Column: GS-GasPro
113-4312
15 m x 0.32 mm

Carrier: Helium at 45 cm/sec
Oven: 240°C, isothermal
Injection: Split, 200°C
Detector: Split ratio 1:100
FID, 200°C
Sample: 0.2 μ l

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Nitrogen
2. Halothane
3. Diethyl ether
4. Acetone



GC and GC/MS Applications

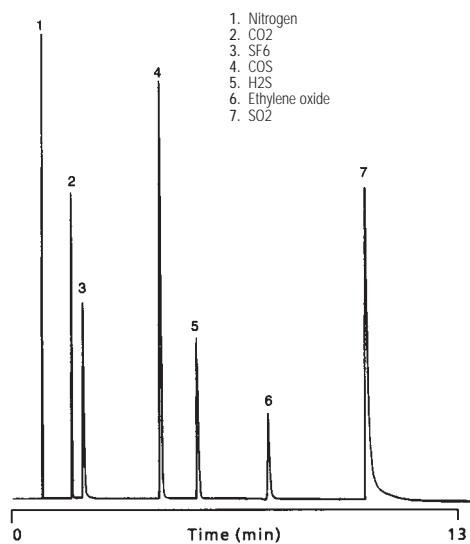
Industrial Chemicals

Inorganic Gases

Column: GS-GasPro
113-4332
30 m x 0.32 mm,
Carrier: Helium at 53 cm/sec
Oven: 25°C for 3 min
25-200°C at 10°/min
200°C Hold
Injection: Split, 200°C
Split ratio 1:50
Detector: TCD, 250°C
Sample: 50 µL

Suggested Supplies

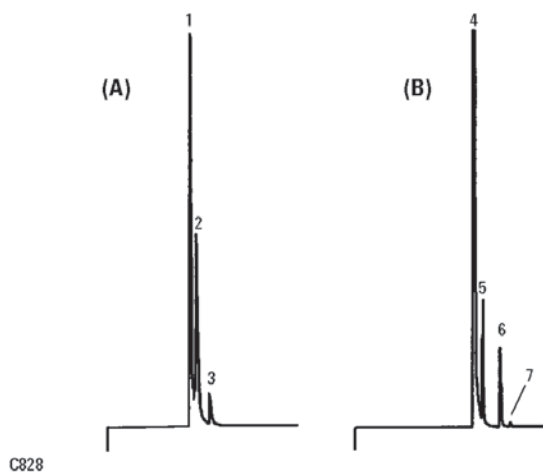
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



Inorganic Hydride Gases

Column: HP-1
19091Z-205
50 m x 0.20 mm, 0.50 µm
Carrier: Helium, 35 cm/sec
Oven: A: -70°C isothermal
B: 30°C isothermal
Injection: Split ratio 25:1
Detector: FPD, 535 µm filter
Sample: 1 µL

1. Arsine 0.1%
2. Phosphine 0.1%
3. Selenide 0.1%
4. Diborane 0.10 ppm
5. Tetraborane 0.10 ppm
6. Pentaborane 0.10 ppm
7. Dihydropentaborane 0.60 ppm



Life Sciences

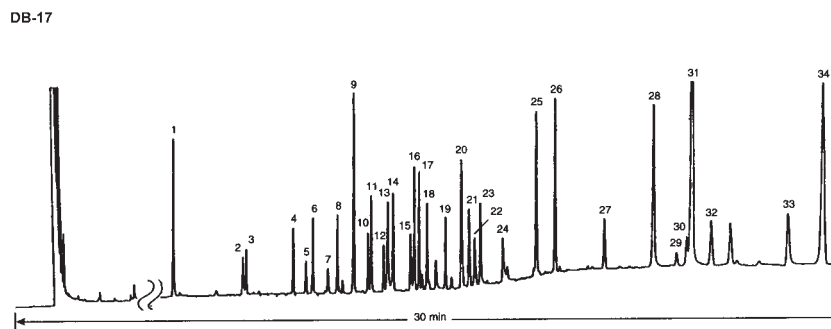
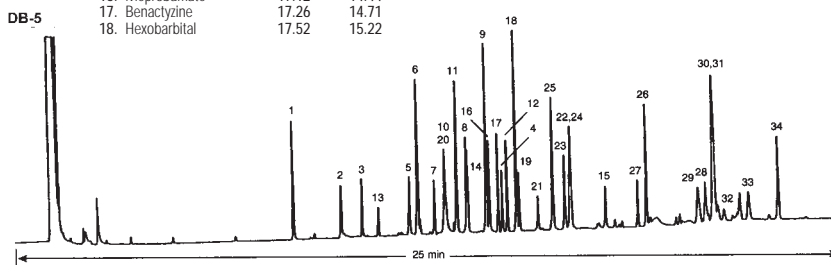
Common Drug Screen

Column: **DB-5**
122-5032
30 m x 0.25 mm, 0.25 μ m
 122-1732
 Carrier: Hydrogen at 41 cm/sec,
 measured at 80°C
 Oven: 80°C for 1 min
 80-280°C at 10°/min
 280°C for 9 min
 Injection: Split, 250°C
 Split ratio 1:40
 Detector: FID, 300°C

Suggested Supplies

Septum: Advanced Green,
 5183-4759
 Liner: Lnr.gen purp
 split/splts.tpr.glswl.deac,
 5183-4711
 Seal: Gold plated seal,
 18740-20885
 Syringe: 10 μ l tapered,
 FN 23-26s/42/HP,
 5181-1267

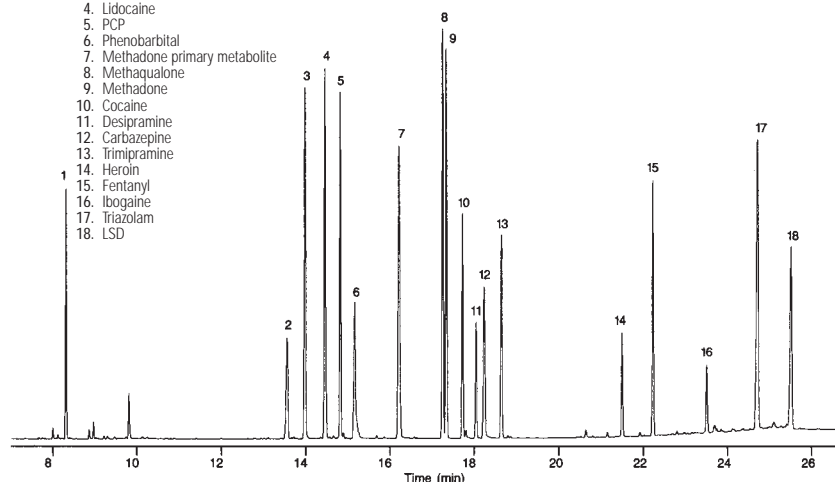
	DB-17	DB-5	DB-17	DB-5	
	Time	Time	Time	Time	
1. Nicotine	9.87	8.57	19. Doxylamine	17.69	15.87
2. Phenmetrazine	11.8	9.95	20. Caffeine	18.05	13.11
3. Ibuprofen	12.06	10.64	21. Chlorpheniramine	18.47	16.35
4. Procaine	13.48	14.82	22. Methapyrilene	18.72	16.68
5. Allobarbitol	13.91	12.02	23. Thenyldiamine	18.87	16.85
6. Aprobartol	14.14	12.27	24. Phenobarbital	19.11	16.29
7. Butabarbitol	14.56	12.76	25. Bromopheniramine	19.71	17.39
8. Secobarbitol	14.87	14.31	26. Chlorcyclizine	20.75	19.13
9. Pentobarbitol	15.41	13.73	27. Cocaine	21.32	18.88
10. Phenacetin	15.72	12.94	28. Pyrrobutamine	22.79	20.89
11. Amobarbitol	15.87	13.43	29. Codeine	24.27	20.66
12. Benzphetamine	16.14	14.96	30. Diazepam	25.27	21.13
13. Acetaminophen	16.34	11.12	31. Morphine	25.36	21.12
14. Hydroxyphenamate	16.47	15.31	32. Hydrocodone	25.98	21.26
15. Dimenhydrinate	16.93	13.79	33. Oxymorphone	28.27	22.21
16. Meprobamate	17.12	14.44	34. Heroin	29.32	23.14
17. Benactyzine	17.26	14.71			
18. Hexobarbitol	17.52	15.22			



Drug Screen

Column: **DB-1ms**
122-0132
30 m x 0.25 mm, 0.25 μ m
 Carrier: Helium at 40 cm/sec,
 measured at 50°C
 Oven: 50°C for 1.0 min
 50-125°C at 25°/min
 125-325°C at 10°/min
 Injection: 325°C for 5 min
 Cold Splitless
 Optic II injector, 50-250°C at 10°/sec
 45 sec purge activation time
 Detector: FID, 300°C
 Sample: 1 μ l injection of 50-150 ppm standard

- Nicotine
- Caffeine
- Glutethimide
- Lidocaine
- PCP
- Phenobarbital
- Methadone primary metabolite
- Methaqualone
- Methadone
- Cocaine
- Desipramine
- Carbazepine
- Trimapramine
- Heroin
- Fentanyl
- Ibogaine
- Triazolam
- LSD



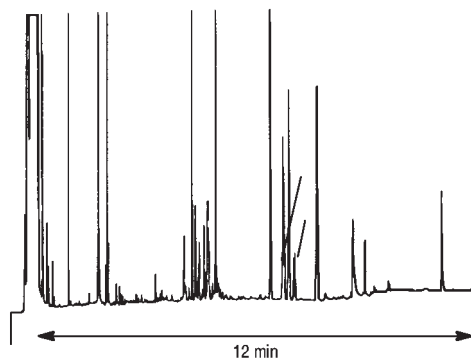
GC and GC/MS Applications

Life Sciences

Urine Drug Screen

Column: ULTRA 2
19091B-115
50 m x 0.32 mm, 0.52 μ m

Carrier: Hydrogen 80 cm/sec
Oven: 45°C for 1.5 min
45-300°C at 6°C/min
Injection: Splitless
Detector: FID

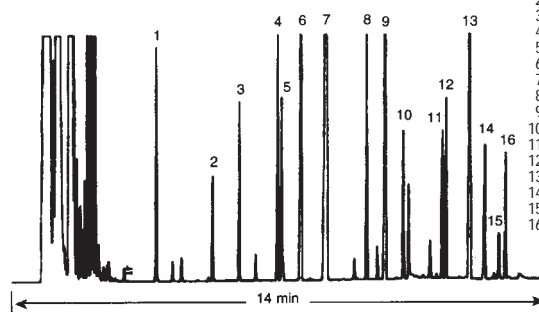


1. Amphetamine
2. Methamphetamine
3. Meperidine
4. Phencyclidine (PCP)
5. Methadone
6. Propoxyphene
7. Amitriptyline
8. Cocaine
9. Imipramine
10. Cyheptamide (ISTD)
11. Codeine
12. Diazepam
13. Flurazepam

Amphetamines and Precursors - TMS Derivatives

Column: DB-5
121-5023
20 m x 0.18 mm, 0.40 μ m

Carrier: Helium at 39 cm/sec, measured at 100°C
Oven: 100-240°C at 10°/min
Injection: Split, 250°C
Detector: Split ratio 1:100
FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
1 μ L of 2 μ g/ μ L each in pyridine



1. Phenylacetone
2. Dimethylamphetamine
3. Amphetamine
4. Phentermine
5. Methamphetamine
6. Methyl ephedrine
7. Nicotinamine
8. Ephedrine
9. Phenacetin
10. 3,4-Methylenedioxyamphetamine (MDA)
11. 3,4-Methylenedioxymethylamphetamine
12. 4-Methyl-2,5-dimethoxyamphetamine (STP)
13. Phenyl ephedrine
14. 3,4-Methylenedioxyethylamphetamine (MDE: Eve)
15. Caffeine
16. Benzphetamine

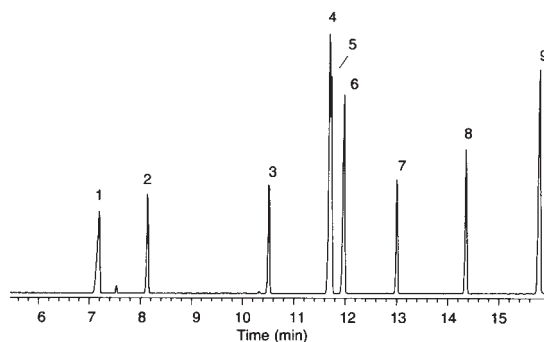
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/split.s tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Anesthetics

Column: DB-EVDX
128-8522
25 m x 0.20 mm, 0.33 μ m

Carrier: Helium at 35 cm/sec, measured at 55°C
Oven: 55°C for 1 min
55-130°C at 25°/min
130-325°C at 15°/min
Injection: Splitless, 250°C
45 sec purge activation time
Detector: MSD, 280°C transfer line
full scan at m/z 35-400
Sample: 1 μ L of 50-100 ng/ μ L standard in methanol



1. Salicylamide
2. Benzocaine
3. Lidocaine
4. Procaine
5. Nefopam
6. Mepivacaine
7. Tetracaine
8. Butacaine
9. Dibucaine

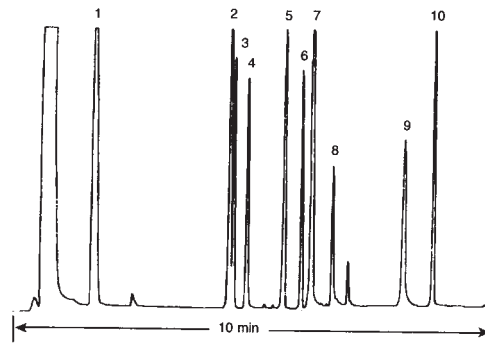
Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Anticonvulsants

Column: DB-1
125-1032
30 m x 0.53 mm, 1.50 μ m

Carrier: Helium at 8 mL/min
Oven: 160°C for 2 min
160-275°C at 15°/min
Injection: Megabore Direct, 250°C
Detector: FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
1 μ L of 100 ng/ μ L in methanol



1. Ethosuximide
2. Methsuximide
3. Phensuximide
4. N-Desmethyl methsuximide
5. Phenylethylmalonamide
6. Phenobarbital
7. Primidone
8. Carbamazepine
9. Phenyloin
10. 5-Methyl-5-phenylhydantoin

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct connect, single taper, deactivated, 4mm ID, G1544-80730
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Antihistamines

Column: DB-5
123-5032
30 m x 0.32 mm, 0.25 μ m

Carrier: Helium at 40 cm/sec, measured at 55°C
Oven: 55°C for 1 min
 55-175°C at 30°/min
 175-320°C at 10°/min
 320°C for 1 min

Injection: Splitless, 250°C
 30 sec purge activation time

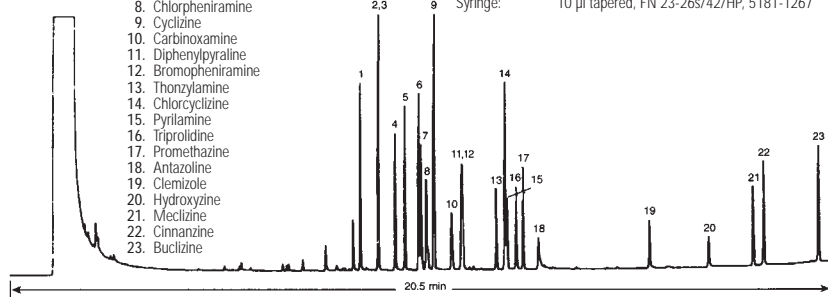
Detector: FID, 300°C
 Nitrogen makeup gas at 30 mL/min

Sample: 1 μ L of 50 ng/ μ L each in methanol

1. Pheniramine
2. Dimenhydrinate
3. Diphenhydramine
4. Doxylamine
5. Phenyltoloxamine
6. Tripelemamine
7. Methapyrilene
8. Chlorpheniramine
9. Cyclizine
10. Carboxamine
11. Diphenylpyraline
12. Bromopheniramine
13. Thonzylamine
14. Chlorcyclizine
15. Pyrilamine
16. Triprolidine
17. Promethazine
18. Antazoline
19. Clemizole
20. Hydroxyzine
21. Meclizine
22. Cinnanzine
23. Buclizine

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267



Antiepileptic Drugs

Column: ULTRA 2
19091B-012
25 m x 0.32 mm, 0.17 μ m

Carrier: Helium, 14 psi
Oven: 100-230°C at 15°C/min
Injection: Split ratio 35:1
Detector: NPD

Tricyclic Antipsychotics

Column: ULTRA 2
19091B-101
12 m x 0.20 mm, 0.33 μ m

Carrier: Hydrogen, 106 cm/sec
Oven: 250°C for 3 min
 250-290°C at 10°C/min
 290°C for 10 min
 Split ratio 75:1

Injection: FPD
Detector: FPD

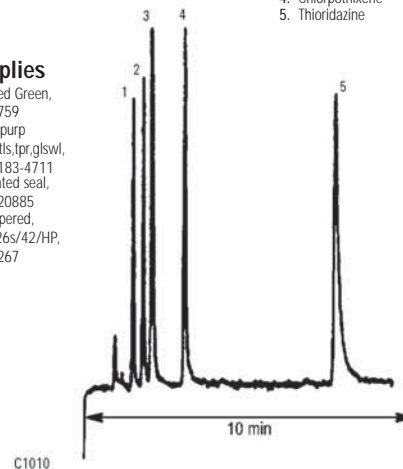
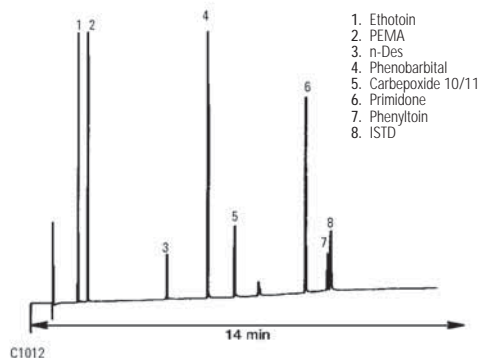
1. Triflupromazine
2. Promethazine
3. Promazine
4. Chlorpromazine
5. Thioridazine

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267



Barbiturates

Column: DB-35ms
122-3832
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 31 cm/sec, measured at 50°C
Oven: 50°C for 0.5 min
 50-150°C at 25°/min
 150-300°C at 10°/min

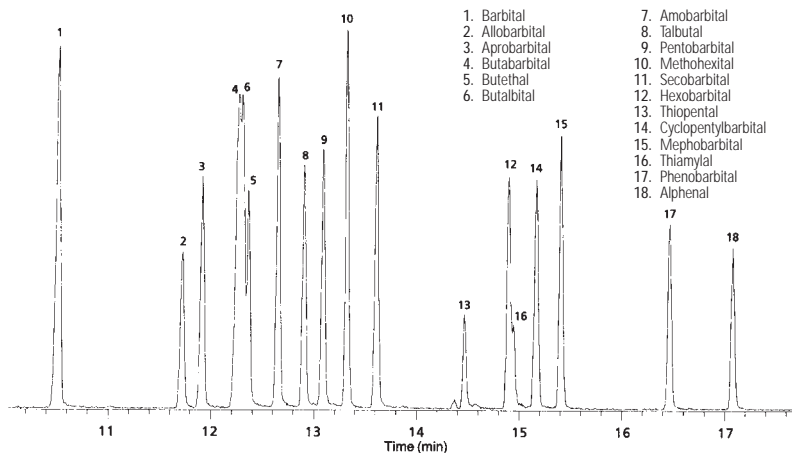
Injection: Splitless, 250°C
 30 sec purge activation time

Detector: MSD, 280°C transfer line
 full scan at m/z 40-270

1. Barbitol
2. Allobarbitol
3. Aprobarbitol
4. Butabarbitol
5. Butethal
6. Butalbitol
7. Amobarbitol
8. Talbutal
9. Pentobarbitol
10. Methohexital
11. Secobarbitol
12. Hexobarbitol
13. Thiopental
14. Cyclopentylbarbitol
15. Mephobarbitol
16. Thiamylal
17. Phenobarbitol
18. Alphenal

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ L tapered, FN 23-26s/42/HP, 5181-1267



GC and GC/MS Applications

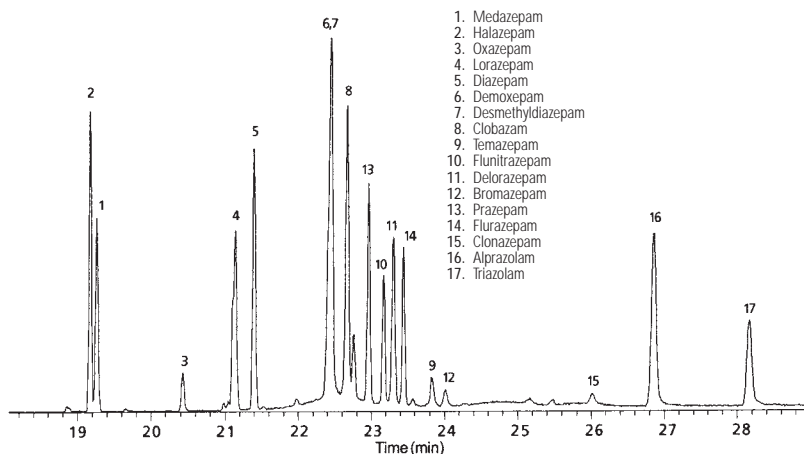
Life Sciences

Benzodiazepines

Column: DB-35ms
122-3832
30 m x 0.25 mm, 0.25 μ m
Carrier: Helium at 31 cm/sec, measured at 50°C
Oven: 50°C for 0.5 min
 50-150°C at 25°/min
 150-340°C at 10°/min
 340°C for 6 min
Injection: Splitless, 250°C
 30 sec purge activation time
Detector: MSD, 280°C transfer line
 full scan at m/z 40-400

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Splitless, single taper, deactivated, 4mm ID, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

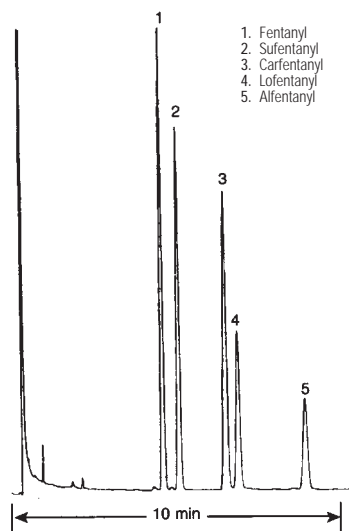


Fentanyls

Column: DB-1701
125-0732
30 m x 0.53 mm, 1.00 μ m
Carrier: Hydrogen at 15 mL/min
Oven: 270°C isothermal
Injection: Split, 250°C
Detector: Split ratio 1:5
 FID, 300°C
Sample: Nitrogen makeup gas at 30 mL/min
 0.8 μ l

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273

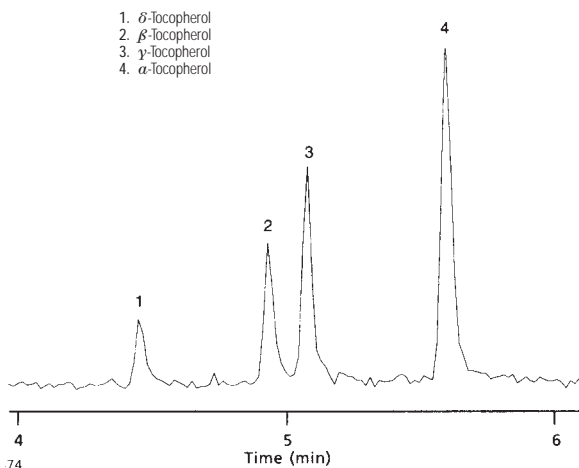


Tocopherols

Column: DB-17ms
122-4732
30 m x 0.25 mm, 0.25 μ m
Carrier: Helium at 40 cm/sec, measured at 150°C
Oven: 300°C for 1 min
 300-320°C at 25°/min
 320°C for 4 min
Injection: Split, 310°C
Detector: Split ratio 1:25
 MSD, 310°C transfer line
 full scan at m/z 45-550
Sample: 1 μ l of 1-10 ng/ μ l in isooctane

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Split, single taper, low pressure drop, galss wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: Syringe, 5ul tapered, FN 23-26s/42/HP, 5181-1273



GC and GC/MS Applications

Life Sciences

Hallucinogens

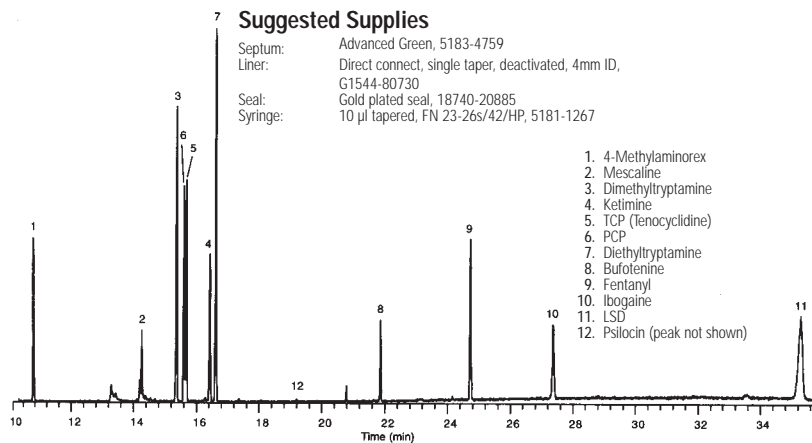
Column: DB-17ms
122-4732
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 30 cm/sec, measured at 50°C
Oven: 50°C for 0.5 min
50-125°C at 25°/min
125-255°C at 10°/min
255-320°C at 25°/min

Injection: 320°C for 16 min
Splitless, 250°C

Detector: 30 sec purge activation time
MSD, 300°C transfer line
full scan at m/z 40-350

Sample: 1 μ L of 10-50 ng/ μ L standard in methanol



Sedative Hypnotics

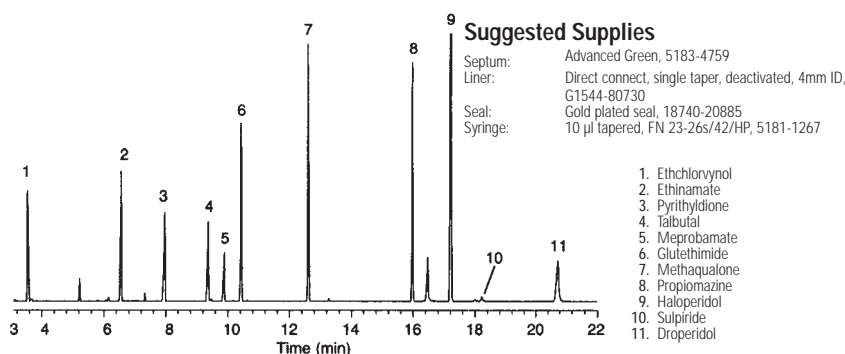
Column: DB-EVDX
128-8522
25 m x 0.20 mm, 0.33 μ m

Carrier: Helium at 35 cm/sec, measured at 55°C
Oven: 55°C for 1 min
55-130°C at 25°/min
130-325°C at 15°/min

Injection: 325°C for 4 min
Splitless, 250°C

Detector: 45 sec purge activation time
MSD, 280°C transfer line
full scan at m/z 35-400

Sample: 1 μ L of 50-100 ng/ μ L standard in methanol



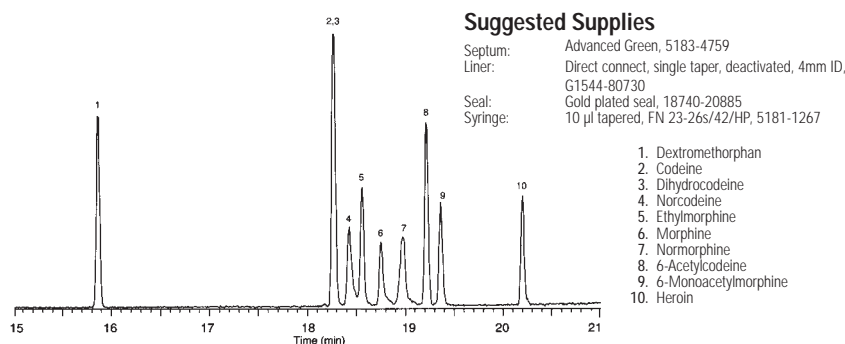
Narcotics

Column: DB-5ms
122-5532
30 m x 0.25 mm, 0.25 μ m

Carrier: Helium at 31 cm/sec, measured at 50°C
Oven: 50°C for 0.5 min
50-150°C at 25°/min
150-325°C at 10°/min

Injection: Splitless, 250°C

Detector: 30 sec purge activation time
MSD, 300°C transfer line
full scan at m/z 40-380



Narcotics and Adulterants

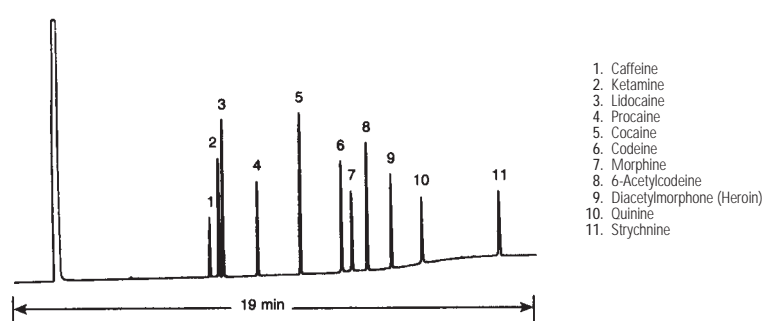
Column: DB-5
123-5032
30 m x 0.32 mm, 0.25 μ m

Carrier: Helium at 40 cm/sec, measured at 140°C
Oven: 140-320°C at 12°/min
320°C for 4 min
Split, 250°C

Injection: Split ratio 1:75
FID, 300°C

Detector: Nitrogen makeup gas at 30 mL/min

Sample: 1 μ L of 0.5 μ g/ μ L each in methanol



GC and GC/MS Applications

Life Sciences

Over-the-Counter Pain Killers - TMS Derivatives

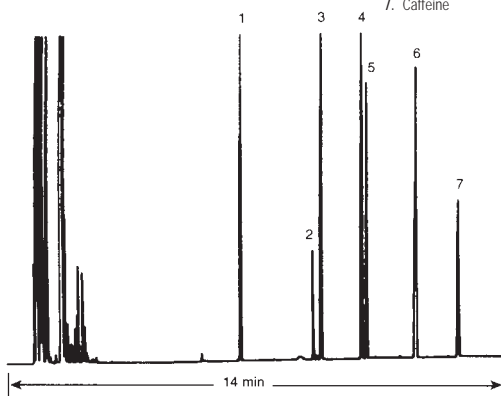
Column: DB-5
121-5023
20 m x 0.18 mm, 0.40 μ m

Carrier: Helium at 39 cm/sec, measured at 100°C
Oven: 100-240°C at 10°/min
Injection: Split, 250°C

Detector: Split ratio 1:100
FID, 300°C

Sample: Nitrogen makeup gas at 30 mL/min
1 μ L of 2 μ g/ μ L each in pyridine

1. Nicotine
2. Unknown
3. Acetylsalicylic acid (aspirin)
4. Ibuprofen
5. Acetaminophen
6. Unknown
7. Caffeine



Aspirin and Ibuprofen in Methanol

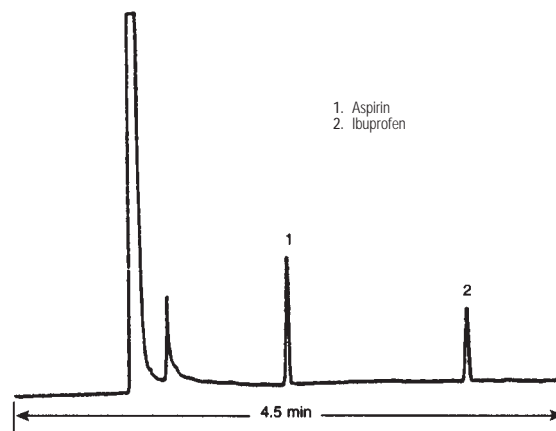
Column: DB-FFAP
122-3232
30 m x 0.25 mm, 0.25 μ m

Carrier: Hydrogen at 24 cm/sec, measured at 180°C
Oven: 180°C isothermal
Injection: Split, 250°C

Detector: Split ratio 1:50
FID, 300°C

Nitrogen makeup gas at 30 mL/min

1. Aspirin
2. Ibuprofen



Free Steroids

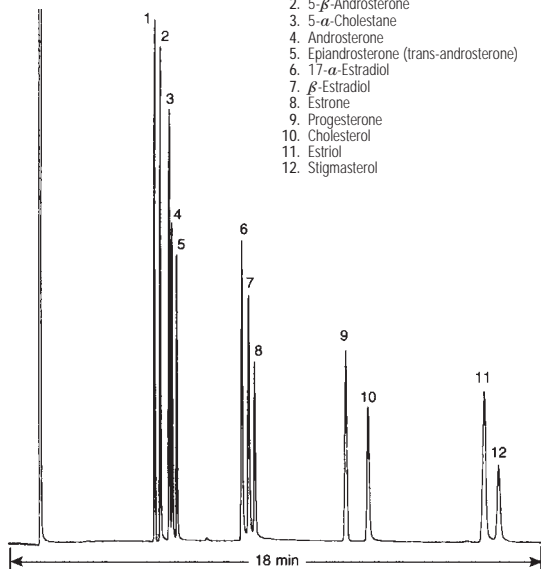
Column: DB-17
122-1731
30 m x 0.25 mm, 0.15 μ m

Carrier: Hydrogen at 44 cm/sec
Oven: 260°C isothermal
Injection: Split, 250°C

Detector: Split ratio 1:100
FID, 300°C

Sample: Nitrogen makeup gas at 30 mL/min
1 μ L

1. Coprostanone (5- β -cholestane)
2. 5- β -Androsterone
3. 5- α -Cholestane
4. Androsterone
5. Epiandrosterone (trans-androsterone)
6. 17- α -Estradiol
7. β -Estradiol
8. Estrone
9. Progesterone
10. Cholesterol
11. Estriol
12. Stigmasterol



Anabolic Steroids

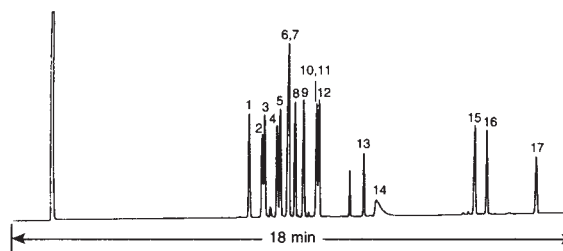
Column: DB-1
122-1031
30 m x 0.25 mm, 0.10 μ m

Carrier: Helium at 40 cm/sec, measured at 180°C
Oven: 180-320°C at 10°/min
320°C for 4 min

Injection: Split ratio 1:40
Detector: FID, Nitrogen makeup gas at 30 mL/min

Sample: 2 μ L of 0.125 μ g/ μ L each in methanol

1. Dehydroisandrosterone (Prasterone)
2. 5 α -Androstan-17 α -ol-3-one (Stanolone)
3. 19-Nortestosterone (Nandrolone)
4. Mesterolone
5. Testosterone
6. 1-Dehydrotestosterone (Boldenone)
7. 17 α -Methyltestosterone
8. 1-Dehydro-17- α -methyltestosterone (Methandrostenolone)
9. Norethandrolone
10. 1-Dehydrotestosterone acetate
11. Oxymetholone
12. 19-Nortestosterone-17-propionate
13. 4-Chlortestosterone-17-acetate (Clostebol)
14. Stanozolol
15. 1-Dehydrotestosterone benzoate
16. 19-Nortestosterone-17-decanoate
17. 1-Dehydrotestosterone undecylenate



Marijuana (Δ^9 -THC) and Major Metabolites - TMS Derivatives

Column: DB-5
123-5032
30 m x 0.32 mm, 0.25 μ m

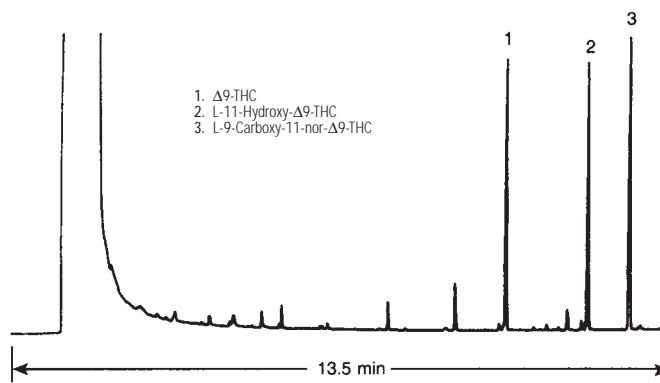
Carrier: Helium at 40 cm/sec, measured at 100°C

Oven: 100°C for 1 min
100-175°C at 30°/min
175-295°C at 12°/min

Injection: Splitless, 250°C
30 sec purge activation time

Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min

Sample: 1 μ l of 0.1 μ g/ μ l each in pyridine



Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct connect, single taper, deactivated, 4mm ID, C1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 μ l tapered, FN 23-26s/42/HP, 5181-1267

Blood Alcohols I (Static Headspace/Split)

Column: DB-ALC1
125-9134
30 m x 0.53 mm, 3.00 μ m

Carrier: Helium at 80 cm/sec, measured at 40°C

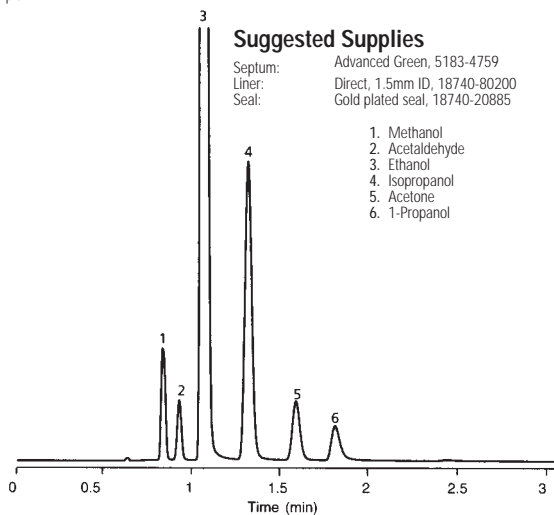
Oven: 40°C Isothermal

Sampler: Headspace

Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 23 mL/min

Sample:



Blood Alcohols II (Static Headspace/Split)

Column: DB-ALC1
125-9134
30 m x 0.53 mm, 3.00 μ m

Carrier: Helium at 80 cm/sec, measured at 40°C

Oven: 40°C Isothermal

Sampler: Headspace

Oven: 70°C

Loop: 80°C

Transfer Line: 90°C

Vial Equil. Time: 10 min

Pressurization Time: 0.20 min

Loop Fill Time: 0.20 min

Loop Equil. Time: 0.05 min

Inject Time: 0.1 - 0.2 min

Sample Loop Size: 1.0 mL

Injection: Split, 250°C

Detector: Split ratio 1:10
FID, 300°C
Nitrogen makeup gas at 23 mL/min

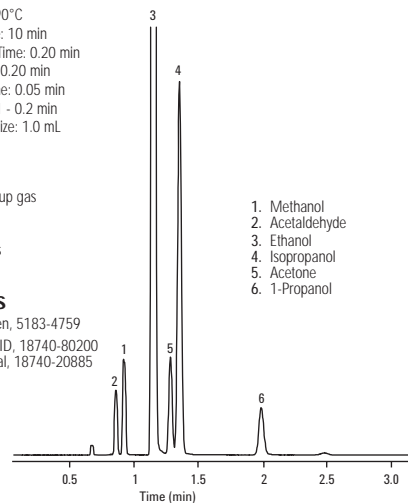
Sample: 0.1% Ethanol, 0.001% Others

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, 18740-20885



GC and GC/MS Applications

Life Sciences

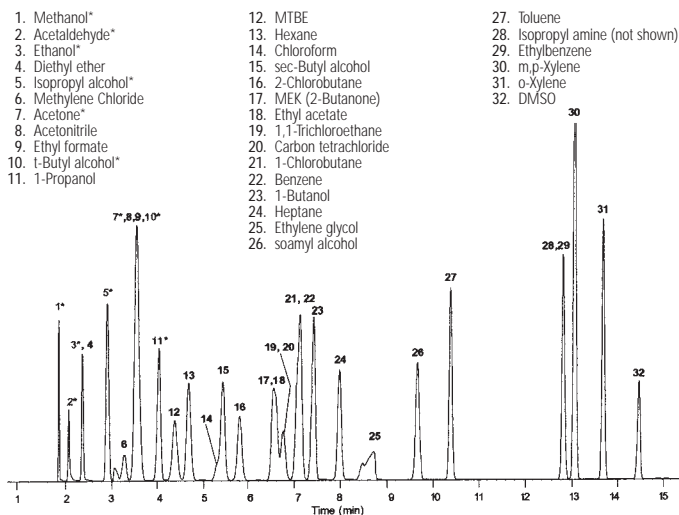
Blood Pollutants I

Column: DB-ALC1
125-9134
30 m x 0.53 mm, 3.00 µm

Carrier: Helium, 36 cm/sec, measured at 40°C
Oven: 40°C for 5 min
40-210°C at 10°/min
Injection: Split, 250°C
Split ratio 1:10
Detector: FID, 300°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



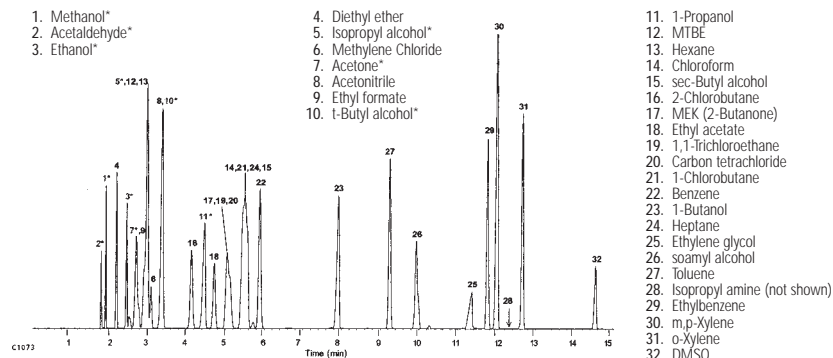
Blood Pollutants II

Column: DB-ALC1
125-9234
30 m x 0.53 mm, 2.00 µm

Carrier: Helium, 36 cm/sec, measured at 40°C
Oven: 40°C for 5 min
40-210°C at 10°/min
Injection: Split, 250°C
Split ratio 1:10
Detector: FID, 300°C

Suggested Supplies

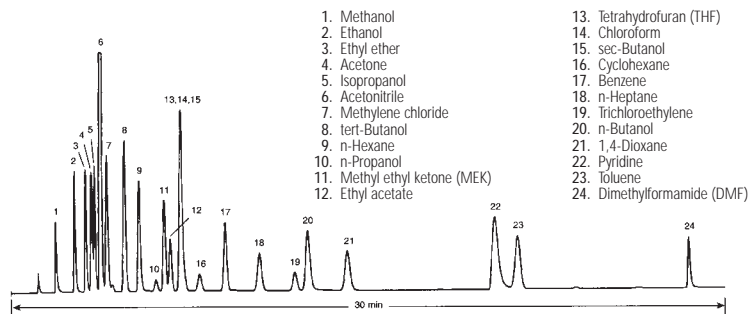
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



Residual Solvents, USP 467

Column: DB-624
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 35 cm/sec, measured at 40°C
Oven: 40°C for 20 min
40-90°C at 5°/min
Injection: Megabore Direct, 250°C
5 m phenylmethylsilane deactivated retention gap
Detector: FID, 300°C
Nitrogen makeup gas at 30 mL/min



GC and GC/MS Applications

Life Sciences

Residual Solvents, DMI Diluent

Column: DB-624
123-1364
60 m x 0.32 mm, 1.80 µm

Oven: 50-60°C, 1°C/min
60-115°C, 9.2°C/min
115-220°C, 35°C/min
220°C - hold 6 min

Sampler: Headspace
Platen 140°C
Transfer line, valve 250°C
Sample Loop 2mL

Injection: Split, 250°C

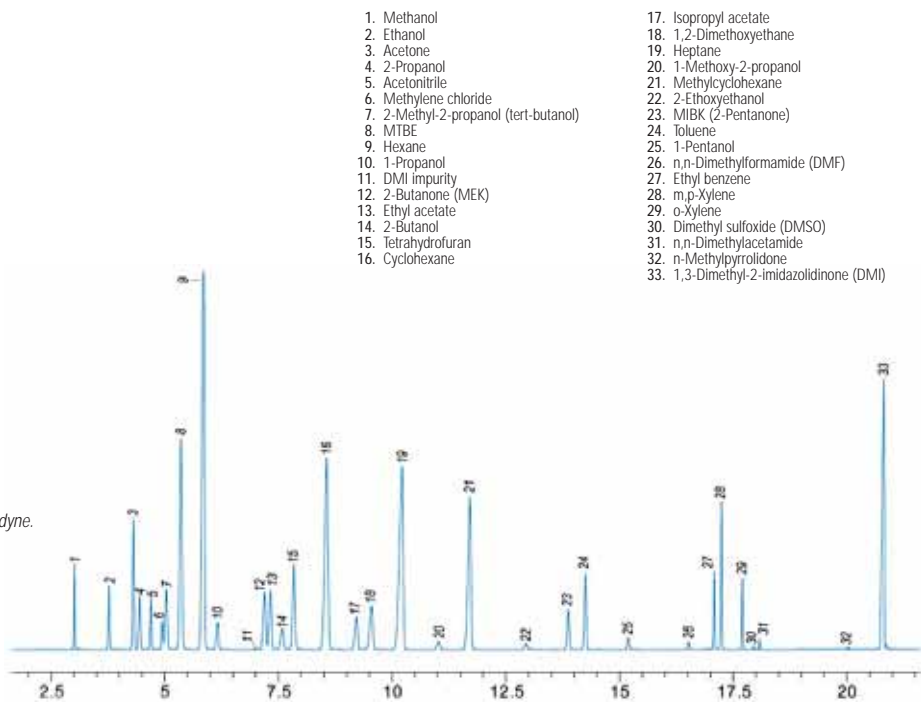
Detector: Split ratio 1:18
FID, 270°C

Sample: Nitrogen makeup
5,000 ppm standard

Suggested Supplies

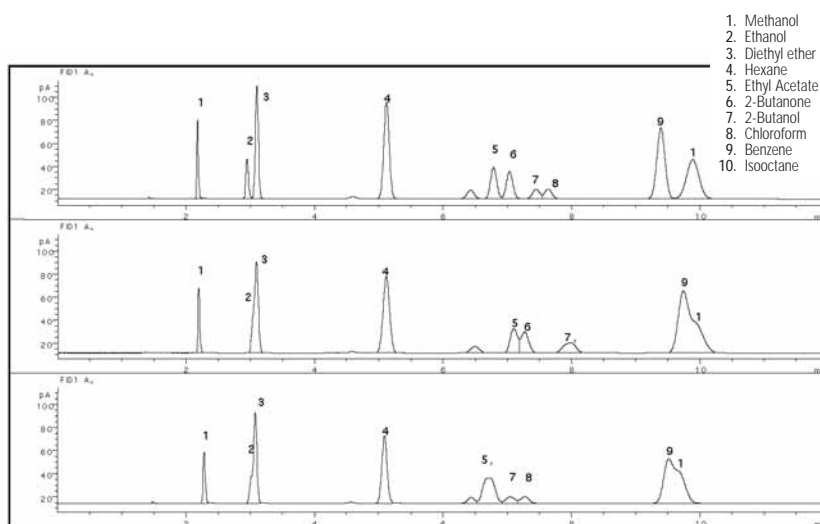
Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Special thanks to Julie Kancler, Brian Wallace, Teledyne.



The three chromatograms to the right show how widely different the two other manufacturer's columns are compared to the DB-624, the original USP G-43 stationary phase column recommended for the analysis of these common organic volatile impurities in pharmaceutical samples.

Top Chromatogram: DB-624
Middle Chromatogram: Manufacturer A's "-624"
Bottom Chromatogram: Manufacturer B's "-624"



Residual Solvents

Column: DB-624
123-1364
60 m x 0.32 mm, 1.80 µm

Carrier: Helium, 35-40 cm/sec, set to yield same RT for Hexane on all columns.

Oven: 40°C Isothermal
Sampler: Ambient Headspace
Injection: Split ratio 1:8
Detector: FID, 240°C
Sample: 4 µL

Peak Numbers	Critical Pair	DB-624	% Resolution* Manufacturer A's 624	Manufacturer B's 624
2,3	ethanol and diethyl ether	100%	0%	0%
5,6	ethyl acetate and 2-butanone	95%	38%	0%
7,8	2-butanol and chloroform	60%	0%	60%
9,10	benzene and isooctane	100%	0%	0%

*Resolution calculated as follows: %R = 100% x valley height/average of peak height 1 + peak height 2

GC and GC/MS Applications

Petroleum

Petroleum

Noble Gases

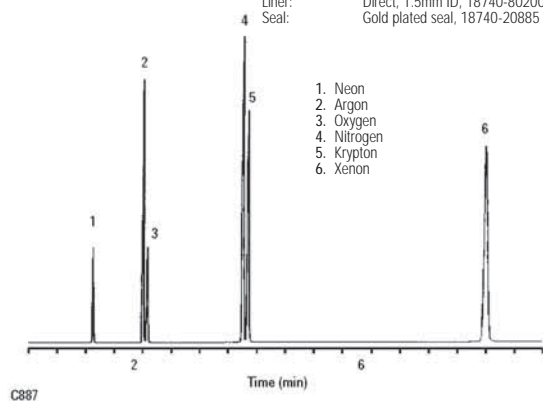
Column: HP-PLOT Molesieve
19095P-MS0
30 m x 0.53 mm, 50.00 µm

Carrier: Helium, 4 mL/min
Oven: 35°C for 3 min
35-120°C at 25°C/min
120°C for 5 min

Injection: Split ratio 50:1
Detector: TCD
Sample: 250 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



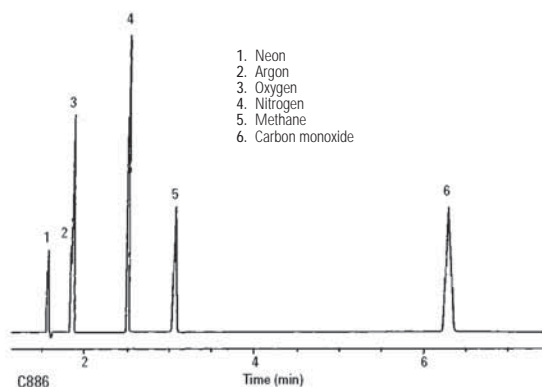
Permanent Gases

Column: HP-PLOT Molesieve
19091P-MS4
30 m x 0.32 mm, 12.00 µm

Carrier: Helium, 2 mL/min
Oven: 40°C Isothermal
Injection: Split ratio 75:1
Detector: TCD
Sample: 250 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



Baseline Resolution of Air/CO, CO₂, and Methane in a Natural Gas Sample

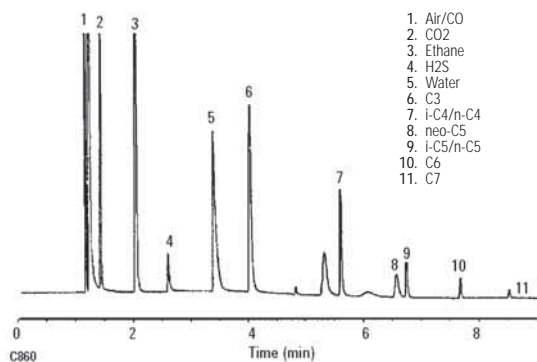
Column: HP-PLOT Q
19095P-Q04
30 m x 0.53 mm, 40.00 µm

Carrier: Helium (8.6 mL/min @ 60°C)
Oven: 60°C for 2 min
60-240°C at 30°C/min
240°C for 1 min

Injection: Split ratio 12:1
Detector: TCD, 250°C
Sample: 0.25 cc natural gas sample, Methane, 80%+

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



Natural Gas

Column: HP-PLOT Al₂O₃ S
19095P-S21
15 m x 0.53 mm, 15.00 µm

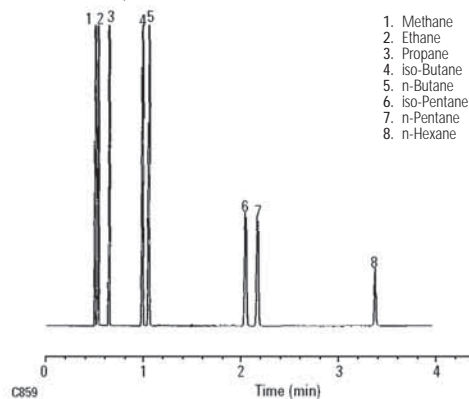
Carrier: Helium, 50 cm/sec (100°C), 6 mL/min
Oven: 100°C for 1.5 min
100-180°C at 30°C/min

Injection: Split, 250°C
Split ratio 50:1

Detector: FID, 250°C
Sample: 5 µL
Natural Gas P/N 5080-8756

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



GC and GC/MS Applications

Petroleum

Ethylene

Column: HP-PLOT Al₂O₃ S
19095P-S25

50 m x 0.53 mm, 15.00 μm

Carrier: Helium, 50 cm/sec (35°C),
7 mL/min constant flow

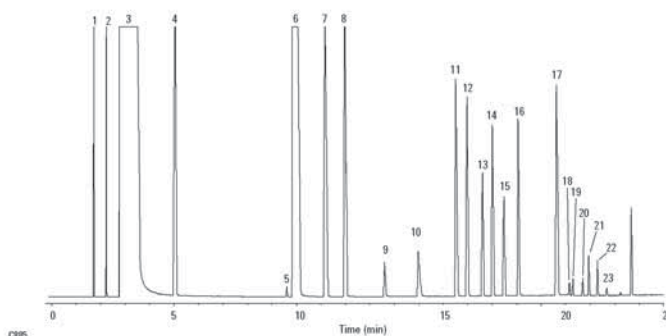
Oven: 35°C for 2 min
35-100°C at 5°C/min

Injection: Split, 250°C

Split ratio 65:1

Detector: FID, 250°C

Sample: 5 μL
Ethylene 98.4%



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

Impurities in Ethylene

Column: GS-Alumina
115-3352

50 m x 0.53 mm,

Carrier: Helium at 8 mL/min, measured at 35°C

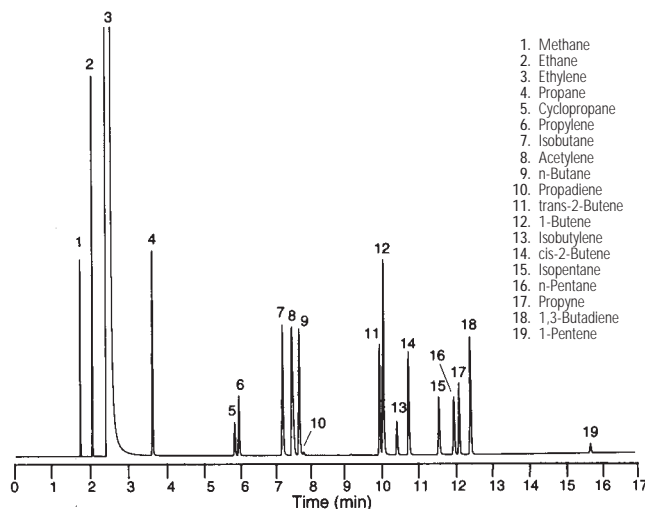
Oven: 35°C for 2 min
35-190°C at 10°/min

Injection: Split, 200°C

Split ratio 1:40

Detector: FID, 200°C

Sample: Nitrogen makeup gas at 20 mL/min
0.2 mL of trace hydrocarbons
in ethylene



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. Acetylene
9. n-Butane
10. Propadiene
11. trans-2-Butene
12. 1-Butene
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. Propyne
18. 1,3-Butadiene
19. 1-Pentene

Impurities in Propylene

Column: GS-Alumina
115-3552

50 m x 0.53 mm

Carrier: Helium at 10 mL/min,
measured at 35°C

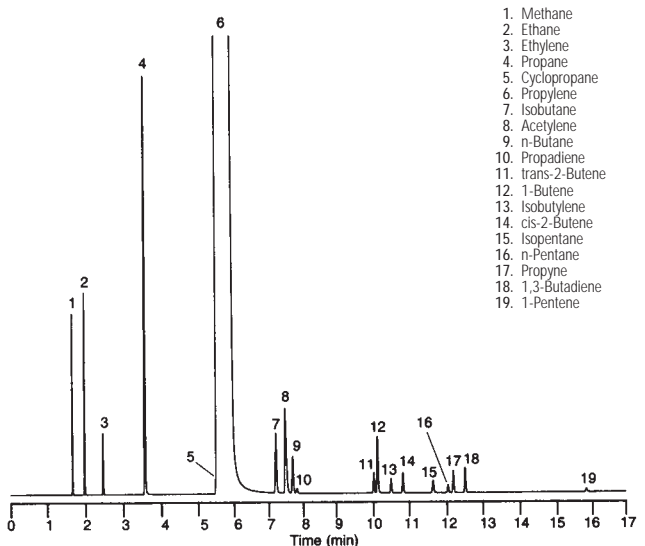
Oven: 35°C for 2 min
35-190°C at 10°/min

Injection: Split, 200°C

Split ratio 1:30

Detector: FID, 200°C

Sample: Nitrogen makeup gas
at 20 mL/min
0.2 mL of trace
hydrocarbons in propylene



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. Acetylene
9. n-Butane
10. Propadiene
11. trans-2-Butene
12. 1-Butene
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. Propyne
18. 1,3-Butadiene
19. 1-Pentene

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

GC and GC/MS Applications

Petroleum

Propylene

Column: GS-Alumina
115-3552
50 m x 0.53 mm

Carrier: Helium at 10 mL/min,
measured at 35°C

Oven: 35°C for 2 min
35-190°C at 10°/min
190°C for 3 min

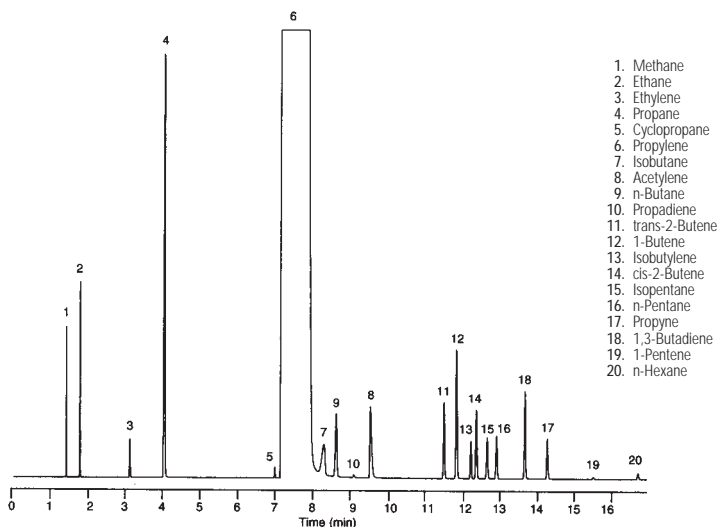
Injection: Split, 200°C

Detector: Split ratio 1:30
FID, 200°C
Nitrogen makeup gas
at 20 mL/min

Sample: 0.2 mL of trace
hydrocarbons in propylene

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



Propylene, Butene-1 and Ethylene

Column: DB-Petro
122-10A6
100 m x 0.25 mm, 0.50 µm

Carrier: Helium at 28.5 cm/sec

Oven: -40°C for 20 min
-40-120°C at 5°/min

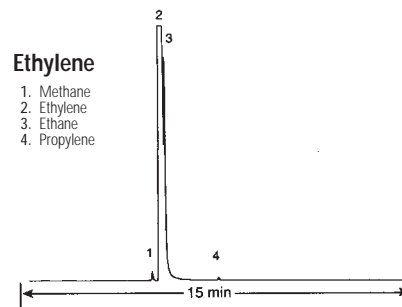
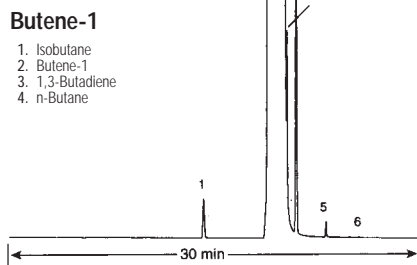
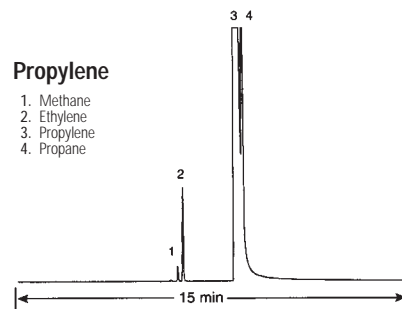
Injection: Split, 200°C

Detector: Split ratio 1:16
FID, 250°C
Nitrogen makeup gas
at 30 mL/min

Sample: 100 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



GC and GC/MS Applications

Petroleum

1,3-Butadiene

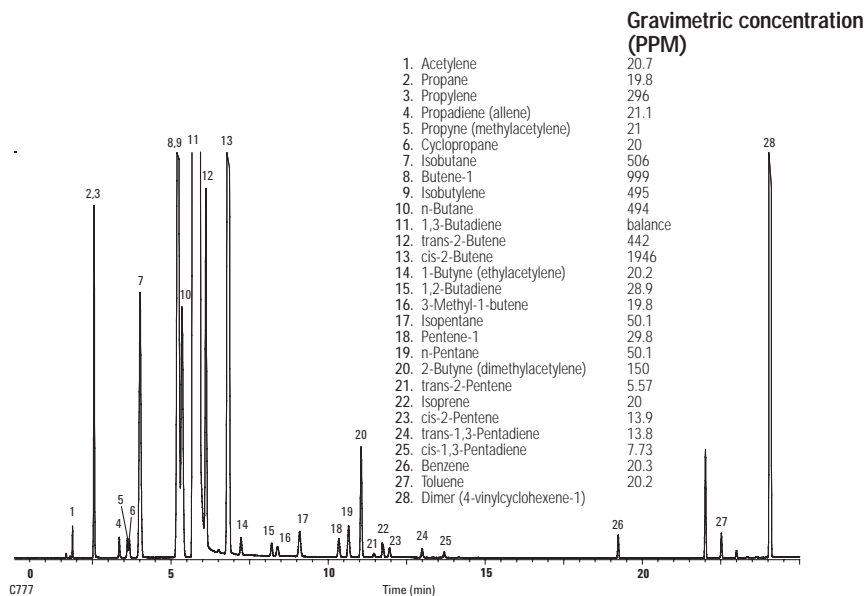
Column: DB-624
128-1324
25 m x 0.20 mm, 1.12 µm

Carrier: Helium at 1.0 mL/min
Oven: -20°C for 3 min
-20 - 20°C at 4°/min
20 - 200°C at 8°/min
200°C for 10 min
Injection: Split, 250°C
Split ratio 1:150
Detector: FID, 250°C
Sample: 0.5 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Agilent Technologies wishes to thank DCG Industries (Pearland, TX) for providing this chromatogram.



1,3-Butadiene Purity

Column: GS-Alumina
115-3552
50 m x 0.53 mm

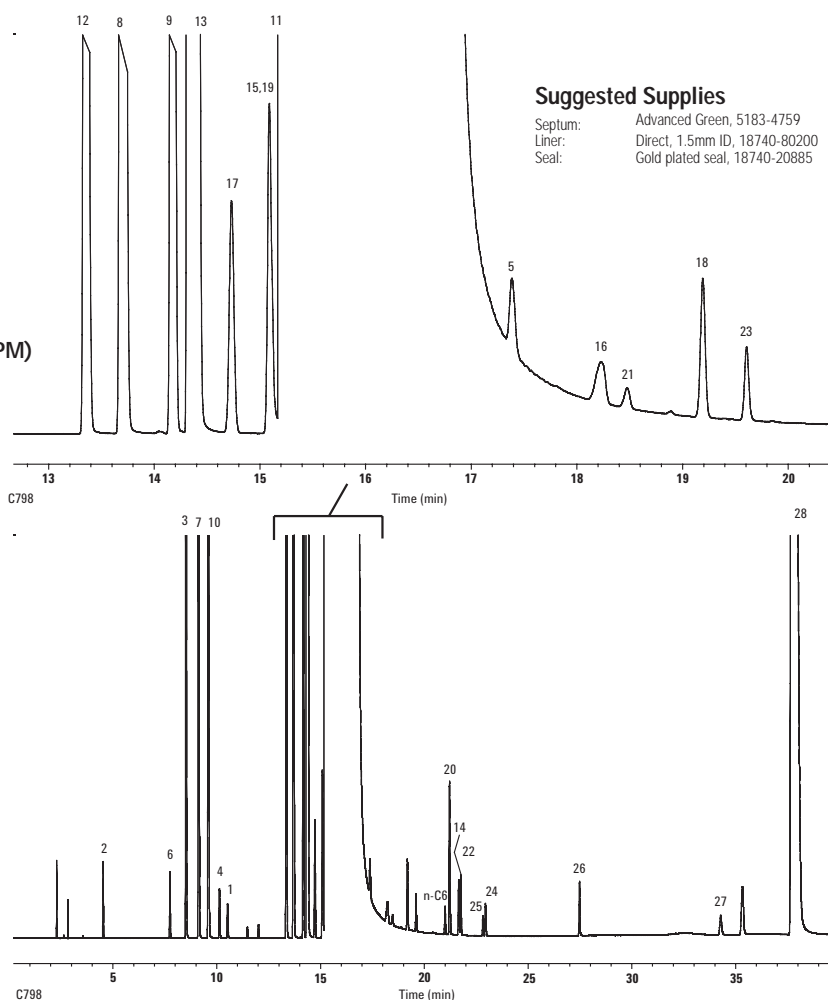
Carrier: Helium, 6.0 mL/min (constant flow mode)
Oven: 45°C for 3 min
6°/min to 195°C
195°C for 15 min
Injection: Split, 250°C
Split ratio 1:50
Detector: FID, 250°C
Sample: 0.5 µL

Gravimetric concentration (PPM)

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Acetylene	20.7
2. Propane	19.8
3. Propylene	296
4. Propadiene (allene)	21.1
5. Propyne (methylacetylene)	21
6. Cyclopropane	20
7. Isobutane	506
8. Butene-1	999
9. Isobutylene	495
10. n-Butane	494
11. 1,3-Butadiene	balance
12. trans-2-Butene	442
13. cis-2-Butene	1946
14. 1-Butyne (ethylacetylene)	20.2
15. 1,2-Butadiene	28.9
16. 3-Methyl-1-butene	19.8
17. Isopentane	50.1
18. Pentene-1	29.8
19. n-Pentane	50.1
20. 2-Butyne (dimethylacetylene)	150
21. trans-2-Pentene	5.57
22. Isoprene	20
23. cis-2-Pentene	13.9
24. trans-1,3-Pentadiene	13.8
25. cis-1,3-Pentadiene	7.73
26. Benzene	20.3
27. Toluene	20.2
28. Dimer (4-vinylcyclohexene-1)	



GC and GC/MS Applications

Petroleum

Extended Hydrocarbon Analysis on GS-Alumina

Column: GS-Alumina
115-3532
30 m x 0.53 mm

Carrier: Helium at 52 cm/sec (6.7 mL/min), measured at 100°C

Oven: 100°C for 1 min
100-140°C at 8°/min
140°C for 0.5 min
140-200°C at 30°/min

Injection: Split, 250°C

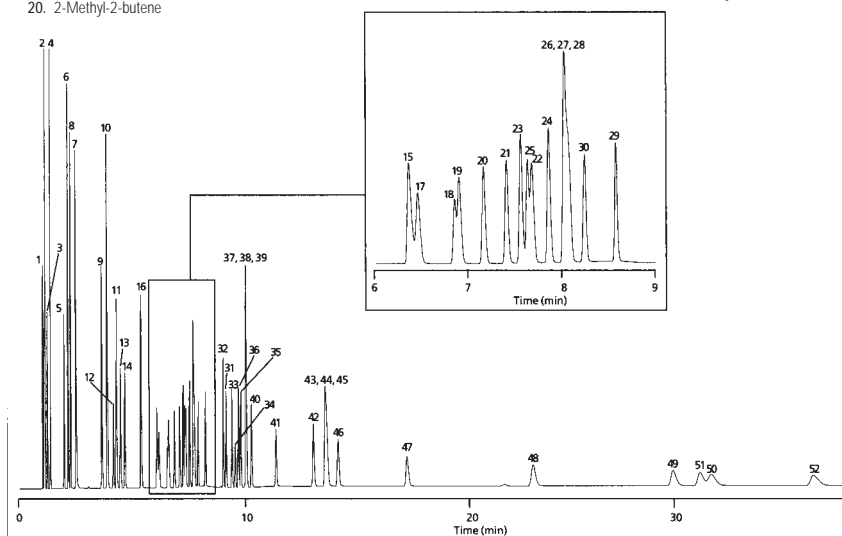
Detector: FID, 275°C

Sample: Nitrogen makeup gas at 29 mL/min
300 µL injection of 100 ppm V SUMMA cannister mixture

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

- | | | |
|-----------------------|-------------------------|--|
| 1. Methane | 21. 1-Pentene | 39. 3-Methylhexane |
| 2. Ethane | 22. cis-2-Pentene | 40. n-Heptane |
| 3. Ethylene | 23. Methylcyclopentane | 41. Benzene |
| 4. Propane | 24. 2,2-Dimethylbutane | 42. Isooctane (2,2,4-Trimethylpentane) |
| 5. Propylene | 25. Cyclohexane | 43. 2,3,4-Trimethylpentane |
| 6. Isobutane | 26. 2,3-Dimethylbutane | 44. 3-Methylheptane |
| 7. Acetylene | 27. 2-Methylpentane | 45. 2-Methylheptane |
| 8. n-Butane | 28. 3-Methylpentane | 46. n-Octane |
| 9. trans-2-Butene | 29. Isoprene | 47. Toluene |
| 10. 1-Butene | 30. n-Hexane | 48. n-Nonane |
| 11. cis-2-Butene | 31. 4-Methyl-1-pentene | 49. Ethylbenzene |
| 12. Cyclopentane | 32. trans-2-Hexene | 50. m-Xylene |
| 13. Isopentane | 33. 2-Methyl-1-pentene | 51. p-Xylene |
| 14. n-Pentane | 34. cis-2-Hexene | 52. o-Xylene |
| 15. Propyne | 35. 2,4-Dimethylpentane | 53. Styrene |
| 16. 1,3-Butadiene | 36. Methylcyclohexane | 54. Isopropylbenzene (Cumene) |
| 17. Cyclopentane | 37. 2,3-Dimethylpentane | 55. n-Propylbenzene |
| 18. 3-Methyl-1-butene | 38. 2-Methylhexane | 56. 1,3,5-Trimethylbenzene |
| 19. trans-2-Pentene | | 57. 1,2,4-Trimethylbenzene |
| 20. 2-Methyl-2-butene | | |



Extended Hydrocarbon Analysis on GS-GasPro

Column: GS-GasPro
113-4362
60 m x 0.32 mm

Carrier: Helium at 40 cm/sec (3.3 mL/min), measured at 80°C

Oven: 80°C for 0.5 min
80-175°C at 25°/min
175°C for 2 min
175-250°C at 25°/min

Injection: Split, 250°C

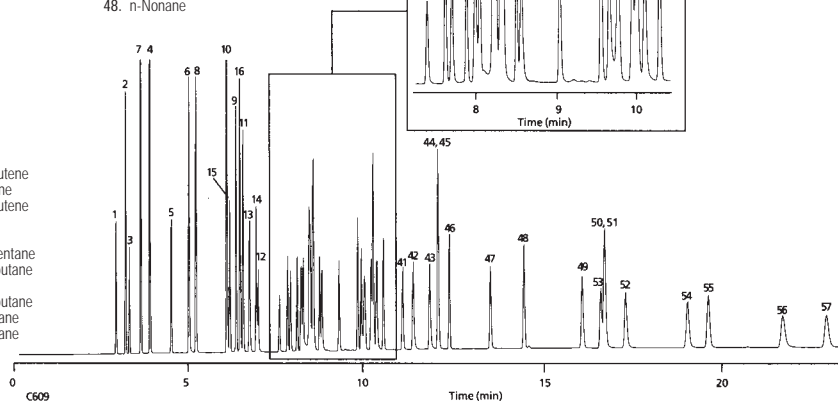
Detector: FID, 275°C

Sample: Nitrogen makeup gas at 32 mL/min
500 µL injection of 100 ppm V SUMMA cannister mixture

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

- | | |
|--|-------------------------------|
| 29. Isoprene | 49. Ethylbenzene |
| 30. n-Hexane | 50. m-Xylene |
| 31. 4-Methyl-1-pentene | 51. p-Xylene |
| 32. trans-2-Hexene | 52. o-Xylene |
| 33. 2-Methyl-1-pentene | 53. Styrene |
| 34. cis-2-Hexene | 54. Isopropylbenzene (Cumene) |
| 35. 2,4-Dimethylpentane | 55. n-Propylbenzene |
| 36. Methylcyclohexane | 56. 1,3,5-Trimethylbenzene |
| 37. 2,3-Dimethylpentane | 57. 1,2,4-Trimethylbenzene |
| 38. 2-Methylhexane | |
| 39. 3-Methylhexane | |
| 40. n-Heptane | |
| 41. Benzene | |
| 42. Isooctane (2,2,4-Trimethylpentane) | |
| 43. 2,3,4-Trimethylpentane | |
| 44. 3-Methylheptane | |
| 45. 2-Methylheptane | |
| 46. n-Octane | |
| 47. Toluene | |
| 48. n-Nonane | |



GC and GC/MS Applications Petroleum

Refinery Gas I

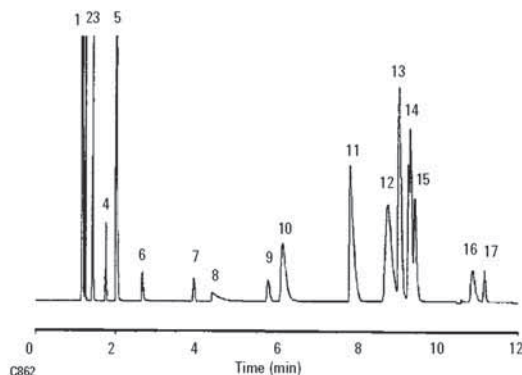
Column: HP-PLOT Q
19095P-Q04
30 m x 0.53 mm, 40.00 μ m

Carrier: Helium p=9.0 psi @ 60°C
Oven: 60°C for 5 min
60-200°C at 20°C/min
200°C for 1 min

Injection: Split, 250°C
Split flow 100mL/min
0.25 cc valve

Detector: TCD, 250°C

Sample: Refinery gas and others



1. Air/CO
2. C1
3. CO2
4. Ethylene
5. C2
6. H2O
7. COS
8. H2O
9. Propylene
10. C3
11. MeOH
12. I-C4
13. I-C4
14. n-C4
15. cis-C4
16. I-C5
17. n-C5

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Refinery Gas II

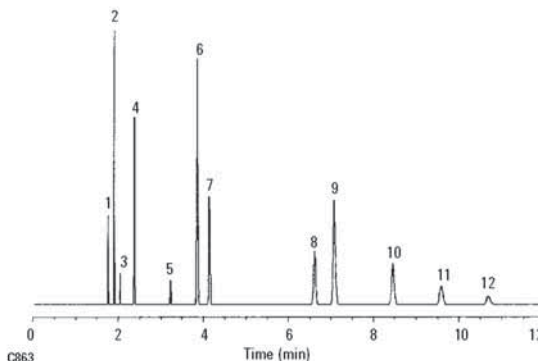
Column: HP-PLOT Al₂O₃ S
19095P-S25
50 m x 0.32 mm, 15.00 μ m

Carrier: Helium 7 mL/min
Oven: 100°C Isothermal

Injection: Split, 250°C
Split ratio 100:1

Detector: FID, 250°C

Sample: 5 μ L



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. iso-Butane
7. n-Butane
8. trans-2-Butene
9. 1-Butene
10. cis-2 Butene
11. iso-Pentane
12. n-Pentane

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Refinery Gas III

Column: HP-PONA
19091S-001
50 m x 0.20 mm, 0.50 μ m

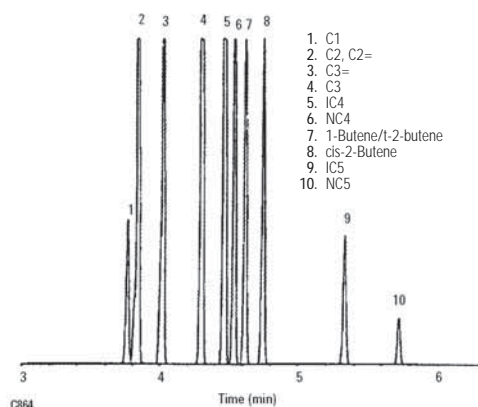
Carrier: Helium, 1 mL/min
Oven: 35°C for 3 min
35-100°C at 10°C/min
100°C for 5 min

Injection: Split 200 - 400:1
2 cc loop

Detector: FID, 250°C

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885



1. C1
2. C2, C2=
3. C3=
4. C3
5. IC4
6. NC4
7. 1-Butene/t-2-butene
8. cis-2-Butene
9. IC5
10. NC5

Volatile Sulfur Compounds

Column: DB-1
123-1035
30 m x 0.32 mm, 5.00 μ m

Carrier: Helium at 23 cm/sec (H₂S at 50°C)
Oven: 50°C for 4 min, 50-120°C at 20°C/min,
120°C for 4 min, 120-220°C at
25°C/min, 220°C for 2.5 min

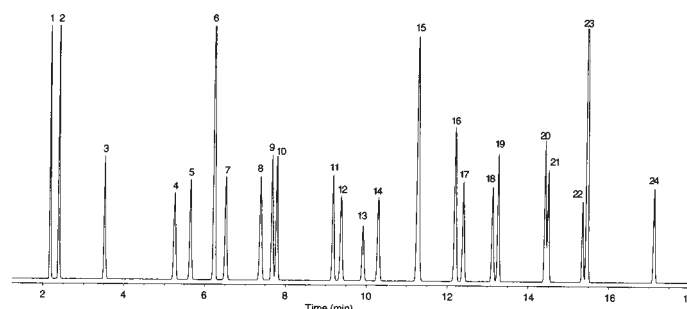
Injection: Split, 200°C
Split ratio 1:10

Detector: PFPD (OI Analytical), 220°C

Sample: 600 μ L of sulfur gas standard
3 ppmV each component

*Agilent wishes to thank Air Toxics, Ltd.
(Folsom, CA) for providing the standard
mixture shown in this chromatogram.*

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Carbon disulfide
7. 2-Propanethiol
8. 2-Methyl-2-propanethiol
9. 1-Propanethiol
10. Ethyl methyl sulfide
11. Thiophene
12. 2-Methyl-1-propanethiol
13. Diethyl sulfide
14. 1-Butanethiol
15. Methyl disulfide
16. 2-Methylthiophene
17. 3-Methylthiophene
18. Tetrahydrothiophene
19. 1-Pentanethiol
20. 2-Ethylthiophene
21. 2,5-Dimethylthiophene
22. 1-Hexanethiol
23. Ethyl disulfide
24. 1-Heptanethiol



GC and GC/MS Applications

Petroleum

Sulfur Gas Analysis in Light Hydrocarbon Streams I

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

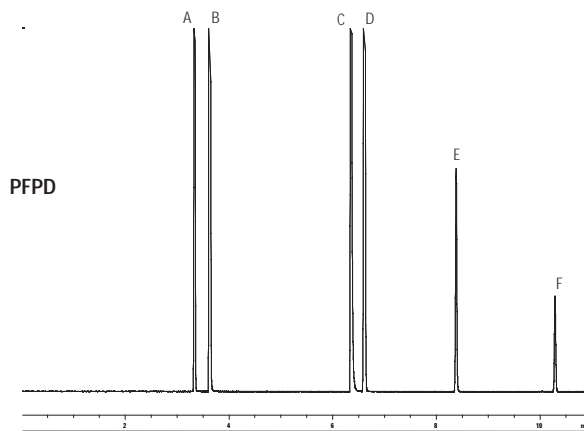
Carrier: Helium, 10 psig, 2.0 mL/min @ 60°C
Oven: 60°C for 2 min, 20°/min to 260°C and hold
Injection: Split, 200°C
Split ratio 1:20
Detector: Two separate analyses under identical conditions on FID and PFPD

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

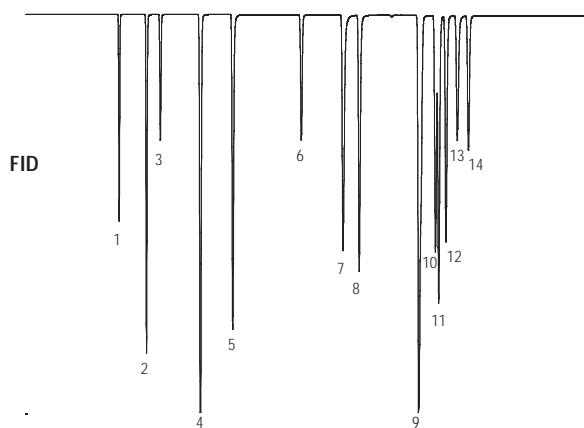
Sulfur Compounds (PFPD)

- A. Carbonyl sulfide
- B. Hydrogen sulfide
- C. Sulfur dioxide
- D. Carbon disulfide
- E. Methyl mercaptan
- F. Ethyl mercaptan

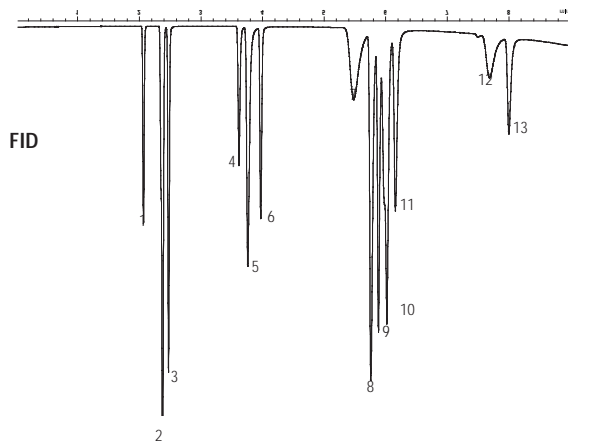
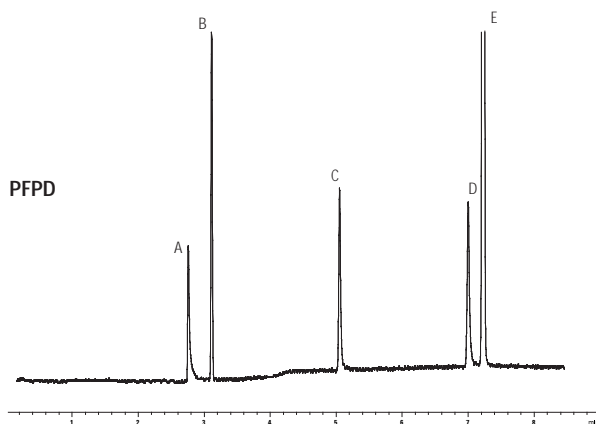


Hydrocarbons (FID)

- 1. Methane
- 2. Ethane
- 3. Ethylene
- 4. Acetylene
- 5. Propane
- 6. Propylene
- 7. iso-Butane
- 8. n-Butane
- 9. 1-Butene/Methyl acetylene
- 10. trans-2-Butene
- 11. 1,3-Butadiene
- 12. cis-2-Butene
- 13. iso-Pentane
- 14. n-Pentane



GC and GC/MS



Sulfur Gas Analysis in Light Hydrocarbon Streams II

Column: **GS-Q**
113-3432
30 m x 0.32 mm

Carrier: Helium, 10 psig, 1.7 mL/min @ 100°C
Oven: 100°C for 2 min, 20°/min to 250°C and hold
Injection: Split, 200°C
Split ratio 1:20
Detector: Two separate analyses under identical conditions on FID and PFPD

Sulfur compounds (PFPD)

- A. Hydrogen sulfide
- B. Carbonyl sulfide
- C. Methyl mercaptan
- D. Ethyl mercaptan
- E. Carbon disulfide

Suggested Supplies

Septum: Advanced Green, 5183-4759
Liner: Direct, 1.5mm ID, 18740-80200
Seal: Gold plated seal, 18740-20885

Hydrocarbons (FID)

- 1. Methane
- 2. Ethylene/Acetylene
- 3. Ethane
- 4. Propylene
- 5. Propane
- 6. Methyl acetylene
- 7. iso-Butane
- 8. 1-Butene
- 9. 1,3-Butadiene
- 10. n-Butane/cis-2-Butene
- 11. trans-2-Butene
- 12. iso-Pentane
- 13. n-Pentane

GC and GC/MS Applications Petroleum

Sulfur Compounds in Propylene (1 ppm)

Column: GS-GasPro
113-4332
30 m x 0.32 mm

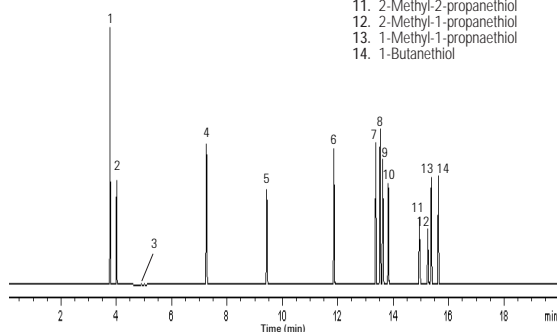
Oven: 60°C for 2.5 minutes
60-250°C at 10°C/min
OI Analytical Volatiles Inlet

Injection: Split ratio 5:1
200 µL gas sampling valve

Detector: OI Analytical Model 5380 PFPD

Sample: 1 ppm Sulfur compounds in Propylene

1. COS
2. H₂S
3. Propylene
4. CS₂
5. Methyl mercaptan
6. Ethyl mercaptan
7. Thiophene
8. Dimethyl sulfide
9. 2-Propanethiol
10. 1-Propanethiol
11. 2-Methyl-2-propanethiol
12. 2-Methyl-1-propanethiol
13. 1-Methyl-1-propanethiol
14. 1-Butanethiol



Chromatogram courtesy of OI Analytical.

Mercaptans

Column: GS-GasPro
113-4332
30 m x 0.32 mm

Carrier: Helium at 25 cm/sec

Oven: 175°C for 2 min
175-260°C at 10°/min

Injection: Split
Split flow 80 mL/min

Detector: FID

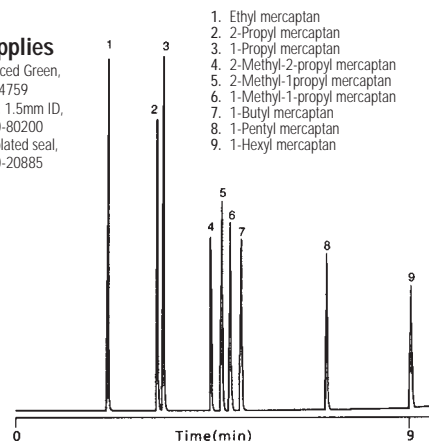
Sample: 0.2 mL

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Ethyl mercaptan
2. 2-Propyl mercaptan
3. 1-Propyl mercaptan
4. 2-Methyl-2-propyl mercaptan
5. 2-Methyl-1-propyl mercaptan
6. 1-Methyl-1-propyl mercaptan
7. 1-Butyl mercaptan
8. 1-Pentyl mercaptan
9. 1-Hexyl mercaptan

Sulfur Compounds in Natural Gas-Synthetic Mixture

Column: HP-1
19091Z-205
50 m x 0.20 mm, 0.50 µm

Carrier: Helium

Oven: 35°C for 10 min
35-300°C at 7°C/min

Injection: Split 100:1

Detector: FPD

Sample: 0.5 mL

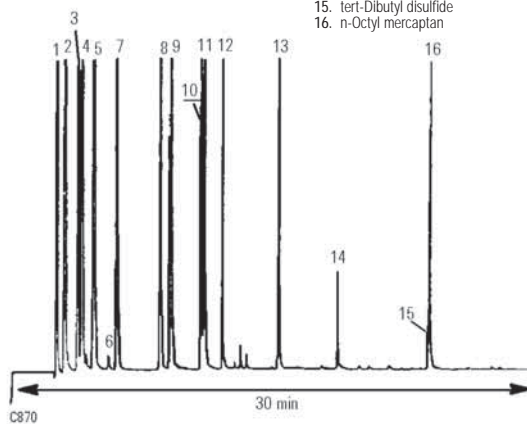
1. Hydrogen sulfide
2. Methyl mercaptan
3. Ethyl mercaptan
4. Dimethyl sulfide
5. Isopropyl mercaptan
6. tert-Butyl mercaptan
7. n-Propyl mercaptan
8. Thiophene and sec-Butyl mercaptan
9. Isobutyl mercaptan
10. n-Butyl mercaptan
11. tert-Amyl mercaptan
12. Isoamyl mercaptan
13. n-Amyl mercaptan
14. n-Hexyl mercaptan
15. tert-Dibutyl disulfide
16. n-Octyl mercaptan

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, 18740-20885



Sulfur Compounds in Naphtha

Column: HP-PONA
19091S-001
50 m x 0.20 mm, 0.50 µm

Carrier: Helium, 26 cm/sec

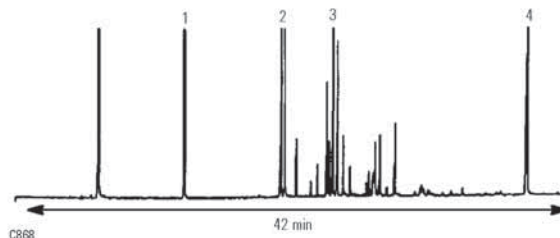
Oven: 35°C for 15 min
35-70°C at 8°C/min
70-130°C at 15°C/min

Injection: Split ratio 400:1

Detector: FPD

Sample: 3 µL

1. Thiophene
2. Methyl thiophenes
3. Ethyl and dimethyl thiophenes
4. Benzothiophene



GC and GC/MS Applications

Petroleum

Aromatics Analysis: ASTM D16 Analytes

Column: **HP-INNOWax**
19091N-216

60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi, constant pressure mode
Oven: 75°C for 10 min

3°C/min to 100°C

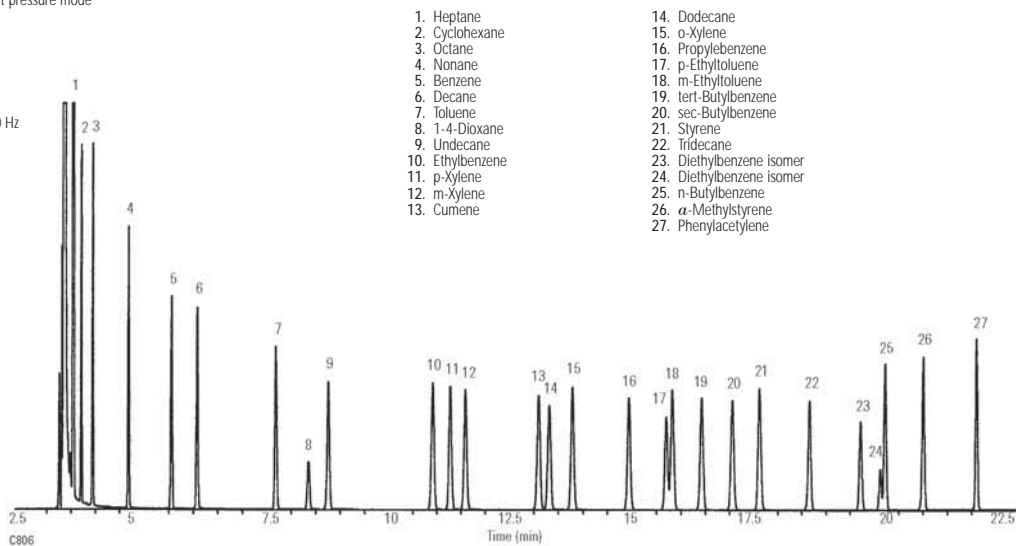
10°C/min to 145°C

Injection: Split, 250°C

Split ratio 100:1 to 400:1

Detector: FID, 250°C

Data acquisition rate at 20 Hz



Aromatics Analysis - Ethylbenzene Impurities

Column: **HP-INNOWax**
19091N-216

60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi, constant pressure mode
Oven: 75°C for 10 min

3°C/min to 100°C

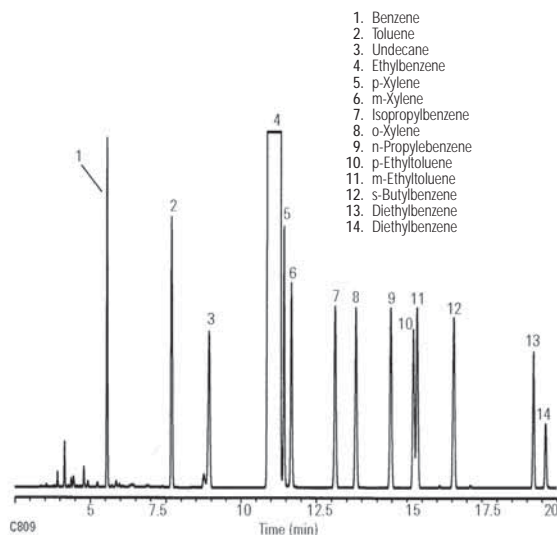
10°C/min to 145°C

Injection: Split, 250°C

Split ratio 100:1 to 400:1

Detector: FID, 250°C

Data acquisition rate at 20 Hz



Impurities in p-Xylene-ASTM D3798

Column: **HP-INNOWax**
19091N-216

60 m x 0.32 mm, 0.50 µm

Carrier: Helium, 32 cm/sec, 19.9 psi (60°C),

2.5 mL/min constant flow

Oven: 60°C for 1 min

60-92°C at 4°C/min

92°C for 4.5 min

92-220°C at 20°C/min

220°C for 5 min

Injection: Split, 220°C

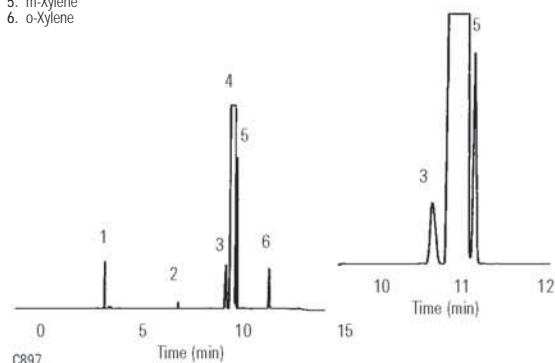
Split ratio 100:1

Detector: FID, 270°C

Sample: 0.5 µL

Neat, 99%+

1. Non aromatic hydrocarbon
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. o-Xylene



GC and GC/MS Applications

Petroleum

Fast Styrene Analysis

Column: DB-WAX
127-7013
10 m x 0.10 mm, 0.20 µm

Carrier: Helium 46.4 psi (48 cm/sec), constant flow, 0.5 mL/min

Oven: 80°C for 1.4 min
80-150°C at 33.8°C/min
150°C for 0.5 min

Injection: Split ratio 300:1

Detector: FID

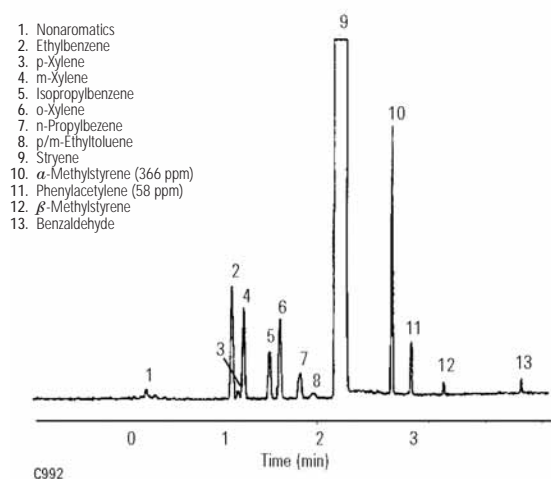
Sample: 0.1 µL

Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Direct, 1.5mm ID, 18740-80200

Seal: Gold plated seal, 18740-20885



Ethylene Oxide Synthetic Standard

Column: HP-PLOT Q
19095P-Q04
30 m x 0.53 mm, 40.00 µm

Carrier: Helium, 25 psi
50°C for 2 min

Oven: 50-250°C at 15°C/min

Injection: Split ratio 40:1

Detector: FID

Sample: 1 µL liquid injection
sample 2000 ppm v/v

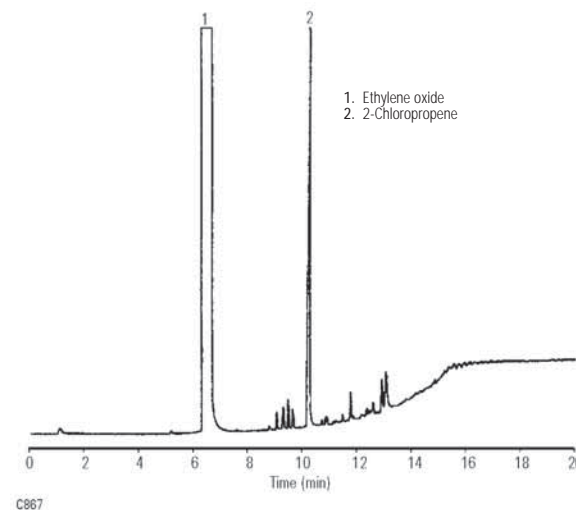
Suggested Supplies

Septum: Advanced Green, 5183-4759

Liner: Lnr.gen purp split/splts.tpr.glswl.deac, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

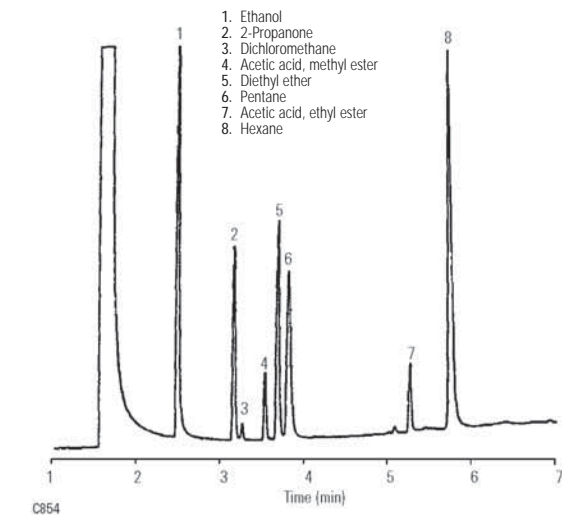


Oxygenates

Column: HP-PLOT Q
19095P-Q04
30 m x 0.53 mm, 40.00 µm

Carrier: Helium, 25 psig
150°C for 2 min
150-250°C at 15°C/min

Detector: FID



Oxygenates in Gasoline ASTM D5599 (GC-OFID)

Column: HP-1
19091Z-236
60 m x 0.25 mm, 1.00 µm

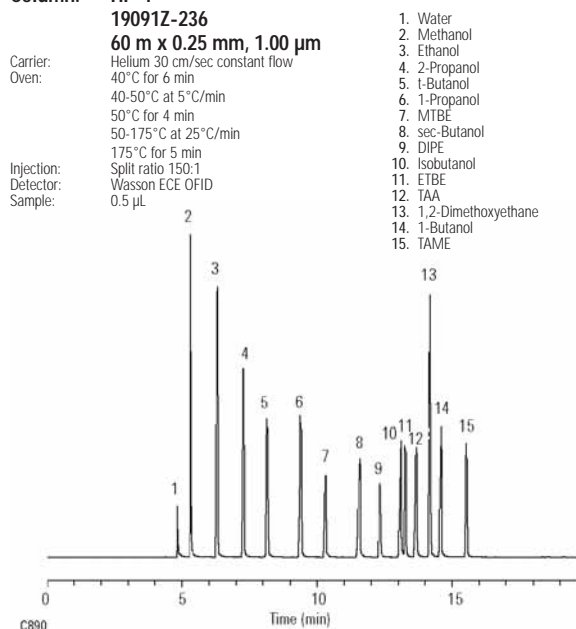
Carrier: Helium 30 cm/sec constant flow

Oven: 40°C for 6 min
40-50°C at 5°C/min
50°C for 4 min
50-175°C at 25°C/min
175°C for 5 min

Injection: Split ratio 150:1

Detector: Wasson ECE OFID

Sample: 0.5 µL



GC and GC/MS Applications

Petroleum

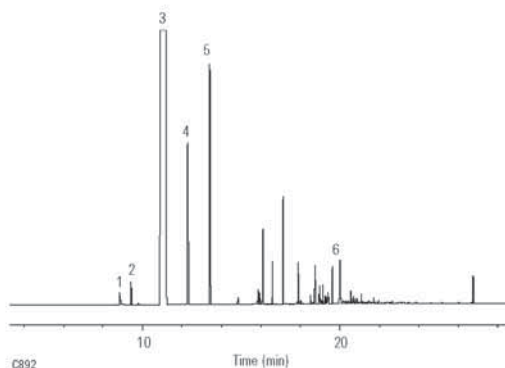
Denatured Fuel Ethanol-ASTM D5501

Column: HP-1
19091Z-530
100 m x 0.25 mm, 0.50 µm

Carrier: Helium 24 cm/sec
Oven: 15°C for 12 min
15-250°C at 19°C/min

Injection: 250°C for 20 min
Split ratio 200:1

Detector: FID 250°C
Sample: Nitrogen makeup gas at 30 mL/min
0.5 µL



1. Methanol
2. n-Butane
3. Ethanol
4. Isopentane
5. n-Pentane
6. Other hydrocarbons

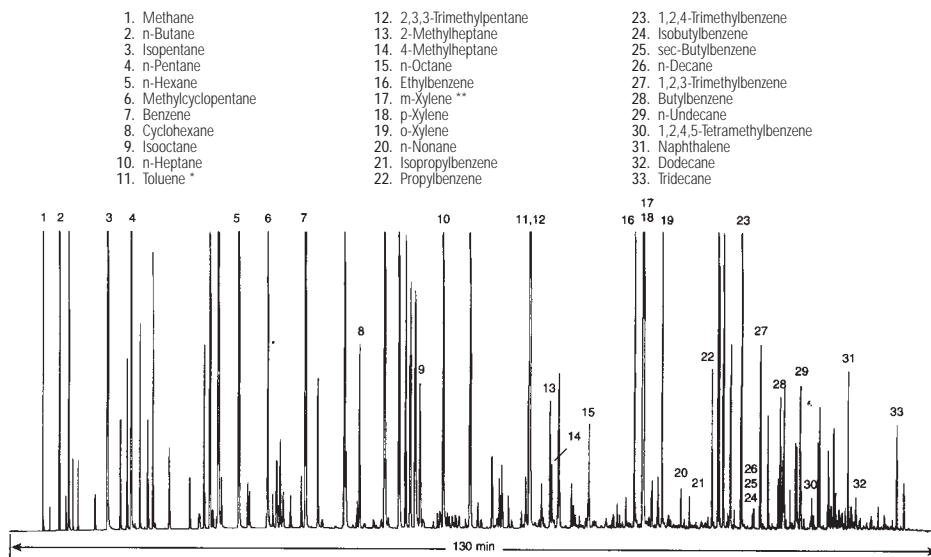
Unleaded Gasoline II

Column: DB-Petro
122-10A6
100 m x 0.25 mm, 0.50 µm

Carrier: Helium at 25.6 cm/sec
Oven: 0°C for 15 min
0-50°C at 1°C/min
50-130°C at 2°C/min
130-180°C at 4°C/min

Injection: 180°C for 20 min
Split, 200°C
Split ratio 1:300

Detector: FID, 250°C
Sample: Nitrogen makeup gas at 30 mL/min
1 µL of neat sample



- | | | |
|-----------------------|----------------------------|--------------------------------|
| 1. Methane | 12. 2,3,3-Trimethylpentane | 23. 1,2,4-Trimethylbenzene |
| 2. n-Butane | 13. 2-Methylheptane | 24. Isobutylbenzene |
| 3. Isopentane | 14. 4-Methylheptane | 25. sec-Butylbenzene |
| 4. n-Pentane | 15. n-Octane | 26. n-Decane |
| 5. n-Hexane | 16. Ethylbenzene | 27. 1,2,3-Trimethylbenzene |
| 6. Methylcyclopentane | 17. m-Xylene ** | 28. Butylbenzene |
| 7. Benzene | 18. p-Xylene | 29. n-Undecane |
| 8. Cyclohexane | 19. o-Xylene | 30. 1,2,4,5-Tetramethylbenzene |
| 9. Isooctane | 20. n-Nonane | 31. Naphthalene |
| 10. n-Heptane | 21. Isopropylbenzene | 32. Dodecane |
| 11. Toluene * | 22. Propylbenzene | 33. Tridecane |

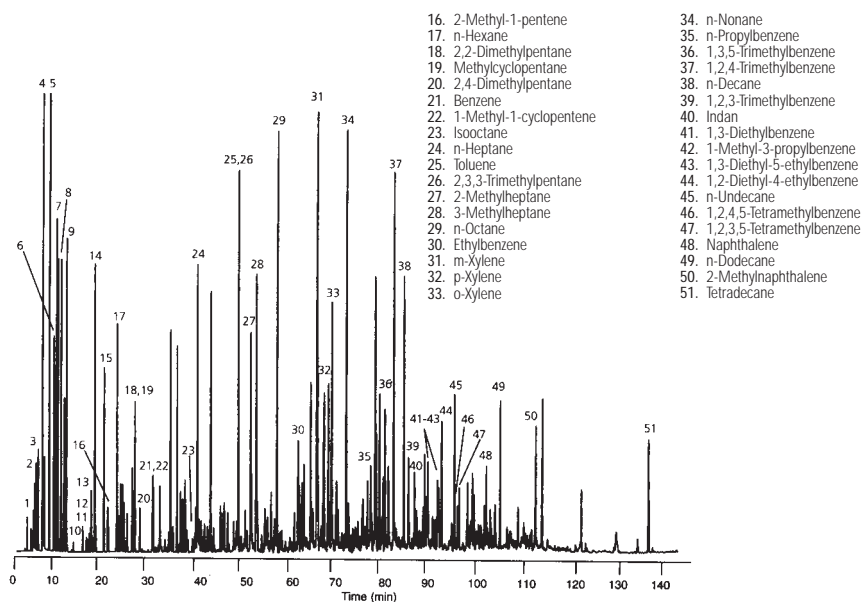
PONA Mix as Specified by AFNOR Method #2

Column: DB-Petro
128-1056
50 m x 0.20 mm, 0.50 µm

Carrier: Helium at 16.7 cm/sec,
measured at 35°C
Oven: 10°C for 15 min
10-70°C at 1.3°C/min

Injection: 70-250°C at 1.7°C/min
Split, 250°C

Detector: FID, 250°C
Sample: Nitrogen makeup gas at 30 mL/min
0.3 µL petroleum reformate



1. Ethane
2. Propane
3. n-Butane
4. Ethanol
5. Isopentane
6. 1-Pentene
7. 2-Methyl-1-butene
8. n-Pentane
9. 2-Methyl-2-butene
10. 2,2-Dimethylbutane
11. 1-Cyclopentene
12. Cyclopentane
13. 2,3-Dimethylbutane
14. 2-Methylpentane
15. 3-Methylpentane

16. 2-Methyl-1-pentene
17. n-Hexane
18. 2,2-Dimethylpentane
19. Methylcyclopentane
20. 2,4-Dimethylpentane
21. Benzene
22. 1-Methyl-1-cyclopentene
23. Isooctane
24. n-Heptane
25. Toluene
26. 2,3,3-Trimethylpentane
27. 2-Methylheptane
28. 3-Methylheptane
29. n-Octane
30. Ethylbenzene
31. m-Xylene
32. p-Xylene
33. o-Xylene

34. n-Nonane
35. n-Propylbenzene
36. 1,3,5-Trimethylbenzene
37. 1,2,4-Trimethylbenzene
38. n-Decane
39. 1,2,3-Trimethylbenzene
40. Indan
41. 1,3-Diethylbenzene
42. 1-Methyl-3-propylbenzene
43. 1,3-Diethyl-5-ethylbenzene
44. 1,2-Diethyl-4-ethylbenzene
45. n-Undecane
46. 1,2,4,5-Tetramethylbenzene
47. 1,2,3,5-Tetramethylbenzene
48. Naphthalene
49. n-Dodecane
50. 2-Methylnaphthalene
51. Tetradecane

GC and GC/MS Applications

Petroleum

Aromatics in Finished Gasoline- ASTM Method 5769

Column: DB-1
122-1063
60 m x 0.25 mm, 1.00 µm

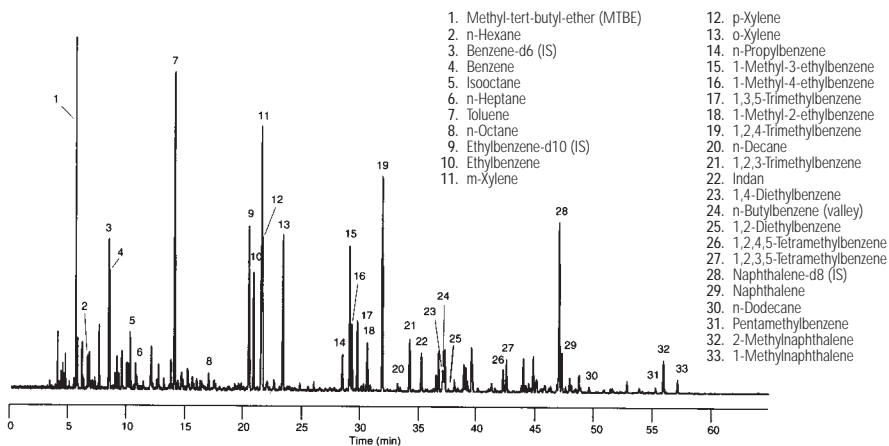
Carrier: Helium at 35 cm/sec,
measured at 50°C

Oven: 50°C for 1 min
50-190°C at 2°/min
190°C for 1 min

Injection: Split, 250°C
Split ratio 1:100

Detector: MSD

Sample: 0.3 µL unleaded gasoline
Calib std: ASTM/EPA gasoline
refinery aromatics
(AccuStandard M-GRA-CAL/IS-SET)



Simulated Distillation

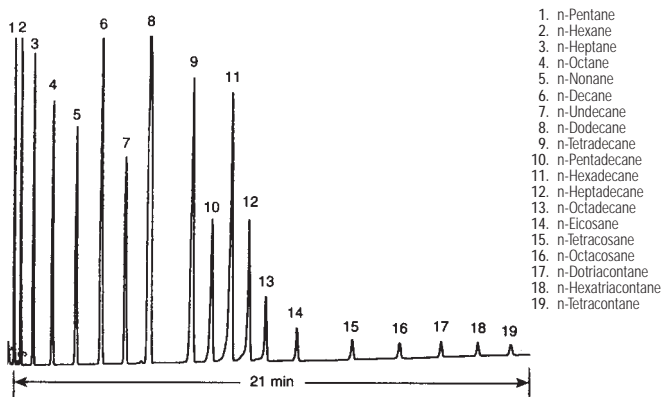
Column: DB-2887
125-2814
10 m x 0.53 mm, 3.00 µm

Carrier: Helium at 7 mL/min

Oven: 35-350°C at 15°/min

Injection: Direct

Detector: FID
Nitrogen makeup gas
at 30 mL/min



Suggested Supplies

Septum: 11 mm Non-Slick BTO septa, 5183-4757

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

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267

Reference Gas Oil

Column: DB-2887
125-2814
10 m x 0.53 mm, 3.00 µm

Carrier: Helium at 7 mL/min

Oven: 35-350°C at 15°/min

Injection: Direct

Detector: FID
Nitrogen makeup gas
at 30 mL/min

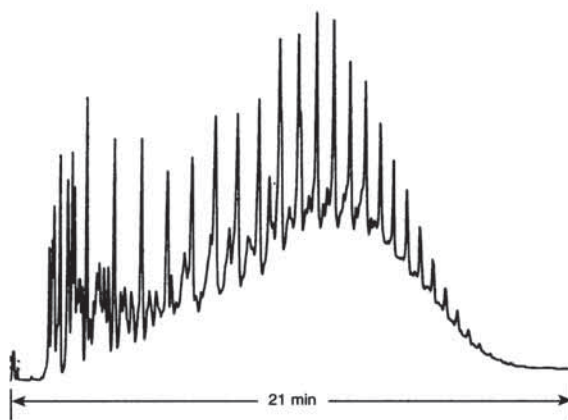
Suggested Supplies

Septum: Advanced Green, 5183-4759

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

Seal: Gold plated seal, 18740-20885

Syringe: 10 µl tapered, FN 23-26s/42/HP, 5181-1267



C167

GC and GC/MS Applications

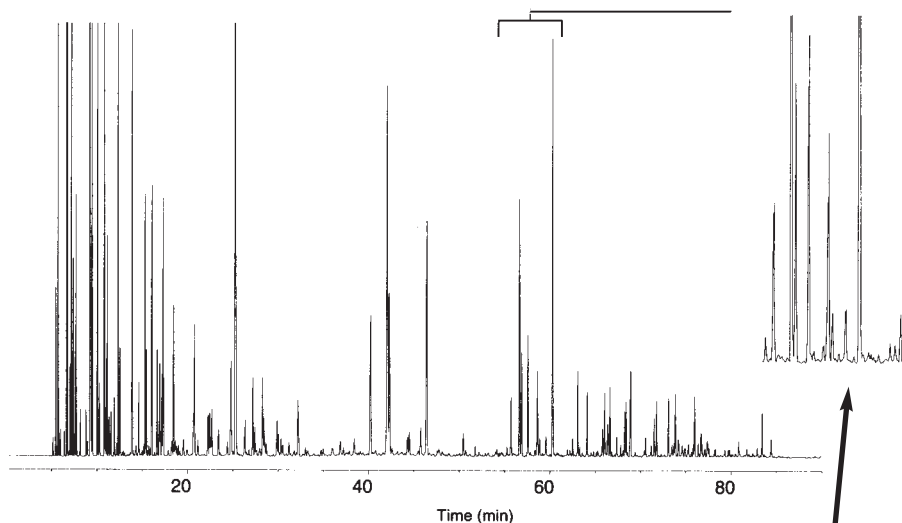
Petroleum

Regular Unleaded Gasoline (California Phase 1) - "Normal" GC Run I

Column: DB-Petro
122-10A6
100 m x 0.25 mm, 0.50 μ m

Carrier: Hydrogen at 31 cm/sec
Oven: 35°C for 9.5 min
45°C for 11 min
45-60°C at 1.4°/min
60°C for 11 min
60-220°C at 2.7°/min
220°C for 3.6 min

Injection: Split ratio 1:200
Detector: FID, 300°C
Sample: 0.2 μ L



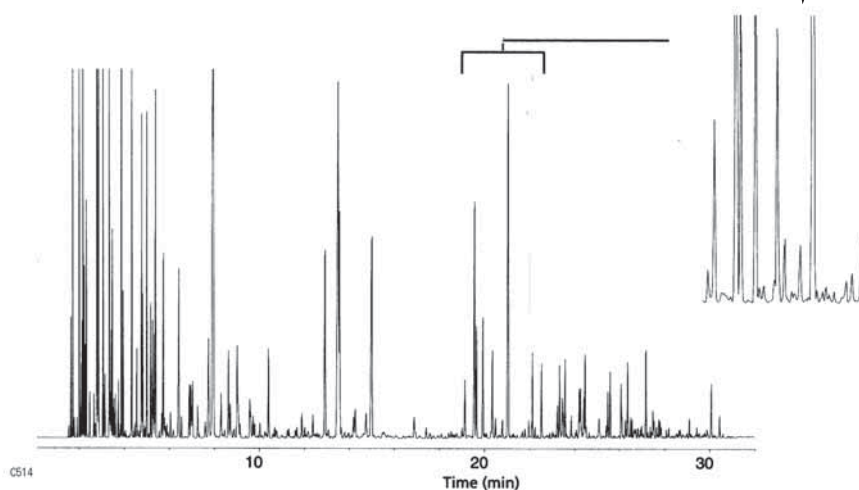
Compare Resolution

Regular Unleaded Gasoline (California Phase 1) - "Normal" GC Run II

Column: DB-1
127-1046
40 m x 0.10 mm, 0.20 μ m

Carrier: Hydrogen at 34.8 cm/sec
Oven: 35°C for 3.6 min
35-45°C at 36.1°/min
45°C for 4.2 min
45-60°C at 3.9°/min
60°C for 4.2 min
60-220°C at 6.9°/min
220°C for 1.4 min

Injection: Split ratio 1:400
Detector: FID, 300°C
Sample: 0.2 μ L



GC and GC/MS Applications

Petroleum

n-Paraffin Standard

Column: DB-HT SimDis
145-1001

5 m x 0.53 mm, 0.15 µm

Carrier: Helium at 18 mL/min, measured at 35°C

Oven: -30-430°C at 10°/min

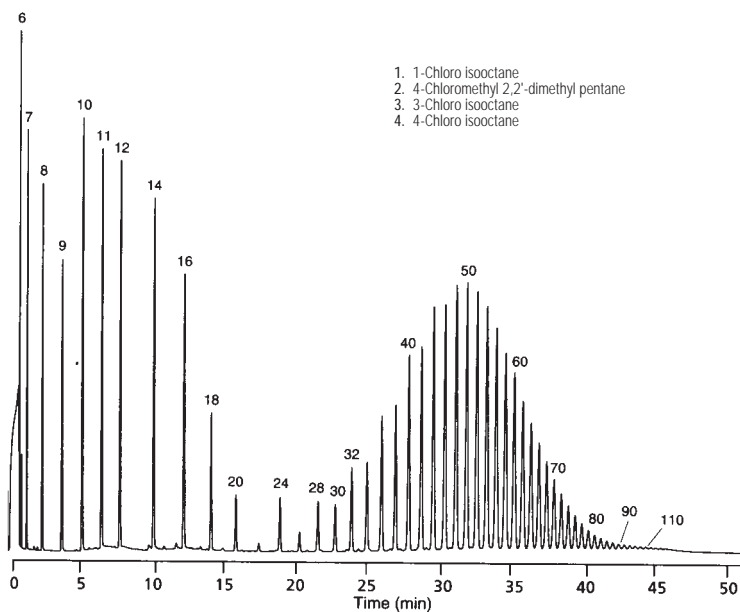
Injection: OPTIC PTV

55-450°C at 2°/sec

Detector: FID, 450°C

Nitrogen makeup gas at 15 mL/min

Sample: 0.5 µL of about 2% n-paraffins in CS₂



Polyethylene

Column: DB-1

125-1011

15 m x 0.53 mm, 0.15 µm

Carrier: Helium at 8 mL/min

Oven: 120-360°C at 10°/min

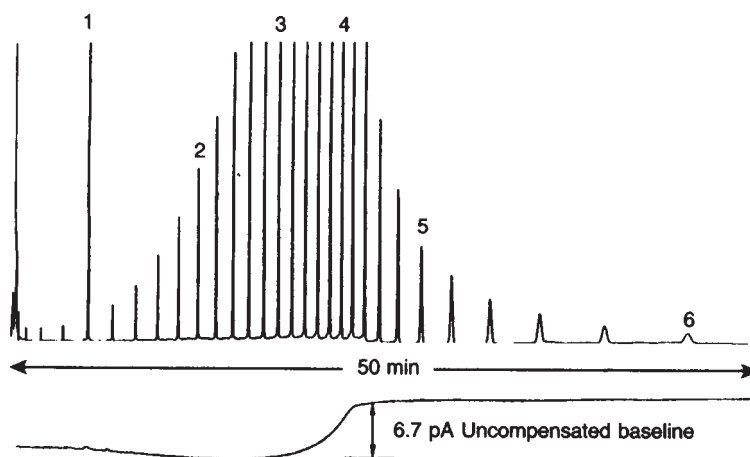
Injection: Split ratio 1:500

Detector: FID, 300°C

Nitrogen makeup gas at 30 mL/min

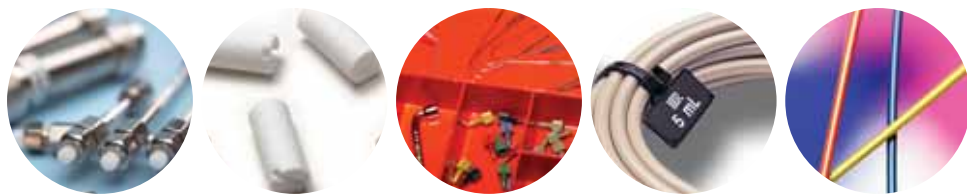
Sample: 0.5 µL

3% Solution in CS₂



LC and LC/MS

General LC Supplies	446-460	ZORBAX 300Å Extend-C18.....	562-564
<i>Tubing and Fittings</i>	446-451	ZORBAX Rx.....	565-566
<i>Solvent Filtration</i>	452-454	ZORBAX for LC/MS	
<i>Manual Injection Valves</i>	455-459	and High Throughput HPLC	567
<i>Switching Valve Solutions</i>	460	ZORBAX Rapid Resolution	
1100/1200 Series Instrument Parts and Supplies.....	461-499	<i>High Throughput 1.8 µm</i>	568-572
<i>Introduction & Maintenance Schedule</i>	461-462	ZORBAX Rapid Resolution 3.5 µm.....	573-575
<i>LC Tools</i>	463	ZORBAX Solvent Saver	576-577
<i>Vacuum Degasser Supplies</i>	464	ZORBAX MicroBore.....	578-579
<i>Pump Supplies</i>	465-471	ZORBAX Capillary and Nano.....	580-584
<i>Autosampler Supplies</i>	472-478	ZORBAX Original Reversed Phase Columns	585
<i>Fraction Collector Supplies</i>	479-481	ZORBAX PrepHT.....	586-588
<i>Column Compartment Supplies</i>	482	Agilent Prep LC Columns.....	589-591
<i>Chip LC Supplies</i>	482	LiChrospher Reversed-Phase	
<i>Biocompatibility Kit</i>	483	Cartridge Columns.....	592
<i>Capillary LC Connectors</i>	483-485	LiChrosorb Columns.....	593
<i>Variable Wavelength Detector (VWD)</i>	486-488	Nucleosil Reversed-Phase Columns	593
<i>Diode Array Detector (DAD)/</i>		Asahipak Reversed-Phase Columns	594
<i>Multiple Wavelength Detector (MWD)</i>	489-493	Purospher Reversed-Phase Columns.....	594
<i>FLD, RID, and Test Solutions</i>	494-495	Superspher Reversed-Phase Columns	595
<i>LC/MSD Supplies</i>	496-499	ZORBAX Normal Phase Columns.....	595-597
1090 Series Instrument Parts and Supplies.....	500-504	LiChrospher Normal-Phase	
<i>Pump and Flow Path Supplies</i>	500-501	Cartridge Columns.....	598
<i>Sample Introduction Supplies</i>	502	Ultron Chiral Columns	599
<i>Detector Module Supplies</i>	502-504	ChiraDex Chiral Columns	600
LC and LC/MS Columns.....	505-619	Polymer Analysis.....	600-607
<i>Column Selection</i>	505-509	ZORBAX GF-250 and GF-450	
<i>Method Development</i>	510-513	Gel Filtration Columns	608-610
<i>USP Designations</i>	514-519	ZORBAX Ion Exchange Columns -	
<i>Cartridge Column Systems</i>	520-526	SAX and SCX	611-613
<i>HPLC Column Protection</i>	527	SynChropak Ion Exchange Columns	613
<i>Agilent ZORBAX Silica</i>	528-530	Special Application Columns and Kits.....	614-618
<i>ZORBAX Reversed-Phase Columns</i>	531-532	Validation Kits and Custom Columns.....	619
<i>ZORBAX Eclipse Plus</i>	533-535	LC and LC/MS Troubleshooting	620-623
<i>ZORBAX Eclipse XDB</i>	536-542	LC and LC/MS Applications.....	624-671
<i>ZORBAX 80Å StableBond</i>	543-549	<i>BioPharmaceutical</i>	624-637
<i>ZORBAX 300Å StableBond</i>	549-553	<i>Chemical/Industrial</i>	638-641
<i>ZORBAX Poroshell</i>	554-555	<i>Environmental</i>	642-648
<i>ZORBAX Bonus-RP</i>	556-558	<i>Food and Consumer Products</i>	649-657
<i>ZORBAX 80Å Extend-C18</i>	559-561	<i>Pharmaceutical</i>	658-671



LC and LC/MS

Run samples up to 20x faster than conventional LC with the Agilent 1200 Series Rapid Resolution System.

Agilent's NEW 1200 Series HPLC features 60% more resolving power than traditional LC, peak capacity greater than 600 bar, and 30-second cycle time, so you can achieve rugged, precise HPLC, ultra-fast separations, and results you can trust.

The following pages contain solutions, specifications, and chromatograms—as well as helpful column selection charts. There is even a maintenance guide that includes essential service schedules, troubleshooting tips, and problem-solving methods for the 1200 Series HPLC—and for older systems, such as Agilent's 1100 Series LC. You'll find new supplies for the 1200 Series HPLC, including high pressure (600 bar) valves and their replacement parts, flow cells and lamps with integrated ID tags, and new low ID connecting capillaries with high pressure fittings.



LC and LC/MS

Tubing and Connectors

General LC Supplies

Agilent offers a wide range of supplies for operation and maintenance of LC systems. These products have been carefully designed or selected by Agilent to work with your Agilent instruments for maximum performance and uptime.

LC Tubing and Connectors

Universal Connection Capillaries

- Made of flexible stainless steel (0.6 mm OD) with 1/16" OD tubing at both ends to accept standard fittings.
- Pre-swaged fittings are assembled according to Swagelok specifications.

Universal Connection Capillaries

From	To	ID (mm)	Length (mm)	Material*	Color Code	Fittings	Part No.	
Pump	Autosampler	0.17	600	SS	Green	Pre-swaged	G1312-67305	
		0.25	130	SS	Blue	Pre-swaged	01090-87308	
		0.25	320	SS	Blue	Pre-swaged	79835-87638	
		0.17	500	SS	Green	With fittings	G1328-87600	
		0.17	900	SS	Green	Not swaged	G1329-87300	
Autosampler	Manual Valve	0.17	900	SS	Green	Not swaged	G1329-87300	
	Universal	0.25	700	SS	Blue	1 end pre-swaged	01018-67305	
	Column	Column	0.12	180	SS	Red	1 end pre-swaged	G1313-87304
			0.12	280	SS	Red	1 end pre-swaged	01090-87610
			0.12	105	SS	Red	1 end pre-swaged	01090-87611
			0.17	180	SS	Green	1 end pre-swaged	G1313-87305
			0.17	280	SS	Green	1 end pre-swaged	01090-87304
			0.17	800	SS	Green	1 end pre-swaged	01048-87302
			0.17	130	SS	Green	1 end pre-swaged	01090-87305
	Manual valve	Column	0.17	500	SS	Green	With fittings	G1328-87600
Column compartment	Column	0.12	70	SS	Red	1 end pre-swaged	G1316-87303	
Detector	Waste	0.17	90	SS	Green	With fittings	G1316-87300	
	DAD	DAD	0.12	150	SS	Red	Pre-swaged	G1315-87312
0.17			380	SS	Green	Pre-swaged	G1315-87311	
VWD	Inlet	0.18	40	PEEK		With fittings	5062-8522	
		0.12	105	SS	Red	Without fittings	5021-1820	
		0.12	150	SS	Red	Without fittings	5021-1821	
		0.12	280	SS	Red	Without fittings	5021-1822	
		0.12	400	SS	Red	Without fittings	5021-1823	
		0.12	70	SS	Red	1 end pre-swaged	G1316-87303	
		0.17	105	SS	Green	Without fittings	5021-1816	
		0.17	150	SS	Green	Without fittings	5021-1817	
		0.17	280	SS	Green	Without fittings	5021-1818	
		0.17	400	SS	Green	Without fittings	5021-1819	
VWD	Outlet	0.17	90	SS	Green	With fittings	G1316-87300	
		0.25	48	PEEK		With fittings	5062-8535	

*SS = stainless steel

Rigid Capillary Tubing

- Squarely cut, pre-cleaned and ready to use
- Use with stainless steel fittings and ferrules (P/N 5062-2418) or PEEK fittings (P/N 0100-1516)

Length (mm)	ID (mm)	Unit	Part No.
100	0.17	10/pk	5061-3361
200	0.17	10/pk	5061-3362

Flexible Stainless Steel Capillaries Without Fittings

- Color coded stainless steel tubings
- For use with stainless steel fittings (P/N 5062-2418) or PEEK fingertight fittings (P/N 0100-1516)

ID (mm)	Length (mm)	Color Code	Volume (µl)	Part No.
0.12	105	Red	1.2	5021-1820
0.12	150	Red	1.7	5021-1821
0.12	200	Red	2.3	5065-9935
0.12	280	Red	3.2	5021-1822
0.12	400	Red	4.5	5021-1823
0.12	500	Red	5.6	5065-9964
0.17	105	Green	2.4	5021-1816
0.17	150	Green	3.4	5021-1817
0.17	200	Green	4.6	5065-9931
0.17	280	Green	6.4	5021-1818
0.17	400	Green	9.1	5021-1819
0.17	600	Green	13.6	5065-9933
0.17	700	Green	15.9	5065-9932
0.17	900	Green	20.5	5065-9963
0.25	250	Blue	12.3	5065-9979
0.25	280	Blue	13.8	5022-6508
0.25	320	Blue	15.8	5065-9980
0.25	800	Blue	39.3	5065-9930
0.50	105	None	20.6	5065-9927
0.50	150	None	29.5	5022-6509
0.50	280	None	55	5022-6510
0.50	800	None	157	5065-9926

Capillary and Fittings Kits

Description	Part No.
SS Flexible Capillary Tubing Kit Includes 0.12 mm ID capillaries: 3 each 105 mm long, 1 each 150 mm long, 1 each 280 mm long, plus fittings	5061-3304
SS Flexible Capillary Tubing Kit Includes preswaged 0.12 mm ID capillaries: 3 each 70 mm long, 1 each 280 mm long, 1 each 35 mm long	5061-3315

LC and LC/MS Tubing

PEEK Tubing

- Flexible and easy to cut to desired lengths
- Color coded for easy tracking
- Accepts both stainless and PEEK fittings
- 1/16 in. od

PEEK Tubing

Length (m)	ID (mm)	Color Code	Part No.
1.5	0.50	Orange	0890-1761
1.5	0.25	Blue	0890-1762
5	0.25	Blue	5042-6463
1.5	0.18	Yellow	0890-1763
5	0.18	Yellow	5042-6462
1.5	0.13	Red	0890-1915
5	0.13	Red	5042-6461

Other Tubing

Description	Length (m)	ID (mm)	OD (mm)	Part No.
Teflon tubing, FEP, Primary use for valve solutions	5	0.7	1.6	5062-2462
Teflon Solvent tubing, Primary use for flow path from solvent bottle to degasser, to pump	5	1.5	3.1	5062-2483
Corrugated tubing, polypropylene	5	6.5		5062-2463
Silicone Tubing, 1mm ID, 3mm OD, 5m	5	1	3	5065-9978
Clamps and micro clamps, 10/pk				5065-9976
Barbed Y-Connector PP for 3/16" ID tube, 10/pk				5065-9971

Accessories

Description	Part No.
Plastic tubing cutter	8710-1930
Blades for plastic tubing cutter, 5/pk	8710-1931



8710-1930
8710-1931

LC and LC/MS Fittings

LC Fittings

How do I choose the correct fittings?

To ensure leak-free connections – and to prevent the loss of peak shape and resolution – always use the manufacturer’s recommended fitting style with columns, valves, and unions. For example:



5062-2418



5065-4454

- Different columns have different fitting requirements. (Zorbax columns use standard Swagelok fittings).
- Agilent 1100 modules use standard Swagelok fittings.
- Rheodyne injection valves require Rheodyne fittings.



5063-6591



0100-1631



5062-8541



5065-4426



5042-6500



0350-1402

Fittings for 1/16 in. od Capillaries

Description	Part No.
1/16 in. SS fittings, front and back ferrules, 10/pk	5062-2418
1/16 in. SS long fittings, front and back ferrules, 10/pk	5065-4454
Extra long SS fittings and ferrules, 10/pk	5065-9967
1/16 in. male fittings, stainless steel	5061-3303
1/16 in. front ferrule, stainless steel	5180-4108
1/16 in. back ferrule, stainless steel	5180-4114
Finger-tight PEEK fittings, beige, 1/16 in., 10/pk	5063-6591
Finger-tight PEEK fittings, beige, 1/16 in.	0100-1516
Finger-tight PEEK long fittings, beige, 1/16 in., 10/pk	5062-8541
Finger-tight PEEK fittings, 1/16 in., 10/pk 2 each: yellow, blue, black, green, red	5065-4426
Double winged 2 piece fitting 1/16 in., 10pk	5042-6500
PEEK RheFlex 2-piece fittings, 5/pk	0100-1631
PEEK RheFlex 2-piece fittings, colored, 10/pk	0100-2175
ChromTrac identifiers, 20/pk 2 each: black, green, white. 4 each: yellow, blue, red	0350-1402
1/16 in. blanking nut, stainless steel	01080-83202
SS hex nut fitting, PEEK ferrule, max 600 bar, 6/pk	5067-1540
1/16 in. plastic fitting (plug)	0100-1259

LC and LC/MS Unions and Fittings



5022-2145



5022-2184



0100-0900



5022-2133

Unions

Description	Use With	Part No.
True ZDV Union, no fittings	Nano LC	5022-2145
ZDV Union, stainless steel, no fitting	Capillary / Nano/ Standard LC	5022-2184
ZDV union, with fittings	Standard LC	0100-0900
ZDV union, PEEK with fittings	Bio applications	0100-2441
High flow union, no fittings	Prep LC	5022-2133
PEEK adapter 1/4-28 to 10-32		0100-1847
Adapter, PEEK int. 1/4-28 to ext. 10-32		0100-2298
Barbed Y-Connector PP for 3/16" ID tube, 10/pk		5065-9971
Adapter, female to female 1/4-28		5042-8517
Adapter, male luer to female 1/4-28		5042-8518
Micro T-connector, PEEK, swept vol 29 nL		5042-8519



Special Offers

Don't forget, we have special offers throughout the year. To view them, turn to the inside back cover of this catalog, then go to www.agilent.com/chem/specialoffers.

LC and LC/MS Capillary and Fittings Kits

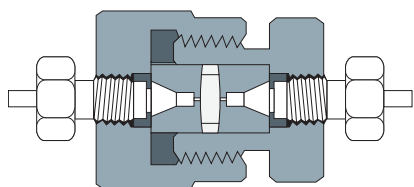


Capillary and Fittings Kits

Agilent starter kits contain the most often used capillaries and fittings. We included our genuine flexible stainless steel capillaries to make the best connection in your LC system, no matter the brand. The kits are for use with 3-4 or 1-2 mm ID columns, as well as for Micro LC columns. The free Cybertool, which contains over 30 tools is useful in every laboratory.

Description	Contents	Part No.
Capillary/fitting starter kit, 0.17 mm ID	Kit includes: Qty 1 - PEEK capillary 0.18 mm id, 1.5 m Qty 4 - Stainless steel capillary, 105 x 0.17 mm Qty 4 - Stainless steel capillary, 150 x 0.17 mm Qty 2 - Stainless steel capillary, 200 x 0.17 mm Qty 2 - Stainless steel capillary, 280 x 0.17 mm Qty 1 - Stainless steel capillary, 400 x 0.17 mm Tubing cutter for PEEK capillaries 1/16 in. stainless steel fittings, 10/pk 1/16 in. PEEK fittings, color 10/pk 1/16 in. PEEK fittings, 10/pk Qty 3 - ZDV union, stainless steel Rheotool Cybertool	5065-9939
Capillary/fitting starter kit, 0.12 mm ID	Kit includes: PEEK capillary 0.13 mm id, 1.5 m Qty 4 - Stainless steel capillary, 105 x 0.12 mm Qty 4 - Stainless steel capillary, 150 x 0.12 mm Qty 2 - Stainless steel capillary, 200 x 0.12 mm Qty 2 - Stainless steel capillary, 280 x 0.12 mm Stainless steel capillary, 400 x 0.12 mm Tubing cutter for PEEK capillaries 1/16 in. stainless steel fittings, 10/pk 1/16 in. PEEK fittings, color 10/pk 1/16 in. PEEK fittings, 10/pk Qty 3 - ZDV fitting Rheotool Cybertool	5065-9937
Capillary/fitting starter kit for 1100 Capillary LC System	Kit includes: Qty 2 - Fused silica/PEEK capillary 50 μ m, 55 cm Qty 1 - Fused silica/PEEK capillary 50 μ m, 20 cm Qty 1 - Fused silica/PEEK capillary 100 μ m, 110 cm Qty 2 - Fused silica/PEEK capillary 50 μ m, 50 cm Qty 2 - Fused silica/PEEK capillary 50 μ m, 40 cm Qty 4 - 4 mm stainless steel fitting, male 10-32 Qty 4 - 1/32 in. PEEK ferrule and stainless steel lock ring Qty 4 - PEEK fittings for μ -valves Qty 4 - Double winged PEEK nuts and 1/32 in. ferrules Qty 1 - Cybertool	5065-9938
Rapid Resolution High Throughput capillary kit	Kit includes: Qty 5 - Capillaries to optimize the 1100 Series LC for use with RRHT columns	5065-9947

LC and LC/MS Filter Systems



In-Line filter

Filter Systems

The use of the appropriate filters in the LC system will prevent blockage.

What is the Function

- Prevent blockage of the column inlet frit from contamination
- Maintain column efficiency and back pressure

Why Replace

- Protect and extend column lifetime
- Increase system uptime

How to Minimize Problems

- Use high capacity filters
- Ensure even distribution of solvent over filter surface



Free Newsletter

Receive a free subscription to *Separation Times* or *Agilent in Pharmaceutical Analysis*! Go to www.agilent.com/chem/subnews to register for the electronic newsletter that provides the science, solutions and special offers you need to ensure your lab achieves maximum productivity.

LC and LC/MS In Line Filters

In Line Filters

Low dispersion in-line filter

Positioned immediately before the LC column
Removes particles from the sample and injection system
Minimizes external band spreading due to frit diameter of only 2.1 mm and tapered inserts
Can be used with any microbore, high speed, or standard analytical columns

Universal in-line filter

Installed between the LC pump and the injector to remove particles from the solvent
Uses a high capacity filter
Frit is placed between the tapered edges of the inserts so the solvent is evenly distributed over the filtering frit

Description	Frit Porosity (µm)	Frit Inlet ID (mm)	Flow Rate	Part No.	Replacement Frits
Low dispersion in-line filter Includes one 1.6mm 2µm frit, filter holder with inserts, 60 x 0.12 mm connecting capillary	2 0.5	1.6	< 1 ml/min	01090-68702	280959-904, 10/pk 280959-907, 10/pk
Universal in-line filter Includes one 4.8mm 2µm frit, filter holder with inserts, 130 x 0.25 mm connecting capillary	2	4.8	1-5 ml/min	01090-68703	01090-27609, 2/pk
Semi Prep Filter	0.5	12.7	1-5 ml/min	5064-8273	5022-2185
Semi Prep Filter	10	19	5-10 ml/min	5022-2165	5022-2166, 10/pk
Prep Filter	10		10-100 ml/min	5065-4500	5065-9901 Replacement Glass Cartridge
In-line filter for G1311A	Recommended when high salt concentrations are used			G1311-60006	



01090-68702



01090-68703



5064-8273



5022-2165



5065-4500



G1311-60006

LC and LC/MS

Solvent Filters/Degassers



Glass solvent filter degasser, 3150-0577

Solvent Filters/Degassers

What is the Function

Mobile phase filters can improve the performance of your LC system by

- Removing contaminants from solvents
- Degassing solvents in systems lacking on-line degassers

Why Use

- Filtered solvents decrease piston wear from particulates
- Increase column life
- Eliminate pump downtime caused by air locks in check valves

How to Minimize Problems

- Filter into safe plastic-coated or heavy-walled solvent reservoirs



PTFE coated sieve, 5188-2744



PTFE seal, 5188-2745

Description	Part No.
HPLC Solvent filter/degasser assembly	3150-0577
Replacement Parts for 3150-0577	
Glass funnel, 250ml	5188-2743
PTFE coated sieve	5188-2744
PTFE seal	5188-2745
Funnel base, glass	5188-2746

Membrane Filters

Description	Diameter (mm)	Pore Size (µm)	Part No.
Regenerated Cellulose, 100/pk	47	0.45	3150-0576
Nylon, 100/pk	47	0.45	9301-0895
PTFE, 10/pk	47	0.45	3150-0509

LC and LC/MS Manual Injection Valves

Manual Injection Valves

Agilent provides the latest developments in LC injection technology from Rheodyne.

- Continuous flow path with “make-before-break” design
- Sample capacity
- Choice of stainless or PEEK flow path
- Easy access to fittings due to wide 30° port angles



Rheodyne Series 7725i

- Stainless steel
- Most popular injection valve for analytical HPLC
- Loops range from 1 µl to 5 ml (20 µl loop installed)
- Built in position sensing switch provides the LC with reproducible start signal
- Selected as Agilent 1050 and 1100 manual injectors



Description	Part No.
Manual injection valve, 7725i, stainless steel	5063-6502

Rheodyne Series 9725i

- PEEK flow path is perfect for biomolecules—sample does not contact metal
- Similar features as 7725i, including the “make-before-break” design

Description	Part No.
Manual injection valve, 9725i, PEEK	0101-1253

Rheodyne Series 3725i

- Large sample volumes, high flow rates and preparative columns
- 100 µl to 20 ml (10 ml loop installed)
- For biomolecules, the 3725i has PEEK materials

Description	Part No.
Manual injection valve, 3725i, stainless steel, prep valve	0101-1232
Manual injection valve, 3725i, PEEK, prep valve	0101-1231
Manual prep injection valve kit, stainless steel	5065-9922
With position sensing, 10 ml loop, 25 ml syringe, ring mounting bracket, start cable, SS connecting capillaries, 0.5 mm ID, 40 cm and 60 cm	
PEEK adapter, 1/8" to 1/16", 4/pk	5067-1503

LC and LC/MS

Manual Injection Valve Parts

Injection Valve Replacement Parts

- Rotor seals wear with use and need routine replacement
- Stators only need replacement if the ports are damaged
- PEEK rotor seals are incompatible with concentrated nitric and sulfuric acids



Stators and Seals



1400-3166

Description	Part No.
Rotor Seals	
Vespel: operating pH 0 to 10 (7125)	0101-0623
Tefzel: operating pH 0 to 14 (7125)	0101-0620
PEEK: operating pH 0 to 14 (7125, 7725, 9725)	0101-1255
Rhebuild kit for 7725 Series	0101-1254
PEEK: operating pH 0 to 14 (3725)	0101-1233
Rotor seal, PEEK, for 7010/7000/7040	0101-1256
Stator Face Assembly	
Rheodyne Series 7125	0101-0624
Rheodyne Series 7725	0100-1859
Stators	
Rheodyne Series 7725	0100-1860
Accessories	
Isolation Seal, Rheodyne Series 7725, 9725, 3725	1535-4046
Rheotool socket wrench 1/4 inch	8710-2391
Hex Key 9/64" 15cm long, T-handle	8710-2394
Ring stand mounting bracket	1400-3166
PEEK adapter, 1/8" to 1/16" for 3725i, 4/pk	5067-1503
Position sensor switch for manual valves	0490-1849

Manual Injection Valve Sample Loops

The right mix of injection valve sample loops are available for your application needs. Agilent offers factory-cut and finished loops of the highest quality.

- Stainless steel loops are square cut, free of burrs, for a flush connection
- Flexible PEEK loops have a clean, straight cut for low dead volume connections

Stainless Steel Sample Loops

- Sample loops for Rheodyne 7725 Series and 7125 Series valves are not interchangeable due to the change in port angle
- Actual volumes can differ due to tolerance of metal tubing bore
- Accuracy of large metal loops is $\pm 5\%$, intermediate loops $\pm 10\%$, small loops $\pm 30\%$



Stainless steel sample loops

Stainless Steel Loops for 7125 and 7010 Injectors

Description	ID (mm)	Part No.
5 μ l	0.18	1535-4860
10 μ l	0.30	0101-0376
20 μ l	0.51	0101-0377
50 μ l	0.51	0101-0378
100 μ l	0.51	0101-0379
200 μ l	0.76	0101-1252
500 μ l	0.76	0101-1251
1 ml	0.76	0101-1219
2 ml	1.00	0101-1250
5 ml	1.00	0101-1249

Stainless Steel Loops for 7725 Injectors

Description	ID (mm)	Part No.
5 μ l	0.18	0101-1248
10 μ l	0.30	0100-1923
20 μ l	0.30	0100-1922
50 μ l	0.51	0100-1924
100 μ l	0.51	0100-1921
200 μ l	0.76	0101-1247
500 μ l	0.76	0101-1246
1 ml	0.76	0101-1245
2 ml	1.00	0101-1244
5 ml	1.00	0101-1243

LC and LC/MS Sample Loops



Peek sample loops

PEEK Sample Loops

- Inert to most organic solvents
- Wall thickness, temperature, exposure time and concentration of organic solvents affect the durability of PEEK tubing
- Concentrated nitric acid and sulfuric acid weaken PEEK tubing
- THF, methylene chloride and DMSO cause PEEK to swell
- Actual volumes can differ because of tolerance of tubing bore
- Accuracy of large PEEK loops is $\pm 14\%$, intermediate loops $\pm 21\%$, small loops $\pm 65\%$

PEEK Loops for 9725 Injectors

Description	ID (mm)	Part No.
5 μ l	0.18	0101-1241
10 μ l	0.25	0101-1240
20 μ l	0.25	0101-1239
50 μ l	0.51	0101-1238
100 μ l	0.51	0101-1242
200 μ l	0.51	0101-1237
500 μ l	0.76	0101-1236
1 ml	0.76	0101-1235
2 ml	0.76	0101-1234
5 ml	0.76	0101-1230

PEEK Loops for 3725 Injectors

Description	ID (mm)	Part No.
2 ml	1.6	0101-1229
5 ml	1.6	0101-1228
10 ml	2.0	0101-1227
20 ml	2.0	0101-1226

LC and LC/MS

Manual Injection Valve Syringes

Syringes for Manual Injection Valves

The syringes for manual injection have a blunt-tip point style needle to prevent damaging the valve's internal parts. They can be used with any type/brand of manual injection valve.

Volume (μ l)	Description	Needle	Part No.
10	Removable	22/51/3	5182-9725
10	Fixed	22/51/3	5182-9644
25	Removable	22/51/3	5182-9719
25	Fixed	22/51/3	5182-9628
50	Removable	22/51/3	5183-4538
50	Fixed	22/51/3	5182-9619
100	Removable	22/51/3	5183-4539
100	Fixed	22/51/3	5182-9613
250	Removable	22/51/3	5182-9720
250	Fixed	22/51/3	5182-9624
500	Removable	22/51/3	5183-4540
500	Fixed	22/51/3	5182-9658



Library

More information is a click away. We have a variety of educational primers, application notes, maintenance guides, and literature available from Agilent for free. To learn more, call your local sales office or an authorized distributor or visit our website at www.agilent.com/chem/OnlineLibrary.

LC and LC/MS

Switching Valve Supplies



Switching Valve Supplies

A set of valve types specially designed for the Agilent 1100/1200 Series HPLC system allows you to extend your HPLC applications. New valve offerings give you:

- More flexibility in solvent selection and column selection
- New automation capabilities in sample preparation
- Increased sample throughput through alternating column regeneration
- Increased separation performance with multidimensional chromatography

Capillary Tubing Kits

Application	Valve Kit	Part No.
Column regeneration Capillaries 0.17 mm ID	G1157A	G1156-68711
Column regeneration Capillaries 0.25 mm ID	G1157A	G1156-68713
Column regeneration Capillaries: 0.17 mm ID	G1316A #057	G1316-68711
Column selection Capillaries 0.17 mm ID	G1159A	G1156-68712
Sample enrichment Capillaries: 0.17 mm ID	G1316A #055	G1316-68710
Sample enrichment Capillaries: 0.17 mm ID	G1158A	G1156-68714
Solvent selection Flow rate up to 10 ml/min	G1160A	G1160-68706

Switching Valve Replacement Parts

Use With	Description	RheBuild Kit Part No.	Rotor Seal Part No.	Stator Part No.
G1160A	12 Position/13 Port Preparative Solvent Selection Valve	0101-1288		0101-1365
G1159A	6 Position/14 Port Column Selection Valve (Six Column Selector)	0101-1290		0101-1364
G1157A	2 Position/10 Port Valve Dual-sided MBB	0101-1359		0101-1362 Stator head
G1158A	2 Position/6 Port Switching Valve	0101-1358 (PEEK)	0100-1855 (Vespel) 0100-1854 (Tefzel) 0100-2233 (PEEK)	0100-1850 Stator head
G1158B	Switching Valve, 2 Position, 6 Port, 600 bar		0101-1409 (HP PEEK blend)	0101-1417
G1162A	2 Position/6 Port Micro Switching Valve		0100-2087	0100-2089
G1163A	2 Position/10 Port Micro Switching Valve		0101-1361	0101-1363

1100/1200 Series Parts and Supplies

1100/1200 Series Instrument Parts and Supplies

The Agilent 1100/1200 Series HPLC modules were designed for long hours of operation and ease of use. To keep your system operating at optimal performance, scheduled routine maintenance is advised. Regular attention to these tasks will further increase your lab's productivity.

Recommended Routine Maintenance Procedures

- Clean or replace the solvent inlet filter
- Flush the degasser
- Perform pump maintenance
- Perform autosampler maintenance
- Perform column switching valve maintenance (if installed)
- Perform detector maintenance

The time needed is approximately 4 hours for a complete system.
The frequency of maintenance is dependent upon your usage and applications.

Failure to maintain your HPLC can have these results:

- Variations in flow and area counts, causing poor precision of quantitative analyses
- Noisy baselines make integration and peak recognition difficult
- Poor injection volume precision may result if the autosampler is not maintained
- Retention time fluctuations can lead to improper peak identification
- If you regularly use UV spectra, the quality of the spectra will be compromised, jeopardizing peak identification



1100/1200 Series Parts and Supplies

Maintenance Schedule

The 1100/1200 Series LC instruments and columns are manufactured under very high quality standards and are well known for their robustness and reliability, delivering the same precise results in daily operation. To ensure that your instrument is also working to your fullest satisfaction, we recommend exchanging the few parts, which have a natural wear at a regular maintenance schedule.

1100/1200 Series LC Maintenance Schedule

Item	Typical Schedule	Action/Comments
Pumps		
PTFE Frits in Purge valve	Every month	Before re-installation of the purge valve, always check the gold seal and replace it if deformed.
Solvent inlet filter	Every 6 months	Never use the system without a filter installed.
Piston seals, Outlet Gold seal, Plastic cap, Wash seal, Gasket wash seal	Every 12 months	When piston seals are exchanged, check the surface of the piston for scratches and deposits. Never re-install a used pump seal.
Piston, Outlet ball valve, Cartridge active Inlet valve	Every 24 months	Pistons can be cleaned with alcohol or tooth paste. Use only long-life, genuine Agilent pistons. After exchanging the active inlet valve cartridge, pump several mL until the system is stable.
Autosampler		
Needle and needle seat, Rotor Seal	Every 12 months	Make sure you use rotor seals of the correct material depending on the operating pH.
Piston seal, Isolation seal, Stator face	Every 24 months	
Column		
Guard column	Every 100-500 injections	Change the guard after 25-50 injections for dirty samples, 100-250 injections for most samples, and 500 injections for very clean samples.
Column inlet fittings	Every 5-10 column changes	PEEK fittings make changing inlet fittings fast and easy. SS fittings are reliable and can be used at higher pressure.
Detectors		
DAD and MWD Detectors	Exchange Standard lamps after 1000 hours Exchange Long-life lamps after 2000 hours	A noisy baseline may indicate it is time to change the lamp.
Flow cell	Check cleanliness every 6 months	Low light intensity can be caused by a dirty flow cell.
VWD Detectors	Exchange lamp after 1000 hours	Low light intensity can be caused by a dirty flow cell.
Flow cell	Check cleanliness every 6 months	

Usage of replacement parts can vary depending on the conditions under which the instruments are used, so these recommendations are for average usage. The lifetime is influenced by: types of solvents/buffers used, flow rates and pressure, cleanliness of solvents but also laboratory environment.

When buffers are used, or small ID capillaries – 0.12 mm ID and smaller – we recommend filtering the mobile phase before use to avoid blocking of the capillaries, frits, column or flow cell.

1100/1200 Series Parts and Supplies

LC Tools

LC Tools

Your Agilent LC system arrives with a full complement of tools needed to perform general maintenance and operation procedures. Should you need additional or replacement tools, Agilent offers a selection of high-precision, high-quality, stainless steel tools, to avoid any deformation of the screws or nuts.



0100-1710



G1377-44900

Description	Part No.
Tool Kit Hex Keys, Rheotool Includes 3 hex keys, 4 mm, 1.5 mm, and 9/64 in., with straight or T-handle plus Rheotool.	5064-8211
Torque Wrench Adapter Used with Nanoliter flow cell for Diode Array Detector to mount capillaries of P/N G1315-68714 cell	G1315-45003
Insert tool (seal wash option)	01018-23702
Mounting tool for flangeless nut	0100-1710
Tool for Micro seal capillary mounting Simplifies the connection of the micro seats with the capillary	G1377-44900
Mounting clamp	5021-1866
Velocity regulator	5062-2486
USB Memory Stick, 256 MB	G4208-68700
Compact Flash Card, 256 MB	01100-68700



Quick Buy

It's easy to order catalog items online. Simply enter desired quantities and part numbers, and then click "Add to Cart."

1100/1200 Series Parts and Supplies

Vacuum Degasser

Vacuum Degassers

A vacuum degasser is recommended for

- Maximum sensitivity in the low UV wavelength range
- High injection precision
- High retention time reproducibility
- Flow rates below 0.5 ml/min

Vacuum Degasser Care

- To generally clean the vacuum degasser tubing, flush the system with isopropanol
- Flush the degasser with water after using buffers
- Speed solvent changes by drawing solvent through the degasser and tubing with syringe adapter kit



5063-6598



5063-6599



0100-1710

G1322A 1100 Series Vacuum Degasser

Description	Unit	Part No.
Online degasser accessory kit Includes 8 screws, 8 bushings, 4 markers, tubing, syringe, syringe adapter		G1322-68705
Glass filter, solvent inlet, 20 µm		5041-2168
Disposable syringes, 20 ml	10/pk	5062-8534
Syringe Adapter, 1/16 in od, 2 in. long		9301-1337
Tefzel Ferrules and SS Lock Rings, 1/8 in.	10/pk	5063-6598
PPS nuts, 1/8 in, 1/4-28 thread	10/pk	5063-6599
Union, 1/4 - 28 threads, Polypropylene	10/pk	5022-2155
Teflon Solvent tubing	5 m	5062-2483
Tubing kit, degasser to pump 4/pk, 30 cm pieces of tubing with screws and bushings		G1322-67300
Mounting tool for flangeless nut		0100-1710
Plastic tubing cutter		8710-1930

G1379A/B 1100/1200 Series Micro Vacuum Degasser

Description	Part No.
Dual channel micro degasser vacuum chamber	G1379-60010
Micro vacuum degasser tubing kit for G1379A	G1379-67310
Micro vacuum degasser tubing kit for G1379B	5042-8922
Mounting tool for flangeless nut	0100-1710

1100/1200 Series Parts and Supplies

Pumps

Pumps

The Agilent 1100/1200 Series of HPLC modules has several different pump units to choose from: isocratic, quaternary, binary, capillary, nano, and preparative. The 1100/1200 was designed for ease of use—all pump maintenance parts can be accessed from the front by simply removing the front cover. Scheduled routine maintenance of these pumps based on your application is recommended to achieve maximum uptime.

1100/1200 Pump Routine Maintenance Procedures

- Replace the seals and pistons
- Replace the PTFE frit
- Replace the cartridge in the Active Inlet Valve
- Clean the outlet ball valve
- Clean or replace the solvent inlet frits

Routine pump maintenance should be done on a regular basis to keep your Agilent 1100/1200 system performing at its optimum. You may perform all the maintenance at once or perform maintenance on an as-needed basis. Some parts may need to be replaced more than others depending upon your application and solvent preparation procedures.



Tips & Tools

Agilent offers a variety of e-seminars, on-site training, and on-demand eLearning to help you learn how to be a more effective chromatographer. For more information, visit www.agilent.com/chem/Education.

1100/1200 Series Parts and Supplies

Seal Wash/Purge Valve



5042-8507

Seal Wash

The routine use of highly concentrated buffer solutions (100 mM) will reduce the life of the seals and pistons in your 1100/1200 Series pump. You can counteract the problem with one of our seal wash kits, which flushes the backside of the seal with a wash solvent; water/isopropanol (90/10) is recommended as the wash solvent. The continuous seal wash uses gravity to flow the wash solvent, and is compatible with all 1050 and 1100/1200 standard and capillary pumps. The active seal wash uses a peristaltic pump to flow the wash solvent, and is compatible with 1100 pumps with the following serial numbers and higher, as well as the 1200 Series pump:

- G1310A: DE40906378
- G1311A: DE40926032
- G1312A: DE40914884

Description	Part No.
Continuous seal wash kit Includes 2 wash seal gaskets, 4m flex tubing, 2 pump seals, 1 flow regulator, 2 seal keepers, 2 support ring assemblies, 20 mL luer lock syringe, seal insert tool, abrasive paper	01018-68722
Silicone Tubing, 1mm ID, 3mm OD, 5m	5065-9978
Seal Keeper	5001-3743
Wash seal	0905-1175
Wash seal gasket	5062-2484
Active seal wash kit for isocratic or quaternary pumps Includes 2 wash seal gaskets, 2 pump seals, peristaltic pump (includes pump cassette and motor), 2 seal keepers, 2 support ring assemblies, seal insert tool, silicone tubing	G1311-68711
Active seal wash kit for binary pumps Includes 4 wash seal gaskets, 4 pump seals, 2 peristaltic pumps (includes pump cassette and motor), 4 seal keepers, 4 support ring assemblies, seal insert tool, silicone tubing	G1312-68711
Peristaltic pump cassette with silicone tubing	5042-8507

Purge Valve

Common to all 1100/1200 pump modules, the purge valve has a gold seal held in place with a plastic cup.

- The most frequently replaced item in the 1100/1200 Series pumps is the purge valve PTFE frit (P/N 01018-22707), which can clog with seal material or solvent particulates.
- When replacing the frit, remember that the cutout in the frit goes on top so that more surface area will be provided on the side facing the solvent flow.
- The gold seal should be replaced after the valve has been removed a few times.

Description	Part No.
1100 Pump Start Up Kit Includes 1 outlet cap, 2 PTFE frits, 4 piston seals, 1 outlet gold seal, 2 inlet filters, 1 cartridge for active inlet valve	G1311-68710
PTFE Frits, 5/pk	01018-22707
Gold seal, outlet	5001-3707
Outlet caps	5062-2485
Purge valve assembly	G1311-60009

1100/1200 Series Parts and Supplies

Purge Valve AIV/Seals & Pistons

Outlet Ball Valve

- Before exchanging the outlet ball valve, try cleaning it in a sonicator by placing the valve in an upright position (onto the plastic cap) in a small beaker with alcohol. Sonicate for 5 to 10 minutes.
- The 1100/1200 Series binary pump has a different outlet ball valve which includes a sieve.



Outlet ball valve parts

Description	Part No.
Outlet ball valve, (quaternary, isocratic)	G1311-60012
Outlet ball valve (binary)	G1312-60012
Gold seal, outlet	5001-3707
Outlet caps, 4/pk	5062-2485
Binary pump outlet valve SS sieve, 10/pk	5063-6505

Active Inlet Valve (AIV)

Description	Part No.
Active inlet valve, without cartridge	G1312-60025
Cartridge for active inlet valve, 400 bar	5062-8562
Cartridge for active inlet valve, 600 bar	G1312-60020
Gold Seal for Inlet Valve	5001-3708



Seals and Pistons

Pump seals should be replaced when there are leaks on the bottom of the pump head, when retention times are inconsistent, or when the pressure ripple is unstable.

Each time the seals are replaced, the pistons (plungers) should be examined for scratches. Scratched pistons will cause small leaks and can damage the seals



Sapphire piston and seals

Description	Part No.
Sapphire Piston	5063-6586
Piston Seals, graphite filled Teflon (reversed phase), 2/pk	5063-6589
Piston Seals, polyethylene (normal phase), 2/pk	0905-1420
Piston housing assembly (includes springs)	G1311-60002
Extended PM kit Contains 5063-6589 piston seal (2), 01018-22707 PTFE frits (5/pk), 5062-8562 cartridge active inlet valve, G1311-60012 outlet ball valve & 5063-6586 pistons (2)	5065-4499

1100/1200 Series Parts and Supplies

Solvent Filters

Solvent Filters for G1311/12/54A Pumps

Unfiltered solvents or solvents contaminated with microbial growth can clog solvent inlet filters, reducing the lifetime of the filter and impacting pump performance. Remember to clean or replace the solvent inlet filters at least once every 3 months.

Inlet Filters		Frit Adapter		Frit Inlet ID (mm)	Tube OD (mm)	Recommended Use
Description	Part No.	Description	Part No.			
Glass filter, solvent inlet, 20 μm pore size	5041-2168	Frit adapter, PTFE, 3 mm, 4 /pk	5062-8517	5	3,2	Analytical scale, micro scale,
Glass filter, solvent inlet, 40 μm pore size	3150-0944	Frit adapter, PTFE, 4mm,	G1361-23204	7	4	Preparative LC
Glass filter, solvent inlet, 40 μm pore size	3150-0944	Frit adapter, PTFE for 1/8" od tubing	G2258-23201	7	3.2	G2258A Dual Loop autosampler



Filter frit adapters, 5062-8517

1100/1200 Series Parts and Supplies

Pump Supplies



Pump Supplies

G1311/12/54A Standard Pump

Description	Part No.
1100 Pump Start Up Kit Includes 1 outlet cap, 2 PTFE frits, 4 piston seals, 1 outlet gold seal, 2 inlet filters, 1 cartridge for active inlet valve	G1311-68710
PM Kit for isocratic/quaternary pump includes piston seal, PTFE frits, 2 gold seals and 2 outlet caps	G1310-68730
PM Kit for binary pump includes 4 piston seals, PTFE frits, 3 gold seals, 2 sieves and 3 outlet caps	G1312-68730
PM Kit for seal wash option includes 2 wash seals and a pack of 6 wash seal gaskets	G1310-68731
1100/1200 Pump accessory kit	G1311-68705
Bottle head assembly, for F29/32 tapered inlet bottle	G1312-68706
Bottle head assembly, for F29/32 tapered solvent bottle	G1312-68716
Solvent reservoir, 1 liter, F29/32	9301-0656
Bottle head assembly, for screw bottle	G1311-60003
Solvent reservoir, 1L	9301-1420
Solvent Reservoir 1L with cap	9301-1421
Solvent reservoir, amber, 1L, for use with bottle head assembly	9301-1450
Bottle cap with 3-hole insert	5063-6531
Solvent mixer, 1100 Series	G1312-87330
Capillary, damper to purge valve	G1312-67301
Tubing kit, degasser to pump 4/pk, 30 cm pieces of tubing with screws and bushings	G1322-67300

G1312B Binary Pump SL

Description	Part No.
Active inlet valve, without cartridge	G1312-60025
Cartridge for active inlet valve, 600 bar	G1312-60020
Outlet valve for binary SL pump, 600 bar	G1312-60022
Purge valve assembly, 600 bar	G1312-60023
Seal Keeper, ceramic	5042-8586
SS Capillary 400x0.17 mm, m/m, ps/ps pump to autosampler	G1312-87303
SS Capillary 700x0.17 mm, m/m, ps/ps pump to cooled ALS	G1312-87304
SS Capillary 150x0.17 mm, m/m, ps/ps damper to pressure sensor	G1312-87305
SS Capillary 105x0.17 mm, m/m, ps/ps damper to mixer or mixer to outlet valve	G1312-87306
Calibration capillary assy	G1312-67500
Absorber capillary, 500 uL volume	G1312-87300
SS Restriction Capillary, 0.17 mm id T-piece to pressure sensor	G1312-87301

1100/1200 Series Parts and Supplies

Pump Supplies

G1376A 1100 Series Capillary Pump

Description	Part No.
Capillary pump accessories kit	G1376-68705
Capillary pump PM kit	G1376-68710
Semi Prep Filter	5064-8273
Replacement frits, 0.5 µm, for P/N 5064-8273	5022-2185
Torque Wrench Adapter	G1315-45003
Bottle head assembly with tubing and filter	G1376-60003
Solvent inlet filter, stainless steel	01018-60025
SS Capillary, pump-ALS 90cm, 0.17mm id	G1329-87300
Extended flow range kit (100 ul/min)	G1376-68707



Special Offers

Don't forget, we have special offers throughout the year. To view them, turn to the inside back cover of this catalog, then go to www.agilent.com/chem/specialoffers.

1100/1200 Series Parts and Supplies

Pump Supplies

G1361A 1100 Series Prep Pump

Description	Part No.
Accessory kit prep pump/gradient G1361A Includes stainless steel connecting capillaries, solvent mixer, 2 L solvent bottle, bottle head assembly, filter, glass stop valve, stainless steel union, tubing, and other parts	G1361-68707
Accessory kit for prep pump G1361A Includes stainless steel connecting capillaries, wrenches, 2 L solvent bottle, bottle head assembly, filter, glass stop valve, stainless steel union, tubing, and other parts	G1361-68708
PM kit for prep pump Includes 3150-0942 filter, 5022-2192 filter assembly, 5065-4445 peristaltic pump, 0890-1764 tubing and 4 prep pump seals	G1361-68710
Hi Flow Inline Filter Kit, Glass, 10 μ m Contains glass filter, caps and connecting tubing	5065-4500
Hi Flow replacement inline filter, glass	5065-9901
O-ring, Viton, 30mm	0905-1516
Glass filter, solvent inlet, 40 μ m pore size	3150-0944
Frit adapter, PTFE for 4.7 mm od tubing	G1361-23205
SS filter assembly with PEEK ring, 2 μ m pore size	5022-2192
Solvent bottle, clear, 2 L, 2 inlets	5065-4421
Solvent bottle, amber, 2L	9301-6341
Solvent bottle, clear 2L	9301-6342
Bottle head assembly for prep system	G1361-60022
Sapphire plunger	G1361-22402
Piston seal for G1361A Preparative Pump	5022-2188
Frit adapter	G1361-23204
Peristaltic pump	5065-4445
Valve assembly, inlet/outlet	G1361-60012
SS capillary outlet valve to 1 multi assembly, 0.6 x 173 mm, male/male	G1361-67300
SS capillary outlet valve 1 to multi assembly, 0.6 x 175 mm, male/male	G1361-67301
SS capillary EMPV to next module, 0.6 x 400 mm, male/male	G1361-67302
SS capillary EMPV to multi assembly, 0.5 x 160 mm, male/male	G1361-67303
SS capillary union to EMPV2, male/female	G1361-67304
SS capillary union to mixer, 0.6 x 40 mm, male/female	G1361-67305
SS capillary EMPV1 to union, male/female	G1361-67306
Manual prep injection valve kit, SS With position sensing, 10 ml loop, 25 ml syringe, ring mounting bracket, start cable, SS connecting capillaries, 0.5 mm ID, 40 cm and 60 cm	5065-9922
Glass stop valve assembly Includes stop valve and 2 adapters	5065-9909
Inlet tubing, SS for pressurized solvent	G1361-60008



5065-4500



5065-9909

1100/1200 Series Parts and Supplies

Autosampler Supplies

Autosampler Supplies

G1313/27A 1100 Series Autosampler Kits

Description	Part No.
Maintenance kit Includes 1 rotor seal (Vespel), 1 needle, 1 needle seat, 2 metering seals, 15 fingercaps	G1313-68709
Accessory kit Includes 3 hex keys, 2 wrenches, tubing, 1 label halftray, wrist strap, 15 fingercaps, 0.17id x 180mm capillary, 100 screw top 2ml vials and caps, tray for 40 2ml vials, tray for 15 6ml vials	G1313-68705
PM kit for standard autosampler Includes 1 each: rotor seal, isolation seal, stator face, needle, needle seat	5065-4498
PM Kit for standard autosamplers includes Vespel rotor seal, standard needle seat and needle	G1313-68730
Light protection Kit for G1329A Includes opaque front and side doors and front cover	G1329-68718
Door replacement Kit for G1329A Includes transparent front and side doors	G1329-68727

Injection Valve Maintenance

Rotor seal replacement is the most common injection valve maintenance procedure.

Use With	Description	Part No.	RheBuild Kit Part No.	Rotor Seal Part No.	Stator Part No.
G1313A, G1329A, G1367A	2 Pos/6 Port Injection Valve	0101-0921	0101-1257	0100-1853 (Vespel) 0100-1849 (Tefzel) 0100-2231 (PEEK)	0100-1850 Stator head 0100-1851 Stator face
G1367C	2 Pos/6 Port Injection Valve, 600 bar	0101-1422		0101-1416	0101-1417
G1377A	2 Position/6 Port μ Injection Valve	0101-1050	0101-1257	0100-2088 (Vespel)	0100-2089
G2258A	10 Port, Dual Loop Valve	0101-1385		0100-2415	0101-1390
G2260A	2 Position/6 Port MBB Injection Valve	0101-1267	0101-1268		



Injection Valve Assembly, 0101-0921

1100/1200 Series Parts and Supplies

Autosampler Supplies

1100/1200 Needles and Needle Seats

The needle should be replaced when it becomes bent, burred or blunt. The needle seat should be replaced when it is leaking or plugged. You should suspect a leak if you notice a trail of buffer crystals on the needle seat. The needle seat can become blocked if the sample contains particulates, as this is the first restriction that the sample experiences. If this occurs, try backflushing the needle seat capillary.

Agilent Autosampler	Needle Assembly Description	Part No.	Compatible with Needle Seat	Part No.
G1313A, G1327A, G1329A	Needle assembly, standard autosampler	G1313-87201	Standard needle seat 0.17mm ID capillary, 2.3 µl	G1313-87101
			Standard needle seat 0.12 mm ID capillary, 1.2 µl	G1313-87103
G1313A, G1327A, G1329A	Needle assembly, for use with PEEK seat	G1313-87203	Standard needle seat, PEEK 0.17 mm ID capillary, 2.3 µl	G1313-87102
G1313A, G1327A, G1329A	Needle assembly, 900µl upgrade	G1313-87202	Standard needle seat 0.17mm ID capillary, 2.3 µl	G1313-87101
G1387A, G1389A	Needle assembly, µ-LC autosampler	G1329-80001	µ-LC Needle seat 100 µm ID capillary, 1.2 µl	G1329-87101
			µ-LC Needle seat 50 µm ID capillary, 0.3 µl	G1329-87103
G1367A	Needle assembly, well plate autosampler (green)	G1367-87200	Needle seat, well plate autosampler 0.17 mm ID capillary, 2.3 µl	G1367-87101
	Needle assembly, well plate autosampler (new, blue)	G1367-87201	Needle seat, well plate autosampler 0.12 mm ID capillary, 1.2 µl	G1367-87102
G1377A	Needle assembly, µ-well plate sampler	G1377-87201	Needle seat, µ-well plate autosampler (without seat capillary)	G1377-87101
			Seat Capillary, 100µm Fused silica/PEEK with fittings, Black	G1375-87317
			Seat Capillary, 75µm Fused silica/PEEK with fittings, Blue	G1375-87316
			Seat Capillary, 50µm, Green	G1375-87300
G2258A	Needle assembly, dual loop autosampler	G2258-68710	Twin needle seat, dual loop autosampler	G2258-87102
G2260A	Needle assembly, prep autosampler	G2260-87201	Needle seat, prep autosampler 0.5 mm ID, 20 µl	G2260-87101

1100/1200 Metering Device Supplies

Infrequently, the metering device seal and piston may need replacement if you see loss in injection volume precision or metering device leaking.

Description	Part No.
Sapphire Piston	5063-6586
Piston Seals, graphite filled Teflon (reversed phase), 2/pk	5063-6589
Metering valve seal, 900 µl	0905-1294
Sapphire piston assembly, 900 µl	5062-8587
Capillary to metering device	G1313-87301
Multidraw Upgrade Kit for G1313A/G1327A/G1329A Autosamplers Includes 500 µl capillary, 1500 µl capillary, and ZDV union	G1313-68711
Seat capillary, 500 µl, 0.5 mm ID	G1313-87307
Seat capillary, 1500 µl, 0.9 mm ID	G1313-87308
1/16 in. union, zero dead volume, stainless steel	0100-0900
Sample loop, 100 µl	01078-87302
Sample loop, 900 µl	G1313-87303

1100/1200 Series Parts and Supplies

Autosampler Supplies



Autosampler trays

G1313/27/29A 1100 Series Autosampler Supplies

Description	Part No.
100 position tray for 2 ml vials	G1313-44500
100 position tray for 2 ml vials, thermostatable	G1329-60001
100 position tray for 2 ml vials, thermostatable, 1200	G1329-60011
40 position tray for 2 ml vials	G1313-44502
40 position tray for 2 ml vials, 1200	G1313-44512
15 position tray for 6 ml vials	G1313-44503
15 position tray for 6 ml vials, 1200	G1313-44513
External Vial Tray for 17 vials (disposal position)	G1313-60004
Disposal Tube for external vial tray	G1313-27302
Needle seat PEEK, 0.17 mm ID capillary, for standard autosampler, 2.3µl	G1313-87102
Needle assembly for use with PEEK seat	G1313-87203
Needle seat PEEK w/o capillary, G1313A	G1313-87104
PEEK seat tubing, 0.17mm ID, 100mm, 2.3 µL	G1313-87302
PEEK capillary, 0.25 mm ID, 160 mm connecting valve with metering device of G1313 autosampler	G1313-87306
PEEK loop capillary for 100 µL sample	G1313-87309
Extended loop capillary, 0.25 mm, 180 cm	G1329-87302
Needle arm kit	G1313-68713
Finger Caps, 15/pk	5063-6506
Waste adapter, 1100 Series autosamplers	G1313-43206
Waste adapter, 1200 Series autosamplers, gray	G1313-43216
Waste tube	G1313-87300
Waste tubing, 5 m, 6.5 mm ID, corrugated polypropylene	5062-2463
Post Column reaction kit for 1100LC	G1313-68712



6 ml Vials, Caps, and Septa for 1100/1200 Series Autosampler

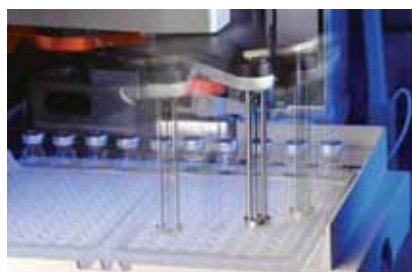
Description	Unit	Part No.
Clear screw vial, 16 mm cap size	100/pk	9301-1377
Screw caps, 16 mm	100/pk	9301-1379
PTFE/silicone septa, 16 mm	100/pk	9301-1378
Clear crimp vial, 20 mm cap size	100/pk	9301-1419
Crimp caps, PTFE/silicone septa, 20 mm	100/pk	9301-1425
Clear screw extreme high recovery vials, 16mm cap size	30/pk	5188-2757
PTFE/silicone septa, pre-slit, 16mm	100/pk	5188-2758
5 ml high recovery screw cap vials	30/pk	5188-5369

1100/1200 Series Parts and Supplies

Autosampler Supplies

G1387A 1100 Series Micro Autosampler

Description	Part No.
Capillary sampler accessories kit	G1329-68715
2 Position/6 Port μ Injection Valve	0101-1050
Rotor seal, Vespel, 2 grooves	0100-2088
Stator	0100-2089
6 fittings, 2 plugs, PEEK	5065-4410
Sapphire piston, 2 mm	5064-8293
Piston seal, 2 mm	5022-2175
Seal support assembly	G1377-60002
Seat assembly, 100 μ m ID, 1.2 μ l	G1329-87101
Seat assembly, 50 μ m ID, 0.3 μ l	G1329-87103
Needle assembly for μ -LC autosampler	G1329-80001
Waste tube, FEP, 1.6mm OD, 0.8mm ID	G1375-87326
SS Capillary, pump-ALS 90cm, 0.17mm id	G1329-87300



Well plate autosampler

G1367A 1100 Series Well Plate Autosampler

Description	Part No.
Well plate sampler accessories kit Standard ship kit, includes 100/pk 2 ml screw top vials & caps, 10/pk 0.5 ml 96 well plates, tools, 380 mm 0.17 mm capillary, CAN cable	G1367-68705
PM Kit for well plate autosamplers includes Vespel rotor seal, needle, needle seat, peristaltic pump cartridge and seal tight nut	G1367-68730
Needle assembly, well plate autosampler (green)	G1367-87200
Needle assembly, well plate autosampler (new, for SN greater than DE21001534)	G1367-87201
Seat assembly, 0.17 mm ID, 2.3 μ l	G1367-87101
Seat assembly, 0.12 mm ID, 1.2 μ l	G1367-87102
Seat assy for G1367C Well Plate Sampler without capillary	G1367-87104
Seat capillary 0.17 x 100 mm, 0.8 mm od use with G1367-87104 seat	G1367-87302
Seat capillary 0.12 x 100 mm, 0.8 mm od use with G1367-87104 seat	G1367-87303
Loop capillary, 100 μ l	G1367-87300
Peristaltic pump	5065-4445
Well plate tray, 2 well plates, 10 vials (supports 50 mm plates), 1200	G2258-60011
Well plate tray, 2 well plates, 10 vials (supports 50 mm plates), 1100	G2258-60001

1100/1200 Series Parts and Supplies

Autosampler Supplies

G1377A 1100 Series Micro Well Plate Autosampler

Description	Part No.
Micro well plate sampler accessories kit Includes 100/pk 2 ml screw top vials & caps, 10/pk 0.5 ml 96 well plates, tools, 40 μ l loop, 50 cm 50 μ m fused silica/PEEK capillary, 75 μ m seat capillary, CAN cable	G1377-68705
Seat Capillary, 50 μ m, 150 mm, Fused silica/PEEK with fittings	G1375-87300
Seat Capillary, 100 μ m, 150 mm, Fused silica/PEEK with fittings	G1375-87317
Seat Capillary, 75 μ m, 150 mm, Fused silica/PEEK with fittings	G1375-87316
Needle assembly, μ -well plate sampler	G1377-87201
Loop capillary, 8 μ l	G1375-87315
Loop capillary, 40 μ l	G1377-87300
SS capillary, 0.25 mm ID, 12 cm long	G1377-87301
Connecting Rheodyne valve - waste	
Tool for Micro seal capillary mounting	G1377-44900

Well Plates

Description	Unit	Part No.
96 Well plates, 0.5 ml, polypropylene	120/pk	5042-1385
96 Well plates, 0.5 ml, polypropylene	10/pk	5042-1386
96 Deep well plates, 1 ml, polypropylene	50/pk	5042-6454
Closing mats for 96 well plates, silicone	50/pk	5042-1389
96 Well Plates, 150 μ l, conical, polypropylene	25/pk	5042-8502
384 Well plates, 90 μ L, polypropylene	30/pk	5042-1388
96 Deep well plate with glass inserts, 0.35 mL, caps/septa	1/ea	5065-4402
Glass inserts, 350 μ l	1000/pk	5188-5321
Caps/septa for glass inserts	1000/pk	5188-5322
Vial plate for 54 x 2 ml vials	6/pk	G2255-68700
Tray for 27 Eppendorf safe lock tubes, 0.5/1.5/2 ml	1/ea	5022-6538
Vial plate for 15 x 6 ml vials		5022-6539



G2255-68700



5022-6539

1100/1200 Series Parts and Supplies

Autosampler Supplies

G2257A Well Plate Handler

Description	Part No.
8.5 well plate rack, 2/pk For 16 shallow well plate, 4 deep well plates (max 48 mm height) or 6 vial racks	G2255-68709
10" well plate rack, 2/pk For 20 shallow well plate (max height 16 mm), not compatible with deep well plates	G2255-68710
8.5" well plate rack extension Includes 3 racks for 3 x 16 shallow well plate, 2 x 4 deep well plates (max 48 mm height) or 3 x 6 vial racks	G2255-68720
10" well plate extension Includes 3 racks for 3 x 20 shallow well plates (max height 16 mm), not compatible with deep well plates	G2255-68730



Micro well plates

G2250A Micro Plate Sampler

Description	Part No.
205H rack, two 96 deep well plates	G2250-04504
200 rack, 13 x 100 mm tubes (9 ml), 96	G2250-04503
207 rack, 16 x 100 mm tubes (12 ml), 75	G2250-04502
209 rack, 12 x 32 mm tubes (12 ml), 96	G2250-04501
94A special holding 1100 tray	G2250-04500
100 µl syringe	G2250-24501
1000 µl syringe	G2250-24500
5 µl loop	1535-4860
20 µl loop	0101-0377
50 µl loop	0101-0378
100 µl loop	0101-0379
500 µl loop	0101-0282
Beveled tip needle	G2250-23200
Injection port seal	G2250-47100
Capillary, 1 m, 0.17 mm ID, 1/16 in. male	G2250-87300

1100/1200 Series Parts and Supplies

Autosampler Supplies



G2258-87102



5065-9948



5065-9950



G2260-87201

G2258A 1100 Series Dual Loop Autosampler

Description	Part No.
Needle assembly, dual loop autosampler	G2258-68710
Well plate tray, 2 well plates, 10 vials (supports 50 mm plates), 1100	G2258-60001
Well plate tray, 2 well plates, 10 vials (supports 50 mm plates), 1200	G2258-60011
Twin needle seat, dual loop autosampler	G2258-87102
Front seat tube, SS, 0.5 mm ID, 10 cm long	G2258-87316
Back seat tube, SS, 0.5 mm ID, 12 cm long	G2258-87315
Front seat tube, PTFE, 0.2 mm ID, 10 cm long, 5 µl	G2258-87312
Back seat tube, PTFE, 0.25 mm ID, 12 cm long, 6 µl	G2258-87313
Waste tube, 0.8 mm ID, 15 cm long	G2258-87310
Waste tube, 0.8 mm ID, 10 cm long	G2258-87311
Buffer loop tubing assembly, PTFE, 1.4 mm ID, 2.0 mm OD	G2258-87300
Drawing tube assembly for flush solvent with filter and bottle cap	G2258-87307
Tubing assembly, solvent flush	G2258-87314
Fitting screws, SS, 10-32, 4 mm, 5/pk	5065-9948
PEEK ferrule+SS ring 5/pk for 2 mm tube	5065-9950
Union, PEEK for 1/8" od tubing, 1/4-28 internal threads	0100-2410
10 Port, Dual Loop Valve	0101-1385
Rotor seal, Vespel, 10 port valve	0101-2415
Stator, DuraLife, 10 port valve	0101-1390
Vial plate for 15 x 6 ml vials	5022-6539
Vial plate for 54 x 2 ml vials, 6/pk	G2255-68700
Frit adapter, PTFE for 1/8" od tubing	G2258-23201
Piston for G2258A Dual Loop ALS, 5 ml	G2258-60003
Piston guide, PEEK for G2258A ALS	G2258-23101
Piston seal for G2258A Dual loop ALS	0905-1599

G2260A 1100 Series Preparative Autosampler

Description	Part No.
Accessory kit Prep autosampler (G2260A) Includes stainless steel connecting capillaries, hex keys, wrenches, 100 2 ml screw cap vials and caps, tray for 6 ml vials, stainless steel union, and other parts	G2260-68705
MBB Injection valve for G2260A sampler	0101-1267
PEEK rotor seal and stator face	0101-1268
Stator head for 0101-1267 valve	0100-2195
Needle seat for G2260A autosampler, 0.5 mm ID, 20 µl	G2260-87101
Needle assembly for G2260-87101 needle seat	G2260-87201
Capillary injection valve to preparative head, SS, 16 cm, 0.5 mm	G2258-87301
Capillary sampler to column, SS, 60 cm, 0.5 mm	G2260-87300
Capillary pump to sampler, SS, 40 cm, 0.5 mm	G2260-87301
5 ml Multi draw loop for use with G2260A, Recommended for injection volumes up to 5 ml	G2260-68711

1100/1200 Series Parts and Supplies

Fraction Collector Supplies

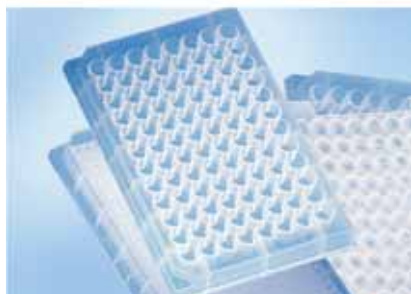
1100/1200 Fraction Collector



1100/1200 Fraction Collector



G1364-84532



Well Plates

Collecting Tubes and Trays

Tray Part No.	Hole Diameter (mm)	No. of Tubes	Tube Dimensions	Unit	Tube Part No.
G1364-84503*	30	40	30 x 100 mm	100/pk	5042-6458
G1364-84523**			30 x 48 mm	100/pk	5042-6470
G1364-84504*	25	60	25 x 100 mm	100/pk	5042-6459
G1364-84524**					
G1364-84505*	16	126	16 x 100 mm	250/pk	5022-6532
G1364-84525**			16 x 48 mm	100/pk	5022-6533
G1364-84506*	12	215	12 x 100 mm	250/pk	5022-6531
G1364-84516**			12 x 48 mm	100/pk	5022-6534
G1364-84512*	Funnel tray	40	Any size		
G1364-84532**					

*1100 color
**1200 color

Well Plate Trays

Description	Part No.
Tray for 4 well plates, cooled	G1364-84501
Tray for 4 well plates, cooled, 1200	G1364-84521
Tray for 4 plates, adjustable, cooled	G1364-84531
Tray for 2 well plates, 10 funnels, cooled	G1364-84502
Tray for 2 well plates, 10 funnels cooled, 1200	G1364-84522
Tray for 2 well plates, 10 vials, 2 ml	G1367-60001

1100/1200 Series Parts and Supplies

Fraction Collector Supplies



5022-6538



5022-6539

Well Plates

Description	Unit	Part No.
96 Well plates, 0.5 ml, polypropylene	120/pk	5042-1385
96 Well plates, 0.5 ml, polypropylene	10/pk	5042-1386
96 Deep well plates, 1 ml, polypropylene	50/pk	5042-6454
Closing mats for 96 well plates, silicone	50/pk	5042-1389
96 Well Plates, 150 μ l, conical, polypropylene	25/pk	5042-8502
384 Well plates, 90 μ L, polypropylene	30/pk	5042-1388
384 Well plates max 45 μ L skirted	25/pk	5188-5375
96 Deep well plate with glass inserts, 0.35 mL, caps/septa		5065-4402
Glass inserts, 350 μ l	1000/pk	5188-5321
Caps/septa for glass inserts	1000/pk	5188-5322
Vial plate for 54 x 2 ml vials	6/pk	G2255-68700
Tray for 27 Eppendorf safe lock tubes, 0.5/1.5/2 ml		5022-6538
Vial plate for 15 x 6 ml vials		5022-6539
Plate for 24 tubes with 18 mm diameter		5042-8544

1100/1200 Fraction Collector Capillary Kits and Needles

1100/1200 Module	Max Flow Rate	Tubing ID (mm)	Tubing Kit	Needle Length	Needle	Typical Use
G1364B	100 ml/min	0.8 mm ID	G1364-68711		G1364-87201	Tubes (max 100 mm)
G1364C	1 ml/min	0.15 mm ID	G1364-68723	50 mm	G1367-87200	Tubes (max 48 mm), well plates, vials
	10 ml/min	0.25 mm ID	G1364-68712	50 mm	G1367-87200	
	10 ml/min	0.25 mm ID	G1364-68712	20 mm	G1364-87202	Funnel tray (tubes max 75 mm)
	100 ml/min	0.8 mm ID	G1364-68711	20 mm	G1364-87202	
G1364D	max 4 μ l/min	25 μ m ID	G1364-87304			MALDI targets, well plates
	4-30 μ l/min	50 μ m ID	G1364-87305			
	30-100 μ l/min	100 μ m ID	G1364-87306			

1100/1200 Series Parts and Supplies

Fraction Collector Supplies



Micro Fraction Collector

G1364D Micro Fraction Collector

Description	Part No.
MALDI spotting adapter for G1364D Micro fraction collector	G1364-83205
Well plate adapter assembly for G1364C/D	G1364-60021
Flap septum, PEEK, for internal tray	G1364-27107
Tray for 4 plates, adjustable, cooled for use with G1364D Micro fraction collector	G1364-84511
Fused silica/PEEK capillary, 25 μ m, 50 cm	G1364-87304
Fused silica/PEEK capillary, 50 μ m, 50 cm	G1364-87305
Fused silica/PEEK capillary, 100 μ m, 50 cm	G1364-87306
Waste tube, PTFE, 20cm 1.4mm ID 2.0mm od	G1364-86711
MALDI plate carrier Bruker	5022-6541
MALDI plate carrier Bruker PAC	5022-6546
MALDI plate carrier ABI	5022-6542
MALDI plate carrier ABI Opti-TOF	5023-0238
MALDI plate carrier Agilent	5022-6543
MALDI plate carrier Micromass	5022-6544
Target Plate for AP-MALDI LC/MS	G1972-60025
Calibration Plate Bruker	5023-0208
Calibration Plate ABI 192	5023-0209
Calibration Plate ABI 10x10 & 20x20	5023-0213
Calibration Plate Agilent	5023-0214
Calibration Plate Micromass	5023-0215
On-line matrix Kit for MALDI spotting Includes BCD board/cable, syringe, needles, adapters, connector, capillary	G1364-68706
Adapter, female to female 1/4-28	5042-8517
Adapter, male luer to female 1/4-28	5042-8518
Syringe, glass, 1 mL, 1/4-28 connector	5181-1541
Micro T-connector, PEEK, swept vol 29 nL	5042-8519
MALDI Spotting tips, PTFE, 10/pk	G1364-81701



G1364-83205



G1364-60021



5022-6541 Maldi plate carrier broker



5023-0208 Calibration plate broker

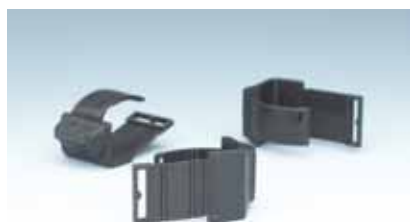
1100/1200 Series Parts and Supplies

Column Compartment Supplies

Thermostated Column Compartment

Switching Valve Replacement Parts

Use With	Description	Part No.	RheBuild Kit Part No.	Rotor Seal Part No.	Stator Part No.
G1316A Option 055	2 position / 6 port Column switching valve, 400 bar	0101-0920	0101-1258	0100-1855 (Vespel) 0100-1854 (Tefzel) 0100-2233 (PEEK)	0100-1850 Stator head 0100-1851 Stator face 0100-1852 Isolation seal
G1316B Option 055, SL	2 Position / 6 Port Column Switching Valve, 600 bar	0101-1420		0101-1409 (HP PEEK blend)	0101-1417
G1316A Option 056	2 Position / 6 Port μ Column Switching Valve, 400 bar	0101-1051		0100-2087 (Vespel)	0100-2089
G1316A Option 057	2 Position / 10 port switching valve, 400 bar	0101-1343	0101-1360	0101-1361	
G1316B Option 057, SL	2 Position / 10 Port Switching Valve, 600 bar	0101-1419		0101-1415 (HP PEEK blend)	0101-1421



5062-8588



G1316-80004

Thermostated Column Compartment

Description	Part No.
High Temperature Heat exchanger, 1.6 uL 0.12 mm id, "R"	G1316-80002
High Temperature Heat exchanger, 1.6 uL 0.12 mm id, "L"	G1316-80003
Heat exchanger / Cooler, 1.5 uL 0.12 mm id	G1316-80004
Carrier for heat exchanger TCC SL	G1316-83200
Column Identification Module (CIM), 3/pk	5062-8588
Column clamp, 6/pk	5063-6526
Column holder for μ -LC columns	5001-3702
Column connecting capillary, 7 cm, 0.12 mm, 1/16 in. male/male	G1316-87303
Column connecting capillary, 9 cm, 0.17 mm ID, 1/16 in. male/male	G1316-87300
Column connecting capillary, 18 cm, 0.12 mm ID, 1/16 in. male/male	G1313-87304
Column connecting capillary, 18 cm, 0.17 mm ID, 1/16 in. male/male	G1313-87305
PEEK tubing, 1/32"od, 0.4mm id, 450 mm Micro valve to waste	5022-6503

Chip LC

Description	Part No.
Rotor, inner valve, 3 grooves, Chip LC	G4240-23705
Rotor, outer valve, 5 grooves, Chip LC	G4240-25206
PEEK fitting, special for Chip-LC	G4240-43200
Fused silica/PEEK capillary, 15um 90cm Nano pump to Chip cube	G4240-87300
Fused silica/PEEK capillary, 25um 105cm Micro well plate sampler to Chip Cube	G4240-87301
Fused silica/PEEK capillary, 100um 100cm Chip Cube to waste	G4240-87302
Fused silica/PEEK capillary, 75um 100cm Syringe pump to Chip Cube	G4240-87303
Fused Silica/PEEK capillary 50um 50cm	G4240-87304

1100/1200 Series Parts and Supplies

Column Compartment Supplies

Biocompatibility Kit

Description	Part No.
Biocompatibility kit for 1100 Series LC Contains PEEK capillaries, PTFE solvent inlet filter, PEEK union, PEEK needle seat and needle, PEEK fittings	5065-9972
Needle seat PEEK w/o capillary, G1313A	G1313-87104
Needle assembly, for use with PEEK seat	G1313-87203
PEEK seat tubing, 0.17mm ID, 100mm, 2.3 µL	G1313-87302
PEEK capillary, 0.25 mm ID, 160 mm connecting valve with metering device of G1313 autosampler	G1313-87306
PEEK loop capillary for 100 µL sample	G1313-87309
Rotor seal, PEEK, 2-groove for 0101-0921	0100-2231
ZDV union, PEEK with fittings	0100-2441
PEEK RheFlex 2-piece fittings, 5/pk	0100-1631
PEEK Tubing, 0.25 mm ID, 15. m	0890-1762
PEEK Tubing, 0.18 mm ID, 1.5 m	0890-1763
Solvent inlet filter, PTFE, 10 µm pore stepped tubing connector, metal free	3150-0958
Finger-tight PEEK fittings, beige, 1/16 in., 10/pk	5063-6591

1100/1200 Connection Capillaries

1200 Rapid Resolution Connection Capillaries

From	To	ID (mm)	Length (mm)	Connection	Fittings	Part No.
Pump	Autosampler	0.17	400	Male to male	Pre-swaged	G1312-87303
	Cooled Autosampler	0.17	700	Male to male	Pre-swaged	G1312-87304
Damper	Pressure sensor	0.17	150	Male to male	Pre-swaged	G1312-87305
Damper Mixer	Mixer Outlet Valve	0.17	105	Male to male	Pre-swaged	G1312-87306
Cell out	MS	0.12	500	Male to male	1 end pre-swaged	G1315-87307
DAD heat exchanger capillary		0.17	310	Male to male	1 end pre-swaged	G1315-87319
DAD heat exchanger capillary		0.12	310	Male to male	1 end pre-swaged	G1315-87339
Valve	Valve	0.12	100	Male to male	Non-swaged	G1316-27301*
Micro Valve	Regeneration Pump	0.12	130	Male to female	Non-swaged	G1316-87304*
WPS	Micro valve	0.12	340	Male to male	1 end pre-swaged	G1316-87305*
Micro valve	Heat exchanger	0.12	75	Male to male	Non-swaged	G1316-87306*
TCC VWD	MS	0.12	500	Male to male	1 end pre-swaged	G1316-87309
Column	DAD cell	0.12	50	Male to female	Non-swaged	G1316-87312
		0.12	70	Male to female	Non-swaged	G1316-87313
		0.12	90	Male to female	Non-swaged	G1316-87314
		0.12	130	Male to female	Non-swaged	G1316-87315
WPS	TCC	0.12	170	Male to male	Non-swaged	G1316-87316
		0.12	210	Male to male	Non-swaged	G1316-87317
Cooled WPS	TCC	0.12	300	Male to male	Non-swaged	G1316-87318
		0.12	340	Male to male	Non-swaged	G1316-87319
Column	Cooler (50-150 mm column)	0.17	105	Male to male	Non-swaged	G1316-87321
	Cooler (20-30 mm column)	0.17	170	Male to male	Non-swaged	G1316-87323
Micro valve	Detector	0.12	75	Male to female	Non-swaged	G1316-87326*
Column	DAD cell	0.12	170	Male to female	Non-swaged	G1316-87327

*0.8 mm OD stainless steel capillaries—use 0.8 mm ID fittings

1100/1200 Series Parts and Supplies

Capillary LC Supplies

Generic Connecting Capillaries for Capillary LC System

Item	From	To	Fitting	Part No.
1	SSV	AIV		G1311-67304
2	OBV	Piston 2	A/A	G1312-67300
3	Pump	Restriction capillary	A/A	G1312-67302
4	Mixing capillary	Damper	A/A	G1312-67304
5	Damper	Mixer	A/A	01090-87308
6	Mixer	Filter	A/A	01090-87308
7	Filter	EMPV	A/A	G1375-87400
8	Needle seat	Injection valve	-C	G1329-87101

PEEK Coated Fused Silica Capillaries for use with 20 µl/min Flow Range

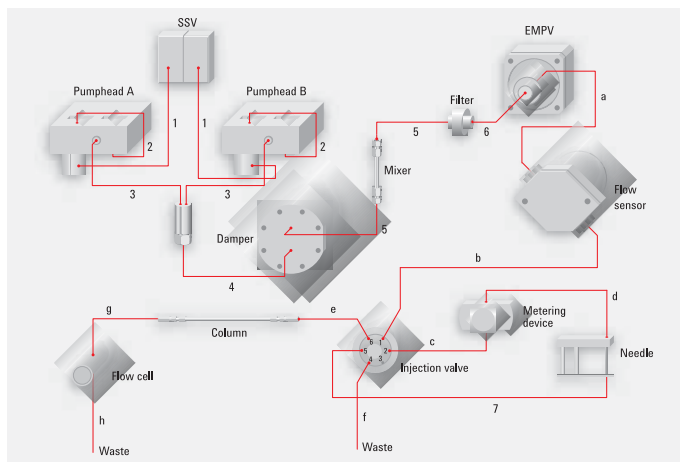
Item	From	To	Fitting	ID (µm)	Part No.
a	EMPV	Flowsensor	B/B	50	G1375-87301
b	Flowsensor	Injection valve	B/C	50	G1375-87310
c	Injection valve	Metering device	B/C	50	G1375-87302
d	Metering device	Needle	B/B	100	G1375-87303
e	Injection valve	Column	C/D	50	G1375-87304
f	Injection valve	Waste	C/-	100	G1375-87307
g	Column	Detector	D/E	50	G1315-68703
h	Detector	Waste	E/-	75	G1315-68708
	µ-switching valve	Column	C/D	50	G1375-87309

PEEK Coated Fused Silica Capillaries for use with 100 µl/min Flow range

Item	From	To	Fitting	ID (µm)	Part No.
a	EMPV	Flowsensor	B/B	100	G1375-87305
b	Flowsensor	Injection valve	B/C	100	G1375-87306
c	Injection valve	Metering device	B/C	100	G1375-87312
d	Metering device	Needle	B/B	100	G1375-87303
e	Injection valve	Column	C/D	75	G1375-87311
f	Injection valve	Waste	C/-	100	G1375-87307
g	Column	Detector	D/E	75	G1375-87308
h	Detector	Waste	E/-	75	G1315-68708
	µ-switching valve	Column	C/D	50	G1375-87309

1100/1200 Series Parts and Supplies

Capillary LC Supplies



Replacement Fittings and Ferrules for Capillary and Nano Flow System

Graphic	Description	Type	Part No.
	1/16 in. SS fittings, front and back ferrules, 10/pk	A	5062-2418
	Fitting male, 1/16", 4mm, SS, 10/pk	B	5063-6593
	1/32" ferrule and SS lock ring, 10/pk	B	5065-4423
	6 fittings, 2 plugs, PEEK for μ -valves	C	5065-4410
	Double winged PEEK nuts and 1/32" ferrules, 10/pk	D	5065-4422
	PEEK fitting long for 1/32" od capillary	D	5022-6536

PEEK Coated Fused Silica Capillaries for Nano LC

Description	Part No.
25 μ m ID, 10 cm long, connecting valve-column	G1375-87320
25 μ m ID, 22 cm long, connecting EMPV-flow sensor	G1375-87321
25 μ m ID, 35 cm long, connecting flow sensor-injection valve	G1375-87322
25 μ m ID, 55 cm long, connecting valve-flow sensor or column	G1375-87323
25 μ m ID, 70 cm long, connecting valve-column	G1375-87324
50 μ m ID, 10 cm long, connecting valve-column	G1375-87325
75 μ m ID, 65 cm long, connecting valve-injector seat or 2nd pump	G1375-87327
Nanoflow LC start-up kit Includes PEEK coated fused silica capillaries, column and fittings to start up an 1100 Nanoflow LC system	G2228-68700

1100/1200 Series Parts and Supplies

Capillary LC Supplies



Variable Wavelength Detector (VWD)

Variable Wavelength Detector (VWD)

Replacement Parts

Description	Part No.
G1314A VW detector accessory kit Includes 1/4in waste tubing, 2 hex keys, 2 wrenches, outlet tubing, 1/16in PEEK male fitting	G1314-68705
Deuterium lamp (1000 hours)	G1314-60100
Deuterium longlife lamp *	2140-0813
VWD inlet tubing with fitting, 0.18 x 40 mm, PEEK	5062-8522
VWD outlet tubing with fitting, 0.25 x 48 mm, PEEK	5062-8535

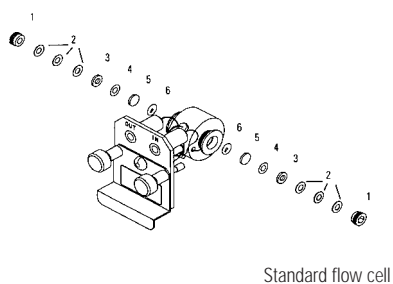
*Check manual for proper setting of detector

VWD Flow Cell Selection

Typical Column Length (cm)	Typical Peak Width	Recommended Flow Cell					
< = 5	0.025	Micro Flow Cell				138	High Pressure Flow Cell for pressure above 100 bar
10	0.05	0.05 - 0.2 ml/min	Semimicro Flow Cell			60	
20	0.1			Standard Flow Cell			
> = 40	0.2					168	
Typical Flow Rate		0.05 - 0.2 ml/min	0.2 - 0.4 ml/min	0.4 - 0.8 ml/min	1 - 2 ml/min	0.05 - 5 ml/min	
Internal Column Diameter		1.0 mm	2.1 mm	3.0 mm	4.6 mm		

G1314-60080 Standard Flow Cell Replacement Parts (old design)

Item	Description	Unit	Part No.
	Standard "D" flow cell kit Includes 2 windows, 2 gaskets #1, 2 gaskets #2		G1314-65050
1	Cell screw		79853-27200
2	Conical spring, "D" version	10/pk	79853-29100
3	Ring, stainless steel, "D" version	2/pk	79853-22500
4	Gasket #1, PTFE, "D" version	10/pk	79853-68743
5	Quartz windows, "D" version	2/pk	79853-68742
6	Gasket #2, PTFE	10/pk	G1314-65051



Standard flow cell

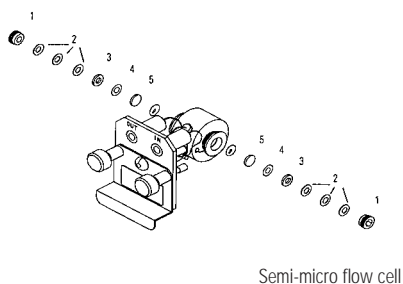
1100/1200 Series Parts and Supplies

VWD Supplies

G1314-60086 Standard Flow Cell Replacement Parts

Item	Description	Unit	Part No.
	Standard "D" type flow cell, 10 mm, 14 μ l, 40 bar		G1314-60086
	Standard "D" flow cell kit Includes 2 windows, 2 gaskets #1, 2 gaskets #2		G1314-65061
1	Cell screws*	2/pk	G1314-65062
2	Conical spring, "D" version	10/pk	79853-29100
3	Ring #1, PEEK	2/pk	G1314-65065
4	Gaskets #1, Kapton	10/pk	G1314-65063
5	Quartz windows, "D" version	2/pk	79853-68742
6	Gaskets #2, Kapton	10/pk	G1314-65064
7	Ring #2, PEEK	2/pk	G1314-65066

*The cell screw of P/N G1314-60086 is painted black to differentiate flow cell types.

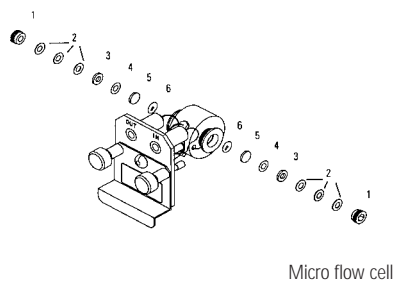


G1314-60083 Semi-micro Flow Cell Replacement Parts

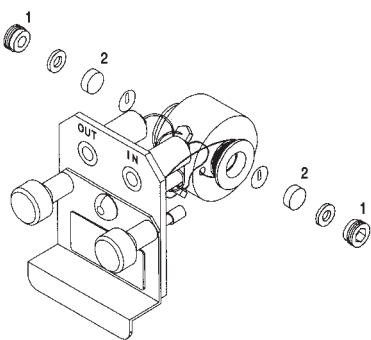
Item	Description	Unit	Part No.
	Semi-micro flow cell assembly 6 mm, 5 μ l, 40 bar		G1314-60083
	Semi-micro flow cell kit Includes 2 windows, 4 gaskets: 2 standard #1, 1 semi-micro #1, 1 semi-micro #2		G1314-65056
1	Cell screw		79853-27200
2	Conical spring, "D" version	10/pk	79853-29100
3	Ring, stainless steel, "D" version	2/pk	79853-22500
4	Quartz windows, "D" version	2/pk	79853-68742

1100/1200 Series Parts and Supplies

VWD Flow Cell



Micro flow cell



High pressure flow cell

G1314-60081 Micro Flow Cell Replacement Parts

Item	Description	Unit	Part No.
	Micro flow cell, 5 mm, 1µl, 40 bar		G1314-60081
	Micro flow cell kit Includes 2 windows, 2 gaskets #1, 2 gaskets #2		G1314-65052
1	Cell screw		79853-27200
2	Conical spring, "D" version	10/pk	79853-29100
3	Ring, stainless steel, "D" version	2/pk	79853-22500
4	Quartz windows, "D" version	2/pk	79853-68742
5	Gasket #1, PTFE, "D" version	10/pk	79853-68743
6	Gasket #2, PTFE	10/pk	G1314-65053

G1314-60082 High Pressure Flow Cell Replacement Parts

Item	Description	Part No.
	High pressure flow cell, 10 mm, 14 µl, 400 bar	G1314-60082
	High pressure flow cell kit Includes 2 windows, 2 Kapton gaskets, 2 PEEK rings	G1314-65054
1	Cell screw	79853-27200
2	Window, UHP, 2/pk	79853-68734



Free Newsletter

Receive a free subscription to *Separation Times* or *Agilent in Pharmaceutical Analysis*! Go to www.agilent.com/chem/subnews to register for the electronic newsletter that provides the science, solutions and special offers you need to ensure your lab achieves maximum productivity.

1100/1200 Series Parts and Supplies

DAD/MWD Supplies



Diode Array Detector (DAD)/Multiple Wavelength Detector (MWD)

The innovative design of the Agilent 1100 Series DAD lamp features

- Lifetime approximately 2000 hours
- Precise alignment
- Thermal stability
- Easy handling during installation and removal

Cleaning or Replacing DAD/MWD Flow Cells

- A decrease in detector performance or unusual noise levels may mean you have dirty flow cell windows.
- Clean and reassemble one side of the flow cell before beginning the other side to prevent mixing the front and rear gaskets which have different hole diameters.
- When you clean or replace flow cell windows, if the washers fall out of the window assembly, they must be inserted in the correct order with a Teflon ring to prevent any leaks from the flow cell window.
- Clean the cell body with water or isopropanol.
- After opening the cell you should always use a new gasket.

DAD/MWD Flow Cell Selection

Typical Column Length (cm)	Typical Peak Width	Recommended Flow Cell				
< = 5	0.025	80/500nl Flow Cell				High Pressure Flow Cell
10	0.05		Semimicro Flow Cell			
20	0.1			Standard Flow Cell		
> = 40	0.2					
Typical Flow Rate		0.05 - 0.2 ml/min	0.2 - 0.4 ml/min	0.4 - 0.8 ml/min	1 - 2 ml/min	0.05 - 5 ml/min
Internal Column Diameter		0.3 - 1 mm	2.1 mm	3.0 mm	4.6 mm	

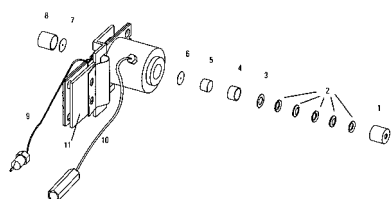
1100/1200 Series Parts and Supplies

DAD/MWD Supplies



Replacement Parts

Description	Part No.
Deuterium lamp, 1100 DAD/MWD	2140-0590
Deuterium lamp, 1100 DAD/MWD, long life	2140-0813
Deuterium lamp, 1100 DAD/MWD, long life, with ID tag For G1315C DAD and G1365C MWD	2140-0820
Deuterium lamp, 1100 DAD/MWD longlife For G1315A/B DAD and G1365A/B MWD	5181-1530
Tungsten lamp assembly For G1315A/B DAD and G1365A/B MWD	G1103-60001
ZDV Union, stainless steel, no fitting, Capillary / Nano/ Standard LC	5022-2184
Holmium Oxide filter	79880-22711
Lever for Holmium Oxide Filter	G1315-45001
Column connect capillary, 380 x 0.17 mm	G1315-87311
Column connect capillary, 150 x 0.12 mm	G1315-87312



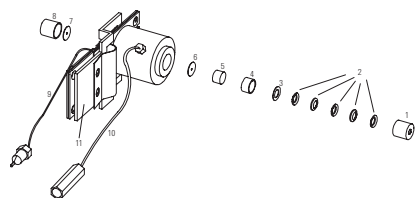
Standard flow cell

G1315-60012/22 Standard Flow Cell and Replacement Parts

Item	Description	Part No.
	Standard flow cell, 10 mm, 13 μ l, 120 bar	G1315-60012
	Standard flow cell, 10 mm, 13 μ l, 120 bar, RFID tag	G1315-60022
1	Window screw	79883-22402
2	Spring washers, 10/pkg	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Seal BACK, 12/pkg	G1315-68711
7	Seal FRONT, 12/pkg	G1315-68710
	Window assembly (includes items 1 through 5)	79883-68703
9	Inlet capillary with heat exchanger, 0.17 mm ID	G1315-87321
10	Outlet capillary, 0.17 mm ID, 200 mm long	G1315-87302
11	Clamp unit	G1315-84901
	1/16 in. union, zero dead volume, stainless steel	0100-0900
	Cell repair kit Includes window screw kit, 4 mm hexagonal wrench and seal kit	G1315-68712

1100/1200 Series Parts and Supplies

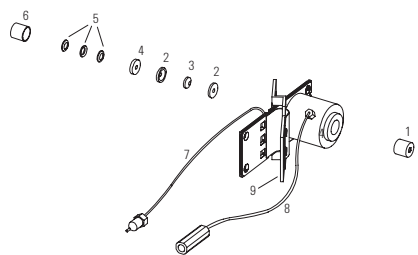
DAD/MWD Supplies



Semi-micro flow cell

G1315-60011 Semi-Micro Flow Cell and Replacement Parts

Item	Description	Part No.
	Semi-micro flow cell, 6 mm, 5 μ l, 120 bar	G1315-60011
	Semi-micro flow cell with ID tag, 6 mm, 5 μ l, 120 bar	G1315-60025
	Micro flow cell with ID tag, 3 mm, 2 μ l, 120 bar	G1315-60024
	Window assembly (includes items 1 through 5)	79883-68703
1	Window screw	79883-22402
2	Spring washers, 10/pk	5062-8553
3	Compression washer	79883-28801
4	Window holder	79883-22301
5	Quartz window	1000-0488
6	Seal BACK, 12/pk	79883-68702
7	Seal FRONT, 12/pk	G1315-68710
8	Inlet capillary with heat exchanger, 0.12 mm ID, 290 mm long for G1315-60011	G1315-87325
9	Outlet capillary, 0.12mm ID, 200 mm long	G1315-87306
	Outlet capillary, 0.17 mm ID, 200 mm long	G1315-87302
10	Clamp unit	G1315-84901
	Screw M 2.5, 4 mm long for cell body/clamp	0515-1056
	Cell repair kit, semi-micro Includes window screw kit, 4 mm hexagonal wrench and seal kits	G1315-68713
	Window assembly (includes items 1 through 5)	79883-68703



Micro high-pressure flow cell

G1315-60015 Micro High-Pressure Flow Cell and Replacement Parts

Item	Description	Part No.
	Micro high-pressure flow cell, 6 mm, 1.7 μ l, 400 bar	G1315-60015
1	Window assembly (includes items 1 through 5)	79883-68703
2	Seal ring	79883-27101
3	Quartz window, high pressure	1000-0953
4	Compression washer, high pressure	79883-28802
5	Spring washers, 10/pk	5062-8553
6	Window screw	79883-22404
7	Inlet capillary with heat exchanger, 0.12 mm ID, 290 mm long for G1315-60011	G1315-87325
8	Outlet capillary, 0.12mm ID, 200 mm long	G1315-87306
9	Clamp unit	G1315-84901
	Screw M 2.5, 4 mm long for cell body/clamp	0515-1056
	Column connect capillary, 150 x 0.12 mm	G1315-87312
	Column connect capillary, 380 x 0.17 mm	G1315-87311
	High pressure cell repair kit Includes 1 quartz window, 5 spring washers, 2 seal rings	79883-68700

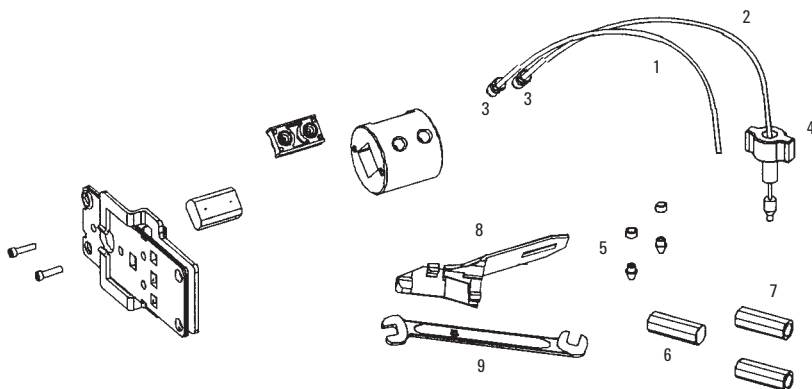
1100/1200 Series Parts and Supplies

DAD/MWD Nano Flow Cells

DAD/MWD Nano

Nano Flow Cell Replacement Parts

Item	Description	Unit	Part No.
	500 nL Flow Cell Contains quartz flow cell with 10 mm path length and 500 nL volume, connecting capillaries, max 50 bar pressure		G1315-68724
	80 nL Flow Cell Contains quartz flow cell with 6 mm path length and 80 nL volume, connecting capillaries, max 50 bar pressure		G1315-68716
1	Fused silica/PEEK capillary, 40 cm long, 50 µm ID		G1315-68703
2	Fused silica/PEEK capillary, 70 cm long, 75 µm ID		G1315-68708
3	Fitting screw	10/pk	5063-6593
4	Double winged nuts and 1/32 in. ferrules	10/pk	5065-4422
5	1/32 in. Ferrule and SS lock ring, lite touch	10/pk	5063-6592
6	Union Adjustment Tool	2/pk	5022-2146
7	ZDV Union, stainless steel, no fitting	2/pk	5022-2184
8	Torque Wrench Adapter		G1315-45003
9	Open end wrench, 4 mm		8710-1534



500 nL flow cell and replacement parts

1100/1200 Series Parts and Supplies

DAD/MWD Nano Flow Cells

Parts for the G1315-68724 500 nl Flow Cell

Description	Part No.
Fused silica/PEEK capillary, 100 µm ID, 30 cm long, Inlet	G1315-87333
Fused silica/PEEK capillary, 50 µm ID, 40 cm long, Inlet	G1315-87323
Fused silica/PEEK capillary, 100 µm ID, 12 cm long, Outlet	G1315-87338
Fused silica/PEEK capillary, 50 µm ID, 12 cm long, Outlet	G1315-87328
Sealing kit Includes torque adapter, 2 cell seal assemblies, 5 litetouch front and back ferrules	G1315-68715

Parts for the G1315-68716 80 nl Flow Cell

Description	Part No.
Fused silica/PEEK capillary, 50 µm ID, 40 cm long, Inlet	G1315-87323
Fused silica/PEEK capillary, 50 µm ID, 12 cm long, Outlet	G1315-87328
Fused silica/PEEK capillary, 25 µm ID, 20 cm long, Inlet	G1315-87313
Fused silica/PEEK capillary, 25 µm ID, 60 cm long, Outlet	G1315-87318
Sealing kit for 80nl flow cell Includes torque adapter, 2 cell seal assemblies, 5 litetouch front and back ferrules, 5 sleeves for 360 µm od capillaries	G1315-68725

G1315-60017/18 Preparative Flow Cells and Replacement Parts

Description	Part No.
Prep Flow Cell Quartz, 0.3 mm, 20 bar	G1315-60017
Prep Flow Cell Quartz, 0.06 mm, 20 bar	G1315-60018
PTFE tubing, 0.8 mm ID, 2 m	G1315-67301
PTFE tubing, 0.5 mm ID, 0.8 m	G1315-67302
Cell housing	G1315-27705
Quartz body, 0.3 mm	G1315-80004
Quartz body, 0.06 mm	G1315-80003
Prep Flow Cell SS, 3 mm, 120 bar	G1315-60016
SS connecting capillary, 0.5 mm, 250 mm	G1315-87305

1100/1200 Series Parts and Supplies

Fluorescence Detector

G1321A 1100 Series Fluorescence Detector (FLD)

Description	Unit	Part No.
Xenon flash Detector lamp		2140-0600
Flow cell		G1321-60005
Cuvette kit, 8 μ l, 20 bar Includes tubing, SS fitting, front and back ferrule, PEEK fitting, syringe needle, syringe		G1321-60007
Cut-off filter kit:		
389, 408, 450, 500, 550 nm		5061-3327
380, 399, 418, 470, 520 nm		5061-3328
280, 295, 305, 335, 345 nm		5061-3329
Corrugated tubing, polypropylene, 6.5 mm ID, 5 m		5062-2463
Teflon tubing, FEP, 0.7 mm ID, 5 m		5062-2462
Finger-tight PEEK fittings, beige, 1/16 in.	2/pk	0100-1516
Column connect capillary, 380 x 0.17 mm		G1315-87311
1/16 in. front ferrule, stainless steel	10/pk	5180-4108
1/16 in. back ferrule, stainless steel	10/pk	5180-4114
1/16 in. male fittings, stainless steel	10/pk	5061-3303
Hex key, 4.0 mm, 10 cm long straight handle		5965-0027
Hex key, 2.5 mm, 10 cm long straight handle		5965-0028
Fluorescence Detector Calibration Sample, 1 g glycogen		5063-6597
Hex key set, 1-5 mm		8710-0641
Open end wrench, 1/4 and 5/16 in.		8710-0510
Glass syringe		9301-1446
Syringe needle		9301-0407

1100/1200 Series Parts and Supplies

Refractive Index Detector /Standards



Caffeine Standards Kit, 8500-6762

G1362A 1100 Series Refractive Index Detector (RID)

Description	Part No.
Tubing kit Includes 300 mm recycle valve to recycle port, 200 mm recycle valve to waste port, 120 mm purge valve to recycle valve, 270 mm purge valve to sample cell, 170 mm purge valve to reference cell	G1362-68709
Interface tubing kit Includes 1/8 in. ferrule, 1/3 in. nut, Teflon tubing	G1362-68706
Interface Capillary, 400 mm, 0.17 mm ID	G1362-87300
Restriction Capillary, 3000 mm, 0.17 mm ID	G1362-87301

LC and LC/MS Standards

Description	Part No.
Caffeine Standards Kit for LC OQ/PV Includes one 10 mL ampoule: 125.0 µg/ml; four 5 mL ampoules: 5.0, 25.0, 250.0 and 500.0 µg/ml caffeine in water	8500-6762
Caffeine Standards Kit for LC/MS OQ/PV Includes 5 ampoules, 5 ml each: 0.5, 1.0, 5.0, 25.0, and 50.0 µg/ml in water	8500-6917
Caffeine Standards Kit for Capillary OQ/PV Includes 5 ampoules, 5 ml: 2.0, 4.0, 20.0, 100.0, 200.0 µg/ml caffeine in water	5065-4420
Caffeine Standards Kit for LC/MS-Trap OQ/PV Includes 5 ampoules, 5 ml each: 0.1, 0.5, 1.0, 5.0, 10.0, µg/ml caffeine in water	5065-9908
Caffeine OQ/PV sample for dissolution test, 150 mg/L caffeine in water, 500 mL	5042-6476
RI Detector OQ/PV Test Sample Includes 5 ampoules, 5ml: 5, 10, 15, 25, and 50 mg/ml glycerin in water	5064-8220
Isocratic and Gradient Standards Contains 0.15% diethylphthalate, 0.01% biphenyl, and 0.03% terphenyl in MeOH (w/w). The gradient standard includes 0.32% dioctyl phthalate as well. Two 0.5 ml ampoules of each.	01080-68702
Isocratic Standard, 0.5 ml ampoule	01080-68704
Capillary, SS, 2 m, 0.12 mm ID, ferrule	5022-2159
OQ/PV capillary for prep LC system, SS, 4 m long, 0.25 mm ID	5065-4493

1100/1200 Series Parts and Supplies

LC/MSD Supplies

LC/MSD Supplies



6510 Quadrupole Time-of-Flight LC/MS



6410 Triple Quadrupole LC/MS

Description	Part No.	LC MSD LC MSD LC MSD		
		Quad	Trap	TOF
Spray shield	G1946-20157	◆	◆	◆
End plate	G1946-20156	◆	◆	◆
ES nebulizer assembly, Used for analytical sprayer	G1946-60098	◆	◆	◆
API-ES nebulizer needle	G2427A	◆	◆	◆
Vented standoff for mesh assembly, 4 required	G1946-20163	◆	◆	◆
APCI Nebulizer assembly	G1946-60037	◆	◆	◆
APCI Nebulizer Needle	G2428A	◆	◆	◆
Needle assembly	G1947-60103	◆	◆	◆
Corona Needle APCI	G1947-20029	◆	◆	◆
Capillary cap (G1946A/B/C)	G1946-20056	◆		
Capillary cap (G1946D and G1956A/B)	G1946-20301	◆	◆	◆
Capillary (G1946A/B/C and G1956A)	G1946-80009	◆	◆	
Capillary (G1946D, G1956B)	59987-20040	◆	◆	◆
Spring canted coil, 0.25" ID, 0.53 mm	1460-2571	◆	◆	◆
1/6 in. tee, low dead volume, stainless steel	0100-0969			◆
Syringe adapter	9301-1291		◆	
Syringe pump	3162-0178		◆	
Finger-tight PEEK fittings, beige, 1/16 in.	0100-1516		◆	◆

1100/1200 Series Parts and Supplies

LC/MSD Supplies



6300 Series Ion Trap LC/MS



6210 Time-of-Flight LC/MS

Description	Part No.	LC MSD		
		Quad	LC MSD Trap	LC MSD TOF
Finger-tight PEEK fittings, beige, 1/16 in.	0100-1516		◆	◆
Female Luer to female 10/32 adaptor	0100-2304		◆	◆
PEEK tubing	0890-1915		◆	◆
Gas-tight syringe, Teflon luer lock	5182-9710		◆	◆
High throughput skimmer, 2 mm	G1969-20302			◆
Skimmer 1 (G1946A/B/C)	G1946-20089	◆		
Skimmer 1 (G1946D)	G1946-20302	◆		
Skimmer 1 (G1956A/B)	G1956-20302	◆		
Skimmer 2 (G1946A/B/C and G1956A Only)	G1946-20087	◆		
HED Electron Multiplier (G1946A/B/C/D)	G1946-80019	◆		
Detector assembly (G1956A/B)	G1956-80000	◆		
Electron multiplier replacement horn	05971-80103	◆		
Replacement horn and dynode	G2441-80010		◆	
Foreline pump 220V; 50/60 Hz US and Japan	G1946-80006	◆	◆	
Foreline pump 230V; 50/60Hz, Europe and Australia	G1946-80041	◆	◆	
Foreline pump, 208V (200 to 220VAC); 50/60 Hz, US and Japan	G1969-80208			◆
Foreline pump, 230V (220 to 264VAC); 50/60 Hz, Europe and Australia	G1969-80230			◆
Delay calibrant	G1946-85020	◆		
Electrospray calibrant solution, 100 ml	G2421A	◆		

LC and LC/MS



Maintenance Minder

Problems with a nebulizer needle can cause low signals. Be sure to inspect and change your nebulizer needle at regular intervals.

1100/1200 Series Parts and Supplies

LC/MSD Supplies

LC MSD Chemical Supplies

Description	Part No.
LC MSD Quad Supplies	
Electrospray calibrant solution, 100 ml	G2421A
APCI/APPI calibrant solution, 100 mL	G2432A
ES Negative Ion Performance Standard, 5 x 1 ml ampoules	G2424A
Delay Calibrant	G1946-85020
LC MSD Trap Supplies	
ESI tune mix for ion trap, 1 mL	G2431A
APCI/APPI calibrant solution, 100 mL	G2432A
LC MSD TOF Supplies	
ES-TOF tuning mix, 100 ml	G1969-85000
APCI-TOF tuning mix, 100 ml	G1969-85010
Multimode TOF tuning mix, 100 mL	G1969-85020
ES-TOF reference mix, 6 x 2 ml ampoules	G1969-85001
ES-TOF Biopolymer reference standard kit	G1969-85003
LC MSD Common Supplies*	
Flushing solvent	G1969-85026
High purity water, 4 L	8500-2236
Methyl alcohol, 1 L	8500-1867
Acetonitrile, 1 L	G2453-85050
Formic acid, 5 ml	G2453-85060
Ammonium formate	G1946-85021
ES/APCI positive ion performance standard, 5 x 1 ml ampoules	G2423A

*These parts are common to all LC MSD systems

LC MSD Common Supplies*

Description	Part No.
Filter element, 5 um, qty 5	0100-2051
Rotor seal, Tefzel, pH 0 to 14	0100-1854
Rotor seal, Vespel, pH 0 to 10	0100-1855
Oil mist filter kit for E2M18	3162-1056
Oil return kit	3162-1057
Rotary pump oil, 4L	6040-0798
Rotary pump oil, 1L	6040-0834
Abrasive mesh 4000 grit	8660-0827
Needle nose pliers, pointed serrated jaws	8710-0004
Open end wrench, 1/4 and 5/16 in.	8710-0510
Wrench, 1/2 and 7/16 in.	8710-0806
Screwdriver, Torx T20	8710-1615
Screwdriver, Torx T15	8710-1622
3 mm wrench for nebulizer needle adjustment	8710-2699
Big hydrocarbon trap	BHT-4
Nebulizer adjustment fixture	G1946-20215
G1946A tool kit	G1946-60157
Inlet filter assembly	G1946-60180
Nebulizer 25X magnifier	G1946-80049
Capillary cleaning wire for dip tube	G1946-80054
SSV long drain tubing assembly	G1969-60086

*These parts are common to all LC MSD systems

1100/1200 Series Parts and Supplies

Quiet Cover Supplies



Quiet Cover

Agilent has developed a solution to quiet your LC/MS rough pump. The Quiet Cover fits right over your rough pump to significantly reduce noise and is compatible with the BOC Edwards Model E1M18 rough pump used with many Agilent LC/MS systems. The Quiet Cover features:

- Sound absorbing cabinet with resistant foam insulation to reduce pump noise
- Pump mounted on cushioned grommets to minimize vibration
- No tools necessary to remove sectioned cover for easy access to pump
- Locking castors to move pump
- Integrated fans maintain temperature inside cover
- LEDs and audible alarm if temperature exceeds 35°C limit
- Built in Lift and Tilt lever raises end of pump to drain oil
- Removable molded plastic drip pan with well and hand holds to collect and transport oil

Description	Part No.
Quiet Cover for Agilent LC/MS Systems 11.7" wide X 16.5" high x 30" deep	G3199A



Library

More information is a click away. We have a variety of educational primers, application notes, maintenance guides, and literature available from Agilent for free. To learn more, call your local sales office or an authorized distributor or visit our website at www.agilent.com/chem/OnlineLibrary.

1090 Parts and Supplies

Pump and Flow Path Supplies

1090 Parts and Supplies

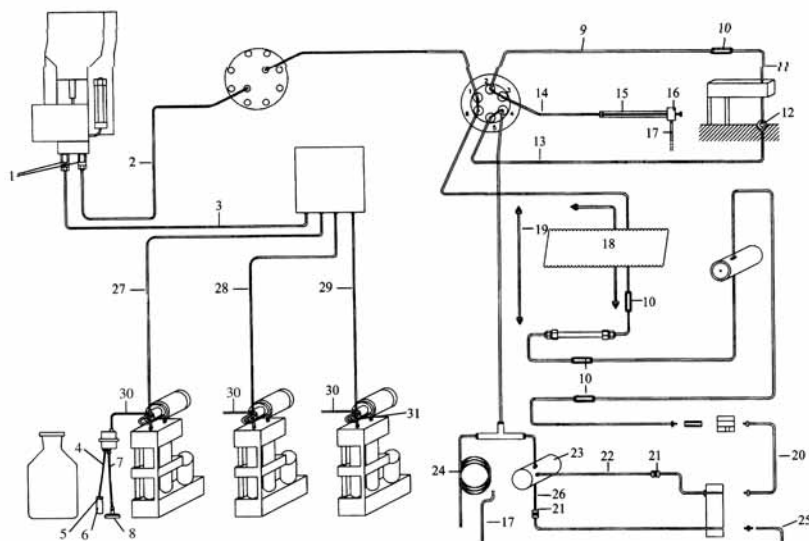
Pump and Flow Path Supplies

Item	Description	Part No.
1	Check valve cartridge	79835-67101
	Check valve cartridge, to pH 12.5	79835-67102
	Replacement sieve for high pressure check valve cartridge	79835-65213
	Replacement sieve for extended pH (12.5) use	79835-65216
	Check valve housing	79835-25211
2	Capillary, 0.25 mm ID, 130 mm	79835-67308
3	Low pressure tube, 0.6 mm ID, 130 mm	79835-67307
4	Tubing, PTFE, 5m, 0.057in. ID	5062-2461
5	Connector for helium sparger, 6/pk	5062-8515
6	Helium sparger, glass filter, 10-16 μm pore size	5041-8339
	Helium sparger with adapter	01019-82702
7	Solvent capillary, 10 μl	01090-87606
8	Solvent inlet filter	01090-60008
	Solvent inlet filter, 12-14 μm , stainless steel	01018-60025
	Solvent reservoir, 1 liter	9301-0656
9	Capillary loop, 25 μl	79846-87604
	125 μl	79846-87612
	250 μl	79846-87613
10	1/16 in. union, zero dead volume, stainless steel	0100-0900
11	Needle insert, 25 μl	79846-87201
	250 μl	79846-87202
12	Needle seat	79846-67101
13	Seat capillary, 0.12 mm ID, 110 mm	79846-87605
	0.17 mm ID, 110 mm	01090-87303
14	Syringe capillary, 0.25 μm ID, 100 mm	79846-87601
15	Syringe, 25 μl	9301-0633
	Syringe, 250 μl	9301-0678
	Replacement plunger, 25 μl	9301-0675
	Replacement plunger, 250 μl	9301-0677
	Syringe seal, 25 μl	79846-27101
	Syringe seal, 250 μl	79846-27103
	Waste sleeve, 25 μl	79846-24501
16	Waste sleeve, 250 μl	79846-24502
	O-ring, 4 mm ID, 4.8 mm OD	0905-0970
	Waste tube	79846-27303
18	Oven heat exchanger	01090-61105
19	Capillary for unheated column compartment, 0.17 mm ID, 370 mm	01090-87317
	0.12 mm ID, 370 mm	01090-87301
20	Flush connector cap, 0.6 mm ID, 190 mm	01090-87615

1090 Parts and Supplies

Pump and Flow Path Supplies

Item	Description	Part No.
21	Union, 1/16 in. stainless steel	0100-1017
22	Detector capillary, 0.6 mm ID	79846-87609
23	Flush valve	79846-67902
24	Restriction capillary	79846-87600
25	Tubing, PTFE, 5m, 0.057in. ID	5062-2461
26	Waste capillary, 0.6 mm ID	79846-87610
27	Delivery tube A, 0.6 mm ID, 600 mm	79835-67302
28	Delivery tube B, 0.6 mm ID, 500 mm	79835-67305
29	Delivery tube C, 0.6 mm ID, 430 mm	79835-67306
30	Connection capillary, 0.9 mm ID, 290 mm	01090-87603
31	Connection capillary, 0.6 mm ID, 90 mm	79835-67304
	Pump seal, black Vespel, 4/pk	5062-2494
	Pump seal, use with buffered solvents	0905-1194
	Sapphire piston	3980-0672
	Diaphragm for high pressure solvent delivery system	79835-04123
	High pressure pump head	79835-27717
	High pressure pump head compression screw	0515-0502
	High pressure hydraulic fluid, 100 ml	01010-80002
	Spare part kit for solvent delivery system Includes 100 ml hydraulic fluid, filter assembly, diaphragm, sieve assemblies (2/pk), ball valve cartridges (2/pk), sapphire plunger, low pressure fittings seals (2/pk)	79835-68701
	Static solvent mixer	79835-87330
	Replacement frits for solvent mixer 40 µl pore size, 6/pk	79835-62701
	Kalrez O-ring, for solvent reservoir	0905-1259



1090 flow path

1090 Parts and Supplies

Sample Introduction/FPD Supplies



Spare parts kit for variable volume injector, 79846-68702

1090 Autoinjector/Sampler

Description	Part No.
Rotor seal, Tefzel, operating pH 0 to 14	1535-4900
Rotor seal, Vespel, operating pH 0 to 10	1535-4048
Spare parts kit for 25 μ l variable volume injector Includes 2 syringe seals, syringe plunger, rotor seal, 2 needle assemblies, 2 needle seats, 0.12 mm ID seat capillary, wrench	79846-68702
250 μ l Syringe Upgrade Kit Includes parts to convert the maximum injection volume of the variable volume injector from 25 μ l to 250 μ l, waste sleeve, needle, restriction capillary, 250 μ l loop capillary	79846-68701
Needle seat	79846-67101
Seat capillary, 0.12 mm ID, 110 mm	79846-87605
Seat capillary, 0.17 mm ID, 110 mm	01090-87303
Syringe capillary, 0.25 μ m ID, 100 mm	79846-87601
Syringe, 25 μ l	9301-0633
Replacement plunger, 25 μ l	9301-0675
Magazine rack	79847-60005
Extraction tool to remove vials from 1090 magazine	79847-44901
1090 Specific Vials and Caps	
Crimp top micro vial with fixed insert , 100/pk	9301-1388
Clear tapered 6 mm crimp top vial, 0.1 ml, 500/pk	5180-0844
Clear round 6 mm crimp top vial, 0.3 ml, 500/pk	5180-0841
8 mm crimp caps with PTFE/silicone septa, 500/pk	5180-0842
Vial sleeves, 10/pk	5180-0843

*Need sleeves, P/N 5180-0843

1090 Filter Photometric Detector (FPD)

Description	Part No.
Detector lamp	79880-60002
Cell spring	79881-09103
Cell gasket, 0.6 mm	79881-27101
Cell gasket, 1.2 mm	79881-27102
Cell window	79881-28101

Standalone Detectors Parts and Supplies

DAD/RID/FLD

1090/1040 Diode Array Detector (DAD)

Description	Part No.
Deuterium lamp	79883-60002
Flow cell, 6 mm path length, 8 μ l	79883-60091
Flow cell, 10 mm path length, 13 μ l	79883-60092
Cell gaskets, 12/pk	79883-68702
Standard cell repair kit Includes 12 gaskets, 2 window holders assembled with windows and washers, 2 cell screws, 10 washers, hex key	79883-68701
Quartz window	1000-0488
Window holder	79883-22301
Window screw	79883-22402
Compression washer	79883-28801
High pressure cell repair kit Includes 1 quartz window, 5 spring washers, 2 seal rings	79883-68700
Detector slit assembly, 2 nm	79883-80022
Detector slit assembly, 4 nm	79883-80024
Detector slit assembly, 8 nm	79883-80028
Detector inlet capillary, 0.12 mm ID, 10 cm	79883-87305
Detector outlet capillary, 0.12 mm ID, 39 cm	79883-87306
Detector inlet capillary, 0.17 mm ID, 10 cm	79883-87303
Detector outlet capillary, 0.17 mm ID, 37 cm	01090-87322
Heat exchanger, 0.12 mm ID 1/16 in. female, 1/6 in. ZDV	79880-67304
Heat exchanger, 0.17 mm ID 1/16 in. female, 1/6 in. ZDV	01090-87307

1037/47A Refractive Index Detector (RID)

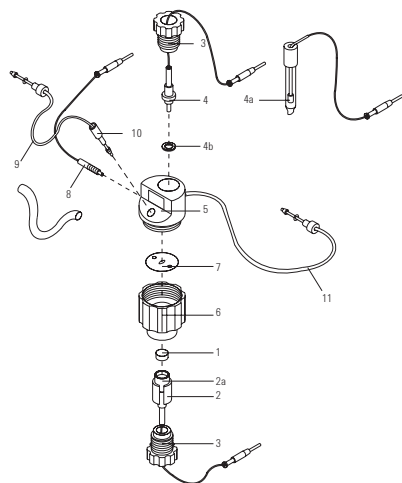
Description	Part No.
Detector lamp	01037-60002

Flourescence Detector (FLD)

Description	Part No.
Flow cell	01046-60010
Inlet capillary, 0.12 mm ID	79881-67301
Outlet capillary, 0.25 mm ID	79881-67302
Spare parts kit Includes 10 gasket stepwindows, 10 gasket cells, 10 guide rings, 3 stepwindows, 2 cell rings, stepwindow black, 10 guide rings, tweezers, and toothpicks	01046-68702
Gasket, stepwindow, 10/pk	01046-67101
Gasket, cell, 10/pk	01046-67102
Stepwindow	01046-28101
Stepwindow, black	01046-28103
Guide ring, 5/pk	01046-67103
Xenon arc flash lamp	2140-0549
Cutoff filter, 295 nm	5062-8530
Cut-off filter kit: 389, 408, 450, 500, 550 nm	5061-3327
Cut-off filter kit: 380, 399, 418, 470, 520 nm	5061-3328
Cut-off filter kit: 280, 295, 305, 335, 345 nm	5061-3329

Standalone Detectors Parts and Supplies

Electrochemical Detector



Electrochemical detector cell

1049 Electrochemical Detector

Item	Description	Part No.
1	Working electrode: Glassy carbon	01049-64105
	Platinum	01049-28801
	Gold	01049-28802
2	Working electrode holder	01049-60013
2a	Silicone tubing	5062-2474
3	Electrode swivel nut	01049-25701
4	Solid state reference electrode	01049-62901
4a	Internal electrolyte electrode	01049-62902
4b	Seal	01049-47102
5	Cell body, black	01049-27708
6	Electrode socket	01049-45201
7	FEP spacer, 10/pk	01049-24705
8	Connector auxiliary electrode	01049-27604
9	Inlet tubing, red PTFE, 0.5 m	01049-27305
10	Inlet connection nut and ferrule	5021-1867
11	Outlet tubing, blue PTFE, 0.5 m	01049-27306
	KCl electrolyte, aqueous solution	01049-92101
	Polishing kit	01049-67001
	Complete ECD cell	01049-68700



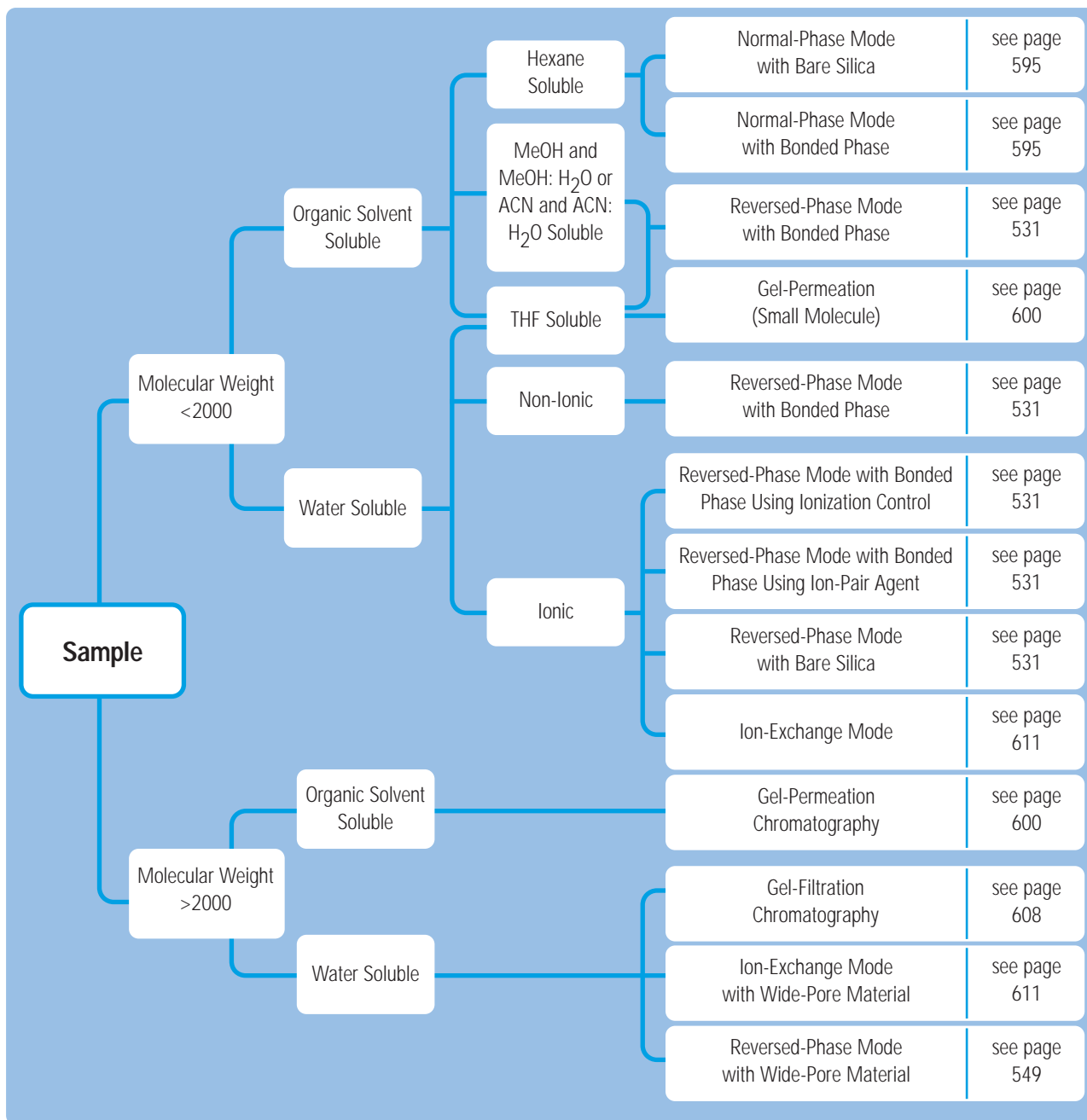
Quick Buy

It's easy to order catalog items online. Simply enter desired quantities and part numbers, and then click "Add to Cart."

LC and LC/MS Columns

Column Selection

To use the column selection guide diagram below, simply follow the path for your analyte and mobile phase. At the far right, follow your final column selection to the catalog section pages indicated.



Adapted with permission from *Practical HPLC Methodology and Applications*, Brian A. Bidlingmeyer, John Wiley & Sons, Inc., New York, p. 109

ZORBAX and Other Agilent LC Column Products for Specific Applications

General small molecule separations

- StableBond
- Eclipse XDB
- Bonus-RP
- Extend

For hydrophilic compounds

(RP columns useable in 100% aqueous mobile phases)

- SB-Aq (low pH)
- Bonus-RP (mid pH)

For hydrophobic compounds

- StableBond columns (low pH, high temp)
- Extend C-18 (high pH, room temp)

For carbohydrate analysis

- Zorbax Carbohydrate Analysis Column

For chiral separations

- Chiradex Columns
- Ultron ES-OVM and Ultron ES-Pepsin Columns

For peptide or protein work

- 300SB
- 300Extend
- 80Å phases also used for peptide work
- Poroshell 300StableBond for proteins
- Poroshell 300Extend for proteins
- GF-Series Size Exclusion Columns

For Amino Acid Analysis

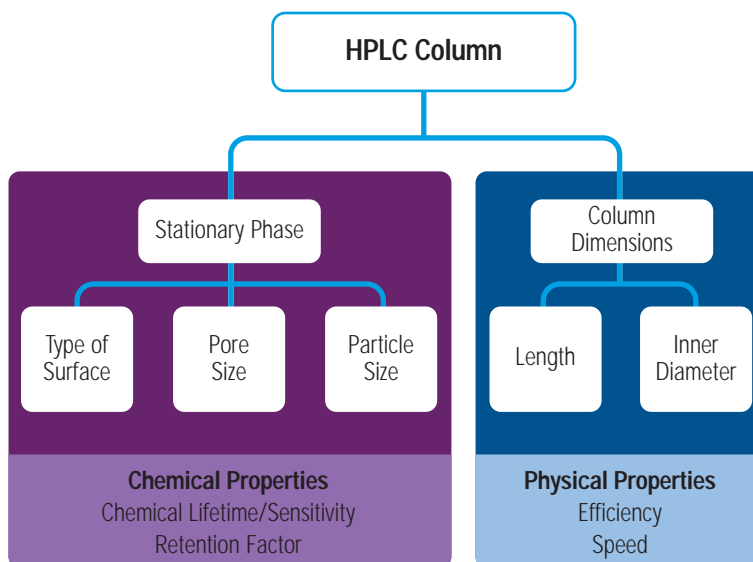
- AminoQuant AA
- Eclipse AAA Columns (amino acid analysis)

LC and LC/MS Columns

Column and Mobile Phase Guidelines:

Reversed Phase

HPLC columns consist of two parts, the column chemistry and hardware. For the proper column chemistry, consult the catalog section for each type of bonded phase. For choosing column hardware and particle sizes, consult the section on column sizes and rapid separations, including Rapid Resolution and Rapid Resolution HT columns, as well as Solvent Saver and Capillary columns and new PrepHT columns.



Pore Size Selection

Choose a column packing with small pore (60-100Å) if the solute molecular weight is less than about 5000. Otherwise, use column packing with the 300Å pore size.

Particle Size Selection

The standard particle size for HPLC columns is 5 µm with 3.5 µm increasing in use. If high-speed analyses or higher resolution analyses are required, packing with 1.8 µm and 3.5 µm particles can be used. Shorter columns with these particles can produce faster high-resolution separations, with the 1.8 µm particle size in Rapid Resolution HT columns, providing the highest efficiency. The 3.5 µm particle size operates at a routine operating pressure and can be used on all LC's. Short (50mm and shorter) 1.8 µm RRHT columns can be used on optimized standard LC's, while the longer columns may require a higher pressure LC (one supporting pressures greater than 400 bar).

LC and LC/MS Columns

Column Selection

Column Configuration

The column sizes most often recommended for analytical method development are 4.6 x 150 mm or 4.6 x 75 mm. If more resolution is needed, use a longer column, 4.6 x 250 mm or the same size column with a smaller particle size. During method development, choose the column internal diameter (e.g., 2.1, 3.0 mm) to accommodate additional application objectives (e.g., sensitivity, solvent usage) or compatibility with certain instrument types (capillary, nano, or prep).

Silica Type and Bonded Phase

Silica Type

ZORBAX reversed phase columns use two different types of porous silica microspheres, the original ZORBAX SIL and ZORBAX Rx-SIL. ZORBAX Rx-SIL is a highly purified, less acidic silica than the original ZORBAX SIL. Less acidic silica means less potential for interaction between the analyte and silanol groups on the silica surface, especially if the solutes are basic, and contributes to improved peak shape. For new method development, we strongly recommend using reversed-phase products based on ZORBAX Rx-SIL (Eclipse, StableBond etc.). However, many excellent methods have been developed on reversed phase columns based on ZORBAX SIL and we continue to manufacture these high quality, reliable products.

Bonded Phase

A good first choice for bonded phase is C18 or C8. If the sample solutes of interest are not adequately separated on these columns, CN and Phenyl columns may offer significant differences in selectivity from the straight-chain alkyl phases to effect the separation.

In general, larger solutes, such as proteins, are best separated on short-chain reversed-phase columns (C3, CN) and peptides and small molecules are separated on longer-chain columns (C8, C18). There are many cases, however, where this conventional wisdom does not apply. For example, peptides can also be effectively separated using short-chain columns, and hydrophobic peptides can show better recovery on longer-chain phases. Therefore, it is best to initially select a phase in the middle of the hydrophobic spectrum (e.g., C8), then change to a more hydrophobic phase or more hydrophilic phase depending on initial results and solubility properties of your sample.

LC and LC/MS Columns

Column Selection

pH and Mobile Phase

The choice of mobile phase for a reversed-phase system starts with selecting the organic modifier. Selectivity differences and sample retention will vary significantly among mobile phases containing acetonitrile, methanol, and tetrahydrofuran (THF). Sample solubility is likely to differ in such solvents and dictate use of a specific solvent or solvents. UV detection at certain wavelengths is not possible with certain modifiers (e.g., methanol at 200 nm).

Both pH and ionic strength of the aqueous portion of mobile phases are important parameters in developing rugged methods that are not sensitive to small variations in conditions. With ionic compounds, retention of typical species shows significant changes with pH. It is very important to control pH in such reversed-phase systems to stabilize retention and band spacing. A pH set between 2 and 4 generally provides the most stable conditions for retention vs. small changes in pH and this pH is recommended for starting method development for most samples, including basic compounds and typical weak acids.

Column Choice Relative to Application Objective

Application	Objective Column Diameter (mm)
Very high sensitivity, LC/MS, peptides and proteins	0.1, 0.075
Very high sensitivity, limited sample, LC/MS, peptides and proteins	0.3, 0.5
High sensitivity, limited sample, LC/MS	1.0
Save solvent; special low-volume instrumentation is available	2.1
Special detectors, e.g., mass spec	2.1
High sensitivity, limited sample	2.1
Save solvent; standard HPLC equipment available, LC/MS	3.0
Standard separations	4.6
Small-scale (mg) preparative separations	9.4
Large-scale preparative separations (100 mg-gram)	21.2
Large-scale preparative separations (up to 100 mg-gram)	30, 50

Consult the Column Hardware section for guard column configurations

Method Development from pH 1-12

Chromatographic resolution between two or more peaks depends upon three factors - column efficiency, selectivity, and retention. With ionizable analytes - bases and acids- all of these factors change dramatically with pH. For example, retention can be improved by changing the separation pH, so that analytes are separated in their non-ionized form. Changes in mobile phase pH also improve column efficiency because the ionization of the analyte and the residual silanols can both be altered. This minimizes secondary interactions between analytes and the silica surface that cause poor peak shape. Achieving optimum resolution can also require changing the mobile phase pH. The following method development strategy explains how this is done with superior column lifetime.

Low, mid, and high pH are the three general regions for chromatographic separations as defined in Figure 1. This figure highlights the benefits of performing separations of ionizable analytes in each pH region. Method development proceeds by investigating chromatographic separations first at low pH and then at higher pH until optimum results are achieved. The ideal column is available for each pH region.

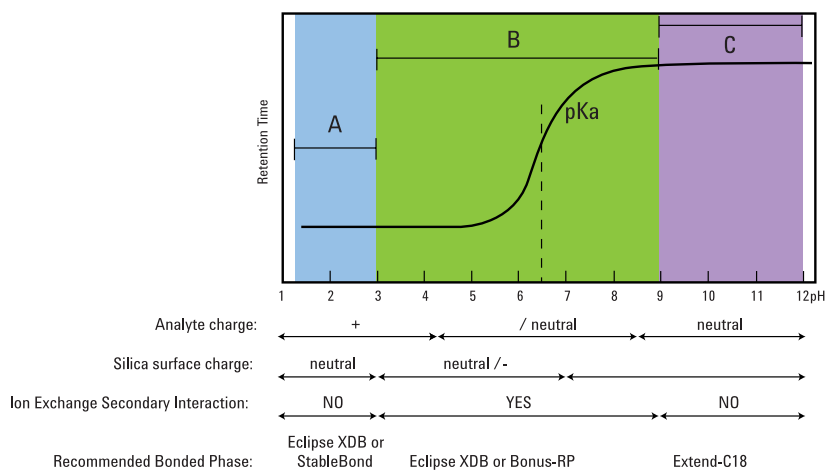


Figure 1: Three pH Regions for HPLC Separations of Basic Compounds
This figure represents the retention behavior of one basic analyte with respect to pKa and pH. Analyte pKa is 6.5

Low pH < 3 – Region A

- Start method development at low pH, where silanols on a RP-HPLC column are protonated. This minimizes peak tailing by eliminating silanol/base interactions.
- At low pH, basic compounds are positively charged and their retention may be reduced.
- Acidic compounds may be protonated and have increased retention.
- Retention times are usually stable with small changes in pH, producing a robust method.
- Volatile mobile phase additives, such as formic acid or trifluoroacetic acid (TFA), are often used at low pH with LC/MS.

Mid pH 7 – Region B

- Develop methods at pHs at least 1 pH unit above or below the pKa to minimize changes in retention with small changes in pH.
- Some silica surface SiOH groups become SiO⁻ above pH 4 to 5; tailing interactions may be possible.
- Minimize interactions by selecting a, well designed and endcapped column, using additives such as TEA (triethylamine) (less desirable) or using "polar-linked" bonded phases.
- Silica breakdown is prevented by innovative bonding chemistry, heavy endcapping, and use of Rx-SIL.

High pH > 9 – Region C

- In this region, basic compounds may be in their free base form.
- Increased retention and resolution of basic compounds are likely.
- Retention changes little in this region, thus robust methods can be developed.
- Silica breakdown is prevented by innovative bidentate column chemistry, heavy endcapping, use of Rx-SIL, and optimum mobile phase.
- Ammonium hydroxide is an excellent volatile mobile phase modifier at high pH.

LC and LC/MS Columns

Method Development

Start method development at low pH (pH 2-4)

With so many column choices available, how do you know where to start your method development? The recommended starting point for method development is using a buffered low pH mobile phase—around pH 2-3. Using a low pH mobile phase most often results in the best peak shape for basic compounds on silica-based columns. At low pH, the silanols on the silica are fully protonated so positively charged basic compounds do not interact strongly. The result is good peak shape. Many acidic compounds are non-charged, maximizing their retention at low pH. These observations are key advantages to method development at low pH.

For standard analytical work, start method development with acetonitrile as the mobile phase organic modifier and 20-50 mM phosphate buffer (pH 2-3) as the aqueous component for non LC/MS applications. These conditions provide good pH control, necessary for the most reproducible analyses of ionizable compounds. For LC/MS applications formic acid or TFA are good mobile phase additives for low pH.

Choose ZORBAX Eclipse Plus first for best peak shape

Select ZORBAX Eclipse Plus C18 or C8 columns first for method development at low pH. Eclipse Plus columns are the newest addition to the Eclipse family and use improved silica and bonding technologies to provide good peak shape for basic compounds. Eclipse Plus columns can be used from pH 2-9 providing method development flexibility. They are stable down to pH 2 making them an ideal choice for initial method development.

Optimize solvents and bonded phases at low pH

The initial method development steps may lead very quickly to a satisfactory separation. But if more optimization is needed, acetonitrile can be replaced by methanol or tetrahydrofuran and the separation re-optimized. This step may lead to a satisfactory solution, but if still more selectivity optimization is needed, the column bonded phase can be changed.

At low pH there are many bonded phase choices available for optimization. These include the Eclipse Plus phases as well as the Eclipse XDB family with C18, C8, Phenyl and CN. Alternate choices include six different StableBond bonded phases: SB-C18, SB-C8, SB-Phenyl, SB-CN, SB-C3, and SB-Aq.

It may be necessary at low pH to improve the retention of acidic compounds. For these situations, lower the pH even further, down to pH 1-2, and use StableBond columns. These columns provide the greatest stability at very low pH and provide many selectivity options for achieving the highest resolution separations.



Tech Support

Find HPLC course descriptions and seminars online. Go to www.agilent.com/chem/Education. Learn from Agilent HPLC experts through classroom training courses, custom on-site training, and free e-seminars. HPLC courses cover instrument and column selection, separation optimization, HPLC maintenance and troubleshooting, Chemstation and more.

LC and LC/MS Columns

Method Development

Method development at mid pH (4-9)

Zorbax Eclipse Plus

There are some samples that may not be resolved at low pH or may have better solubility and stability at mid pH. While still using the Eclipse Plus C18 column, the mid pH range can be used for method development. The Eclipse Plus column is stable up to pH 9 so it is equally reliable at mid pH. These double endcapped columns have two key advantages – good peak shape at low and mid pH, as well as sufficient bonded phase density to protect the column from silica degradation from pH 6-9.

At mid pH, basic compounds (e.g., amines) may still have a positive charge and the silanols on the silica surface may have a negative charge. Therefore covering as many silanols as possible leads to the best peak shape at mid pH. This makes the Eclipse Plus C18 the best starting choice for a column at mid pH. Phosphate buffer is usually the first choice for mobile phase modifier at pH 7 because its buffer range is pH 6.1-8.1. A second choice for mid pH is acetate buffer since it buffers from pH 3.8-5.8 and its volatility makes it a good choice for LC/MS compatibility.

Alternate selectivities – Eclipse XDB-Phenyl, CN and Bonus-RP

The method development process at mid pH mimics the process at low pH with optimization of the organic modifier and selecting an alternate bonded phase if resolution is not achieved after that step. The alternate bonded phases at mid pH are the Eclipse XDB-Phenyl, Eclipse XDB-CN and Bonus-RP. They provide very different selectivities for many samples and the method development process is followed again. The Bonus-RP column has a polar embedded amide group that provides different selectivity for many samples, provides good peak shape for basic compounds and allows the column to be used with up to 100% aqueous mobile phases.

Method development at high pH (pH 9-12)

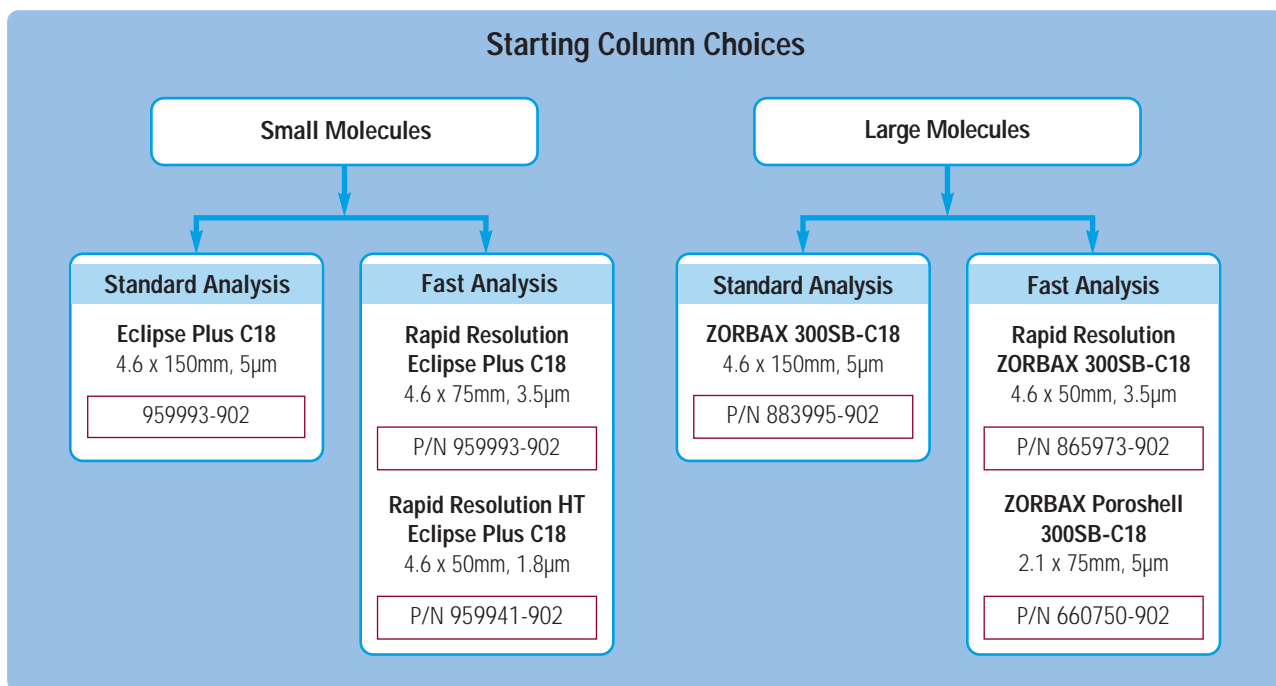
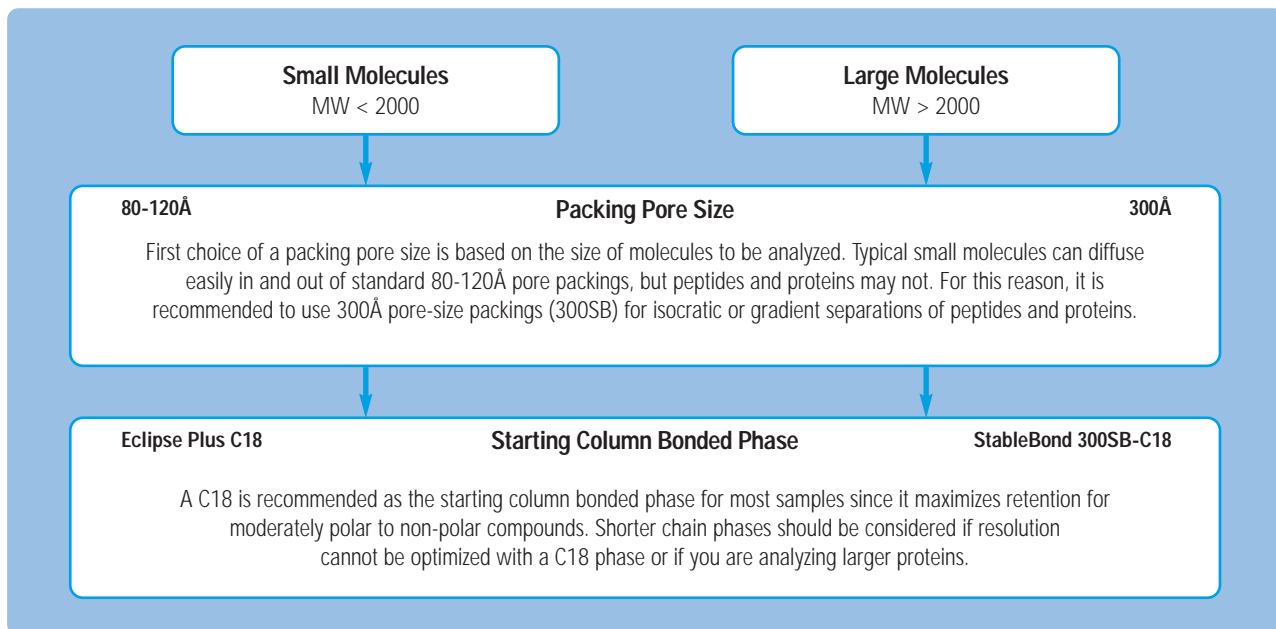
Choose ZORBAX Extend-C18 columns

At low or mid pH, some separations of basic compounds may still not have enough retention or the desired selectivity. For these samples, high pH separations may be appropriate. Until recently, high pH separations on silica-based columns were avoided because of short column lifetimes, due to dissolution of the underlying silica gel. Newer column technologies, i.e. the ZORBAX Extend-C18, can protect the silica from dissolution, so that a reasonable column lifetime can be achieved and the selectivity advantages of high pH can be explored.

The mobile phase buffer choices at high pH with the Extend-C18 column are organic buffers like triethylamine and ammonium hydroxide. These buffers are best used with methanol as the organic modifier to extend the column lifetime at high pH.

LC and LC/MS Columns

Method Development



LC and LC/MS Columns

USP Designations

USP Designations

The US Pharmacopeia (USP) is a standard source for many pharmaceutical methods. The USP specifies columns by packing materials rather than by manufacturer. Listed below are the recommended Agilent Technologies HPLC columns suitable for most LC methods listed with the USP.

USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L1	Octadecyl silane chemically bonded to porous silica or ceramic micro-particles, 1.5 to 10 µm in diameter	ZORBAX ODS	5	70	see page 585
		ZORBAX ODS classic	5	70	see page 585
		ZORBAX Eclipse Plus C18	3.5 and 5	80	see page 533
		ZORBAX Eclipse XDB-C18	3.5 and 5	80, 300	see page 536
		ZORBAX Eclipse XDB-C18	3.5 and 5	80, 300	see page 543
		ZORBAX SB-C18	3 and 5	80, 300	see page 565
		ZORBAX SB-C18	3 and 5	120	see page 559
		ZORBAX Rx-C18	5 and 10	100	see page 593
		ZORBAX Extend-C18	5	100	see page 592
		LiChrosorb RP-18	5	100	see page 594
		LiChrospher RP-18	4	100	see page 595
		Purospher RP-18/-e	5	100	see page 593
Superspher RP-18/-e					
Nucleosil 100-5 C18					
L2	Octadecyl silane chemically bonded to porous silica gel of a controlled surface porosity that has been bonded to a solid spherical core, 3 to 50 µm in diameter	N/A			
L3	Porous silica particles, 5 to 10 µm in diameter	ZORBAX SIL	5	70	see page 565
		ZORBAX Rx-Sil	3.5 and 5	80, 300	see page 565
		LiChrospher 60 Si	5	60	see page 592
L4	Silica gel of controlled surface porosity bonded to a solid spherical core, 30 to 50 µm in diameter	Custom Order			
L5	Alumina of controlled surface porosity bonded to a solid spherical core, 30 to 50 µm in diameter	N/A			
L6	Strong cation-exchange packing: sulfonated fluorocarbon polymer coated on a solid spherical core, 30 to 50 µm in diameter	N/A			
L7	Octyl silane chemically bonded to totally porous microsilica particles, 1.5 to 10 µm in diameter	ZORBAX C8	5	70	
		ZORBAX Eclipse Plus C8	3.5 and 5	80	
		ZORBAX Eclipse XDB-C8	3.5 and 5	80, 300	see page 533
		ZORBAX SB-C8	3.5 and 5	80, 300	see page 536
		ZORBAX Rx-C8	3.5 and 5	80, 300	see page 543
		LiChrosorb RP-8	5	100	see page 565
		LiChrospher RP-8	5	100	see page 593
LiChrospher RP select B	5	60	see page 592		
L8	An essentially monomolecular layer of aminopropyl-silane chemically bonded to totally porous silica gel support, 10 µm in diameter	ZORBAX NH ₂	5	70	see pages 595-596
		LiChrospher NH ₂	5	100	see page 598

LC and LC/MS Columns USP Designations

USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L9	10 µm irregular, totally porous silica gel having a chemically bonded, strongly acidic cation-exchange coating	ZORBAX SCX aSynChropak SCX	5 spherical 6.5	300 300	see page 611 see page 613
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX CN ZORBAX SB-CN ZORBAX Eclipse XDB-CN LiChrospher CN	5 3.5 and 5 3.5 and 5 5	70 80, 300 80 100	see pages 595-596 see page 543 see page 536 see page 598
L11	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter	ZORBAX Phenyl ZORBAX SB-Phenyl ZORBAX Eclipse XDB Phenyl	5 3.5 and 5 3.5 and 5	70 80 80	see page 543 see page 536
L12	Strong anion-exchange packing made by chemically bonding a quaternary amine to a solid silica spherical core, 30 to 50 µm in diameter	Accubond Bulk SAX, 25 g bottle			
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX TMS	5	70	
L14	Silica gel 10 µm in diameter with a chemically bonded, strongly basic quaternary ammonium anion-exchange coating	ZORBAX SAX SynChropak SAX	5 6.5	70 300	see page 611 see page 613
L15	Hexyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter	N/A			
L16	Dimethyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter	N/A			
L17	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11 µm in diameter	N/A			
L18	Amino and cyano groups chemically bonded to porous silica particles, 5 to 10 µm in diameter	N/A			
L19	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 9 µm in diameter	N/A			
L20	Dihydroxypropane groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	LiChrospher Diol	5	100	see page 598

LC and LC/MS Columns

USP Designations

USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L21	A rigid, spherical styrene-divinylbenzene copolymer, 5 to 10 µm in diameter	N/A			
L22	A cation exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10 µm in size	N/A			
L23	An ion exchange resin made of porous polymethacrylate or polyacrylate gel with quaternary ammonium groups, about 10 µm in size	N/A			
L24	A semi-rigid hydrophilic gel consisting of vinyl polymers with numerous hydroxyl groups on the matrix surface, 32 to 63 µm in diameter	N/A			
L25	Packing having the capacity to separate compounds with a MW range from 1000 to 5000 da (as determined by the polyethylene oxide), applied to neutral, anionic and cationic water-soluble polymers	PL aquagel-OH		N/A	see page 607
L26	Butyl silane chemically bonded to totally porous silica particles, 5 to 10 µm in diameter				
L27	Porous silica particles, 30 to 50 µm in diameter	AccuBond Bulk SIL, 25 g bottle			
L28	A multifunctional support, which consists of a high purity, 100Å, spherical silica substrate that has been bonded with anionic (amine) functionality in addition to conventional reversed-phase C8 functionality	N/A			
L29	Gamma alumina, reversed phase, low carbon percentage by weight, alumina-based polybutadiene spherical particles, 5 µm diameter with a pore diameter of 80Å	N/A			
L30	Ethyl silane chemically bonded to a totally porous silica particle, 3 to 10 µm in diameter	N/A			

LC and LC/MS Columns

USP Designations

USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L31	A strong anion-exchange resin-quaternary amine bonded on latex particles attached to a core of 8.5 µm macroporous particles having a pore size of 2000Å and consisting of ethylvinylbenzene cross-linked with 55% divinylbenzene	N/A			
L32	A chiral ligand-exchange packing L-proline copper complex covalently bonded to irregularly shaped silica particles, 5 to 10 µm in diameter	N/A			
L33	Packing having the capacity to separate proteins by molecular size over a range of 4,000 to 400,000 da. It is spherical, silica-based, and processed to provide pH stability	ZORBAX GF-250	4	150	see page 608
L34	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, 9 µm in diameter	N/A			
L35	A zirconium-stabilizes spherical silica packing with a hydrophilic (diol-type) molecular monolayer bonded phase	ZORBAX GF-250 ZORBAX GF-450	4 6	150 300	see page 608
L36	L-Phenylglycine-3,5-dinitrobenzoyl on 5 µm amino propyl silica	N/A			
L37	Polymethacrylate gel packing having the capacity to separate proteins by molecular size over a range of 2,000-4,000 da MW	N/A			
L38	Methacrylate-based size exclusion packing for water solubles	N/A			
L39	Hydrophilic polyhydroxymethacrylate gel of totally porous spherical resin	N/A			
L40	Cellulose tris-3,5-dimethylphenylcarbamate coated porous silica particles, 5 to 20 µm in diameter	N/A			

LC and LC/MS Columns

USP Designations

USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L41	Immobilized alpha-acid glyco-protein on spherical silica particles, 5 µm in diameter	N/A			
L42	Octylsilane and octadecylsilane groups chemically bonded to porous silica particles	N/A			
L43	Pentafluorophenyl groups chemically bonded to silica particles 5 to 10 µm in diameter	N/A			
L44	A multifunctional support, which consists of a high purity, 60Å spherical silica substrate, that has been bonded with a cationic exchanger, sulfonic acid functionality in addition to a conventional reversed phase C8 functionality	N/A			
L45	Beta cyclodextrin bonded to porous silica particles, 5 to 10 µm in diameter	ChiraDex Chiral	5		see page 600
L46	Polystyrene/divinylbenzene substrate agglomerated with quaternary amine functionalized latex beads, 10 µm in diameter	N/A			
L47	High capacity anion exchange microporous substrate, fully functionalized with a trimethyl-amine group, 8 µm in diameter	N/A			
L48	Sulfonated, cross-linked polystyrene with an outer layer of submicron, porous, anion-exchange microbeads, 15 µm in diameter	N/A			
L49	Amylose tris-3,5-dimethylphenyl-carbamate-coated, porous, spherical, silica particles, 5 to 10 µm in diameter	N/A			
L50	A strong cation exchange resin made of porous silica with sulfopropyl groups, 5 to 10 µm in diameter	ZORBAX 300SCX SynChropak SCX	5 5	300 300	see page 611 see page 613

LC and LC/MS Columns USP Designations






USP Designations	USP Packing Materials	Columns	Particle Size (µm)	Pore Size (Å)	Page No.
L51	A reversed-phase packing made by coating a thin layer of polybutadiene on to spherical porous zirconia particles, 3 to 10 µm in diameter	N/A			
L52	Multifunction resin with reversed-phase retention and strong anion-exchange functionalities. The resin consists of ethylvinyl-benzene, 55% cross-linked with divinylbenzene copolymer, 3 to 15 µm in diameter, and a surface area of not less than 350m ² /g, substrate is coated with quaternary ammonium functionalized latex particles consisting of styrene cross-linked with divinylbenzene.	N/A			
L53	An anion-exchange resin consisting of rigid, spherical styrene-divinylbenzene copolymer with trimethylammonium groups at a loading of about 2 meq per g, 3 to 29 µm in diameter	N/A			
L54	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 7 to 11 µm diameter	N/A			
L55	Weak cation-exchange resin consisting of ethylvinylbenzene, 55% cross-linked with divinylbenzene copolymer, 3 to 15 µm diameter. Substrate is surface grafted with carboxylic acid and/or phosphoric acid functionalized monomers. Capacity not less than 500 µ Eq/column	N/A			
L56	Propyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter	SB-C3	3.5 and 5	80	see page 543
L57	A chiral-recognition protein, ovomucoid, chemically bonded in silica particles, about 5 µm in diameter, with a pore size of 120 angstroms.	Ultron ES-OVM 5		120	see page 599

LC and LC/MS Columns

Cartridge Column Systems

Cartridge Column Systems

Cartridge Selection Guide






Icon*	Type of Cartridge	Features	Benefits
	Agilent HPLC Cartridge	Can reverse collets in the end fitting to add guard cartridges	Inexpensive Extends column lifetime Permits rapid column changes Can use 2, 3, 4 and 4.6 mm cartridges
		Cartridges have a unique filter and sieve at each end	Helps prevent blockage
	ZORBAX Guard Cartridge: Stand alone system	High efficiency, stand-alone, low dead volume cartridge	Seals up to 400bar
		Polymeric cartridge designed for leak-tight seals against metal surfaces	No gaskets required More solvent-resistant than PEEK
		Reusable fittings	Adapt for connections to 1/16 in. LC fittings
	ZORBAX Rapid Resolution and Rapid Resolution HT Cartridge Columns: 3.5 µm and 1.8 µm packings, stand alone system	For high throughput LC/MS, LC/MS/MS and combinatorial separations	
		Packed with Eclipse XDB for pH use from 2-9	For all analyte types Low bleed
		Packed with StableBond for low pH use	
		Sold individually or as three-packs	
	ZORBAX Semi-Preparative Guard HPLC Hardware Kit: Stand alone system	Easy low-dead-volume assembly	Seals up to 2000 psi (135 bar, 13.5 MPa)
		Tubing (polyphenylene sulfone) designed for leak-tight seals against metal surfaces	No gaskets required
		Reusable fittings	Adapt for connections to 1/16 in. LC fittings
	ZORBAX and Agilent Prep Preparative Cartridge Column and Guard HPLC System: Stand alone and integral hardware options	Easy low-dead-volume assembly	Extends column lifetime
		Reusable fittings	Permits rapid column changes
		Hardware options for integral and external guards	Can use with 21.2 and 30 mm ID columns

*Look for these icons on subsequent pages to help you select the proper guard cartridges and columns.

LC and LC/MS Columns

Cartridge Column Systems

Cartridge/Guard Cartridge Systems Compatibility Guide*

Icon	Column Type	Guard Cartridge Holder	ID (mm)	Phases
	Cartridge column cartridge holder 5021-1845	Guard cartridge (internal system) cartridge holder 5021-1845	2.0 3.0 4.0 4.6	Asahipak LiChrospher Nucleosil Purospher Superspher ZORBAX
	Standard fitting	Column guard cartridge (stand-alone) cartridge holder 820888-901	2.1 3.0 4.6	ZORBAX
	Rapid Resolution cartridge holder	No guard cartridge holder	4.6	ZORBAX
	Semi preparative column	Semi prep guard cartridge (stand-alone) cartridge holder 840140-901	9.4	ZORBAX
	PrepHT	Guard cartridge 820444-901	21.2	ZORBAX Agilent Prep

*Stand-alone guard cartridges fit to all cartridge and standard fitting columns available from Agilent. All columns without icons are standard fitting columns.

LC and LC/MS Columns

Cartridge Column Systems



Look for this icon identifying Agilent cartridge columns in column ordering tables.



Guard Cartridge installed



No guard cartridge installed

Cartridge Column Systems

Agilent offers a variety of popular HPLC packing material in economical, easy-to-use cartridge configurations.

Agilent Cartridge System

Agilent's flexible cartridge system has been thoroughly tested to ensure that the design and hardware meet Agilent's standards of quality. Finger-tight connections allow rapid column changes without removing the capillaries from the end fittings. The same convenient, easy-to-use cartridge holder accommodates 2, 3, 4 and 4.6 mm diameter cartridges of varying lengths. The cartridge columns have a unique filter and sieve at each end that help prevent blockage.

By reversing the collets in the end fitting, an inexpensive guard cartridge can be added to further extend column lifetime.

Hardware

Description	Unit	Part No.
Cartridge holder for 2, 3, 4 and 4.6 mm ID cartridges	2/pk	5021-1845
Replacement filters for 4 and 4.6 mm ID cartridges	10/pk	5063-6574
Replacement filters for 2 and 3 mm ID cartridges	10/pk	5063-6519
Mounting tool for replacement filters		5021-1846
Replacement collets	2/pk	5021-1849

LC and LC/MS Columns

Cartridge Column Systems

ZGC This icon identifies stand-alone guard cartridges for ZORBAX analytical columns.

ZORBAX High Performance Guard Cartridge

The ZORBAX High Performance Guard Cartridge series has been developed to provide convenient, cost-effective protection for high performance analytical columns. The cartridge components assemble quickly and easily to provide a high efficiency, low dead volume column that seals, with hand tightening, up to 5000 psi (340 bar) or 3000 psi with a PEEK fitting.

The reusable guard column end fitting with integrated 1/16-inch OD tubing adapts the cartridge guard column for direct connection to standard 1/16-inch LC fittings and provides a stand-alone guard column system for 2.1-4.6 mm ID columns. There are two different end fitting options to allow the use of other connecting tubing.

The polymeric guard cartridges used in this holder are specifically designed to make leak-tight seals against metal surface without requiring gaskets. This polymeric material (polyphenylenesulfone) is also more solvent resistant than PEEK.

Guard cartridges are available for almost every ZORBAX bonded phase and can be found in the ordering information for each type of column.



Hardware

Description	Part No.
Guard fittings kit Includes low-volume guard holder, inlet end fitting (2), outlet end fitting with integrated column connector, and PEEK fingertight fitting	820888-901
Inlet end fitting, also used as alternate outlet end fitting	820340-001
Exit end fitting with integrated column connector	820345-001
Finger-tight PEEK fittings, beige, 1/16 in., 2/pk	0100-1516
Perfluoro-Elastomer Seals, 2/pk	820370-901



Tips & Tools

Take the guesswork out of guard column selection. Order your guard columns at the same time as your analytical columns. An online guide shows compatibility for guard cartridges and Agilent HPLC columns. For easy ordering, this guide shows pictures and part numbers of guard column hardware, with links to the online store. Find LC Column Tips at www.agilent.com/chem/GuardGuide.

LC and LC/MS Columns

Cartridge Column Systems



This icon identifies stand-alone guard cartridges for ZORBAX analytical columns.

Rapid Resolution and Rapid Resolution HT Cartridge Column System (400 bar)

For fast, clean high throughput LC/MS, LC/MS/MS and combinatorial separations, we recommend the ZORBAX Rapid Resolution (3.5 μm) and Rapid Resolution HT (1.8 μm) Cartridge Columns. These cartridges are packed with ZORBAX Eclipse and StableBond bonded phases that provide excellent separations.

Cartridge dimensions are 4.6 x 15 mm, 4.6 x 30 mm or 4.6 x 50 mm and 2.1 x 15 mm, 2.1 x 30 mm or 2.1 x 50 mm. All 15 and 30 mm cartridges are available in both Eclipse and StableBond phases in both the 3.5 μm and the new very high efficiency 1.8 μm particles. The new 1.8 μm particles are available as 50 mm cartridges and as 50 mm columns with fixed endfittings. Choose the Eclipse XDB bonded phases for most methods and when using LC/MS mobile phase additives such as formic acid or acetic acid. The StableBond phases are ideal for different selectivity and for long lifetime with TFA containing mobile phases. Additional bonded phases can be packed upon request.

These economical and easy-to-use cartridge columns are offered individually and as a convenient three pack.

One cartridge holder kit will provide all the pieces to use with either Rapid Resolution or Rapid Resolution HT columns.

Hardware

Description	Part No.
Hardware Kit for RR and RRHT Cartridges Includes cartridge holder 15 mm, cartridge holder 30 mm, cartridge holder 50 mm (1ea), and end fitting assemblies (2)	820555-901
Cartridge holder, 15 mm	820315-015
Cartridge holder, 30 mm	820330-030
Cartridge holder, 50 mm	820320-050
Perfluoro-Elastomer Seals, 2/pk	820370-901
End fitting assembly, need two for one system	820311-001



LC and LC/MS Columns

Cartridge Column Systems



This icon identifies preparative guard columns.

ZORBAX Semi-Preparative Guard-Column Hardware Kit

The ZORBAX Semi-Preparative Guard-Column has been developed to provide convenient, cost-effective protection for high-performance lab-scale semi-preparative columns. The cartridge components assemble quickly and easily to provide a high-efficiency, low-dead-volume column that seals at pressures up to 2000 psi (135 bar, 13.5 MPa).

The guard-column housing made from polyphenylene sulfone is specifically engineered to make leak-tight seals against metal surfaces, without requiring gaskets. The reusable guard-column end fittings adapt the cartridge guard column for connection to standard 1/16 in. LC fittings and provide a stand-alone guard column system. The ZORBAX materials used in preparative cartridges are matched with chemistry chosen for compatibility with a wide range of applications.



Preparative guard system

Hardware

Description	Part No.
Preparative guard-column hardware kit* Includes inlet fitting, outlet end fitting, column connector	840140-901

*The semi-preparative guard column hardware is available only as a kit.

LC and LC/MS Columns

Cartridge Column Systems



This icon identifies prep preparative cartridge and guard-columns.

ZORBAX PrepHT and Agilent Prep Preparative Cartridge and Guard Column Hardware

The ZORBAX PrepHT and Agilent Prep Preparative Cartridge and Guard column hardware kits have been developed to provide a convenient preparative 21.2 mm ID cartridge design. The 21.2 mm ID preparative cartridge columns are reusable and allow rapid change of column lengths from 50-250 mm for optimizing sample loadability. This easy-to-use cartridge hardware design is used for both ZORBAX PrepHT and Agilent Prep materials and can be finger-tightened up to 5000 psi (350 bar).

The cartridge hardware can be used stand alone or with an integral guard column. The integral guard column holder is a stainless steel body and is used with a Teflon sealing gasket to assure a tight, leak-free and extremely low-dead-volume seal against the 21.2 mm ID cartridge body. The guard system seals fingertight up to 2000 psi (135 bar). The reusable guard holder is ready to use with standard 1/16 in. LC fittings. Both ZORBAX and Agilent Prep guard cartridges are available to use with this holder and are selected to match the preparative column used in the application.

The 21.2 mm ID guard columns can be used with the 30 mm ID Agilent Prep columns. For this application select the external preparative guard column hardware kit.

PrepHT Columns are easy to use



Guard Cartridge, 820444-901



Assembled 420420-901
Preparative External Guard
Hardware Kit.

Hardware

Description	Part No.
PrepHT cartridge column hardware Includes cartridge column end fittings (2), polymeric seals (2)	820400-901
PrepHT guard column hardware kit, Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)	820444-901
Agilent Prep external guard hardware kit, Includes guard holder, guard column end fitting, polymeric seal (2), seal insertion tool, and connector tubing	420420-901
Replacement polymeric seals, 2/pk	820385-901

LC and LC/MS Columns

HPLC Column Protection Columns

HPLC Column Protection

Column Protection

Guard columns and in-line filters are inexpensive and easy-to-use tools for column protection. They can improve the accuracy of the results and improve analytical column lifetime while enhancing reliability. Column protection is available for all sizes of columns with any particle size packed into the column.

Guard Columns

Guard columns provide protection against contamination with minimal impact on column efficiency. Prepacked ZORBAX cartridge columns are available for most types of ZORBAX material. Guard cartridges are available in different internal diameters to provide high efficiency protection to all types of columns. Guard columns are also available for many of the non-Zorbax columns. See the respective column listings for the available guard columns.

Low Volume In-line Filters

Low volume in-line filters are recommended for every column and provide column protection from particulate materials. An in-line filter will increase analytical column lifetime by preventing particulates (from unfiltered samples and/or eluents) from plugging the analytical column frit. Using guard columns can compromise the efficiency of very low volume columns and/or columns with very small particle sizes. For these columns low volume in-line filters are strongly encouraged. A small, 0.5 µm frit should be used to maximize column efficiency.

Replacement Column Inlet Frits

If HPLC columns are used without a guard column or in-line precolumns filter, the analytical column may become plugged. Due to the high efficiency packing processes used today replacing the column inlet frit is discouraged. Column efficiency may be compromised if the frit is replaced. PEEK-encapsulated replacement frits are available for ZORBAX columns packing in 2.1 mm, 3.0 mm, 4.6 mm, and 9.4 mm standard column hardware.

Replacement Inlet Frits (PEEK Encapsulated) for Standard Hardware Columns

Description	Diameter (mm)	Unit	Part No.
Narrow Bore	2.1	10/pk	280959-904
Solvent Saver	3.0	1/ea	280959-006
Analytical	4.6	10/pk	280959-905
Semi-Preparative	9.4	1/ea	280959-001

Agilent ZORBAX Silica

ZORBAX Silica Manufacturing Process—the Making of a Rugged, High-Purity Silica

All Agilent ZORBAX columns are built from porous silica microspheres (PSM) based on silica sols. The silica particle is made of tiny, solid sol microparticles agglutinated in a patented polymerization process, then fused together at very high temperatures to form the final particle (Figure 1). These strong, durable silica particles are called ZORBAX Rx-SIL or ZORBAX SIL and are the base silicas for ZORBAX columns.

The ZORBAX Rx-SIL process produces ultra-pure (99.995%) particles, with very low metal content. The final silica particle is fully hydroxylated and of low acidity. The Rx-SIL process also allows careful and reproducible control of pore size and particle size. These key features—purity (low acidity), strength, and careful control of pore and particle size—are critical to excellent chromatographic results and are the building blocks of superior ZORBAX bonded phases.

The table below compares the process used to make the ZORBAX Rx-SIL particles to a second process—the Xerogel process—commonly used to make silica particles for HPLC columns. To produce silica with the key features that maximizes chromatographic performance—purity, strength, controlled pore and particle size, plus higher pH resistance—the Agilent ZORBAX process is an excellent choice.

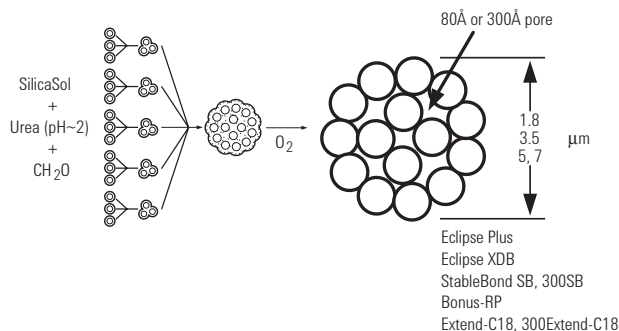


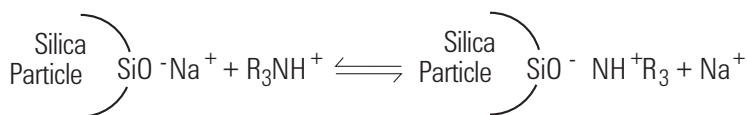
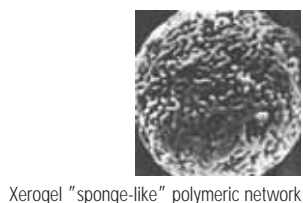
Figure 1. Formation of ZORBAX porous silica particles

Characteristics of ZORBAX Rx-SIL and a Contrasting Type of Silica

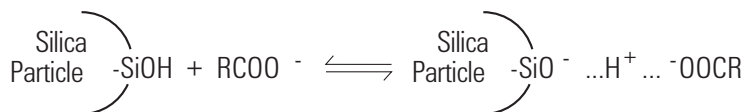
Structure	ZORBAX Rx-SIL (Sol-type)	Xerogel (SIL-type)
Purity	High (99.995%)	Low to High
Strength	High	Moderate
Pore Size, Particle Size Distribution	Narrow	Broad
Pore Size/Surface Area	80Å/180m ² /g	100Å/300m ² /g
Porosity (%)	60	70
High pH Resistance	Good	Poor

LC and LC/MS Columns

ZORBAX Silica Columns



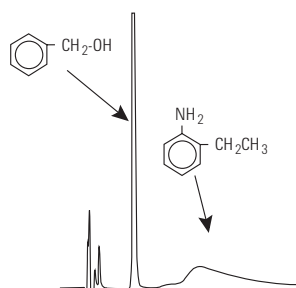
1. Ionized silanols (SiO^-) will ion-exchange with protonated bases (R_3NH^+) which can cause tailing and method variability



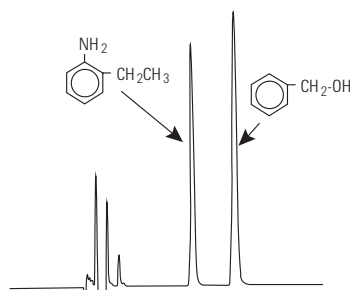
2. Unprotonated acids can compete for H^+ with protonated silanols.

Figure 1. Potential Secondary Interactions with Silica Silanols and Ionizable Compounds

Original ZORBAX SIL (1973)



Highly Purified ZORBAX Rx-SIL



Mobile Phase: 5% Propanol in Heptane
Flow Rate: 2.0 mL/min

Figure 2. Chromatographic Improvement Using Highly Purified ZORBAX Rx-SIL

The Benefit of Silica Purity—Reduced Peak Tailing

Peak tailing of basic compounds can be a major chromatographic problem. Peak tailing reduces chromatographic efficiency and the accuracy and precision of results. The major cause of peak tailing is interactions between analytes and the silica surface (Figure 1). Typically the presence of acidic silanol sites on the silica surface cause this type of peak tailing. Trace metals in silica increase silanol acidity and peak asymmetry. These silanol interactions are reduced or eliminated by choosing a less acidic, ultrapure (99.995%) silica, such as ZORBAX Rx-SIL. The improvement in chromatography is dramatic. Figure 2 shows the reduction in peak tailing for a basic analyte using ZORBAX Rx-SIL versus a more acidic silica.

The Benefits of Strong Particles—Greater Efficiency and Durability

During the silica manufacturing process, the agglutinated sol particles are sintered for increased strength. This improved mechanical stability allows ZORBAX columns to be packed at high pressures when needed—up to 14,000 - 15,000 psi. This results in a packed column with an exceptionally stable column bed that will not compress under normal or even high operating pressures—up to 9000 psi (600 bar). This packed bed stability increases column lifetime using ZORBAX 1.8, 3.5, 5 or 7 μm particles. When ZORBAX Rapid Resolution HT 1.8 μm and Rapid Resolution 3.5 μm silica particles are used as the underlying support, high speed, high efficiency chromatography is possible without compromising column lifetime.

LC and LC/MS Columns

ZORBAX Silica Columns

The Benefits of Careful Pore Size and Particle Size Control – High Efficiency and Better Reproducibility with More Column Choices

Accurate and closely monitored particle and pore size control for ZORBAX Rx-SIL produces reproducible retention behavior from column-to-column and lot-to-lot. The narrow, consistent particle size distribution of ZORBAX Rx-SIL particles maximizes efficiency and column bed stability. Column pressure is never unusually high due to “fines” – smaller particles at the low end of the particle size distribution. Accurate and precise control of particle size allows specific 1.8, 3.5, 5 and 7 μm particles to be produced. The small 3.5 μm and 1.8 μm particle sizes are the basis for the Rapid Resolution and Rapid Resolution HT, high-speed analysis columns designed to maximize resolution in shorter column lengths – ideal for LC/MS or any application demanding shorter analysis times. The 5 μm particles are an industry standard and provide high resolution in a wide variety of column dimensions. This particle size also provides high efficiency in a short preparative configuration – the PrepHT column – because careful particle size control means consistent pressure expectations within normal operating limits. The 7 μm particle size provides the ideal balance between efficiency and operating pressure for longer preparative columns.

ZORBAX Rx-SIL – The Foundation for Many Bonded Phases

With such strong performance characteristics, ZORBAX Rx-SIL particles have been developed into many effective bonded phases for solving key analytical problems. These include columns that can be used at extremes of pH, unmatched by any other silica-based columns. Because silica-based columns have different limitations at low and high pH, specific bonded-phase chemistries are required to provide longer column life over different pH ranges. As a result, Agilent ZORBAX RP-HPLC bonded phases are designed to give extended column lifetime and reproducibility in the pH ranges that provide optimum and long lasting resolution, all starting with high performance ZORBAX Rx-SIL.



Library

Save time on method development, column selection, LC instrumentation, and chromatographic troubleshooting. The LC Reference Library has practical answers to many commonly-asked questions, and is available 24 hours a day. Go to www.agilent.com/chem/LCLibrary.

LC and LC/MS Columns

ZORBAX Reversed-Phase Columns

ZORBAX Reversed-Phase Columns

The following table summarizes the unique bonding chemistry of ZORBAX RP-HPLC columns. Each is designed for long column lifetime and resolution that lasts in their optimal pH range.

ZORBAX RP-HPLC Column Chemistry

Modern ZORBAX Columns*	Silica Type	Endcapping	Side Group Structure on Silane	Polar Group	Page No.
Eclipse Plus	B	Double	Dimethyl	None	see page 533
Eclipse XDB	B	Double	Dimethyl	None	see page 536
StableBond	B	None	Diisopropyl (C8, C3, CN, phenyl), diisobutyl (C18)	None	see page 543
Rx-C18	B	None	Dimethyl	None	see page 565
Bonus-RP	B	Triple	Diisopropyl	Amide	see page 556
Extend-C18	B	Double	Unique bidentate structure	None	see page 559
Original ZORBAX Columns**					
ZORBAX	A	Single	Dimethyl	None	see page 585
ZORBAX ODS Classic	A	None	Dimethyl	None	see page 585

**Type A silica: more acidic, higher metal content; these bonded phases used ZORBAX SIL
*Type B silica: low acidity, low metal content; these bonded phases use ZORBAX Rx-SIL

LC and LC/MS Columns

ZORBAX Reversed-Phase Columns

Quick Guide to ZORBAX Reversed-Phase Bonded Phases

Modern ZORBAX RP-HPLC Columns	Recommended Uses and Applications	Page No.
Eclipse Plus	Excellent first choice for method development Long life from pH 2-9 for reliable separations of basic, acidic and neutral compounds Superior peak shape with basic compounds High resolution and efficiency with 1.8, 3.5 and 5 µm columns Rigorous QA/QC testing for greater long-term reproducibility	see page 533
Eclipse XDB	Four selectivity choices for flexible method development High performance over a wide pH range, pH 2-9 Good peak shape for acids, bases and neutrals Long lifetime with extra dense bonding and double endcapping Fast, ultra-fast, and high resolution separations using 1.8 and 3.5 µm columns Choices from capillary to prep	see page 536
StableBond (SB)	Basic, acidic, neutral compounds Exceptional stability at low pH Use of high temperature (up to 90°C for C18, 80°C for C8, C3, Phenyl, CN, and Aq) and low pH as an added selectivity tool Widest selection of bonded phases for different selectivity (C18, C8, C3, CN, Phenyl, Aq) Uses mobile phases for LC/MS with formic acid, acetic acid, or TFA Uses mobile phases with TFA for peptide and protein separation Rapid separations using 1.8 and 3.5 µm columns	see page 543
ZORBAX Rx	General separation of basic, acidic and neutral compounds at low pH with different selectivity than SB columns Rx-C8 is the same as SB-C8	see page 565
Bonus-RP	Separating basic compounds in higher aqueous mobile phases General separation of basic, neutral, acidic compounds at mid-range pH or low pH; especially stable at low pH Separating peptides for different selectivity Rapid separations using 3.5 µm columns	see page 556
Extend-C18	Separating basic compounds above their pKa in free base form; separation of basic, acidic, neutral compounds at high pH; up to pH 11.5 Uses ammonium hydroxide as mobile phase additive with LC/MS with small molecules or peptides Separating at high, mid-range and low pH for selectivity changes Rapid separations using 3.5 µm columns	see page 559
Original ZORBAX Columns	Recommended Uses and Applications	Page No.
ZORBAX	General separation of basic, acidic, neutral compounds at low pH with different selectivity than SB columns; higher number of active silanols than SB "Mixed mode" separation at more neutral pH values	see page 585
ZORBAX ODS Classic (non-end capped)	General separation of basic, acidic, neutral compounds at mid-range to low pH with different selectivity than SB or XDB columns	see page 585

LC and LC/MS Columns

ZORBAX Eclipse Plus Columns



ZORBAX Eclipse Plus

- Excellent peak shape for basic compounds
- High level of performance—peak shape, efficiency, resolution, and lifetime—with all sample types: acids, bases and neutrals
- Superior reproducibility with more rigorous QA/QC testing
- Improved, patented silica manufacturing with start-to-finish product control
- Available in 1.8, 3.5 and 5 μm particle sizes for all analytical, high resolution, and fast LC analyses

New Eclipse Plus columns provide the ultimate in performance for silica-based columns. Peak shape is excellent for the most challenging basic compounds, improving efficiency and resolution with these sample types. These results are achieved by improvements in the silica manufacturing and bonding technology, which is completely controlled by Agilent.

Because of their high level of performance, Eclipse Plus columns are the ideal first choice for method development of all samples. If you need to achieve fast method development and superior productivity, then choose a column with high-resolution 1.8 μm particles. For standard methods, conventional 5 μm and Rapid Resolution 3.5 μm columns are your best choice. With all particle sizes, easy method transfer is possible.

With more rigorous QA and QC testing, column lot-to-lot reproducibility is also improved, resulting in long-term reliable results for all analyses.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
ZORBAX Eclipse Plus C18	95Å	160 m ² /g	60°C	2.0-9.0	Double	8%
ZORBAX Eclipse Plus C8	95Å	160 m ² /g	60°C	2.0-9.0	Double	8%



Product Finder

Column configurations not shown are available upon request.

LC and LC/MS Columns

ZORBAX Eclipse Plus Columns

Eclipse Plus: Best Peak Shape in the Industry Without Tailing

Column: Eclipse Plus C18
959996-902
4.6 x 100mm, 5µm

Mobile Phase: A: 60% Water
B: 40% Acetonitrile

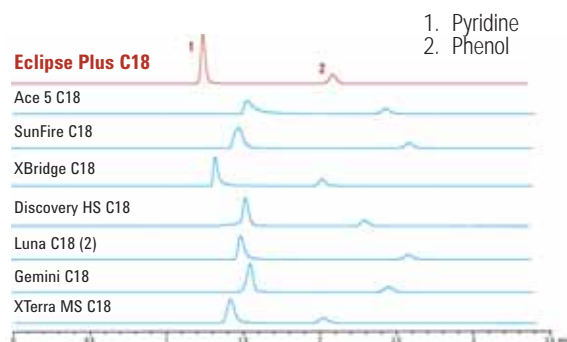
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Publication: 5989-4934EN

Sample: Pyridine, Phenol



Fast and Ultra-Fast Analysis of Basic Compounds on Eclipse Plus

Column A: Eclipse Plus C18
959941-902
4.6 x 50mm, 1.8µm

Column B: Eclipse Plus C18
959993-902
4.6 x 150mm, 5µm

Mobile Phase: A: 50% 8 mM K2HPO4, pH 7
B: 50% ACN

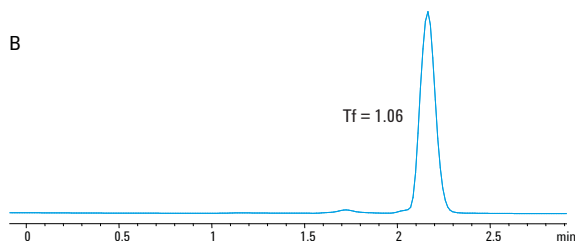
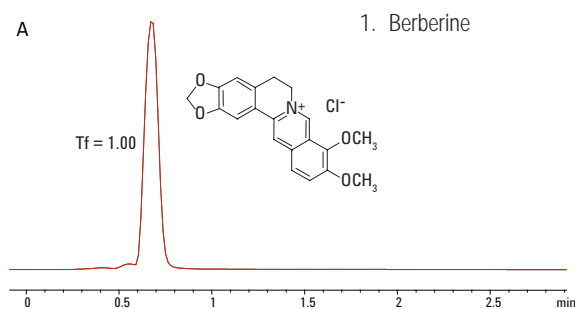
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Publication: 5989-4934EN

Sample: Berberine, 0.4 mg/mL, 2 µL



LC and LC/MS

Peak Shape and Efficiency are Better with ZORBAX Eclipse Plus

Column A: XBridge C18, 4.6 x 150mm, 5µm

Column B: Eclipse Plus C18
959993-902
4.6 x 150mm, 5µm

Mobile Phase: A: 0.1% formic acid
B: 0.1% formic acid in ACN

Flow Rate: 1.0 mL/min

Gradient: 0.0 min 10% B
15 min 30% B

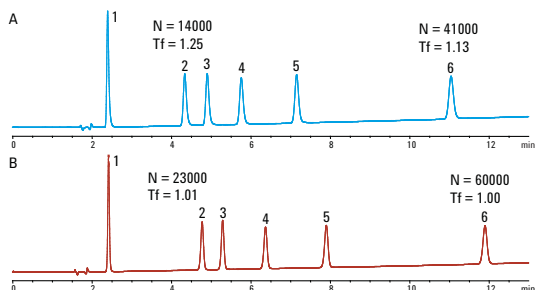
Temperature: 40°C

Detector: UV 254 nm

Publication: 5989-4934EN

Sample: Sulfonamides

1. Sulfanilamide
2. Sulfadiazine
3. Sulfathiazole
4. Sulfamerazine
5. Sulfmethazine
6. Sulfamethoxazole



LC and LC/MS Columns

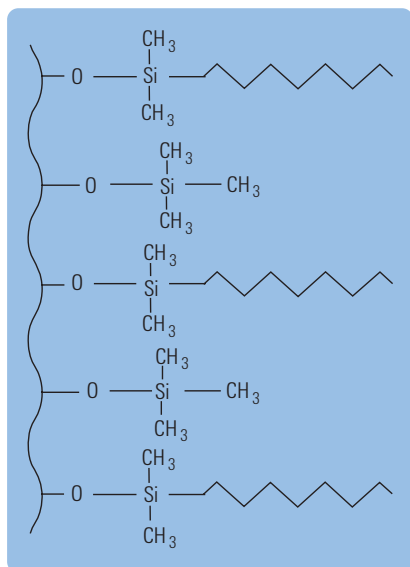
ZORBAX Eclipse Plus Columns

ZORBAX Eclipse Plus

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7
	Analytical	4.6 x 250	5	959990-902	959990-906
	Analytical	4.6 x 150	5	959993-902	959993-906
	Analytical	4.6 x 100	5	959996-902	959996-906
	Analytical	4.6 x 50	5	959946-902	959946-906
	Rapid Resolution	4.6 x 150	3.5	959963-902	959963-906
	Rapid Resolution	4.6 x 100	3.5	959961-902	959961-906
	Rapid Resolution	4.6 x 75	3.5	959933-902	959933-906
	Rapid Resolution	4.6 x 50	3.5	959943-902	959943-906
	Rapid Resolution	4.6 x 30	3.5	959936-902	959936-906
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906
	Solvent Saver	3.0 x 150	5	959993-302	959993-306
	Solvent Saver Plus	3.0 x 150	3.5	959963-302	959963-306
	Solvent Saver Plus	3.0 x 100	3.5	959961-302	959961-306
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306
	Narrow Bore	2.1 x 150	5	959701-902	959701-906
	Narrow Bore RR	2.1 x 50	5	959746-902	959746-906
	Narrow Bore RR	2.1 x 150	3.5	959763-902	959763-906
	Narrow Bore RR	2.1 x 100	3.5	959793-902	959793-906
	Narrow Bore RR	2.1 x 50	3.5	959743-902	959743-906
	Narrow Bore RR	2.1 x 30	3.5	959733-902	959733-906
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-936	820950-937
ZGC	Guard Cartridges, 4pk	2.1 x 12.5	5	821125-936	821125-937
ZGC	Guard Hardware Kit			820888-901	820888-901

LC and LC/MS Columns

ZORBAX Eclipse XDB Columns



Extra Densely Bonded and Double Endcapped Eclipse XDB Bonded Phase

ZORBAX Eclipse XDB

- Four selectivity choices for method development optimization
- Good peak shape for basic, acidic and neutral compounds
- High performance over a wide pH range—pH 2-9
- Particle sizes from 1.8µm to 7µm
- Long lifetime with extra dense bonding and double endcapping

The Agilent ZORBAX Eclipse XDB columns—C18, C8, Phenyl and CN—provide four bonded phase choices for method development optimization. These columns provide good peak shape over a wide pH range (2-9) for additional method development flexibility with one family of columns. Eclipse XDB columns can be used for method development at low pH (2-3) and the same column can be used for method development in the mid pH (6-8) region. In the mid pH region residual silanols are more active and tailing interactions are more likely. To overcome these interactions, Eclipse XDB columns are eXtra Densely Bonded and double endcapped through a proprietary process to cover as many active silanols as possible. The result is superior peak shape of basic compounds from pH 2-9. Eclipse XDB columns are available in 1.8, 3.5, 5 and 7µm particle sizes for high speed, high resolution, analytical and prep scale separations.

Column Specifications

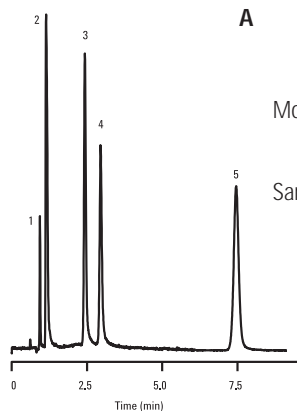
Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
ZORBAX Eclipse XDB-C18	80Å	180 m ² /g	60°C	2.0-9.0	Double	10%
ZORBAX Eclipse XDB-C8	80Å	180 m ² /g	60°C	2.0-9.0	Double	7.6%
ZORBAX Eclipse XDB-Phenyl	80Å	180 m ² /g	60°C	2.0-9.0	Double	7.2%
ZORBAX Eclipse XDB-CN	80Å	180 m ² /g	60°C	2.0-8.0	Double	4.3%

LC and LC/MS Columns

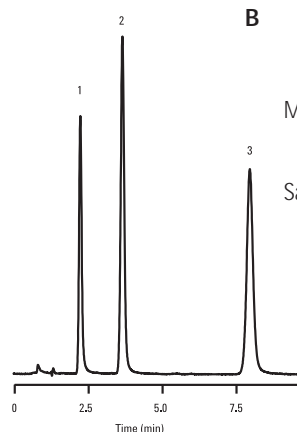
ZORBAX Eclipse XDB Columns

Good Peak Shape Over a Wide pH Range with ZORBAX Eclipse XDB

Column: **Eclipse XDB-C8**
993967-906
4.6 x 150mm, 5µm
 Flow Rate: 1.5 mL/min
 Temperature: 40°C



Mobile Phase: pH 3.0 75% 25 mM phosphate buffer
 pH 3.0: 25% ACN
 Sample:
 1. Maleate
 2. Doxylamine
 3. Chlorpheniramine
 4. Triprolidine
 5. Diphenhydramine

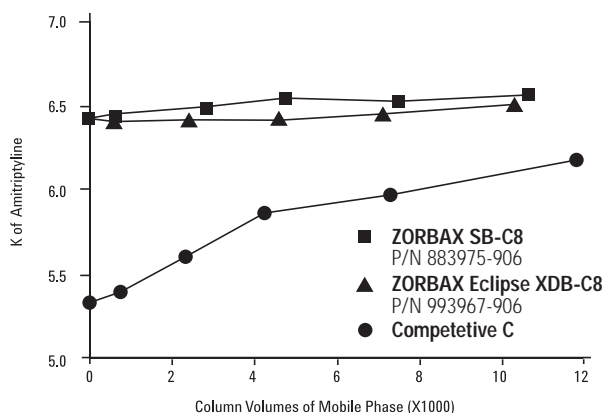


Mobile Phase: pH 7.0 90% 20 mM phosphate pH 7.0
 10% ACN
 Sample:
 1. Procainamide
 2. N-acetylprocainamide
 3. N-propionylprocainamide

ZORBAX Eclipse XDB columns provide good peak shape over a wide pH range and are an excellent first choice for method development from pH 2-9.

Column Stability Testing at pH 3 and 60°C

Column: **ZORBAX SB-C8**
883975-906
4.6 x 150mm, 5µm
 Column: **Eclipse XDB-C8**
993967-906
4.6 x 150mm, 5µm
 Mobile Phase: Purge Conditions:
 70% 50 mM NaAc-HCl, pH 3.0
 30% ACN
 Retention Test Conditions:
 65% Methanol
 35% Water
 Flow Rate: 1.0 mL/min
 Temperature: 60°C
 Sample: Tricyclic Antidepressants



Eclipse XDB columns are stable over a wide pH range. At low pH, Eclipse, an end capped column is extremely stable and shows equivalent stability to a non-endcapped column, SB-C8, at pH 3. The columns were purged with a pH 3 mobile phase at 60°C. Then they were tested with a strongly basic compound to determine if the endcapping or bonded phase had been hydrolyzed from the silica surface. The Eclipse XDB column was very stable, as shown by the consistency of the retention of amitriptyline over the 12,000 column volumes of the test. Another endcapped column shows less stability under these same conditions.

LC and LC/MS Columns

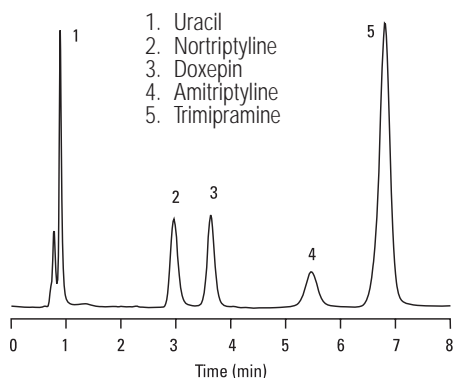
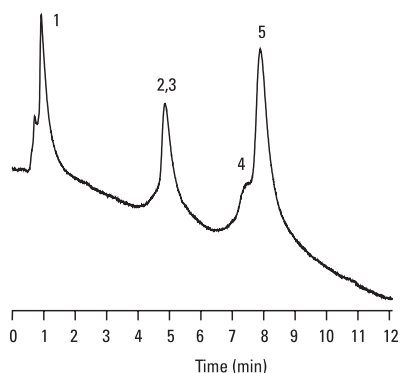
ZORBAX Eclipse XDB Columns

Column Stability Testing at pH 7.0

Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm

Mobile Phase: 60% ACN
40% 250 mM Phosphate
Buffer, pH 7.0

Flow Rate: 1.5 mL/min
Temperature: 60°C
Sample: Tricyclic Antidepressants



Double endcapping, dense bonding and the durable Rx-Sil particles (sol-type) combine to provide long lifetime at pH 7 when compared to single endcapped sil-gel columns used here. The conditions used for this test—high temperature (60°C) and high salt concentration (250 mM), accelerate the dissolution of silica, causing premature failure of the sil-gel type column.

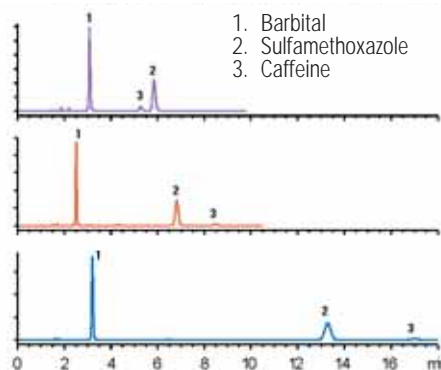
Optimize Separations with Eclipse XDB Selectivity Options—Analysis of Sunscreens

Column: Eclipse XDB-Phenyl
963967-912
4.6 x 150mm, 3.5µm

Column: Eclipse XDB-C8
963967-906
4.6 x 150mm, 3.5µm

Column: Eclipse XDB-C18
963967-902
4.6 x 150mm, 3.5µm

Mobile Phase: 15% H₂O: 85% MeOH
Flow Rate: 1.0 mL/min
Temperature: 35°C
Sample: Sunscreens



This separation of sunscreens on all three Eclipse XDB bonded phases—C18, C8 and Phenyl—shows that different bonded phases can be used to optimize a separation. While all three bonded phases provide an adequate separation, the Eclipse XDB-Phenyl provides a different peak elution order and a much shorter overall analysis time. All three bonded phases also provide excellent peak shape with no mobile phase additives.

LC and LC/MS Columns

ZORBAX Eclipse XDB Columns

Selectivity Changes for Basic Compounds with Eclipse XDB and Stable Bond

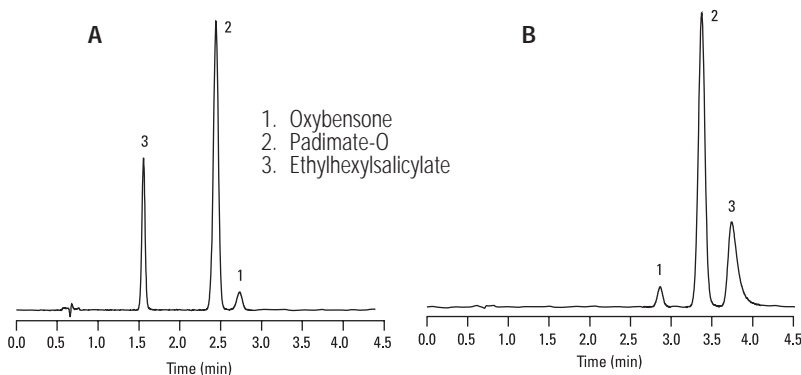
Column A: Eclipse XDB-C8
966967-906
4.6 x 75mm, 3.5µm

Column B: ZORBAX Rx/SB-C8
866953-906
4.6 x 75mm, 3.5µm

Mobile Phase: 70% 25 mM NaH₂PO₄, pH 3.0
30% Methanol

Flow Rate: 1.0 mL/min

Temperature: 35°C



Eclipse XDB and StableBond columns are based on the same silica but have different bonding and endcapping. Therefore, they can have very different selectivity for the same sample under the same conditions, as this example shows.

Separation of Cephalosporins on Eclipse XDB-C8

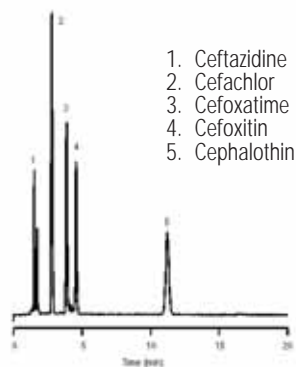
Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm

Mobile Phase: 85% 25 mM Na₂HPO₄ pH 7: 15% ACN

Flow Rate: 1.0 mL/min

Temperature: 35°C

Sample: Cephalosporins



Cephalosporins are a type of antibiotic and many compounds in this family are well separated on the Eclipse XDB-C8 column.

Selectivity for Urea Pesticides

Column A: Eclipse XDB-C18
993967-902
4.6 x 150mm, 5µm

Column B: Eclipse XDB-CN
993967-905
4.6 x 150mm, 5µm

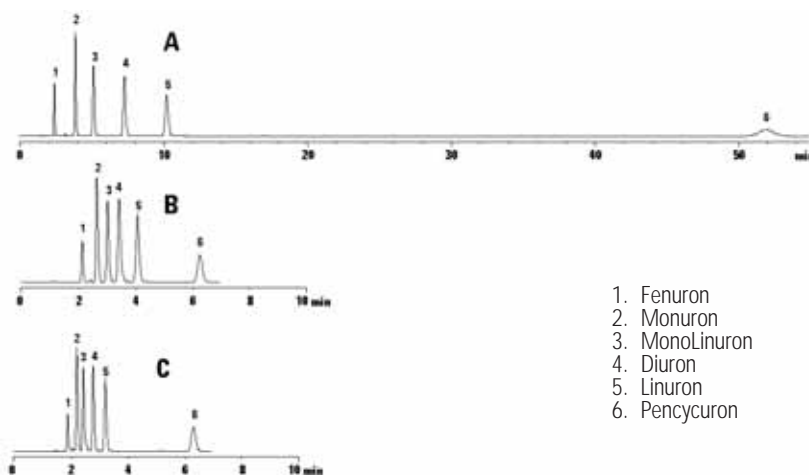
Column C: Eclipse XDB-C18
993967-902
4.6 x 150mm, 5µm

Mobile Phase: A. 60:40 MeOH:Water
B. 60:40 MeOH:Water
C. 77:23 MeOH:Water

Flow Rate: 1.0 mL/min

Temperature: 25°C

Sample: Urea pesticides



The Eclipse XDB-CN column reduces retention time and provides good selectivity for Urea pesticides when compared to an Eclipse XDB-C18 column.

LC and LC/MS Columns

ZORBAX Eclipse XDB Columns

ZORBAX Eclipse XDB









Hardware Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7	XDB-Phenyl USP L11	XDB-CN USP L10
Standard Columns (no special hardware required, 400 bar)						
Semi-Preparative	9.4 x 250	5	990967-202	990967-206		
Analytical	4.6 x 250	5	990967-902	990967-906	990967-912	990967-905
Analytical	4.6 x 150	5	993967-902	993967-906	993967-912	993967-905
Analytical	4.6 x 50	5	946975-902	946975-906		
Rapid Resolution	4.6 x 150	3.5	963967-902	963967-906	963967-912	963967-905
Rapid Resolution	4.6 x 100	3.5	961967-902	961967-906		961967-905
Rapid Resolution	4.6 x 75	3.5	966967-902	966967-906	966967-912	966967-905
Rapid Resolution	4.6 x 50	3.5	935967-902	935967-906	935967-912	
Rapid Resolution HT, 600 bar	4.6 x 100	1.8	928975-902			
Rapid Resolution HT, 600bar	4.6 x 50	1.8	927975-902	927975-906		
Rapid Resolution HT, 600bar	4.6 x 30	1.8	924975-902	924975-906		
Rapid Resolution HT, 600bar	4.6 x 20	1.8	926975-902	926975-906		
Solvent Saver	3.0 x 250	5	990967-302	990967-306	990967-312	990967-305
Solvent Saver	3.0 x 150	5	993967-302	993967-306	993967-312	993967-305
Solvent Saver Plus	3.0 x 150	3.5	963954-302	963954-306	963954-312	963954-305
Solvent Saver Plus	3.0 x 100	3.5	961967-302	961967-306	961967-312	
Solvent Saver Plus	3.0 x 75	3.5	966954-302			
Solvent Saver HT, 600 bar	3.0 x 100	1.8	928975-302			
Solvent Saver HT, 600 bar	3.0 x 50	1.8	927975-302	927975-306		
Solvent Saver HT, 600 bar	3.0 x 30	1.8	924975-302	924975-306		
Solvent Saver HT, 600 bar	3.0 x 20	1.8	926975-302	926975-306		
Narrow Bore	2.1 x 150	5	993700-902	993700-906	993700-912	993700-905
Narrow Bore	2.1 x 50	5	960967-902	960967-906	960967-912	960967-905
Narrow Bore RR*	2.1 x 150	3.5	930990-902	930990-906		
Narrow Bore RR*	2.1 x 100	3.5	961753-902	961753-906		961753-905
Narrow Bore RR*	2.1 x 75	3.5	966735-902			
Narrow Bore RR*	2.1 x 50	3.5	971700-902	971700-906		
Narrow Bore RRHT, 600bar**	2.1 x 100	1.8	928700-902	928700-906		
Narrow Bore RRHT, 600bar**	2.1 x 50	1.8	927700-902	927700-906		
Narrow Bore RRHT, 600bar**	2.1 x 30	1.8	924700-902	924700-906		
Narrow Bore RRHT, 600bar**	2.1 x 20	1.8	926700-902	926700-906		
MicroBore RR*	1.0 x 150	3.5	963600-902	963600-906		
MicroBore RR*	1.0 x 50	3.5	965600-902	965600-906		
MicroBore RR*	1.0 x 30	3.5	961600-902	961600-906		
MicroBore Guard Cartridges, 3pk	1.0 x 17	5	5185-5921	5185-5921		
ZGC Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-925	820950-926	820950-927	820950-935
ZGC Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-926	821125-926	821125-926	821125-935
ZGC Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901






*RR: Rapid Resolution 3.5 µm
 **RRHT: Rapid Resolution HT 1.8 µm

LC and LC/MS Columns

ZORBAX Eclipse XDB Columns

ZORBAX Eclipse XDB (Continued)






















Hardware Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7	XDB-Phenyl USP L11	XDB-CN USP L10
PrepHT Cartridge Columns (require endfittings kit 820400-901)						
 PrepHT Cartridge	21.2 x 250	7	977250-102	977250-106		
 PrepHT Cartridge	21.2 x 150	7	977150-102	977150-106		
 PrepHT Cartridge	21.2 x 150	5	970150-902	970150-906		
 PrepHT Cartridge	21.2 x 100	5	970100-902	970100-906		
 PrepHT Cartridge	21.2 x 50	5	970050-902	970050-906		
 PrepHT Guard Cartridge	17 x 7.5	5	820212-925	820212-926		
 Guard Cartridge Hardware			820444-901	820444-901		
 PrepHT Endfittings, 2/pk			820400-901	820400-901		

Hardware	Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7
Agilent Cartridge Columns (require hardware kit 5021-1845)					
 Analytical	Analytical	4.6 x 250	5	7995118-585	7995108-585
 Analytical	Analytical	4.6 x 150	5	7995118-595	7995108-595
 Rapid Resolution	Rapid Resolution	4.6 x 75	3.5	7995118-344	7995108-344
 Solvent Saver Plus	Solvent Saver Plus	3.0 x 75	3.5	7995230-344	
	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504
	Cartridge Holder			5021-1845	5021-1845
Standard Columns (no special hardware required, 400 bar)					
	Rapid Resolution HT	4.6 x 50	1.8	922975-902	922975-906
 Rapid Resolution HT, 3/pk	Rapid Resolution HT, 3/pk	4.6 x 50	1.8	922975-932	
	Narrow Bore RRHT	2.1 x 50	1.8	922700-902	
	Narrow Bore RRHT, 3/pk	2.1 x 50	1.8	922700-932	

LC and LC/MS Columns

ZORBAX Eclipse XDB Columns

ZORBAX Eclipse XDB (Continued)

Hardware	Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7
	Capillary RR	0.5 x 35	3.5	5064-8298	
	Capillary	0.3 x 250	5	5064-8269	
	Capillary	0.3 x 150	5	5064-8291	
	Capillary RR	0.3 x 150	3.5	5064-8271	
	Capillary	0.5 x 35	5	5064-8296	
	Capillary	0.3 x 35	5	5064-8297	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
	Rapid Resolution Cartridge	4.6 x 30	3.5	933975-902	933975-906
	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	933975-932	933975-936
	Rapid Resolution Cartridge	4.6 x 15	3.5	931975-902	931975-906
	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	931975-932	931975-936
	Rapid Resolution Cartridge	2.1 x 30	3.5	973700-902	973700-906
	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	973700-932	973700-936
	Rapid Resolution Cartridge	2.1 x 15	3.5	975700-902	975700-906
	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	975700-932	975700-936
	Rapid Resolution HT Cartridge	4.6 x 50	1.8	925975-902	
	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	925975-932	
	Rapid Resolution HT Cartridge	4.6 x 30	1.8	923975-902	
	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	923975-932	
	Rapid Resolution HT Cartridge	4.6 x 15	1.8	921975-902	
	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	921975-932	
	Rapid Resolution HT Cartridge	2.1 x 50	1.8	925700-902	
	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	925700-932	
	Rapid Resolution HT Cartridge	2.1 x 30	1.8	923700-902	
	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	923700-932	
	Rapid Resolution HT Cartridge	2.1 x 15	1.8	921700-902	
	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	921700-932	
	Hardware Kit for RR and RRHT Cartridges			820555-901	820555-901
Capillary Glass-lined Columns					
	Capillary	0.5 x 250	5	5064-8286	
	Capillary	0.5 x 150	5	5064-8287	
	Capillary RR	0.5 x 150	3.5	5064-8288	

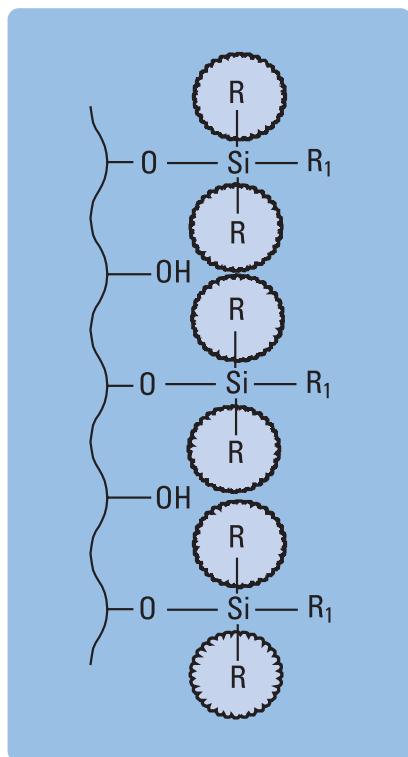
LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

ZORBAX 80Å StableBond

- Longest column lifetime and best reproducibility for low pH separations – down to pH 1
- Patented stable column chemistry allows use at high temperature and low pH without degradation
- Six different bonded phases provide broad selectivity – SB-C18, SB-C8, SB-CN, SB-Phenyl, SB-C3, SB-Aq
- High purity (Type B) silica for good peak shape

Agilent ZORBAX StableBond columns use patented, unique, nonfunctional silanes with bulky diisobutyl (SB-C18) or diisopropyl (SB-C8, SB-C3, SB-Phenyl, SB-CN, and SB-Aq) side chain groups that sterically protect the key siloxane bond to the silica surface from hydrolytic attack at low pH. StableBond packing materials are not endcapped in order to provide exceptional stability and to maximize lifetime and reproducibility under acidic mobile phase conditions. The high purity, low acidity silica provides excellent peak shape with acidic, basic and neutral compounds so that StableBond columns are an excellent choice for low pH method development. ZORBAX StableBond columns are compatible with all common mobile phases, including very high aqueous mobile phases.



Sterically Protected StableBond Bonded Phase

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range*	Endcapped	Carbon Load
ZORBAX SB-C18	80Å	180 m ² /g	90°C	1.0-8.0	No	10%
ZORBAX SB-C8	80Å	180 m ² /g	80°C	1.0-8.0	No	5.5%
ZORBAX SB-C3	80Å	180 m ² /g	80°C	1.0-8.0	No	4%
ZORBAX SB-Phenyl	80Å	180 m ² /g	80°C	1.0-8.0	No	5.5%
ZORBAX SB-CN	80Å	180 m ² /g	80°C	1.0-8.0	No	4%
ZORBAX SB-Aq	80Å	180 m ² /g	80°C	1.0-8.0	No	proprietary

*StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40°C and using lower buffer concentrations in the range of 0.01-0.02M. At mid-range pH, Eclipse XDB and Bonus-RP are recommended.

LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

StableBond SB-C18 Shows Excellent Stability at Low pH and High Temperature (pH 0.8, 90°C)

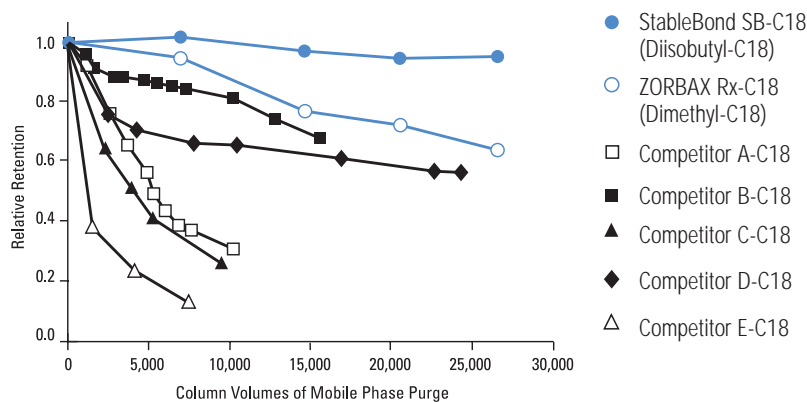
Column: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm

Column: ZORBAX Rx-C18
883967-902
4.6 x 150mm, 5µm

Mobile Phase: 50% Methanol/50% Water with 1.0% TFA

Test Solute: Toluene

Temperature: 90°C



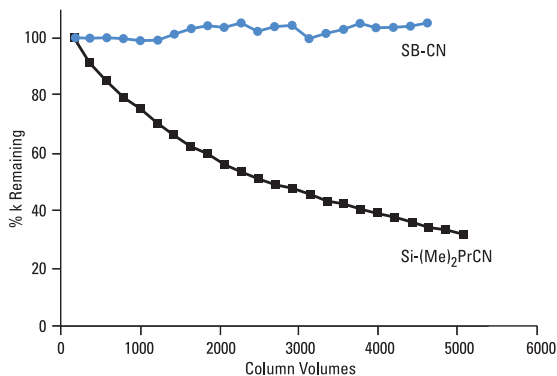
As an indicator of column breakdown, retention time of toluene was measured after purging the column with mobile phase. Only the StableBond SB-C18 is unchanged after three working months of use under these very low pH (0.8) and high temperature (90°C) conditions. ZORBAX Rx-C18 also provides a stable matrix, and can be used as an alternative selectivity to StableBond SB-C18.

Shorter Chain ZORBAX SB-CN is also Stable at Low pH (pH 2.0, 50°C)

Column: ZORBAX SB-CN
883975-905
4.6 x 150mm, 5µm

Mobile Phase:
Flow Rate:
Gradient:
Temperature:
Detector:
MS Conditions:
Publication:
Sample:

ZORBAX StableBond SB-CN and the other short chain StableBond bonded phases are also exceptionally stable at low pH. Conventional dimethyl CN and similar bonded phases lack this stability.



SB-CN Optimizes Retention and Resolution

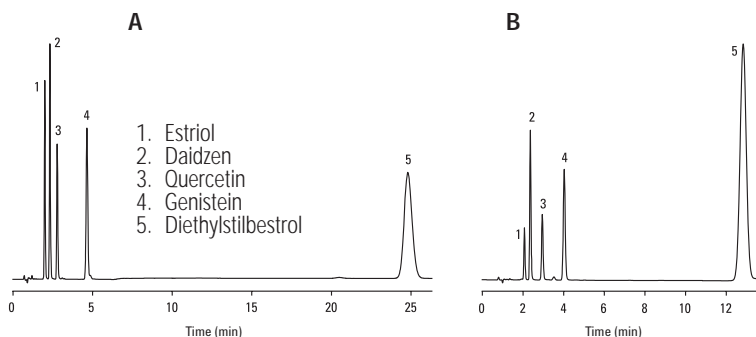
Column A: ZORBAX SB-C18
866953-902
4.6 x 75

Column B: ZORBAX SB-CN
866953-905
4.6 x 75

Mobile Phase: 30% ACN
70% 25mM NaH₂PO₄, pH 2.5

Flow Rate: 1.0 mL/min

Temperature: 35°C



The SB-CN column is used here to reduce analysis time by 50%. The retention of the most hydrophobic analyte is cut in half. At the same time retention of the more polar, early eluting peaks increases slightly.

LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

Five Different Bonded Phases Provide Selectivity Options

Column A: ZORBAX SB-C18
883975-902

Column B: ZORBAX SB-C8
883975-906

Column C: ZORBAX SB-C3
883975-909

Column D: ZORBAX SB-Phenyl
883975-912

Column E: ZORBAX SB-CN
883975-905

Mobile Phase: 0-100% B in 18.8 min
A: 50 mM NaH₂PO₄,
pH 2.5 in 95% H₂O / 5% ACN
B: 50 mM NaH₂PO₄,
pH 2.5 in 47% H₂O / 53%
ACN

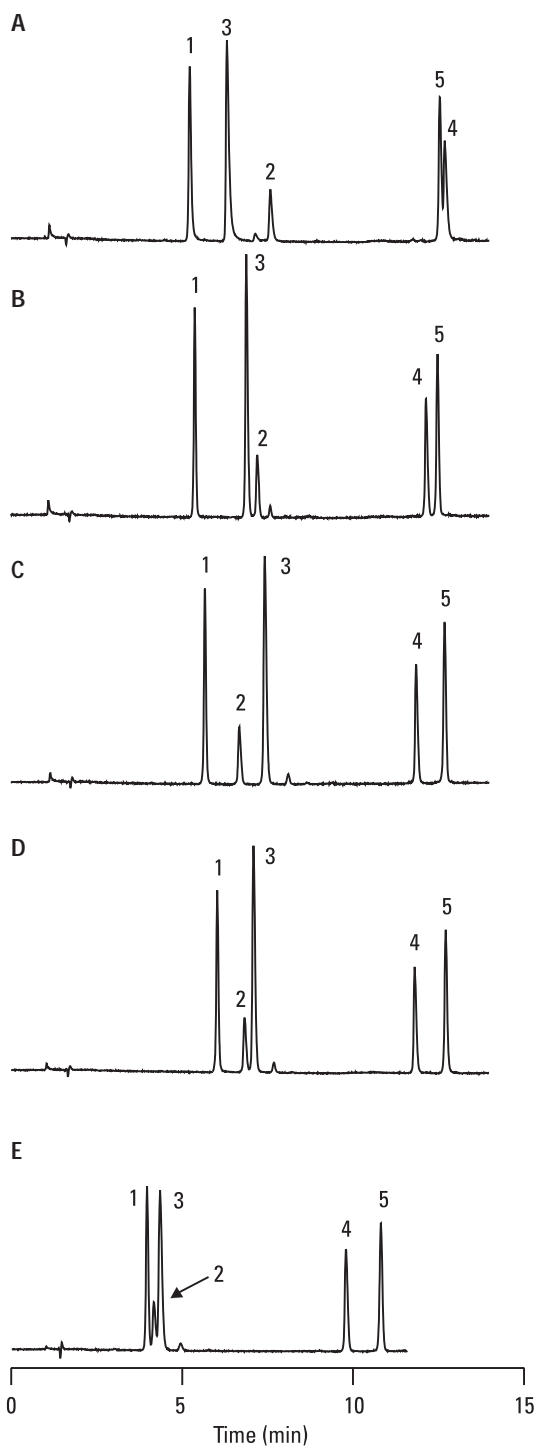
Flow Rate: 1.0 mL/min

Temperature: 26°C

Detector: 254 nm

Sample:

1. Procaine
2. Lidocaine
3. d-Cinchonine
4. Butacaine
5. Tetracaine



SB-C3 is just one of the five different StableBond selectivity choices. In this example, optimum resolution is obtained with SB-C3. All are based on the same high purity Rx-SIL. Selectivity changes are therefore dependent only on the bonded phases, making method development more reliable.

LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

ZORBAX 80Å StableBond

Hardware Description	Size (mm)	Particle Size (µm)	Particle					
			SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required, 400 bar)								
Semi-Preparative	9.4 x 250	5	880975-202	880967-201	880975-205	880975-209	880975-212	
Semi-Preparative	9.4 x 150	5	883975-202					
Semi-Preparative	9.4 x 100	5	884975-202					
Semi-Preparative	9.4 x 50	5	846975-202					
Analytical	4.6 x 250	5	880975-902	880975-906	880975-905	880975-909	880975-912	880975-914
Analytical	4.6 x 150	5	883975-902	883975-906	883975-905	883975-909	883975-912	883975-914
Analytical	4.6 x 50	5	846975-902	846975-906				846975-914
Rapid Resolution	4.6 x 250	3.5	884950-567					
Rapid Resolution	4.6 x 150	3.5	863953-902	863953-906	863953-905		863953-912	863953-914
Rapid Resolution	4.6 x 100	3.5	861953-902	861953-906	861953-905		861953-912	861953-914
Rapid Resolution	4.6 x 75	3.5	866953-902	866953-906	866953-905		866953-912	866953-914
Rapid Resolution	4.6 x 50	3.5	835975-902	835975-906	835975-905		835975-912	835975-914
Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902					
Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906				
Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-905			
Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-905			
Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906				
Solvent Saver	3.0 x 250	5	880975-302	880975-306	880975-305	880975-309	880975-312	880975-314
Solvent Saver	3.0 x 150	5	883975-302	883975-306	883975-305	883975-309	883975-312	883975-314
Solvent Saver Plus	3.0 x 150	3.5	863954-302	863954-306	863954-305		863954-312	863954-314
Solvent Saver Plus	3.0 x 100	3.5	861954-302	861954-306	861954-305	861954-309	861954-312	861954-314
Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302					
Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306				
Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-305			
Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306	824975-305			
Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306				
Narrow Bore	2.1 x 150	5	883700-922	883700-906	883700-905	883700-909	883700-912	
Narrow Bore	2.1 x 50	5	860975-902	860975-906	860975-905	860975-909	860975-912	860975-914
Narrow Bore RR*	2.1 x 150	3.5	830990-902	830990-906				830990-914
Narrow Bore RR*	2.1 x 100	3.5	861753-902	861753-906	861753-905		861753-912	861753-914
Narrow Bore RR*	2.1 x 75	3.5	866735-902					
Narrow Bore RR*	2.1 x 50	3.5	871700-902	871700-906				871700-914
Narrow Bore RRHT, 600 bar**	2.1 x 150	1.8	820700-902	820700-906	820700-905			
Narrow Bore RRHT, 600 bar**	2.1 x 100	1.8	828700-902	828700-906	828700-905			

LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

ZORBAX 80Å StableBond (Continued)

Hardware Description	Size (mm)	Particle Size (µm)	Particle					
			SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Narrow Bore RRHT, 600 bar**	2.1 x 50	1.8	827700-902	827700-906	827700-905			
Narrow Bore RRHT, 600 bar**	2.1 x 30	1.8	824700-902	824700-906	824700-905			
Narrow Bore RRHT, 600 bar**	2.1 x 20	1.8	826700-902	826700-906				
MicroBore RR*	1.0 x 150	3.5	863600-902	863600-906	863600-905			
MicroBore RR*	1.0 x 50	3.5	865600-902	865600-906				
MicroBore RR*	1.0 x 30	3.5	861600-902	861600-906				
MicroBore RRHT, 600 bar**	1.0 x 100	1.8	828600-902	828600-906	828600-905			
MicroBore Guard Cartridges, 3/pk	1.0 x 17	5	5185-5920	5185-5920				
P Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-124		820675-115	
ZGC Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-920	820950-915	820950-916	820950-922	820950-917	820950-933
ZGC Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915	821125-924	821125-924	821125-915	821125-933
P Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	840140-901	840140-901	
ZGC Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901	820888-901	820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)								
PI PrepHT Cartridge	21.2 x 250	7	877250-102	877250-106	877250-105		877250-112	877250-114
PI PrepHT Cartridge	21.2 x 150	7	877150-102	877150-106				877150-114
PI PrepHT Cartridge	21.2 x 150	5	870150-902	870150-906				870150-914
PI PrepHT Cartridge	21.2 x 100	5	870100-902	870100-906				870100-914
PI PrepHT Cartridge	21.2 x 50	5	870050-902	870050-906				870050-914
PI PrepHT Guard Cartridge, 2/pk	17 x 7.5	5	820212-920	820212-915	820212-915		820212-915	820212-933
Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901	820444-901	820444-901
PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	820400-901	820400-901

*RR: Rapid Resolution 3.5 µm
 **RRHT: Rapid Resolution HT 1.8 µm

LC and LC/MS Columns

ZORBAX 80Å StableBond Columns

ZORBAX 80Å StableBond (Continued)

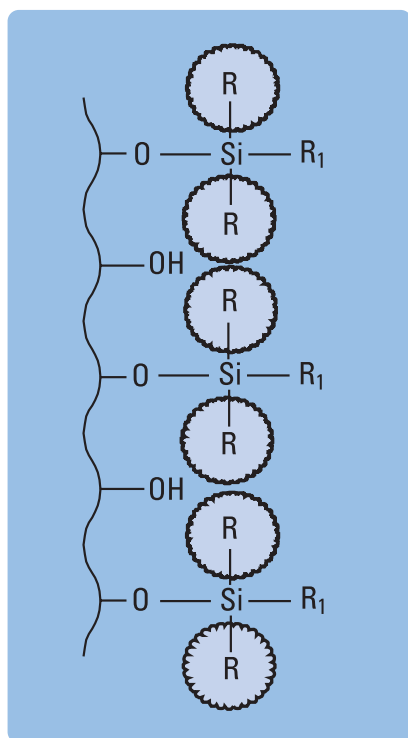
Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7
Agilent Cartridge Columns (require hardware kit 5021-1845)					
AC	Analytical	4.6 x 250	5	7995218-585	7995208-585
AC	Analytical	4.6 x 150	5	7995218-595	7995208-595
AC	Rapid Resolution	4.6 x 75	3.5	7995218-344	7995208-344
AC	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504
AC	Cartridge Holder			5021-1845	5021-1845
Standard Columns (no special hardware required, 400 bar)					
	Rapid Resolution HT	4.6 x 50	1.8	822975-902	822975-906
	Rapid Resolution HT, 3/pk	4.6 x 50	1.8	822975-932	
	Narrow Bore RRHT	2.1 x 50	1.8	822700-902	
	Narrow Bore RRHT, 3/pk	2.1 x 50	1.8	822700-932	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
RR	Rapid Resolution Cartridge	4.6 x 30	3.5	833975-902	833975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	833975-932	833975-936
RR	Rapid Resolution Cartridge	4.6 x 15	3.5	831975-902	831975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	831975-932	831975-936
RR	Rapid Resolution Cartridge	2.1 x 30	3.5	873700-902	873700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	873700-932	873700-936
RR	Rapid Resolution Cartridge	2.1 x 15	3.5	875700-902	875700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	875700-932	875700-936
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	825975-902	
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	825975-932	
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	823975-902	
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	823975-932	
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	821975-902	
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	821975-932	
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	825700-902	
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	825700-932	
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	823700-902	
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	823700-932	
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	821700-902	
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	821700-932	
RR	Hardware Kit for RR and RRHT Cartridges			820555-901	820555-901

LC and LC/MS Columns

ZORBAX 300Å StableBond Columns

ZORBAX 80Å StableBond (Continued)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7
Capillary Glass-lined Columns					
	Capillary	0.5 x 250	5	5064-8258	
	Capillary	0.5 x 150	5	5064-8256	
	Capillary	0.5 x 35	5	5064-8254	
	Capillary RR*	0.5 x 150	3.5	5064-8262	
	Capillary RR	0.5 x 35	3.5	5064-8260	
	Capillary	0.3 x 250	5	5064-8257	
	Capillary	0.3 x 150	5	5064-8255	
	Capillary	0.3 x 35	5	5064-8253	
	Capillary RR	0.3 x 150	3.5	5064-8261	



Sterically Protected 300Å StableBond Bonded Phase

ZORBAX 300Å StableBond

ZORBAX 300Å StableBond columns are an ideal choice for the reproducible separations of proteins and peptides for two key reasons. First, wide-pore, 300Å columns are necessary for an efficient separation of proteins and peptides, or other large molecules, in order to allow these analytes to completely access the bonded phase. Second, 300Å StableBond columns are unmatched in their durability at low pH, such as with the TFA containing mobile phases typically used for protein and peptide separations. For LC/MS separations at low pH, 300Å StableBond columns can also be used with formic acid and acetic acid mobile phase modifiers. These columns are available in four different bonded phases (C18, C8, C3, and CN) for selectivity and recovery optimization of proteins and polypeptides. To further increase sample recovery and improve efficiency for difficult proteins, 300Å StableBond columns can be used up to 80-90°C. 300SB-C18 and 300SB-C8 columns are an ideal choice for complex protein and protein digest separations. These columns are available in capillary (0.3, 0.5 mm ID) and nano (0.075 and 0.10 mm ID) dimensions for reversed-phase LC/MS separations of these protein digests. These capillary and nano columns can be used for either 1-D or 2-D proteomics separations.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range*	Endcapped	Carbon Load
ZORBAX 300SB-C18	300Å	45 m ² /g	90°C	1.0-8.0	No	2.8%
ZORBAX 300SB-C8	300Å	45 m ² /g	80°C	1.0-8.0	No	1.5%
ZORBAX 300SB-C3	300Å	45 m ² /g	80°C	1.0-8.0	No	1.1%
ZORBAX 300SB-CN	300Å	45 m ² /g	80°C	1.0-8.0	No	1.2%

*300 Å StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40°C and using low buffer concentrations in the range of 0.01-0.02M. At mid or high pH, 300Extend-C18 is recommended.

LC and LC/MS Columns

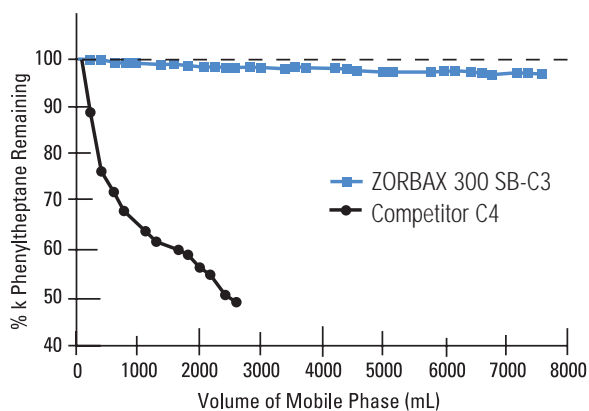
ZORBAX 300Å StableBond Columns

Short-Chain ZORBAX 300SB-C3 Is Stable at Low pH, High Temperature

Column: ZORBAX 300SB-C3
883995-909
4.6 x 150mm, 5µm

Mobile Phase: Gradients 0-100% B in 80 min
A: 0.5% TFA in Water
B: 0.5% TFA in Acetonitrile
Isocratic Retention Test Conditions:
1-phenylheptane 50% A, 50% B

Flow Rate: 1.0 mL/min
Temperature: 60°C



Four Different 300SB Bonded Phases Optimize Separation of Large Polypeptides

Column A: ZORBAX 300SB-C18
883995-902
4.6 x 150mm, 5µm

Column B: ZORBAX 300SB-C8
883995-906
4.6 x 150mm, 5µm

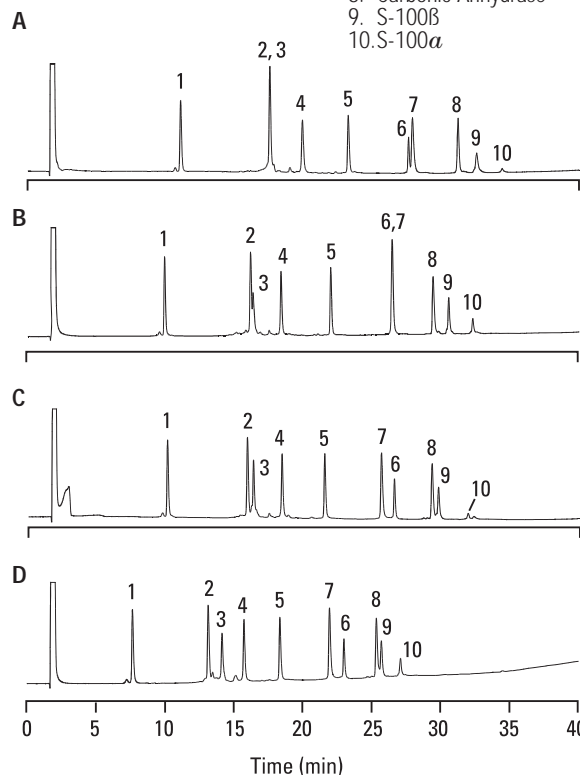
Column C: ZORBAX 300SB-C3
883995-909
4.6 x 150mm, 5µm

Column D: ZORBAX 300SB-CN
883995-905
4.6 x 150mm, 5µm

Mobile Phase: Linear Gradient, 25 - 70% B in 40 min
A: 0.1% TFA in Water
B: 0.09% TFA in 80% Acetonitrile/20% Water

Flow Rate: 1.0 mL/min
Temperature: 60°C
Sample: 3 µg each protein

1. Rnase
2. Insulin
3. Cytochrome C
4. Lysozyme
5. Parvalbumin
6. CDR
7. Myoglobin
8. Carbonic Anhydrase
9. S-100β
10. S-100α



The 300SB-C18, C8, C3, and CN bonded phases all provide a different separation of this group of polypeptides. This adds an important parameter for quickly optimizing protein separations. The 300SB-CN column offers unique selectivity for more hydrophilic polypeptides.

LC and LC/MS Columns

ZORBAX 300Å StableBond Columns

Capillary Columns for HPLC Analyses with UV and MS Detection

Column: ZORBAX 300SB-C18 5064-8263
0.3 x 150mm, 5µm

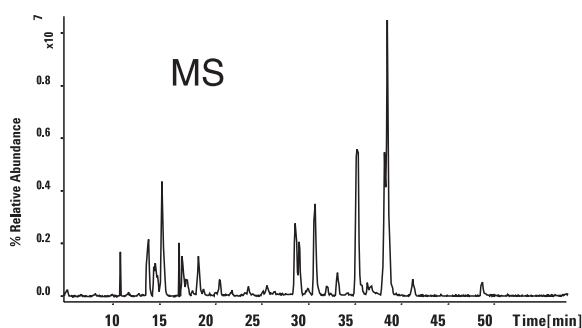
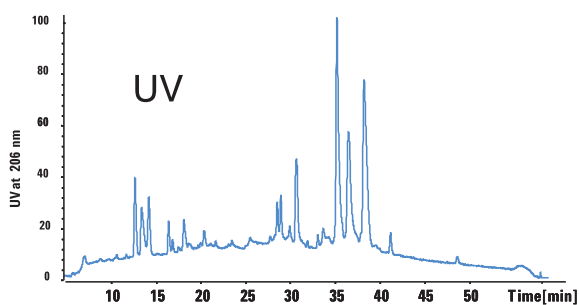
Mobile Phase: 5-55% B in 50 min, to 85% B from 55-57 min
A: 0.1% Formic Acid in Water
B: 0.1% Formic Acid in ACN

Flow Rate: 5.5 µL/min

Detector: 206 nm

MS Conditions: LC/MS: Pos. Ion ESI with LC/MSD trap-Vcap 4000 V
Drying Gas Flow: 7 L/min
Drying Gas Temperature: 250°C
Nebulizer: 15 psi
Capillary Exit Volt: 50 V
Max Accum Time: 300 ms
Total Averages: 3
Isolation Width: 3 m/z
Frag Amplitude: 1.0 V

Sample: 100 nL
Beta Casein Digest (4 pmol)



A ZORBAX 300SB-C18 capillary column (0.3 mm ID) is used for the separation of the protein digest. Detection is by both UV and Electro spray MS. MS detection can be used for identification of peptide fragments.

ZORBAX Nano Columns For High Sensitivity Protein Digest Analysis by LC/MS

Column: ZORBAX 300SB-C18 5065-9911
0.075 x 150mm, 3.5µm

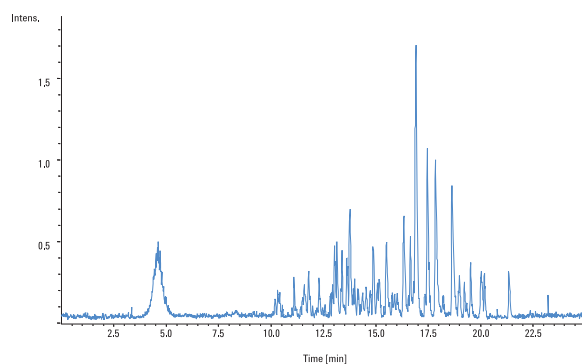
Mobile Phase: A: Water + 0.1% Formic Acid,
B: ACN + 0.1% Formic Acid

Flow Rate: 600 nL/min

Gradient: 2% B to 52% B in 25 min

Detector: Positive Ion Nano Electrospray MS

Sample: 100 fm (1 µl) Digest of 8 Proteins



A ZORBAX nano HPLC column, 0.075 mm ID, is used for high sensitivity LC/MS analysis of a protein digest sample.

LC and LC/MS Columns

ZORBAX 300Å StableBond Columns

ZORBAX 300Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56
Standard Columns (no special hardware required, 400 bar)							
	Semi-Preparative	9.4 x 250	5	880995-202	880995-206	880995-205	880995-209
	Analytical	4.6 x 250	5	880995-902	880995-906	880995-905	880995-909
	Analytical	4.6 x 150	5	883995-902	883995-906	883995-905	883995-909
	Analytical	4.6 x 50	5	860950-902	860950-906	860950-905	860950-909
	Rapid Resolution	4.6 x 150	3.5	863973-902	863973-906	863973-905	863973-909
	Rapid Resolution	4.6 x 100	3.5	861973-902	861973-906		
	Rapid Resolution	4.6 x 50	3.5	865973-902	865973-906	865973-905	865973-909
	Solvent Saver Plus	3.0 x 150	3.5	863974-302	863974-306		863974-309
	Solvent Saver Plus	3.0 x 100	3.5		861973-306		
	Narrow Bore	2.1 x 250	5	881750-902			
	Narrow Bore	2.1 x 150	5	883750-902	883750-906	883750-905	883750-909
	Narrow Bore RR*	2.1 x 150	5		863750-906		
	Narrow Bore RR*	2.1 x 100	3.5	861775-902	861775-906		
	Narrow Bore RR*	2.1 x 50	3.5	865750-902	865750-906		
	MicroBore	1.0 x 250	5	861630-902			
	MicroBore RR*	1.0 x 150	3.5	863630-902	863630-906		
	MicroBore RR*	1.0 x 50	3.5	865630-902	865630-906		
	MicroBore Guard Cartridges, 3/pk	1.0 x 17	5	5185-5920	5185-5920		
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-124	820675-124	820675-124	820675-124
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-921	820950-918	820950-923	820950-924
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-918	821125-918	821125-924	821125-924
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	840140-901
ZGC	Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
PI	PrepHT Cartridge	21.2 x 250	7	897250-102	897250-106	897250-105	897250-109
PI	PrepHT Cartridge	21.2 x 150	7	897150-102	897150-106		897150-109
PI	PrepHT Cartridge	21.2 x 150	5	895150-902	895150-906		895150-909
PI	PrepHT Cartridge	21.2 x 100	5	895100-902	895100-906		895100-909
PI	PrepHT Cartridge	21.2 x 50	5	895050-902	895050-906		895050-909
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901
PI	PrepHT Guard Cartridge, 2/pk	17 x 7.5	5	820212-921	820212-918	820212-924	820212-924
PI	Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901

LC and LC/MS Columns

ZORBAX 300Å StableBond Columns

ZORBAX 300Å StableBond (Continued)

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56
Capillary Glass-lined Columns							
	Capillary	0.5 x 250	5	5064-8266			
	Capillary	0.5 x 150	5	5064-8264			
	Capillary	0.5 x 35	5	5064-8294			
	Capillary RR*	0.5 x 150	3.5	5064-8268			
	Capillary RR*	0.5 x 35	3.5	5065-4459			
	Capillary	0.3 x 250	5	5064-8265			
	Capillary	0.3 x 150	5	5064-8263			
	Capillary	0.3 x 35	5	5064-8295			
	Capillary RR*	0.3 x 150	3.5	5064-8267	5065-4460		
	Capillary RR*	0.3 x 100	3.5	5064-8259	5065-4461		
	Capillary RR*	0.3 x 35	3.5	5064-8270	5065-4462		
	Capillary RR*	0.3 x 50	3.5	5064-8300	5065-4463		
Nano Columns (PEEK fused silica)							
	Nano RR*	0.1 x 150	3.5	5065-9910			
	Nano RR*	0.075 x 150	3.5	5065-9911			
	Nano RR*	0.075 x 50	3.5	5065-9924	5065-9923		
	Trap/Guard, 5/pk	0.3 x 5	5	5065-9913	5065-9914		
	Trap/Guard Hardware kit			5065-9915	5065-9915		

*RR: Rapid Resolution 3.5 µm

LC and LC/MS Columns

ZORBAX Poroshell Columns

ZORBAX Poroshell

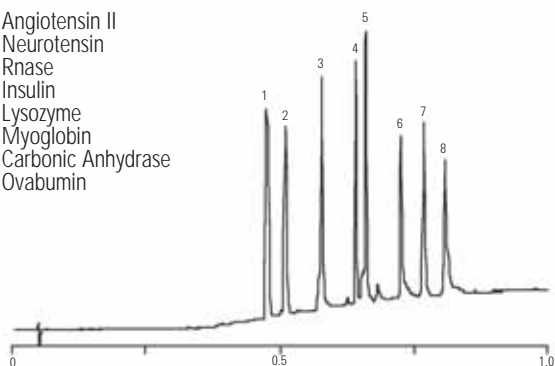
- High-resolution separations of biomolecules with unique particle design
- High efficiency and recovery with proteins (up to 1,000 kDa) and monoclonal antibodies
- Achieve long lifetime at low pH with Poroshell 300SB; at high pH with 300Extend-C18
- Optimize recovery and selectivity with four different bonded phases – 300SB-C18, 300SB-C8, 300SB-C3, and 300Extend-C18

ZORBAX Poroshell columns are ideal for fast separations of proteins and peptides because the unique particle allows for fast flow rates to be used while maintaining sharp, efficient peaks. Peptides and proteins are typically separated slowly to reduce the potential peak broadening of these slow diffusing analytes. But Poroshell columns use a unique particle made with a thin layer of porous silica on a solid core of silica. This reduces the diffusion distance for proteins making practical rapid HPLC separations of peptides and proteins up to 500-1,000 kDa. Poroshell columns bonded with StableBond bonded phases provide excellent stability and selectivity choices with TFA and formic acid mobile phases. The Poroshell 300Extend-C18 column can be used from pH 2-10 for unique separations. These columns can be used for analytical protein separations as well as LC/MS separations.

Poroshell Columns Can Separate Proteins and Peptides in Seconds

Column: ZORBAX Poroshell 300SB-C18 660750-902
2.1 x 75mm, 5µm
Mobile Phase: A: 0.1% TFA in H₂O
B: 0.07% TFA in ACN
Flow Rate: 3.0 mL/min
Gradient: 5-100% B in 1.0 min
Temperature: 70°C, 260 bar pressure
Detector: 215 nm
Sample: Proteins and Peptides

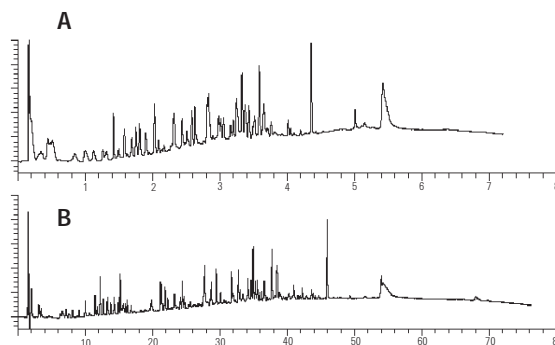
1. Angiotensin II
2. Neurotensin
3. Rnase
4. Insulin
5. Lysozyme
6. Myoglobin
7. Carbonic Anhydrase
8. Ovabumin



This separation of eight polypeptides and proteins is completed in less than 60 seconds. Each peak is sharp and efficient.

Reduce Peptide Map Analysis Time by 90% with ZORBAX Poroshell 300SB

Column A: ZORBAX Poroshell 300SB-C18 660750-902
2.1 x 75mm, 5µm
Column B: ZORBAX 300SB-C18 883750-902
2.1 x 150mm, 5µm
Mobile Phase: A: 95% H₂O, 5% ACN, 0.1% TFA
B: 5% H₂O, 95% ACN, 0.07% TFA
Flow Rate: 1 mL/min
0.208 mL/min
Gradient: 0-100%B = 12 min
0-100%B = 120 min
Temperature: 70°C
Sample: 20 µL (0.22 µg/1 µL)
BSA Tryptic Digest
(15 hours, 70 pmol)



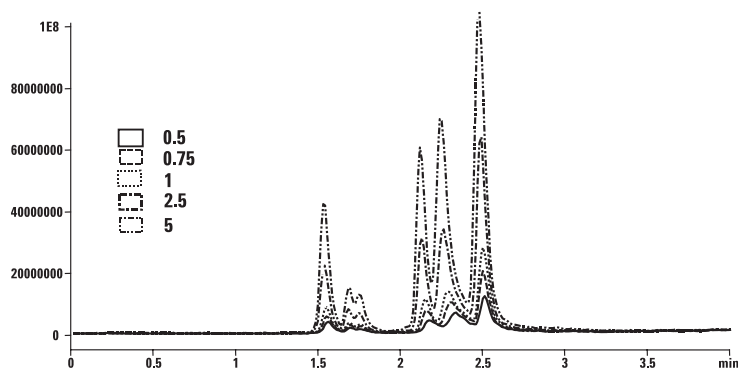
A single chromatographic run of a protein tryptic digest can require an hour or more to complete. With ZORBAX Poroshell columns, the same complex separation can be completed in 1/10th the time.

LC and LC/MS Columns

ZORBAX Poroshell Columns

MicroBore ZORBAX Poroshell Columns Provide Maximum Sensitivity for LC/MS

Column: ZORBAX Poroshell
300SB-C18
661750-902
1.0 x 75mm, 5µm
Mobile Phase: A: Water + 0.1% Formic Acid
 B: ACN + 0.1% Formic Acid
Flow Rate: 600 µL/min
Gradient: 20-100% B in 5.5 min
Temperature: 80°C
MS Conditions: LC/MS: Pos. Ion ESI – Vcap
 6000 V
 Drying Gas Flow: 12 Liters/min
 Drying Gas Temperature:
 350°C
 Nebulizer: 45 psi
 Fragmentor Voltage: 140 V
 Scan: 600 - 2500
 Stepsize: 0.15 amu
 Peakwidth: 0.06 min
Sample: 1 µL



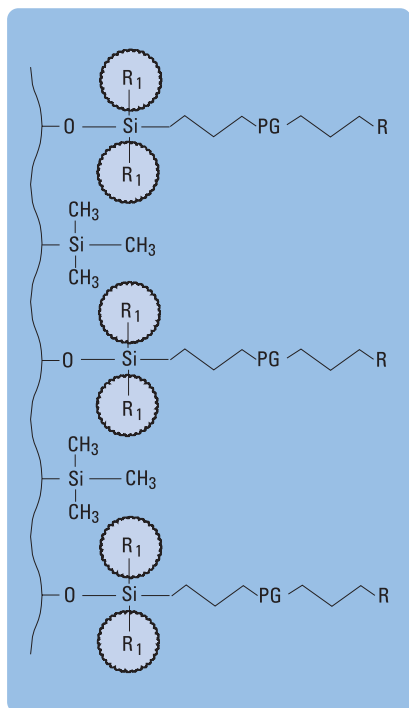
With narrow bore diameters like 2.1 mm, 1.0 mm, and 0.5 mm, ZORBAX Poroshell columns make an ideal LC/MS partner. When the sample is very limited, the 1.0 mm or 0.5 mm ID Poroshell columns are an excellent choice for high sensitivity LC/MS analyses. Sensitive MS molecular weight determinations are possible with as little as 0.5 to 5 pmole of protein on Poroshell columns. Poroshell columns have also been used for rapid MS identification of intact proteins even in the presence of stabilizers and tissue culture media.

ZORBAX Poroshell

Hardware	Description	Size (mm)	Particle Size (µm)	Poroshell 300SB-C18	Poroshell 300SB-C8	Poroshell 300SB-C3	Poroshell 300Extend-C18
	Narrow Bore	2.1 x 75	5	660750-902	660750-906	660750-909	670750-902
	MicroBore	1.0 x 75	5	661750-902	661750-906	661750-909	671750-902
	Capillary	0.5 x 75	5		5065-4468		
	Guard Cartridge, 4/pk	2.1 x 12.5	5	821075-920	821075-918	821075-924	
	Guard Hardware Kit			820888-901	820888-901	820888-901	
	MicroBore Guard Cartridge, 3/pk	1.0 x 17	5	5185-5968	5185-5968	5185-5968	5185-5968

LC and LC/MS Columns

ZORBAX Bonus-RP Columns



Unique, Polar Alkyl Bonus-RP Bonded Phase

ZORBAX Bonus-RP

- Excellent peak shape for challenging basic compounds at low and mid pH
- Unique reversed-phase selectivity
- Novel bonding technology with embedded polar group and steric protection
- Usable in 100% aqueous mobile phases

The Agilent ZORBAX Bonus-RP column has a polar amide group embedded in a long alkyl chain. This novel bonding reduces interactions between basic compounds and the silica support, improving peak shape for the most difficult basic compounds. Peak shape and column lifetime are further improved by triple endcapping. In addition, diisopropyl side groups provide steric protection against acid hydrolysis for good lifetime at low pH. The Bonus-RP column provides an alternate selectivity to C18 and C8 alkyl bonded phases.

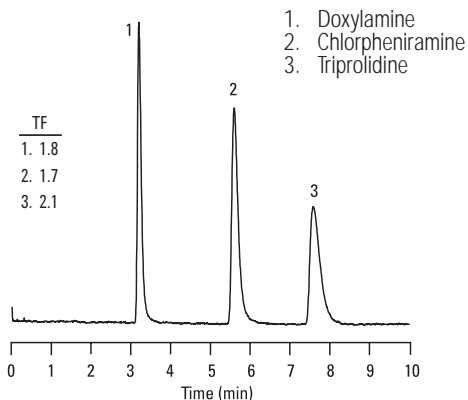
Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX Bonus-RP	80Å	180 m ² /g	60°C	2.0-9.0	Triple	9.5%

*Temperature limits are 60°C up to pH 8, 40°C from pH 8-9.

Improved Peak Shape of Basic Compounds Using Bonus-RP

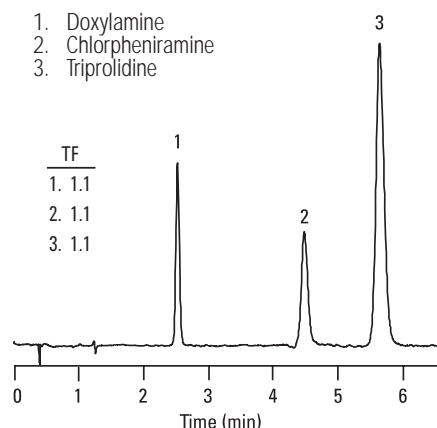
Column: Alkyl-C8
4.6 x 150 mm, 5 µm
Mobile Phase: 75% 25 mM NH₄OAc,
pH 5.5
25% ACN
Flow Rate: 1.5 mL/min
Temperature: 40°C
Detector: 254 nm



Bonus-RP eliminates peak tailing of these basic compounds in comparison to a typical alkyl C8 bonded phase. In the mid-pH region, residual silanols can interact more strongly with basic compounds to cause peak tailing. The polar group in the Bonus-RP bonded phase eliminates peak tailing of these basic compounds by reducing interactions with residual silanols.

Improved Peak Shape of Basic Compounds Using Bonus-RP 2

Column: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm
Mobile Phase: 80% 25 mM NH₄OAc,
pH 5.5
20% ACN
Flow Rate: 1.5 mL/min
Temperature: 40°C
Detector: 254 nm



LC and LC/MS Columns

ZORBAX Bonus-RP Columns

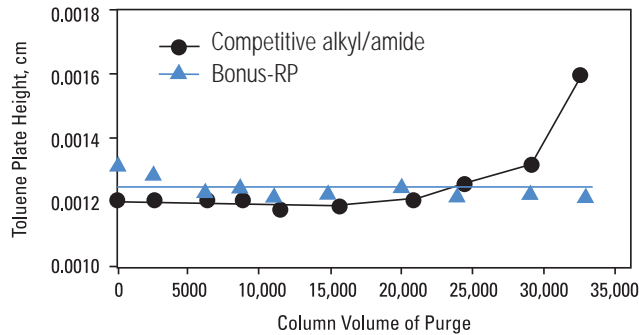
ZORBAX Bonus-RP is Stable at Low and Mid pH

Column: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm

Mobile Phase: 60% 25 mM Phosphate Buffer, pH 7.0; 40% ACN

Flow Rate: 1.5 mL/min

Temperature: 23°C



Triple endcapping of Bonus-RP enhances stability at pH 7. Each 10,000 column volumes is equivalent to approximately one working month.

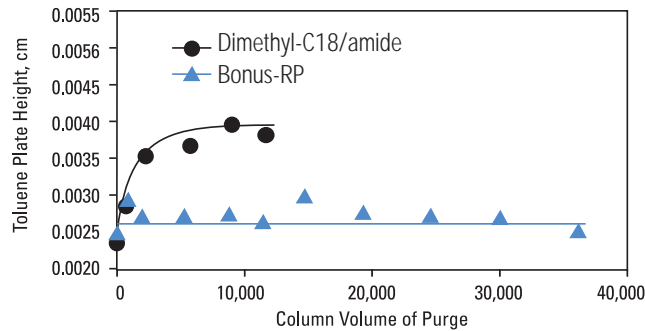
Dimethyl-C18/amide, Bonus-RP

Column: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm

Mobile Phase: Aging: 50% MeOH, 50% 0.1% TFA
Test: 80% MeOH, 20% H₂O

Flow Rate: 1.0 mL/min

Temperature: Aging: 60°C
Test: 23°C



Sterically protecting side groups provide good low pH stability and longer column lifetime than similar polar alkyl bonded phases.

ZORBAX Bonus-RP Provides Unique Selectivity

Column A: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm

Column B: Eclipse XDB-C8
993967-906
4.6 x 150

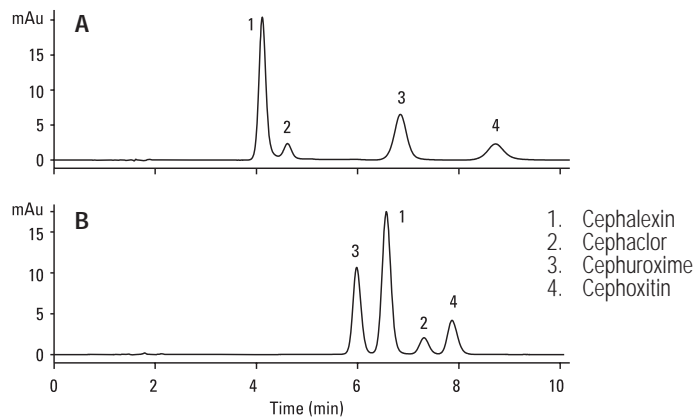
Mobile Phase: 75% 25 mM Na Citrate, pH 6; 25% MeOH

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: 3 µL Cephalosporins














Peak elution order can change dramatically when using Bonus-RP. In this example, the elution order of the first three peaks change.

LC and LC/MS Columns

ZORBAX Bonus-RP Columns

ZORBAX Bonus-RP

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
Standard Columns (no special hardware required, 400 bar)				
	Analytical	4.6 x 250	5	880668-901
	Analytical	4.6 x 150	5	883668-901
	Rapid Resolution	4.6 x 150	3.5	863668-901
	Rapid Resolution	4.6 x 100	3.5	864668-901
	Rapid Resolution	4.6 x 75	3.5	866668-901
	Solvent Saver	3.0 x 250	5	880668-301
	Solvent Saver	3.0 x 150	5	883668-301
	Solvent Saver Plus	3.0 x 150	3.5	863668-301
	Solvent Saver Plus	3.0 x 100	3.5	864668-301
	Narrow Bore	2.1 x 150	5	883725-901
	Narrow Bore	2.1 x 50	5	861971-901
	Narrow Bore RR*	2.1 x 150	3.5	863700-901
	Narrow Bore RR*	2.1 x 100	3.5	861768-901
	Narrow Bore RR*	2.1 x 50	3.5	861700-901
	MicroBore RR*	1.0 x 150	3.5	863608-901
	MicroBore RR*	1.0 x 50	3.5	865608-901
	MicroBore RR*	1.0 x 30	3.5	861608-901
	MicroBore Guard Cartridge, 3/pk	1.0 x 17	5	5185-5922
	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-928
	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-928
	Guard Hardware Kit			820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
	PrepHT Cartridge	21.2 x 250	7	878250-101
	PrepHT Cartridge	21.2 x 150	7	878150-101
	PrepHT Cartridge	21.2 x 150	5	868150-901
	PrepHT Cartridge	21.2 x 100	5	868100-901
	PrepHT Cartridge	21.2 x 50	5	868050-901
	PrepHT Endfittings, 2/pk			820400-901
	PrepHT Guard Cartridge, 2/pk	17 x 7.5	5	820212-928
	Guard Cartridge Hardware			820444-901

*RR: Rapid Resolution 3.5 µm

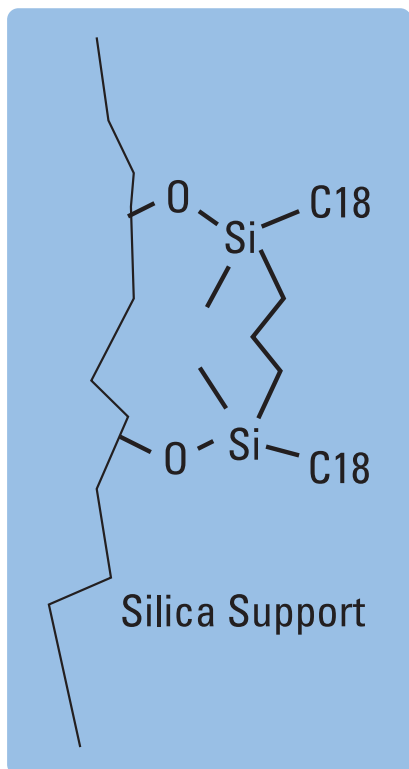
LC and LC/MS Columns

ZORBAX 80Å Extend-C18 Columns

ZORBAX 80Å Extend-C18

- High efficiency and long life at high pH—up to pH 11.5
- Unique bidentate bonding and double endcapping provides high pH stability
- More efficiency and better peak shape than polymer-based columns
- Improve retention, resolution and peak shape of basic compounds
- High sensitivity for LC/MS separations of peptides

The Agilent ZORBAX Extend-C18 column uses a novel bidentate C18-C18 bonding technology to make it possible to develop high-resolution separations at high pH with a silica-based column. At high pH non-charged basic compounds will not interact with the underlying silica. The result is high efficiency separations with superior peak shape and improved resolution. High pH separations are also the best choice for compounds that are more stable or more soluble in high pH solutions. Some of the mobile phase buffer options for high pH include triethylamine, pyrrolidine, glycine, borate and ammonium hydroxide. Ammonium hydroxide at pH 10.5 is an excellent mobile phase modifier for the LC/MS of peptides and small molecules with improved sensitivity compared with TFA containing mobile phase at low pH. The Extend-C18 column is stable from pH 2-11.5 with good peak shape for all types of compounds. Extend-C18 columns also provide an additional selectivity choice at low pH.



Novel Bidentate C18-C18 Bonding for Extend C-18 Bonded Phase

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX Extend-C18	80Å	180 m ² /g	60°C	2.0-11.5	Double	12.5%

*Temperature limits are 60°C up to pH 8, 40°C from pH 8-11.5.

LC and LC/MS Columns

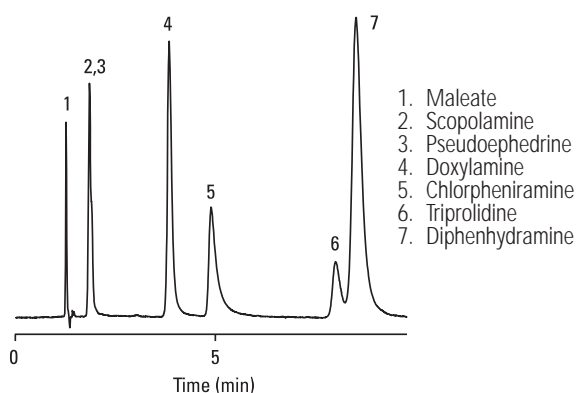
ZORBAX 80Å Extend-C18 Columns

Basic Antihistamines on Extend-C18 at High pH

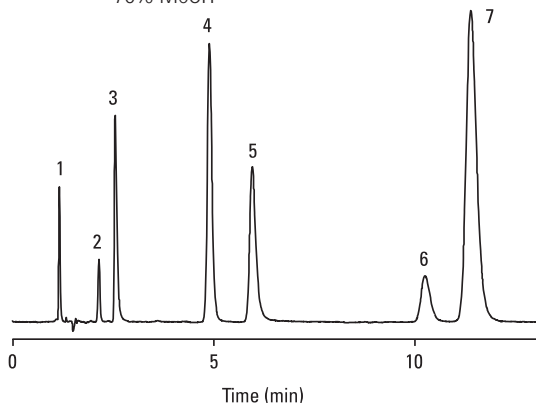
Column: ZORBAX Extend-C18
773450-902
4.6 x 150mm, 5µm

Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: 254 nm
Sample: Antihistamines

Mobile Phase: pH 7:
30% 20 mM Na₂HPO₄
70% MeOH



Mobile Phase: pH 11:
30% 20 mM TEA
70% MeOH



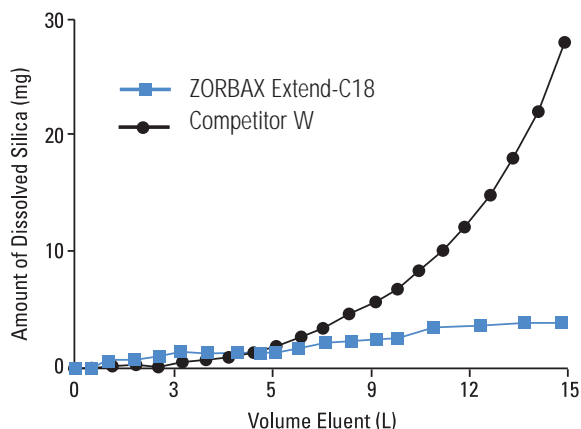
Pseudoephedrine and scopolamine are difficult to retain at low and mid pH. Pseudoephedrine is often analyzed by ion exchange methods. The Extend-C18 column retains these compounds in a noncharged form at high pH and improves resolution.

Long Life at High pH with Extend-C18

Column: ZORBAX Extend-C18
773450-902
4.6 x 150mm, 5µm

Mobile Phase: 20% Methanol
80% 0.1 M Carbonate Buffer, pH 10.0

Flow Rate: 1.0 mL/min
Temperature: Ambient



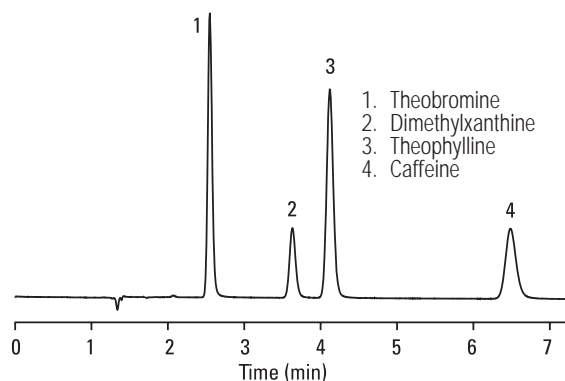
At high pH, columns will fail due to silica dissolution. The example here shows extended lifetime of ZORBAX Extend-C18 at high pH in comparison to competitor W. This was measured by the amount of dissolved silica.

Extend-C18 Provides Good Peak Shape at Low pH

Column: ZORBAX Extend-C18
773450-902
4.6 x 150mm, 5µm

Mobile Phase: 80% 25 mM NaH₂PO₄, pH 3.0
20% Methanol

Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: 254 nm
Sample: Basic Compounds












These basic compounds are separated on the Extend-C18 at low pH with excellent peak shape. The Extend-C18 column can be used at high and low pH.

LC and LC/MS Columns

ZORBAX 80Å Extend-C18 Columns

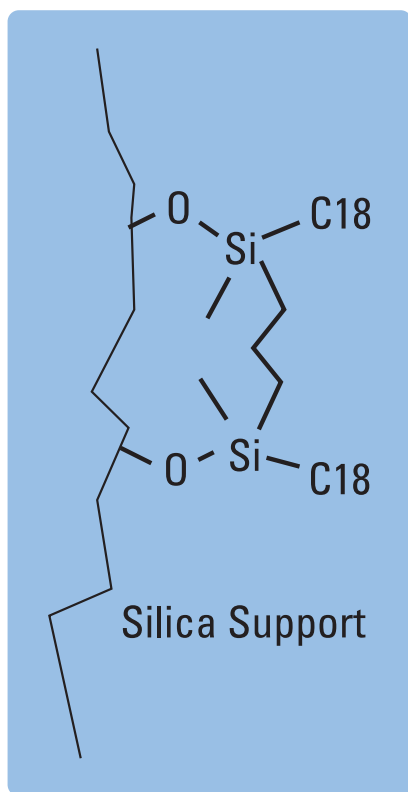
ZORBAX 80Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
Standard Columns (no special hardware required, 400 bar)				
	Analytical	4.6 x 250	5	770450-902
	Analytical	4.6 x 150	5	773450-902
	Analytical	4.6 x 50	5	746450-902
	Rapid Resolution	4.6 x 150	3.5	763953-902
	Rapid Resolution	4.6 x 100	3.5	764953-902
	Rapid Resolution	4.6 x 75	3.5	766953-902
	Rapid Resolution	4.6 x 50	3.5	735953-902
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	728975-902
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	727975-902
	Rapid Resolution HT, 400 bar	4.6 x 50	1.8	722975-902
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	724975-902
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	726975-902
	Solvent Saver	3.0 x 250	5	770450-302
	Solvent Saver	3.0 x 150	5	773450-302
	Solvent Saver Plus	3.0 x 150	3.5	763954-302
	Solvent Saver Plus	3.0 x 100	3.5	764953-302
	Solvent Saver Plus	3.0 x 50	3.5	735954-302
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	728975-302
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	727975-302
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	724975-302
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	726975-302
	Narrow Bore	2.1 x 150	5	773700-902
	Narrow Bore	2.1 x 50	5	760450-902
	Narrow Bore RR*	2.1 x 100	3.5	761753-902
	Narrow Bore RR*	2.1 x 50	3.5	735700-902
	Narrow Bore RRHT, 600 bar**	2.1 x 100	1.8	728700-902
	Narrow Bore RRHT, 600 bar**	2.1 x 50	1.8	727700-902
	Narrow Bore RRHT, 600 bar**	2.1 x 30	1.8	724700-902
	Narrow Bore RRHT, 600 bar**	2.1 x 20	1.8	726700-902
	MicroBore RR*	1.0 x 150	3.5	763600-902
	MicroBore RR*	1.0 x 50	3.5	765600-902
	MicroBore RR*	1.0 x 30	3.5	761600-902
	MicroBore Guard Cartridge, 3/pk	1.0 x 17	5	5185-5923
	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-930
	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-930
	Guard Hardware Kit			820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
	PrepHT Cartridge	21.2 x 150	5	770150-902
	PrepHT	21.2 x 100	5	770100-902
	PrepHT	21.2 x 50	5	770050-902
	PrepHT Endfittings, 2/pk			820400-901
	PrepHT Guard Cartridge, 2/pk	17 x 7.5	5	820212-930
	Guard Cartridge Hardware			820444-901

*RR: Rapid Resolution 3.5 µm
 **RRHT: Rapid Resolution HT 1.8 µm

LC and LC/MS Columns

ZORBAX 300Å Extend-C18 Columns



Novel Bidentate C18-C18 Bonding for Extend-C18 Bonded Phase

ZORBAX 300Å Extend-C18

- Rugged, high and low pH separations of polypeptides and peptides from pH 2-11.5
- Different selectivity possible at high and low pH
- High efficiency and good recovery of hydrophobic peptides at high pH
- Ideal for LC/MS with ammonium hydroxide-modified mobile phase

ZORBAX 300Extend C-18 is a wide-pore HPLC column for high efficiency separations of peptides from pH 2-11.5. The unique, bidentate bonded phase provides excellent lifetime and reproducibility at high and low pH. At high pH, retention and selectivity of peptides and polypeptides can change dramatically as a result of changes in charge on molecules. Excellent recoveries of hydrophobic polypeptides have been achieved at room temperature and high pH. LC/MS sensitivity of peptides and polypeptides can also be improved at high pH using a simple ammonium hydroxide-containing mobile phase.

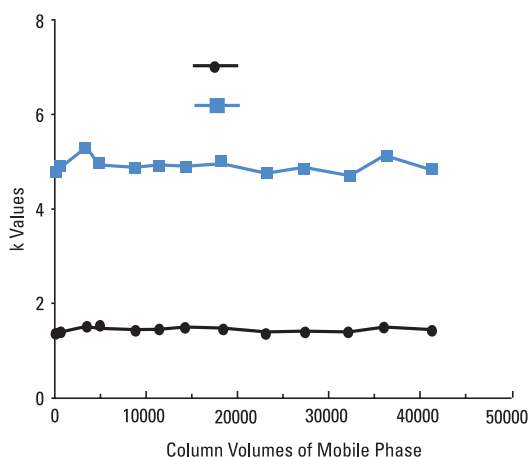
Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX 300Extend-C18	80Å	180 m ² /g	60°C	2.0-11.5	Double	4%

*Temperature limits are 60°C up to pH 8, 40°C from pH 8-11.5.

Long Life at High pH with 300Extend-C18

Column: ZORBAX Extend-C18
773450-902
4.6 x 150mm, 5µm
Mobile Phase: 20% 20 mM NH₄OH, pH 10.5
80% Methanol
Flow Rate: 1.5 mL/min
Temperature: Aging 24°C
Tests 40°C



Each 10,000 column volume is approximately one working month.

LC and LC/MS Columns

ZORBAX 300Å Extend-C18 Columns

Extend-C18 and StableBond SB-C18
Are Stable at Low pH

Column A: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm

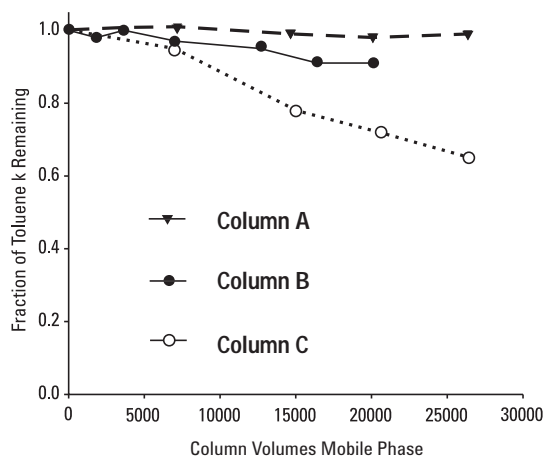
Column B: ZORBAX Extend-C18
773450-902
4.6 x 150mm, 5µm

Column C: ZORBAX Rx-C18
883967-902
4.6 x 150mm, 5µm

Mobile Phase: Column Aging:
50% Methanol : 50% Water +
1% TFA
Column Test:
60% Methanol : 40% Water
Test Solute: Toluene

Flow Rate: 1.5 mL/min, continuous

Temperature: Aging:
90°C
Test:
Ambient



The 300Extend-C18 column can be used at high and low pH—from pH 2-11.5. This chart shows that the 300Extend-C18 has the needed stability at low pH for long-term reproducible separations. Therefore, one wide-pore column can be used for selectivity optimization at low and high pH with both TFA and ammonium hydroxide mobile phases.

LC/MS Analysis of Angiotensin
on Extend-C18

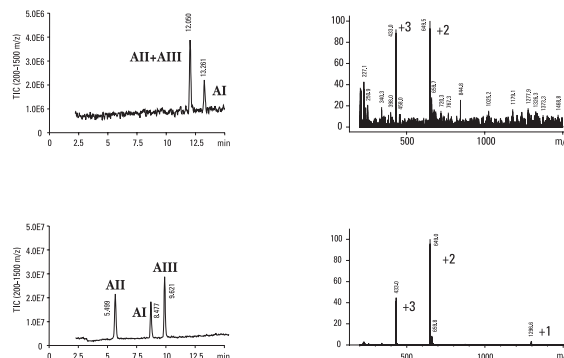
Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5µm

Mobile Phase: Acidic Conditions: A: 0.1% TFA in water B: 0.085% TFA in 80% acetonitrile (ACN)
Basic Conditions: A: 10 mM NH4OH in water B: 10 mM NH4OH in 80% ACN

Flow Rate: 0.2 mL/min
Gradient: 15-50% B in 15 min
Temperature: 35°C
MS Conditions: Pos. Ion ESI- Vf 70V, Vcap 4.5 kV, N2- 35 psi, 12 L/min., 325°C

Sample: 2.5 µL sample (50 pmol each)
Angiotensin I, II, III

Reference: B.E. Boyes. Separation and Analysis of Peptides at High pH Using RP-HPLC/ESI-MS, 4th WCBP, San Francisco, CA Jan 2000.



Both small and large peptides demonstrate selectivity changes at high and low pH. At high pH, due to a change in charge, all three Angiotensins can be resolved. In addition, the spectral clarity of Angiotensin I is dramatically improved at high pH with the ammonium hydroxide mobile phase. The Extend-C18 column can be used for the analysis of small peptides at high pH as well.

LC and LC/MS Columns

ZORBAX 300Å Extend-C18 Columns

ZORBAX 300Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	Analytical	4.6 x 250	5	770995-902
	Analytical	4.6 x 150	5	773995-902
	Rapid Resolution	4.6 x 150	3.5	763973-902
	Rapid Resolution	4.6 x 100	3.5	761973-902
	Rapid Resolution	4.6 x 50	3.5	765973-902
	Narrow Bore RR*	2.1 x 150	3.5	763750-902
	Narrow Bore RR*	2.1 x 100	3.5	761775-902
	Narrow Bore RR*	2.1 x 50	3.5	765750-902
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-932
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-932
ZGC	Guard Hardware Kit			820888-901
	Capillary RR*	0.3 x 150	3.5	5065-4464
	Capillary RR*	0.3 x 100	3.5	5065-4465
	Capillary RR*	0.3 x 75	3.5	5065-4466
	Capillary RR*	0.3 x 50	3.5	5065-4467

*RR: Rapid Resolution 3.5 µm

LC and LC/MS Columns

ZORBAX Rx Columns

ZORBAX Rx

- Rx-C18 is recommended for alternate selectivity at low pH relative to Eclipse XDB-C18 and StableBond SB-C18; for higher temperature applications, StableBond is recommended. This column has a higher carbon load than SB-C18 columns (12% vs. 10%)
- Rx-C18 offers high stability and good peak shape for low pH applications
- Rx-C18 is manufactured using dimethyloctadecylsilane, is non-encapped and provides excellent stability up to pH 9.
- Rx-C8 is the same product as SB-C8.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Encapped	Carbon Load
ZORBAX Rx-C18	80Å	180 m ² /g	60°C	2.0-9.0	No	12%
ZORBAX Rx-C8	80Å	180 m ² /g	80°C	1.0-8.0	No	5.5%

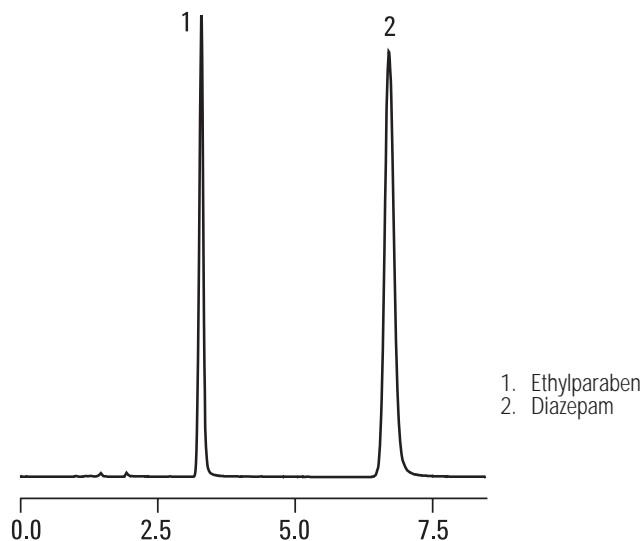
Analysis of Diazepam on Rx-C18

Column: ZORBAX Rx-C18
880967-302

3.0 x 250mm, 5µm

Mobile Phase: 35% H₂O: 65% MeOH

Flow Rate: 0.5 mL/min
















An Rx-C18 column is used for this USP analysis of diazepam and the internal standard ethylparaben. The Solvent Saver 3.0 mm i.d. Rx-C18 column reduces solvent usage by 60% over what would be used if the analysis were done on a 4.6 x 250 mm column.

LC and LC/MS Columns

ZORBAX Rx Columns

ZORBAX Rx

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-C18 USP L1	Rx-C8 USP L7**
	Semi-Preparative	9.4 x 250	5	880967-202	880967-201
	Analytical	4.6 x 250	5	880967-902	880967-901
	Analytical	4.6 x 150	5	883967-902	883967-901
	Rapid Resolution	4.6 x 150	3.5	863967-902	863953-906
	Rapid Resolution	4.6 x 100	3.5	861967-902	861953-906
	Rapid Resolution	4.6 x 75	3.5	866967-902	866953-906
	Solvent Saver	3.0 x 250	5	880967-302	880975-306
	Solvent Saver	3.0 x 150	5	883967-302	883975-306
	Solvent Saver Plus	3.0 x 150	3.5	863967-302	863954-306
	Solvent Saver Plus	3.0 x 100	3.5	861967-302	861954-306
	Narrow Bore	2.1 x 150	5	883700-902	883700-906
	Narrow Bore RR*	2.1 x 100	3.5	861767-902	861753-906
	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115
	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-914	820950-913
	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915
	Guard Hardware Kit	9.4 x 15		840140-901	840140-901
	Guard Hardware Kit			820888-901	820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)					
	PrepHT Cartridge	21.2 x 250	7	877967-102	877250-106
	PrepHT Cartridge	21.2 x 150	7		877150-106
	PrepHT Cartridge	21.2 x 150	5		870150-906
	PrepHT Cartridge	21.2 x 100	5		870100-906
	PrepHT Cartridge	21.2 x 50	5		870050-906
	PrepHT Guard Cartridge, 2/pk			820212-914	820212-915
	Guard Cartridge Hardware			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

*RR: Rapid Resolution 3.5 µm
 **Rx-C8 is the same product as SB-C8

LC and LC/MS Columns

ZORBAX High Throughput HPLC Columns

ZORBAX Columns for LC/MS and High Throughput HPLC

- Fast analysis for high speed LC/MS with Rapid Resolution (3.5 μm) and Rapid Resolution HT (1.8 μm) columns
- Highest resolution with 1.8 μm RRHT columns
- Many column choices for LC/MS compatibility—from nano to analytical
- Narrow bore columns for improved sensitivity
- Transfer methods from longer columns with 5 μm particles with no loss in resolution
- Capillary and nano columns are most often used to analyze complex protein and peptides samples by LC/MS.

Column choices for LC/MS are wide ranging, depending on the sample to be studied. For simple analytical samples, column choices focus on finding short columns with high resolution to reduce analysis time for high throughput LC/MS. For these applications short Rapid Resolution and Rapid Resolution HT columns are the best choice. For higher resolution longer columns, including new 100 and 150mm RRHT columns can be used.

Column choice is also guided by the desired flow rate. LC/MS systems operate at flow rates from 1 $\mu\text{l}/\text{min}$ to 1 ml/min . This makes smaller internal diameter columns good choices for high sensitivity and fast flow rates. Choices include Solvent Saver, Narrow Bore, MicroBore and Capillary columns. The right choice is available for your single quad, QQQ or TOF detector.

Columns are available in the new high performance ZORBAX Eclipse Plus bonded phase for best peak shape and highest efficiency, ideal for maximizing resolution. Other ZORBAX columns are also available including popular Eclipse XDB and StableBond bonded phases. These bonded phases are compatible with the typical volatile mobile phase additives used for LC/MS, including TFA, formic acid, and acetic acid.

On the next few pages you will see columns good for LC/MS

- Rapid Resolution HT (1.8 μm) columns from 1.0 - 4.6 mm ID for LC/MS
- Rapid Resolution (3.5 μm) columns for good resolution at lower pressure
- Solvent Saver 3.0mm ID columns ideal for LC/MS at 0.5 - 1.0 mL/min with high sensitivity
- MicroBore columns for maximum sensitivity
- Capillary and Nano columns for the smallest volume samples

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns



ZORBAX Rapid Resolution High Throughput 1.8 μm

- New high pressure (600 bar) columns for ultra high speed or maximum resolution analyses with Rapid Resolution HT columns packed with totally porous, 1.8 μm packings
- Carefully engineered particles deliver maximum resolution at 25% less pressure than other sub 2-micron materials
- Reduce analysis time by up to 95%
- Develop HPLC methods more quickly
- Securely transfer conventional methods with over 80 RRHT column choices
- Analyze complex samples on shorter columns faster and maximize peak capacity
- Perform faster analyses and use less solvent
- Short (50mm long and less) column can be used on some conventional LCs

ZORBAX Rapid Resolution HT (1.8 μm) columns use a totally porous, 1.8 μm particle to provide maximum resolution in fast, ultra-fast and high resolution analyses. You can reduce analysis time by up to 95% in comparison to 250 mm length columns. With more than 80 RRHT column choices, including the new high performance ZORBAX Eclipse Plus and many other ZORBAX column choices (Eclipse XDB, StableBond, Extend), methods can be developed quickly or securely transferred to a smaller particle size column with no loss in resolution. The small particle size provides double the efficiency of a 3.5 μm column in the same column length providing the highest efficiency and resolution possible. This permits the analysis of complex samples on shorter column with the highest resolution and peak capacity. The 1.8 μm Rapid Resolution HT columns take high-speed, high-resolution HPLC to a new level. The 600 bar columns can be used with the new Agilent 1200 Rapid Resolution LC up to this high pressure limit. In addition, the shorter columns can be used on many other LC's, including the Agilent 1100 by using the RRHT-1100 conversion kits to maximize performance.

1100 Series Conversion Kits for Fast LC

These kits make it easy to convert your Agilent 1100 system with a binary pump to a lower-volume system for RRHT LC columns. Each kit contains all capillaries, a flow cell, starter columns, and detailed instructions for system conversion. Note: you will still be able to use your converted 1100 for standard methods and columns.

Kit Selection	Description	Part No.
For Variable Wavelength Detectors (VWD)	Columns: 4.6 x 50 mm, 1.8 μm (3) Flow Cell for VWD, 5 μl capillaries, $\mu\text{-LC}$ inline filter	5188-5323
For Diode Array Detectors (DAD & DAD SL) and Multiple Wavelength Detectors (MWD)	Columns: 4.6 x 50 mm, 1.8 μm (2) Flow Cell for DAD, 5 μl capillaries, $\mu\text{-LC}$ inline filter	5188-5324
For Diode Array Detector and Mass Spec	Columns: 2.1 x 50 mm, 1.8 μm (2) Flow Cell for DAD, 1.7 μl capillaries, ZDV union	5188-5328

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

Rapid Resolution HT—Up to 20X Faster

Column: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm
827700-902, 827700-902

Mobile Phase: A:H2O
B: ACN

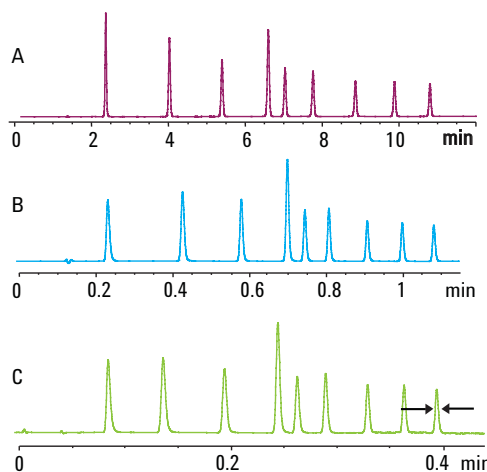
Flow Rate: 1.2 mL/min, 1.0 mL/min, 2.4 mL/min

Gradient: 0.0 min 50% B
11/1.2/0.4 min 100% B

Temperature: 40°C, 40°C, 95°C

Detector: UV 254 nm

Sample: Alkylphenones



1. C3-Alkylphenone
2. C4-Alkylphenone
3. C5-Alkylphenone
4. C6-Alkylphenone
5. C7-Alkylphenone
6. C8-Alkylphenone
7. C9-Alkylphenone
8. C10-Alkylphenone
9. C12-Alkylphenone

Rapid Resolution HT Provides Double the Efficiency of Rapid Resolution Columns

Column A: ZORBAX SB-C18
835975-902
4.6 x 50mm, 3.5µm

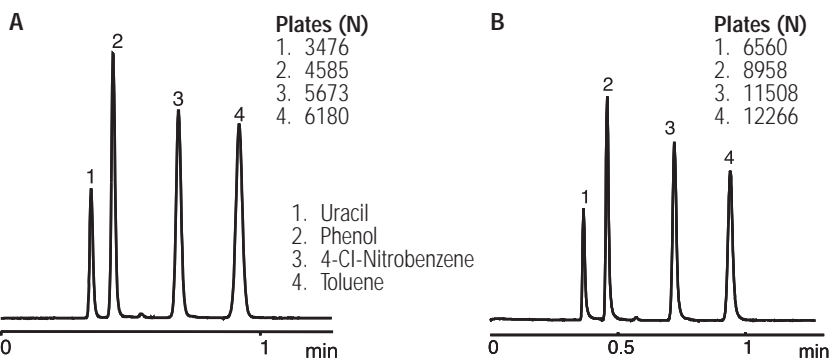
Column B: ZORBAX SB-C18
835975-902
4.6 x 50mm, 3.5µm

Mobile Phase: 25% Water, 75% MeOH

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: 254 nm



This figure shows that Rapid Resolution HT columns can provide double the efficiency of a 3.5 µm column in the same column length. This high efficiency can be used for very high-resolution, high throughput analyses.

Reduce Analysis Time Dramatically with Rapid Resolution HT Columns

Column A: Eclipse XDB-C18
990967-902
4.6 x 250mm, 5µm

Column B: Eclipse XDB-C18
963967-902
4.6 x 150mm, 3.5µm

Column C: Eclipse XDB-C18
966967-902
4.6 x 75mm, 3.5µm

Column D: Eclipse XDB-C18
925975-902
4.6 x 50mm, 3.5µm

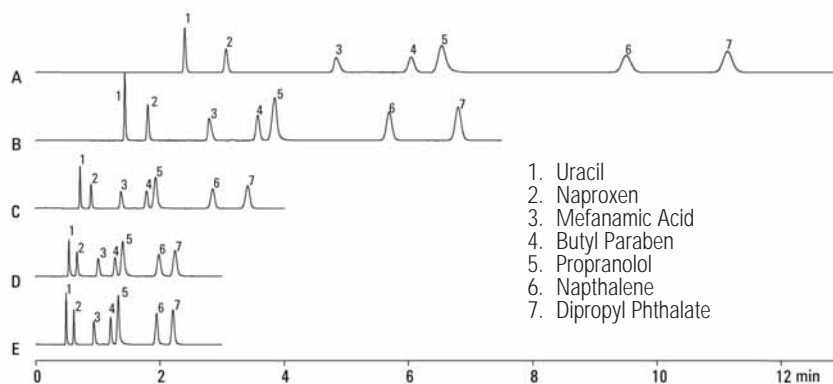
Column E: Eclipse XDB-C18
925975-902
4.6 x 50mm, 1.8µm

Mobile Phase: 73% MeOH: 27% 20 mM Phosphate Buffer, pH 7.0

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: 254 nm



This figure shows the dramatic reduction in analysis time possible by using Rapid Resolution HT columns. Chromatogram A shows a separation that takes 11.5 minutes on a 25 cm, 5 µm column. Rapid Resolution (3.5 µm) columns, shown in chromatogram B and C, reduce analysis time substantially, but with a slight compromise in resolution. The Rapid Resolution HT column reduces analysis time to 2.2 minutes, an 80% reduction, while still maintaining baseline resolution.

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

Increase Peak Capacity with RRHT Columns

Column A: Eclipse XDB-C8
928700-906
2.1 x 100mm, 1.8µm

Column B: Eclipse XDB-C18
961753-902
2.1 x 100mm, 3.5µm

Mobile Phase: A: H2O
B: ACN

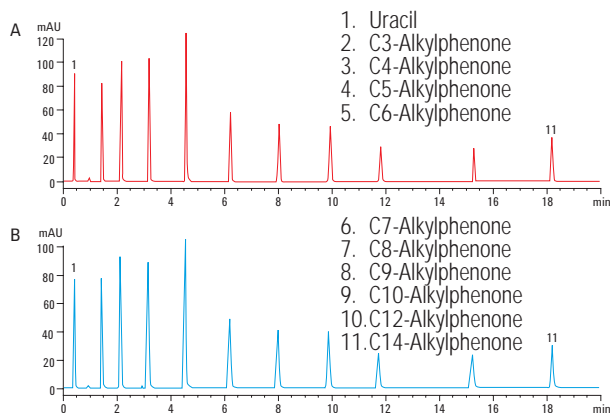
Flow Rate: 0.5 mL/min

Gradient: 0.0 min 50% B
20.0 min 100% B

Temperature: 40°C

Detector: UV 254 nm

Sample: Alkylphenones



Long Lifetime of RRHT Columns at Elevated Temp.

Column: SB-C18
827700-902
2.1 x 50mm, 1.8µm

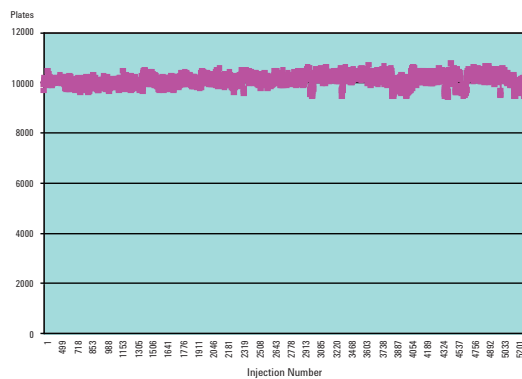
Mobile Phase: A: 60% H2O
B: 40% ACN

Flow Rate: 1 mL/min

Temperature: 80°C

Detector: UV 254 nm

Sample: QC Test Mix



Comparison of Efficiencies – RRHT (1.8µm) and Rapid Resolution (3.5µm) Columns

Column Length	Resolving Power N (3.5 µm)*	Resolving Power N (1.8 µm)
High Resolution		
150	21,000	32,500
100	14,000	24,000
75	10,500	17,000**
Ultra Fast		
50	7000	12,000
30	4200	6000
20	—	3500
15	2100	2500
Resolution $\propto N^{1/2}$		

*5 µm HPLC columns of the same length have 40% fewer plates (N-value); 4.6 mm ID
**Available as a custom column

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	XDB-C18 USP L1	XDB-C8 USP L7	Extend-C18
Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906	928975-902		728975-902
Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906	927975-902	927975-906	727975-902
Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906	924975-902	924975-906	724975-902
Rapid Resolution HT, 600 bar	4.6 x 20	1.8			926975-902	926975-906	726975-902
Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306	928975-302		728975-302
Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306	927975-302	927975-306	727975-302
Solvent Saver HT, 600 bar	3.0 x 30	1.8			924975-302	924975-306	724975-302
Solvent Saver HT, 600 bar	3.0 x 20	1.8			926975-302	926975-306	726975-302
Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906	928700-902	928700-906	728700-902
Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906	927700-902	927700-906	727700-902
Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906	924700-902	924700-906	724700-902
Narrow Bore RRHT, 600 bar	2.1 x 20	1.8			926700-902	926700-906	726700-902
MicroBore RRHT, 600 bar	1.0 x 100	1.8			928600-902	928600-906	728600-902
MicroBore RRHT, 600 bar	1.0 x 50	1.8			922600-902	922600-906	722600-902

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10
Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902		
Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906	
Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-905
Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-905
Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906	
Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302		
Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306	
Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-305
Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306	824975-305
Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306	
Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	820700-902	820700-906	820700-905
Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828700-902	828700-906	828700-905
Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827700-902	827700-906	827700-905
Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	824700-902	824700-906	824700-905
Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	826700-902	826700-906	
MicroBore RRHT, 600 bar	1.0 x 100	1.8	828600-902	828600-906	828600-905
MicroBore RRHT	1.0 x 50	1.8	822600-902	822600-906	822600-905

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

Rapid Resolution HT Columns and Cartridges (Maximum Pressure: 400 bar, 6000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7	SB-C18 USP L1	SB-C8 USP L7	Extend-C18
	Rapid Resolution HT	4.6 x 50	1.8	922975-902	922975-906	822975-902	822975-906	722975-902
	Rapid Resolution HT, 3/pk	4.6 x 50	1.8	922975-932		822975-932		
	Narrow Bore RRHT	2.1 x 50	1.8	922700-902		822700-902		
	Narrow Bore RRHT, 3/pk	2.1 x 50	1.8	922700-932		822700-932		
Rapid Resolution HT Cartridges (require hardware kit 820555-901)								
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	925975-902		825975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	925975-932		825975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	925700-902		825700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	925700-932		825700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	923975-902		823975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	923975-932		823975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	923700-902		823700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	923700-932		823700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	921975-902		821975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	921975-932		821975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	921700-902		821700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	921700-932		821700-932		
RR	Hardware Kit for RR and RRHT Cartridges			820555-901		820555-901		

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

ZORBAX Rapid Resolution 3.5 μm Columns

- Reduce analysis time and solvent usage and increase sample throughput
- High efficiency in short and ultra-short column lengths
- Available in analytical (4.6 mm) and narrow-bore (2.1 mm) ID
- Comparable lifetime to 5 μm columns

Agilent ZORBAX Rapid Resolution columns, with a 3.5 μm particle size, reduce analysis time and increase sample throughput for any application when compared to 5 μm columns. Rapid Resolution columns are available from 15-150 mm, in 1-4.6 mm IDs, so the best configurations are available for high throughput, LC/MS, combinatorial chemistry and rapid analytical applications. Rapid Resolution 3.5 μm particles have superior mechanical strength, so every column has an extremely stable packed bed and provides a comparable lifetime to 5 μm columns. These are available in most ZORBAX bonded phases.

Rapid Resolution Columns Reduce Analysis Time While Maintaining Resolution

Column A: ZORBAX Bonus-RP
883668-901

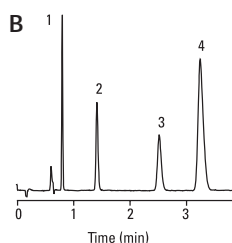
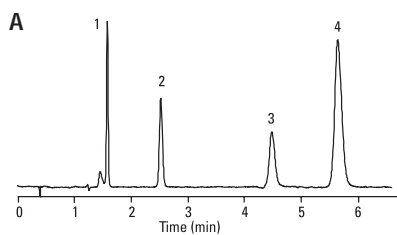
Column B: ZORBAX Bonus-RP
866668-901

Column C: ZORBAX Bonus-RP
861700-901

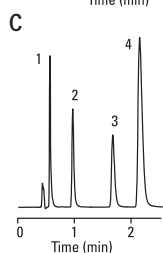
Mobile Phase: 80% 25 mM NH₄Ac,
pH 5.5

Flow Rate: 1.5 mL/min
1.5 mL/min
0.3 mL/min

Temperature: 40°C
Detector: 254 nm



1. Caffeine
2. Doxylamine
3. Chlorpheniramine
4. Triprolidine



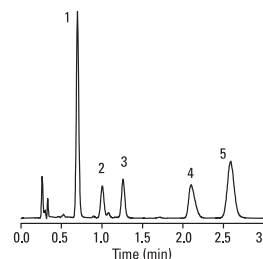
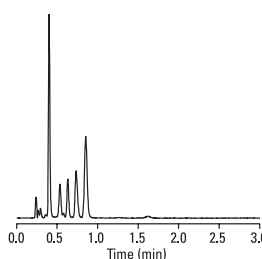
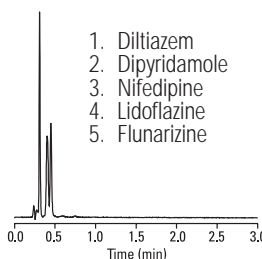
Rapid Resolution 3.5 μm columns are available in narrow bore configurations for great compatibility with LC/MS.

Run Method Development Chromatograms on Rapid Resolution Columns

Column: ZORBAX SB-C18
866953-902

Mobile Phase: A: 25 mM NaH₂PO₄, pH 3.0
B: MeOH

Flow Rate: 2.0 mL/min
Temperature: 35°C
Detector: 254 nm






Rapid Resolution 4.6 x 75 mm, 3.5 μm columns are a good choice for initial method development because they allow you to quickly determine if a given column and mobile phase combination can produce the desired separation.

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

ZORBAX Rapid Resolution 3.5 μ m Eclipse Columns

Hardware Description	Size (mm)	Particle Size (μ m)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	XDB-C18 USP L1	XDB-C8 USP L7	XDB-Phenyl USP L11	XDB-CN USP L10
Rapid Resolution	4.6 x 150	3.5	959963-902	959963-906	963967-902	963967-906	963967-912	963967-905
Rapid Resolution	4.6 x 100	3.5	959961-902	959961-906	961967-902	961967-906		961967-905
Rapid Resolution	4.6 x 75	3.5	959933-902	959933-906	966967-902	966967-906	966967-912	966967-905
Rapid Resolution	4.6 x 50	3.5	959943-902	959943-906	935967-902	935967-906	935967-912	
Rapid Resolution	4.6 x 30	3.5	959936-902	959936-906	934967-902	934967-906		
Rapid Resolution	4.6 x 20	3.5			932967-902	932967-906		
Solvent Saver Plus	3.0 x 150	3.5	959963-302	959963-306	963954-302	963954-306	963954-312	963954-305
Solvent Saver Plus	3.0 x 100	3.5	959961-302	959961-306	961967-302	961967-306	961967-312	
Solvent Saver Plus	3.0 x 75	3.5			966954-302			
Narrow Bore RR*	2.1 x 150	3.5	959763-902	959763-906	930990-902	930990-906		
Narrow Bore RR*	2.1 x 100	3.5	959793-902	959793-906	961753-902	961753-906		961753-905
Narrow Bore RR*	2.1 x 75	3.5			966735-902			
Narrow Bore RR*	2.1 x 50	3.5	959743-902	959743-906	971700-902	971700-906		
Narrow Bore RR*	2.1 x 30	3.5	959733-902	959733-906	974700-902	974700-906		
Narrow Bore RR*	2.1 x 20	3.5			972700-902	972700-906		
MicroBore RR*	1.0 x 150	3.5			963600-902	963600-906		
MicroBore RR*	1.0 x 50	3.5			965600-902	965600-906		
MicroBore RR*	1.0 x 30	3.5			961600-902	961600-906		
MicroBore Guard Cartridges, 3pk	1.0 x 17	5			5185-5921	5185-5921		
 Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-936	820950-937	820950-925	820950-926	820950-927	820950-935
 Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-936	821125-937	821125-926	821125-926	821125-926	821125-935
 Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901	820888-901	820888-901

*RR: Rapid Resolution 3.5 μ m

LC and LC/MS Columns

ZORBAX Rapid Resolution HT Columns

ZORBAX Rapid Resolution 3.5 μ m StableBond Columns

Hardware Description	Size (mm)	Particle Size (μ m)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-Phenyl USP L11	SB-C3 USP L56	SB-Aq
Rapid Resolution	4.6 x 150	3.5	863953-902	863953-906	863953-905	863953-912		863953-914
Rapid Resolution	4.6 x 100	3.5	861953-902	861953-906	861953-905	861953-912		861953-914
Rapid Resolution	4.6 x 75	3.5	866953-902	866953-906	866953-905	866953-912		866953-914
Rapid Resolution	4.6 x 50	3.5	835975-902	835975-906	835975-905	835975-912		835975-914
Rapid Resolution	4.6 x 30	3.5	834975-902	834975-906				
Rapid Resolution	4.6 x 20	3.5	832975-902	832975-906				
Solvent Saver Plus	3.0 x 150	3.5	863954-302	863954-306	863954-305	863954-312		863954-314
Solvent Saver Plus	3.0 x 100	3.5	861954-302	861954-306	861954-305	861954-312	861954-309	861954-314
Narrow Bore RR*	2.1 x 150	3.5	830990-902	830990-906				830990-914
Narrow Bore RR*	2.1 x 100	3.5	861753-902	861753-906	861753-905	861753-912		861753-914
Narrow Bore RR*	2.1 x 75	3.5	866735-902					
Narrow Bore RR*	2.1 x 50	3.5	871700-902	871700-906				871700-914
Narrow Bore RR*	2.1 x 30	3.5	874700-902	874700-906				
Narrow Bore RR*	2.1 x 20	3.5	872700-902	872700-906				
MicroBore RR*	1.0 x 150	3.5	863600-902	863600-906				
MicroBore RR*	1.0 x 50	3.5	865600-902	865600-906				
MicroBore RR*	1.0 x 30	3.5	861600-902	861600-906				
MicroBore Guard Cartridges, 3/pk	1.0 x 17	5	5185-5920	5185-5920				
ZGC Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-920	820950-915	820950-916	820950-917	820950-922	820950-933
ZGC Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-926	821125-926	821125-924	821125-926	821125-924	821125-933
ZGC Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901	820888-901	820888-901

*RR: Rapid Resolution 3.5 μ m

ZORBAX Rapid Resolution 3.5 μ m Rx, Bonus-RP, and Extend-C18 Columns

Hardware	Description	Size (mm)	Particle Size (μ m)	Rx-C18 USP L1	Rx-C8 USP L7	Bonus-RP	Extend-C18
Rapid Resolution		4.6 x 150	3.5	863967-902	863953-906	863668-901	763953-902
Rapid Resolution		4.6 x 100	3.5	861967-902	861953-906	864668-901	764953-902
Rapid Resolution		4.6 x 75	3.5	866967-902	866953-906	866668-901	766953-902
Rapid Resolution		4.6 x 50	3.5				735953-902
Solvent Saver Plus		3.0 x 150	3.5	863967-302	863954-306	863668-301	763954-302
Solvent Saver Plus		3.0 x 100	3.5	861967-302	861954-306	864668-301	764953-302
Narrow Bore RR		2.1 x 150	3.5		830990-906	863700-901	
Narrow Bore RR*		2.1 x 100	3.5	861767-902	861753-906	861768-901	761753-902
Narrow Bore RR*		2.1 x 50	3.5			861700-901	735700-902
MicroBore RR*		1.0 x 150	3.5			863608-901	763600-902
MicroBore RR*		1.0 x 50	3.5			865608-901	765600-902
MicroBore RR*		1.0 x 30	3.5			861608-901	761600-902
MicroBore Guard Cartridge, 3/pk		1.0 x 17	5			5185-5922	5185-5923
ZGC Guard Cartridge, 4/pk		4.6 x 12.5	5	820950-914	820950-913	820950-928	820950-930
ZGC Guard Cartridge, 4/pk		2.1 x 12.5	5	821125-915	821125-915	821125-928	821125-930
ZGC Guard Hardware Kit				820888-901	820888-901	820888-901	820888-901

*RR: Rapid Resolution 3.5 μ m

LC and LC/MS Columns

ZORBAX Solvent Saver

ZORBAX Solvent Saver

- Provide 60% reduction in mobile phase usage and waste generation compared to a 4.6 mm ID column
- Provide 2- to 3-fold signal-to-noise (S/N ratio) improvement
- Deliver optimal LC/MS performance at intermediate flow rates
- Can be used with most conventional LC instrument configurations without modification

ZORBAX Solvent Saver columns have a 3.0 mm internal diameter. This is ideal for reducing solvent usage by 50% over 4.6 mm ID columns. Solvent Saver columns are also ideal for LC/MS. With a typical flow rate of 0.5 ml/min, these columns are compatible with electrospray, atmospheric pressure chemical ionization (APCI), and atmospheric pressure photoionization (APPI) MS interfaces. These columns also improve sensitivity 2 to 3 times over 4.6 mm ID columns. Solvent Saver columns can be used with conventional HPLC instruments and are a good choice for cost effective analyses.

Solvent Saver Columns Provide up to 60% Reduction in Solvent Use and Waste

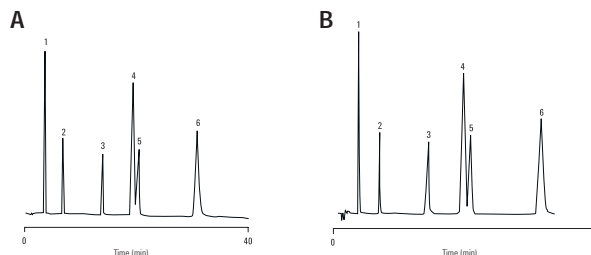
Column A: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm

Column B: ZORBAX SB-C18
883975-302
3.0 x 150mm, 5µm

Mobile Phase: 20% ACN: 80% 0.2 M Na₂HPO₄
+ 0.1 M Citric Acid, pH 2.6

Temperature: Ambient

Sample: Antibacterials



1. Sulfamerazine
2. Furazolidone
3. Oxolinic Acid
4. Sulfadimethoxine
5. Sulfaquinoxaline
6. Nalidixic Acid

This separation of antibacterials on a 4.6 and 3.0 mm ID columns, shows that solvent use is reduced by 50% just by changing to the Solvent Saver column with no change in the chromatography. This reduces the cost of analyses dramatically.

Solvent Saver Columns Increase Sensitivity

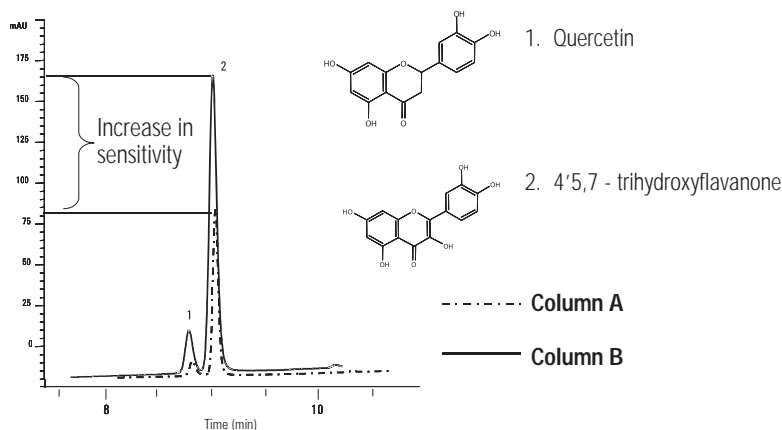
Column A: ZORBAX SB-C18
863953-902
4.6 x 150mm, 3.5µm

Column B: ZORBAX SB-C18
863954-302
3.0 x 150mm, 3.5µm

Mobile Phase: 25% Methanol:
75% 0.4% Formic Acid

Detector: 254 nm

This figure shows sensitivity is increased 2-3 times with Solvent Saver columns compared to 4.6 mm ID columns when the same mass sample is injected. No change in the HPLC instrumentation is required to see the sensitivity improvements.



LC and LC/MS Columns

ZORBAX Solvent Saver Columns

Solvent Saver Columns are Ideal for LC/MS

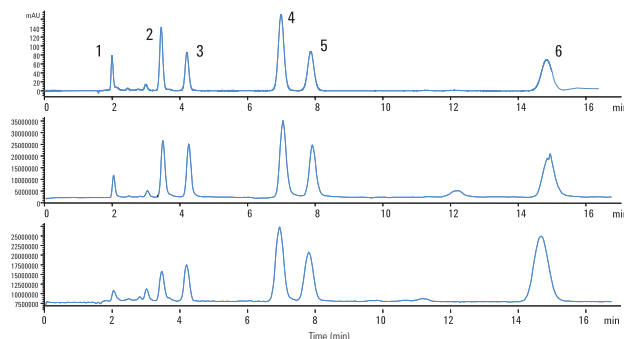
Column: ZORBAX SB-C18
861954-302
3.0 x 100mm, 3.5µm

Mobile Phase:
A: 70% Methanol+0.4% Formic Acid
B: 30% Water+0.4% Formic Acid

Flow Rate: 0.425 mL/min

Detector:
A: UV 254 nm
B: Positive Ion APCI
C: Positive Ion Electrospray

Sample: Steroids



1. Triamcinolone
2. Hydrocortisone
3. Cortisone acetate
4. Deoxycorticosterone
5. Hydroxyprogesterone
6. Progesterone

Solvent Saver columns are ideal for LC/MS because the typical 0.5 mL/min flow rate allows samples to be evaluated and analyzed without changing columns when the MS interface is changed from electrospray to APCI.

ZORBAX 80Å StableBond

Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Solvent Saver	3.0 x 250	5	880975-302	880975-306	880975-305	880975-309	880975-312	880975-314
Solvent Saver	3.0 x 150	5	883975-302	883975-306	883975-305	883975-309	883975-312	883975-314
Solvent Saver Plus	3.0 x 150	3.5	863954-302	863954-306	863954-305	863954-309	863954-312	863954-314
Solvent Saver Plus	3.0 x 100	3.5	861954-302	861954-306	861954-305	861954-309	861954-312	861954-314

ZORBAX 300Å StableBond

Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56
Solvent Saver Plus	3.0 x 150	3.5	863974-302	863974-306	863974-309	863974-309
Solvent Saver Plus	3.0 x 100	3.5		861973-306		

ZORBAX 80Å Eclipse XDB

Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7	XDB-Phenyl USP L11	XDB-CN USP L10
Solvent Saver	3.0 x 250	5	990967-302	990967-306	990967-312	990967-305
Solvent Saver	3.0 x 150	5	993967-302	993967-306	993967-312	993967-905
Solvent Saver Plus	3.0 x 150	3.5	963954-302	963954-306	963954-312	963954-305
Solvent Saver Plus	3.0 x 100	3.5	961967-302	961967-306	961967-312	
Solvent Saver Plus	3.0 x 75	3.5	966954-302			

ZORBAX 80Å Bonus-RP, and Rx

Description	Size (mm)	Particle Size (µm)	Bonus-RP	Rx-C18 USP L1	Rx-C8 USP L7
Solvent Saver	3.0 x 250	5	880668-301	880967-302	880975-306
Solvent Saver	3.0 x 150	5	883668-301	883967-302	883975-306
Solvent Saver Plus	3.0 x 150	3.5	863668-301	863967-302	863954-306
Solvent Saver Plus	3.0 x 100	3.5	864668-301	861967-302	861954-306

ZORBAX 80Å Extend-C18

Description	Size (mm)	Particle Size (µm)	Extend-C18
Solvent Saver	3.0 x 250	5	770450-302
Solvent Saver Plus	3.0 x 150	3.5	763954-302
Solvent Saver	3.0 x 150	5	773450-302
Solvent Saver Plus	3.0 x 100	3.5	764953-302
Solvent Saver Plus	3.0 x 50	3.5	735954-302

LC and LC/MS Columns

ZORBAX MicroBore Columns

ZORBAX MicroBore (1.0 mm ID)

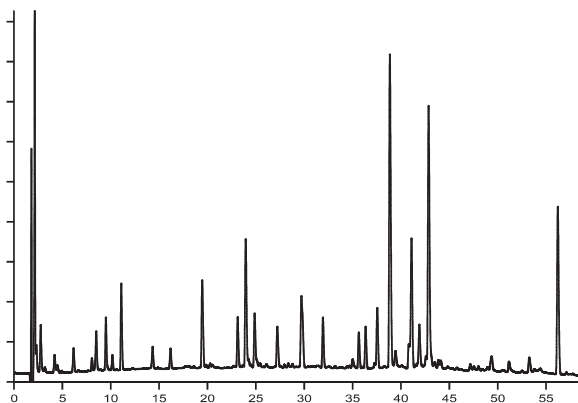
- High sensitivity for small sample sizes
- Compatible with LC/MS interfaces
- Wide variety of bonded phases

MicroBore (1 mm ID) columns are often a good choice when sample sizes are limited. They can improve detection limits 5 times over 2.1 mm ID columns when the same sample mass is used. This increase in sensitivity can be critical. MicroBore columns use low flow rates (typically ~ 50 $\mu\text{L}/\text{min}$). Therefore, these columns are ideal for use with detectors requiring low flow rates such as some mass spectrometers and with capillary LC systems.

MicroBore columns perform optimally with HPLC systems purchased or modified for microbore use. A wide variety of bonded phases are available for use up to 400 bar including StableBond SB-C18, SB-C8, 300SB-C18; Eclipse XDB-C18 and XDB-C8; Bonus RP, Extend C-18; and Poroshell columns. Guard columns are also now available with an adjustable tube stop depth to provide a perfect zero dead volume connection every time. A selection of bonded phases are available in 1.8 μm and a higher pressure format. See the product listings for more detail.

Separation of a Tryptic Digest on ZORBAX MicroBore 300SB-C18

Column:	ZORBAX 300SB-C18 863630-902 1.0 x 150mm, 3.5 μm
Mobile Phase:	Gradient: 2-60% B in 60 Min. A: 0.1% TFA B: 0.075% TFA/80% ACN
Flow Rate:	50 $\mu\text{L}/\text{min}$
Temperature:	50 $^{\circ}\text{C}$
Detector:	215 nm
Sample:	2 μL Tryptic Digest of rhGH



This example of a tryptic digest separated on a MicroBore column demonstrates the high sensitivity and resolution possible with 1.0 mm ID columns.

LC and LC/MS Columns

ZORBAX MicroBore Columns

ZORBAX MicroBore (1.0 mm ID)

Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	300SB-C18 USP L1	300SB-C8 USP L7	SB-CN USP L10
MicroBore	1.0 x 250	5			861630-902		
MicroBore RR*	1.0 x 150	3.5	863600-902	863600-906	863630-902	863630-906	
MicroBore RR*	1.0 x 50	3.5	865600-902	865600-906	865630-902	865630-906	
MicroBore RR*	1.0 x 30	3.5	861600-902	861600-906			
MicroBore RRHT**	1.0 x 50	1.8	822600-902	822600-906			822600-905
MicroBore Guard Cartridges, 3/pk	1.0 x 17	5	5185-5920	5185-5920	5185-5920	5185-5920	

Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7	Bonus-RP	Extend-C18
MicroBore RR*	1.0 x 150	3.5	963600-902	963600-906	863608-901	763600-902
MicroBore RR*	1.0 x 50	3.5	965600-902	965600-906	865608-901	765600-902
MicroBore RR*	1.0 x 30	3.5	961600-902	961600-906	861608-901	761600-902
MicroBore RRHT, 600 bar**	1.0 x 100	1.8	928600-902	928600-906		728600-902
MicroBore Guard Cartridges, 3pk	1.0 x 17	5	5185-5921	5185-5921	5185-5922	5185-5923

Description	Size (mm)	Particle Size (µm)	Poroshell 300SB-C18	Poroshell 300SB-C8	Poroshell 300SB-C3	Poroshell 300Extend-C18
MicroBore	1.0 x 75	5	661750-902	661750-906	661750-909	671750-902
MicroBore Guard Cartridge, 3/pk	1.0 x 17	5	5185-5968	5185-5968	5185-5968	

*RR: Rapid Resolution 3.5 µm
 **RRHT: Rapid Resolution HT 1.8 µm

LC and LC/MS Columns

ZORBAX Capillary and Nano Columns



ZORBAX Capillary and Nano

- Highest sensitivity for your smallest sample sizes
- Compatible with all LC/MS interfaces
- Internal diameters of 0.5, 0.3, 0.1, and 0.075 mm
- Packings/phases for both small and large molecules (80Å and 300Å pore sizes, respectively)
- Ideal for 1-D and 2-D (proteomics) applications

Agilent ZORBAX capillary (0.5, 0.3 mm ID) and nano (0.1, 0.075 mm ID) columns are now available in a wide variety of phases, pore sizes, and dimensions. These columns are ideal for very sample-limited applications because they provide enhanced sensitivity by reducing on-column sample dilution. This high sensitivity can be provided with exceptional reproducibility using Agilent columns and low dispersion HPLC instruments. The fastest growing application for capillary and nano columns is 2-D LC/MS for complex proteomics samples. Agilent provides all the columns needed for the 2-D separation—the SCX columns for the first dimension, the reversed-phase trapping column, and the reversed-phase column for the second dimension.

Separation of Peptides on Capillary Columns

Column A: ZORBAX 300SB-C8
5065-4460
0.3 x 150mm, 3.5µm

Column B: ZORBAX Eclipse XDB-C18
5064-8291
0.3 x 150mm, 5µm

Column C: ZORBAX Eclipse XDB-C18
5064-8291
0.3 x 150mm, 5µm

Column D: ZORBAX SB-C18
5064-8255
0.3 x 150mm, 5µm

Column E: ZORBAX 300SB-C18
5064-8267
0.3 x 150mm, 3.5µm

Column F: ZORBAX 300Extend-C18
5065-4464
0.3 x 150mm, 3.5µm

Mobile Phase:
Water + 0.05% TFA, pH = 2.2 = A
Acetonitrile + 0.045% TFA = B
Gradient 0.5%B/min:
at 0 min = 1%B,
at 60 min = 31%B, at 70 min = 50%B,
at 75 min = 85%B,
at 80 min = 85%B, at 81 min = 1%B,
at 110 min = 1%B

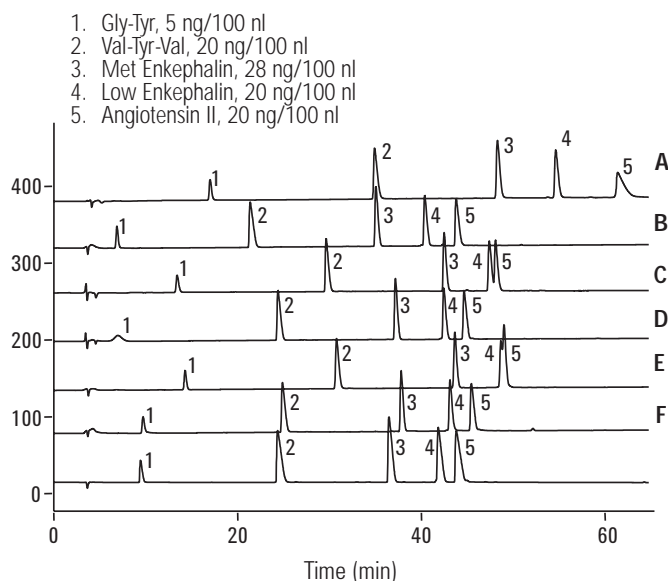
Flow Rate: 5.5 µl/min
Low Solvent Consumption:
200-500 µl/min

Temperature: 30°C

Detector: 206/10 nm, ref 450/80 nm

Sample: 0.1 µl, automatic delay volume reduction was activated

Peptides



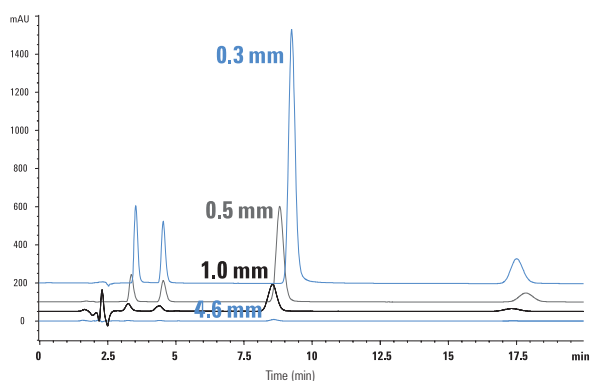
This example shows a peptide standard mixture separated on a variety of the ZORBAX capillary columns. These chromatograms demonstrate the wide range of selectivities available, which can be used to optimize your specific separation.

LC and LC/MS Columns

ZORBAX Capillary and Nano Columns

High Sensitivity with Capillary Columns

Column: ZORBAX SB-C18
 5064-8255
 0.3 x 150mm, 5 μ m
Column: ZORBAX SB-C18
 5064-8256
 0.5 x 150mm, 5 μ m
Column: ZORBAX SB-C18
 863600-902
 1.0 x 150mm, 3.5 μ m
Column: ZORBAX SB-C18
 883975-902
 4.6 x 150mm, 5 μ m
Sample: 200 ng Biphenyl

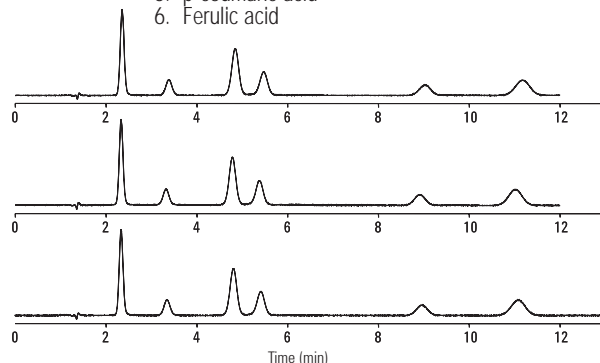


Sample-limited applications require capillary column dimensions to minimize on-column sample dilution and to enhance sensitivity. The 0.3 mm capillary in this example provides 100 times more sensitivity than the standard 4.6 mm column. Nanobore (0.1 mm-0.075 mm ID) columns can provide up to 2000 times more sensitivity for your most limited sample applications.

Excellent Column-to-Column Reproducibility with Agilent Capillary Columns

Column: ZORBAX SB-C18
 5064-8256
 0.5 x 150mm, 5 μ m
Mobile Phase: A: 75% H₂O with 0.4% formic acid
 B: 25% MeOH with 0.4% formic acid
Flow Rate: 20 μ L/min
Temperature: 25 $^{\circ}$ C
Sample: 0.1 μ L
 Polar organic acids

1. Protocatechuic acid
2. Chlorogenic acid
3. Caffeic acid
4. Syringic acid
5. p-coumaric acid
6. Ferulic acid



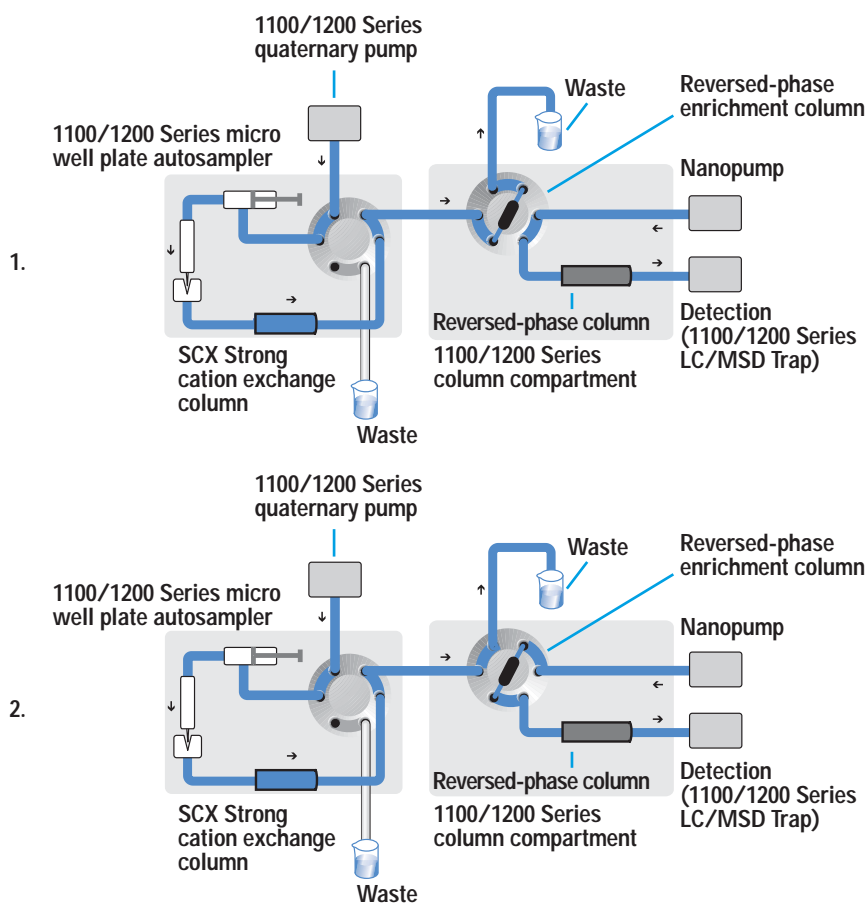
Excellent reproducibility is seen for a separation of polar organic acids on three different StableBond-C18, 0.5x150 mm, 5 μ m columns. Retention (k) varied less than 0.8% RSD and selectivity (a) varied less than 0.4% RSD.

LC and LC/MS Columns

ZORBAX Capillary and Nano Columns

2D LC/MS Analyses Using ZORBAX Capillary and Nano LC Columns

Typical Column Configuration for 2D HPLC



Flow path of the Agilent 1100 Series Nanoflow Proteomics Solution system.

1. Sample loading, elution from SCX and trapping on enrichment column
2. Valve switch in column compartment, elution from enrichment column; separation on RP, and MS analysis

LC and LC/MS Columns

ZORBAX Capillary and Nano Columns

Proteins in a Complex Sample by 2-D HPLC with Nano HPLC Columns

Column: ZORBAX 300SB-C18
5065-9913

Column: 0.3 x 5mm, 5µm
ZORBAX 300SB-C18
5065-9911

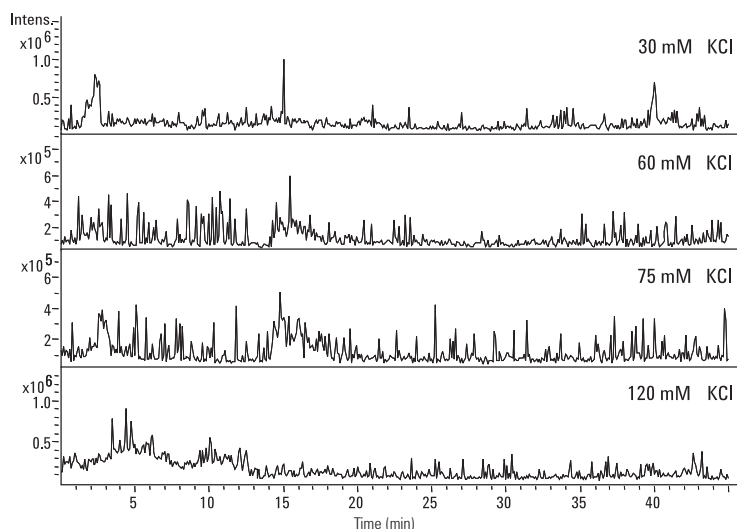
Mobile Phase: 0.075 x 150mm, 3.5µm
Quaternary Pump: 3%
Acetonitrile/0.1% Formic Acid
Nanopump: A = Water, 0.1%
Formic Acid, B = ACN, 0.1%
Formic Acid

Flow Rate: Quaternary Pump: 30 µL/min
Nanopump: 300 nL/min

Gradient: Quaternary Pump: Isocratic
Nanopump:
6 min = 3%B, 120 min = 60%B,
125 min = 80%B,
130 min = 80% B, 131 min =
3%B, 140 min = 3% B

MS Conditions: Source: Nano ESI, drying gas flow:
5L/min, drying gas temp.: 225°C.
Ion Trap: Skim: 1:35 V, cap exit
offset: 115 V, octopole 1:12 V,
octopole 2:3.5 V, trap drive: 80 V.
ICC: on, averages: 4, max accu
time: 150 ms; target 60,000, ion
mode positive, MS/MS mode.

Sample: Tryptic Digest of bovine serum
albumin
Volume: 1 to 8 µL
Salt Step Elution: 8ml of 10 mM-
100 mM KCl (10 mM increments),
125 mM,
150 mM, 200 mM, 300 mM, 500
mM, 1M.



Tryptic digest of bovine serum albumin (BSA). The base peak chromatograms show a selection of fractions from a 2-dimensional HPLC separation. Single chromatograms represent peptides from BSA eluting at a given salt concentration followed by enrichment and reversed phase chromatography.

LC and LC/MS Columns

ZORBAX Capillary and Nano Columns

ZORBAX Capillary and Nano

Description	Size (mm)	Particle Size (µm)	Eclipse			Poroshell 300SB-C8	300Extend C18	Bio-SCX Series II
			SB-C18	XDB-C18	300SB-C18			
Capillary	0.8 x 50	3.5						5065-9942
Capillary	0.5 x 250	5	5064-8258	5064-8286	5064-8266			
Capillary	0.5 x 150	5	5064-8256	5064-8287	5064-8264			
Capillary	0.5 x 75	5				5065-4468		
Capillary	0.5 x 35	5	5064-8254	5064-8296	5064-8294			
Capillary RR*	0.5 x 35	3.5	5064-8260	5064-8298	5065-4459			
Capillary	0.3 x 250	5	5064-8257	5064-8269	5064-8265			
Capillary	0.3 x 150	5	5064-8255	5064-8291	5064-8263			
Capillary	0.3 x 35	5	5064-8253	5064-8297	5064-8295			
Capillary	0.3 x 35	3.5						5065-9912
Capillary RR*	0.3 x 150	3.5	5064-8261	5064-8271	5064-8267	5065-4460		5065-4464
Capillary RR*	0.3 x 100	3.5			5064-8259	5065-4461		5065-4465
Capillary RR*	0.3 x 75	3.5			5064-8270	5065-4462		5065-4466
Capillary RR*	0.3 x 50	3.5			5064-8300	5065-4463		5065-4467
Replacement Screens, 10/pk			5065-4427	5065-4427	5065-4427	5065-4427	5065-4427	5065-4427

*RR: Rapid Resolution 3.5 µm

Description	Size (mm)	Particle Size (µm)	300SB-C18	300SB-C8
			USP L1	USP L7
Nano RR*	0.1 x 150	3.5	5065-9910	
Nano RR*	0.075 x 150	3.5	5065-9911	
Nano RR*	0.075 x 50	3.5	5065-9924	5065-9923
Trap/Guard, 5/pk	0.3 x 5	5	5065-9913	5065-9914
Trap/Guard Hardware kit			5065-9915	5065-9915







*RR: Rapid Resolution 3.5 µm

LC and LC/MS Columns

ZORBAX Original Reversed Phase Columns

ZORBAX Original Reversed Phase Columns

Original ZORBAX columns are made with Type A silica and are useful for many applications of acidic or neutral compounds. These columns have a higher activity level and are therefore useful for separating isomers (e.g. cis-trans, geometric) or other compounds where silanol activity enhances selectivity. These columns are used in many established methods.

Hardware Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	Phenyl USP L11	CN USP L10	TMS USP L13
Standard Columns (no special hardware required, 400 bar)							
Semi-Preparative	9.4 x 250	5	880952-202	880952-206			
Analytical (Endcapped)	4.6 x 250	5	880952-702	880952-706	880952-712	884950-507	880952-710
Analytical (Non-endcapped)	4.6 x 250	5	884950-543				
Analytical	4.6 x 150	5	883952-702	883952-706	883952-712	884950-526	883952-710
Solvent Saver	3.0 x 250	5	880952-302				
Solvent Saver	3.0 x 150	5	883952-302				
Guard Columns (hardware required)							
 Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-115	820675-124	
 Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-902	820950-906	820950-912	820950-905	820950-924
 Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	840140-901	840140-901
 Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901	820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
 PrepHT Cartridge	21.2 x 250	7	877952-102	877952-106		877952-105	
 PrepHT Endfittings, 2/pk			820400-901	820400-901		820400-901	

LC and LC/MS Columns

ZORBAX PrepHT Columns



ZORBAX PrepHT

- Easy scale-up from analytical to preparative scale with ZORBAX phases
- Fast preparative separations, up to 2000 mg
- 5 to 7 μm particles for high efficiency and high yield
- Easy to install finger tight connections seal up to 5000 psi/350 bar

High purity, high recovery and high throughput can be easily achieved with Agilent ZORBAX PrepHT columns. These are available in a variety of bonded phases – Eclipse XDB, StableBond, Bonus-RP, and Extend-C18 – for optimized resolution and loadability under any conditions.

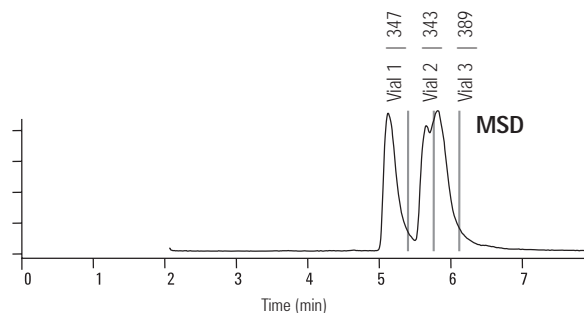
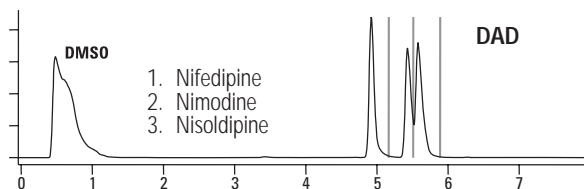
ZORBAX PrepHT columns are packed with 5 and 7 μm particle sizes for very high resolution. The high resolution allows high loadability, high yield, and high purity of compounds. The larger diameter columns and mechanically stronger ZORBAX particles allow for flow rates up to 100 ml/min, thus increasing throughput.

ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations on larger columns (21.2 mm ID, 150 mm length and longer), Agilent has carefully chosen the 7 μm particle size to achieve a balance between high efficiency and high loadability.

High Purity and High Recovery with ZORBAX PrepHT Columns

Sample: Antianginal drugs

Mass-based fraction collection using ZORBAX SB-C18 column shows high purity and high recovery of each compound (Application Note publication number 5988-7113EN). The separation of the three antianginal drugs was successfully done in a single run with high recovery and >90% purity. Separations up to 2000 mg are possible depending on the complexity of separation.



LC and LC/MS Columns

ZORBAX PrepHT Columns

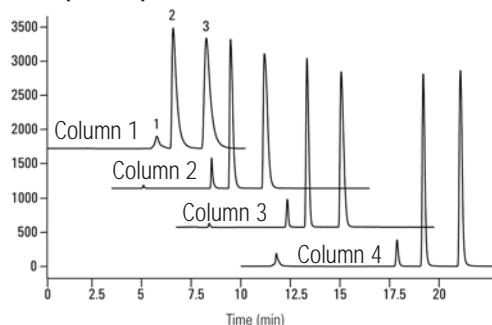
ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations for larger columns (21.2 mm ID and higher), 150 mm length and higher), Agilent has carefully chosen the 7 μm particle size to achieve a balance between high efficiency and high loadability.

Scale-Up from Analytical to Prep ZORBAX SB-C18 Columns Using the Same Pump

Column	Size	Flow (mL/min)	Injection (μL)	Detector Cell	Part No.
Column 1	50 x 150 mm	100	2200	0.3 mm quartz	Custom Column
Column 2	21.2 x 150 mm	18	400	0.3 mm quartz	877150-102
Column 3	9.4 x 150 mm	3.5	80	0.3 mm quartz	883975-202
Column 4	4.6 x 150 mm	0.85	2.0	3 mm SST	883975-902

Using the same 1100 pump, a scale-up from 4.6 mm to 50 mm ID was possible without any loss of resolution. This increase in throughput by reducing the time required for redeveloping and adjusting the method.

Scale-Up to PrepHT



1. Theobromine
2. Theophylline
3. Caffeine

ZORBAX PrepHT StableBond

ZORBAX PrepHT 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (μm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11
	PrepHT Cartridge*	21.2 x 250	7	877250-102	877250-106	877250-114	877250-105	877250-112
		21.2 x 150	7	877150-102	877150-106	877150-114		
		21.2 x 150	5	870150-902	870150-906	870150-914		
		21.2 x 100	5	870100-902	870100-906	870100-914		
		21.2 x 50	5	870050-902	870050-906	870050-914		
	PrepHT Guard Cartridge, 2/pk**	17 x 7.5	5	820212-920	820212-915	820212-933	820212-933	820212-915

ZORBAX PrepHT 300Å StableBond

Hardware	Description	Size (mm)	Particle Size (μm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56
	PrepHT Cartridge*	21.2 x 250	7	897250-102	897250-106	897250-109	897250-105
		21.2 x 150	7	897150-102	897150-106	897150-109	
		21.2 x 150	5	895150-902	895150-906	895150-909	
		21.2 x 100	5	895100-902	895100-906	895100-909	
		21.2 x 50	5	895050-902	895050-906	895050-909	
	PrepHT Guard Cartridge, 2/pk**	17 x 7.5	5	820212-921	820212-918	820212-924	820212-924







*Requires PrepHT endfittings 820400-901

**Requires Guard hardware kit (820444-901) which contains guard column fitting, seal insertion tool, and 1 polymeric seal

LC and LC/MS Columns







ZORBAX PrepHT Columns

ZORBAX PrepHT Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	XDB-C18 USP L1	XDB-C8 USP L7
	PrepHT Cartridge*	21.2 x 250	7	977250-102	977250-106
		21.2 x 150	7	977150-102	977150-106
		21.2 x 150	5	970150-902	970150-906
		21.2 x 100	5	970100-902	970100-906
		21.2 x 50	5	970050-902	970050-906
	PrepHT Guard Cartridge**	17 x 7.5	5	820212-925	820212-926


*Requires PrepHT endfittings 820400-901
**Requires Guard hardware kit (820444-901) which contains guard column fitting, seal insertion tool, and 1 polymeric seal

ZORBAX PrepHT Bonus-RP and Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP	Extend-C18
	PrepHT Cartridge*	21.2 x 250	7	878250-101	
		21.2 x 150	7	878150-101	
		21.2 x 150	5	868150-901	770150-902
		21.2 x 100	5	868100-901	770100-902
		21.2 x 50	5	868050-901	770050-902
	PrepHT Guard Cartridge, 2/pk**	17 x 7.5	5	820212-928	820212-930




*Requires PrepHT endfittings 820400-901
**Requires Guard hardware kit (820444-901) which contains guard column fitting, seal insertion tool, and 1 polymeric seal

ZORBAX PrepHT Original

Hardware	Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	CN USP L10	NH2 USP L8	SIL USP L3
	PrepHT Cartridge*	21.2 x 250	7	877952-102	877952-106	877952-105	877952-108	877952-101




*Requires PrepHT endfittings 820400-901

ZORBAX PrepHT Rx-SIL

Hardware	Description	Size (mm)	Particle Size (µm)	SIL USP L3	Rx-C18 USP L1
	PrepHT Cartridge*	21.2 x 250	7	877250-101	
		21.2 x 250	7		877967-102
	PrepHT Guard Cartridge, 2/pk**	17 x 7.5	5	820212-919	820212-914

*Requires PrepHT endfittings 820400-901
**Requires Guard hardware kit (820444-901) which contains guard column fitting, seal insertion tool, and 1 polymeric seal

ZORBAX PrepHT Accessories

Hardware	Description	Part No.
	Guard Cartridge Hardware	820444-901
	PrepHT Endfittings, 2/pk	820400-901
	Replacement Seals	820385-901

Agilent Prep LC Columns



P/N 410910-302

- High loadability for maximum sample purification
- Easy scalability from 4.6 mm ID up to 50 mm ID for rapid method development
- High throughput 21.2 mm ID cartridges for fast purification
- Exceptional column stability and loadability up to pH 10

Agilent Prep LC columns are designed for high loadability to purify milligram to gram quantities of products. Preparative sized columns are available in 21.2, 30, and 50 mm internal diameters with lengths ranging from 50-250 mm. Columns are available in 5 and 10 μm particle sizes with very high efficiency in every dimension. These column choices accommodate almost every preparative sample.

Agilent Prep 21.2 mm ID columns are available with Agilent's Preparative Cartridge Hardware. This reliable cartridge hardware makes it simple to use columns with different lengths to increase sample load. Guard columns are easily integrated onto these columns providing superior protection of the analysis column. Analytical sized 4.6 mm ID scalar columns are available for method development and optimization prior to scaling up to larger columns. Bulk material is also available.

Agilent Prep columns are available in a C18 bonded phase suitable for purification of a wide variety of non-polar and polar compounds. Unbonded silica columns are also available.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
C18	100Å	400 m ² /g	60°C*	2.0-10.0	Single	24%
Silica	100Å	400 m ² /g	**	1.0-8.0	N/A	N/A

*Temperature limits are 60°C up to pH 8, 40°C from pH 8-10.

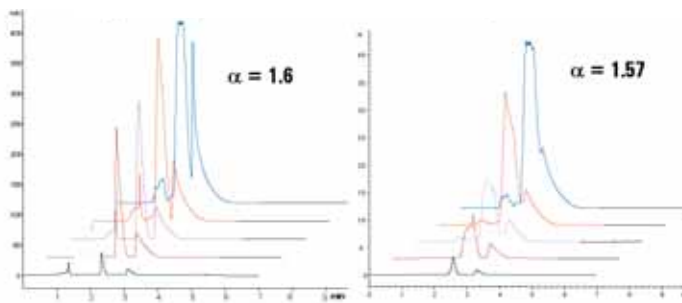
**Temperature limits for bare silica are determined by the pH of the mobile phase.

LC and LC/MS Columns

Prep LC Columns

Superior Loadability on Agilent Prep C18 with Basic Compounds

Column: Agilent Prep-C18
 443905-902
 4.6 x 150mm, 5 μ m
Mobile Phase: 50% 0.1%TFA:
 50% ACN
Flow Rate: 1 mL/min
Sample: 10 μ L
 Doxepin/Amitriptyline
 0.5 - 50 mg/mL

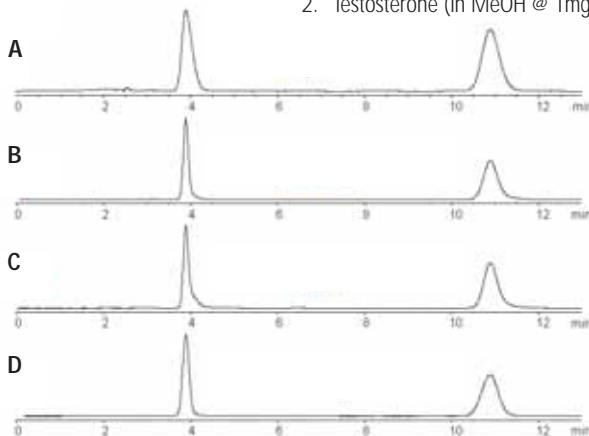


Agilent Prep Columns show better resolution and loadability than competitor columns.

Steroids: Easy Scalability Using Agilent Prep Columns

Column A: Agilent Prep-C18
 443905-902
 4.6 x 150mm, 5 μ m
Column B: 443905-102
 21.2 x 150mm, 5 μ m
Column C: 413910-302
 30 x 150mm, 10 μ m
Column D: 413910-502
 50 x 150mm, 10 μ m
Mobile Phase: 55% Water:45% ACN
Flow Rate: 0.7 mL/min
 14.87 mL/min
 29.77 mL/min
 85.37 mL/min
Temperature: Ambient
Detector: 240 nm
Sample: 2 μ L
 42.4 μ L
 170 μ L
 488 μ L

1. Hydrocortisone
 2. Testosterone (in MeOH @ 1mg/mL)













Agilent Prep-C18 shows excellent scalability making method transfer simple and predictable.

LC and LC/MS Columns

Prep LC Columns

Agilent Prep LC Columns

Hardware	Description	Size (mm)	Particle Size (µm)	C18	Silica
Standard Columns (no special hardware required, 400 bar)					
	Scalar	4.6 x 250	5	440905-902	440905-901
	Scalar	4.6 x 150	5	443905-902	443905-901
	Scalar	4.6 x 100	5	449905-902	449905-901
	Scalar	4.6 x 50	5	446905-902	446905-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)*					
	PrepHT	21.2 x 250	10	410910-102	410910-101
	PrepHT	21.2 x 150	10	413910-102	413910-101
	PrepHT	21.2 x 50	10	446910-102	
	PrepHT	21.2 x 150	5	443905-102	443905-101
	PrepHT	21.2 x 100	5	449905-102	449905-101
	PrepHT	21.2 x 50	5	446905-102	446905-101
	PrepHT Endfittings, 2/pk			820400-901	820400-901
Standard Columns (no special hardware required, 400 bar)					
	Prep 30	30 x 250	10	410910-302	410910-301
	Prep 30	30 x 150	10	413910-302	413910-301
	Prep 30	30 x 100	10	419910-302	419910-301
	Prep 30	30 x 100	5	449905-302	449905-301
	Prep 30	30 x 50	5	446905-302	446905-301
	Prep 50	50 x 250	10	410910-502	410910-501
	Prep 50	50 x 150	10	413910-502	413910-501
	Prep 50	50 x 100	10	419910-502	419910-501
	Prep 50	50 x 100	5	449905-502	449905-501
	Prep 50	50 x 50	5	446905-502	446905-501
Guard Columns (hardware required)					
	PrepHT Guard Cartridges, 2/pk	21.2 x 10	10	420212-902	420212-901
	Guard Cartridge Hardware			820444-901	820444-901
	PrepHT External Guard Hardware Kit			420420-901	420420-901
	Bulk Packing (1kg)		10	420910-902	420910-901

*All PrepHT cartridge columns require hardware kit 820400-901. If a guard column is desired for the 21.2 mm ID columns then the PrepHT Guard Hardware Kit, 820444-901, is also required. If the guard column is used on a 30 mm ID column then the external guard column hardware kit, 420420-901, is required.

LC and LC/MS Columns









LiChrospher Reversed-Phase Cartridge Columns

Additional HPLC Columns

In addition to ZORBAX brand HPLC columns, Agilent packs columns with a variety of excellent sorbents from other manufacturers. These packings have been carefully evaluated by Agilent to meet rigorous quality assurance standards. Agilent's automated and optimized column packing stations and ISO-regulated procedures guarantee high reproducibility.

LiChrospher Reversed-Phase Cartridge Columns

LiChrospher silica columns are made with spherical "sil-gel" type porous silica particles. LiChrospher 60 RP-select B starts with 60Å pore size silica optimized for symmetrical peak shapes of basic compounds. LiChrospher 100Å is offered in both C8 and C18, as well as an endcapped C18. These columns are noted for high sample capacity and efficiency. The popular LiChrospher packings are offered in the convenient and economical Agilent cartridge configuration.

Hardware Description	Size (mm)	Particle Size (µm)		RP-18	RP-18 Endcapped	RP-8	RP-Select B	
							CN	
 Cartridge Column	3.0 x 125	5		7992518-563			79925SB-563	
 Cartridge Column	3.0 x 250	5		7992518-583			79925SB-583	
 Cartridge Column	4.0 x 125	5			799250DE-564		79925SB-564	79925CN-564
 Cartridge Column, 3/pk	4.0 x 125	5		799250D-564-3		79925MO-564-3	79925SB-56K	
 Cartridge Column	4.0 x 250	5		799250D-584	799250DE-584	79925MO-584	79925SB-584	79925CN-584
 Cartridge Column, 3/pk	4.0 x 250	5		799250D-58K	799250E-58K	79925MO-58K	79925SB-58K	
 Guard Cartridge, 10/pk	4.0 x 4.0	5		799250D-504		79925MO-504	79925SB-504	79925CN-504
 Cartridge Holder				5021-1845	5021-1845	5021-1845	5021-1845	5021-1845

LC and LC/MS Columns

LiChrosorb/Nucleosil Reversed-Phase Columns





LiChrosorb Reversed-Phase Columns

LiChrosorb is a widely used silica packing material manufactured by E. Merck. The irregularly shaped porous silica particles are made by grinding and sifting coarse silica particles into narrow particle size ranges. Agilent offers LiChrosorb columns in C8 and C18 phases and in both 5 and 10 μm particle sizes. These standard fitting columns are packed by Agilent using ISO-regulated, automated packing procedures to ensure high quality column-to-column reproducibility.

Description	Size (mm)	Particle Size		RP-18	RP-8
		Size (mm)	(μm)		
Standard Fitting Column	4.6 x 200		5	799150D-574	79915M0-574
Standard Fitting Column	4.6 x 200		10	799150D-174	79915M0-174

Nucleosil Reversed-Phase Columns

Nucleosil is a spherical porous "sil-gel" type silica packing material from Machery/Nagel. Agilent packs Nucleosil columns using tight ISO-regulated production control procedures to guarantee consistent quality. Nucleosil 100-5, C18 is used for non-polar to moderately polar compounds in reversed-phase applications.





Hardware	Description	Size (mm)	Particle Size		Part No.
			Size (mm)	(μm)	
	Cartridge column	4.0 x 125		5	7992718-564
	Cartridge column	4.0 x 250		5	7992718-584
	Guard cartridge, 10/pk	4 x 4		5	7992718-504
	Cartridge Holder				5021-1845

LC and LC/MS Columns

Asahipak/ Purospher Reversed-Phase Columns





Asahipak Reversed-Phase Columns

Asahipak ODP-50 is a microparticulate, macroporous polyvinylalcohol based polymeric packing. Designed for analysis of basic substances. Asahipak ODP-50 columns provide high separation efficiency with buffered and alkaline solutions at high pH. These polymeric columns can be used up to pH 13 with a variety of solvents with minimal mechanical swelling or shrinkage. Asahipak ODP-50 is offered in Agilent's convenient cartridge column configuration.

Hardware	Description	Size (mm)	Particle Size	
			(μm)	Part No.
	Cartridge column	4.0 x 250	5	799230P-584
	Cartridge column	4.0 x 125	5	799230P-564
	Cartridge column	2.0 x 125	5	7992318-562
	Cartridge Holder			5021-1845

Purospher Reversed-Phase Columns

An ultrapure spherical silica support, deactivated by an efficient bonding process, makes Purospher an excellent packing for basic compounds. Multistep bonding and deactivating processes provide high surface coverage, blocking residual silanol groups and reducing peak tailing.







Hardware	Description	Size (mm)	Particle Size		RP-18 Endcapped
			(μm)	RP-18	
	Cartridge column	4.0 x 125	5	79925PU-564	79925PE-564
	Cartridge column	4.0 x 250	5	79925PU-584	79925PE-584
	Guard cartridge, 10/pk	4.0 x 4.0	5	79925PU-504	79925PE-504
	Cartridge Holder			5021-1845	5021-1845

LC and LC/MS Columns

Superspher Reversed-Phase/ZORBAX Normal Phase

Superspher Reversed-Phase Columns

Superspher is a high performance 4 μm silica support. It offers excellent pressure/performance ratio for analysis of complex mixtures requiring high peak capacity. Superspher columns are available as two C18 phases; one endcapped for best peak and one non-endcapped for alternate selectivity. It is also available in a C8 phase as the RP-Select B.

Hardware	Description	Size (mm)	Particle Size (μm)	RP-Select B	RP-18	RP-18 Endcapped
	Cartridge column	4.0 x 250	4	79925SB-484	7992518-484	
	Cartridge column	4.0 x 125	4	79925SB-464	799250D-464	
	Cartridge column	2.0 x 250	4	79925SB-482		79925EC-482
	Cartridge column	2.0 x 125	4	79925SB-462		79925EC-462
	Guard Cartridge, 3/pk	2.0 x 10	4	79925SB-402	7992518-402	
	Cartridge Holder			5021-1845	5021-1845	5021-1845

ZORBAX Normal Phase Columns

For normal-phase chromatography, the ZORBAX product line offers a choice of bonded and non-bonded silica packings.

ZORBAX Rx-SIL

- Made from highly pure (>99.995%) porous silica microspheres (pore size is the space between the solid silica microparticles)
- Stronger than other silica types
- Less acidic than ZORBAX-SIL, lower metal content
- Low acidity and low metal content make ZORBAX Rx-SIL ideal for normal-phase separation of polar compounds that exhibit poor peak symmetry on more acidic silica
- Useful for very hydrophilic compounds with high organic mobile phases in HILIC mode

ZORBAX Eclipse XDB-CN

- Made from highly pure Rx-SIL
- Excellent choice for normal phase applications with basic compounds
- Equilibrates more rapidly than ZORBAX Rx-SIL and is used for many of the same normal-phase applications

ZORBAX CN

- Cyanopropyldimethylsilane monolayer bonded to ZORBAX SIL
- Equilibrates more rapidly than ZORBAX SIL, and used for many of the same normal-phase applications
- Less prone to fouling and less water sensitive than silica

LC and LC/MS Columns

ZORBAX Normal Phase Columns

ZORBAX NH₂

- Amino-propyl silane phase bonded to ZORBAX SIL
- Used for normal phase and weak anion-exchange, and reversed-phase HPLC of polar compounds
- Vitamins A and D are separated in the normal-phase mode
- Carbohydrates and sugars are separated in the reversed-phase mode

Column Specifications

Bonded Phase	Pore Size	Surface Area	Carbon Load
ZORBAX Rx-SIL	80Å	180 m ² /g	
ZORBAX Eclipse XDB-CN	80Å	180 m ² /g	4.3%
ZORBAX SIL	70Å	300 m ² /g	
ZORBAX CN	70Å	300 m ² /g	7%
ZORBAX NH ₂	70Å	300 m ² /g	4%

High Resolution Normal Phase Separation of Octylphenoxy Ethanol Surfactant on ZORBAX CN

Column: ZORBAX CN
880952-705
4.6 x 250mm, 5µm

Mobile Phase: Primary: Heptane
Secondary: 2-Methoxyethanol/Isopropanol (50/50)

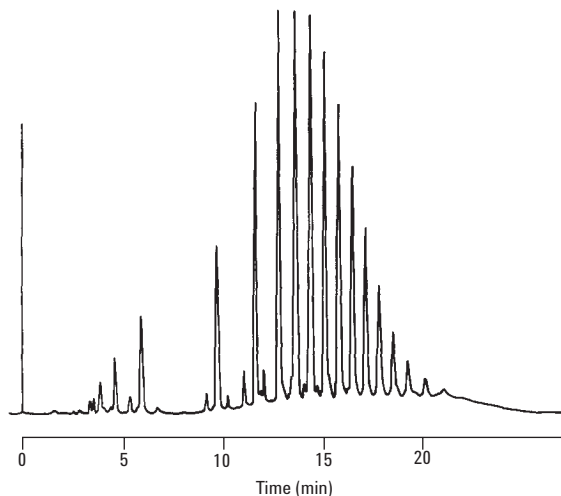
Flow Rate: 2 mL/min

Gradient: 2-20% Secondary in 10 min.,
Linear Hold at 20%

Temperature: 50°C

Detector: 278 nm

Sample: Octylphenoxy (polyethylene oxy)
Ethanol Surfactant (n= 10)



LC and LC/MS Columns

ZORBAX Normal Phase Columns

ZORBAX Normal Phase Columns

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-SIL	SIL USP L3	CN USP L10	NH2 USP L8	Carbohydrate Analysis	XDB-CN USP L10
Standard Columns (no special hardware required, 400 bar)									
	Semi-Prep	9.4 x 250	5	880975-201	880952-201	880952-205	880952-208		
	Analytical	4.6 x 250	5	880975-901	880952-701	880952-705	880952-708	840300-908	990967-905*
	Analytical	4.6 x 150	5	883975-901	883952-701	883952-705	883952-708	843300-908	993967-905*
	Narrow Bore	2.1 x 150	5	883700-901					993700-905*
	Narrow Bore	2.1 x 50	5				860700-708		
Guard Columns (hardware required)									
P	Guard Cartridge, 2/pk	9.4 x 15	5	820675-119	820675-119	820675-111	820675-111		
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-919	820950-901	820950-905	820950-908	820950-908	820950-935
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-919					821125-935
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	840140-901		
ZGC	Guard Hardware Kit			820888-901	820888-901	820888-901	820888-901	820888-901	820888-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)									
PI	PrepHT Cartridge	21.2 x 250	7	877250-101	877952-101				
PI	PrepHT Cartridge	21.2 x 250	7			877952-105	877952-108		
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901		
PI	PrepHT Guard Cartridge, 2/pk	17 x 7.5	5	820212-919					
PI	Guard Cartridge Hardware			820444-901					

*These columns ship containing reversed phase solvents. Flush with isopropanol before using normal phase solvents.

LC and LC/MS Columns

LiChrospher Normal-Phase Cartridge Columns

LiChrospher Normal-Phase Cartridge Columns





For normal phase chromatography, Agilent supplies silica and polar modified silica gel phases including LiChrospher Si, LiChrospher NH₂, LiChrospher DIOL and LiChrospher CN as convenient cartridge columns.

LiChrospher Si

- Spherical silica for acidic, neutral and basic compounds
- Great batch-to-batch reproducibility

LiChrospher CN, Diol, NH₂

- Polar-modified silica-gel phases have both polar and hydrophobic properties
- Applicable for reversed-phase and normal-phase separations

Hardware	Description	Size (mm)	Particle Size				
			(μm)	Si	CN	Diol	NH ₂
	Cartridge Column	4.0 x 250	5	79925SI-584	79925CN-584	79925DI-584	79925AP-584
	Cartridge Column	4.0 x 125	5	79925SI-564	79925CN-564	79925DI-564	79925AP-564
	Guard Cartridge	4.0 x 4.0	5	79925SI-504	79925CN-504		79925AP-504
	Cartridge Holder			5021-1845	5021-1845	5021-1845	5021-1845

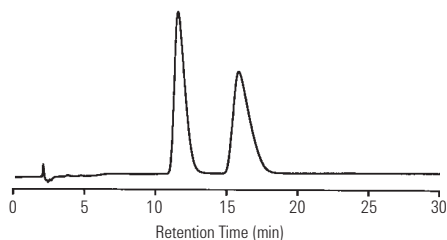
Ultron Chiral Columns

- Direct racemic separations without derivatization
- Use Ultron ES-OVM to separate enantiomers of pharmaceuticals, such as hexobarbital, ibuprofen, and profenamine
- Ultron ES-Pepsin Chiral columns are best suited to separate basic compounds that are difficult to separate by other columns
- ES-OVM and ES-Pepsin columns contain 120Å, 5 µm silica particles bonded with an ovomucoid protein and pepsin protein, respectively
- Both types of chiral columns are usable with reversed-phase mobile phases such as acetonitrile or ethanol and phosphate buffer

Separation of Enantiomers of Fluoxetine (Prozac)

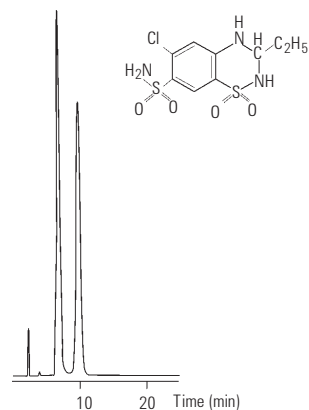
Column: Ultron ES-OVM Chiral 702111651
4.6 x 150mm, 5µm
Mobile Phase: 25:75 (v/v) EtOH / 20 mM KH₂PO₄, pH 5.5 (adjusted with NaOH)
Temperature: Ambient
Detector: UV (225 nm)
Sample: Mixture Fluoxetine (Prozac) enantiomers

Courtesy of D. S. Risley and V. S. Sharp of Lilly Research Laboratories, Eli Lilly and Co.



Separation of Ethiazide (diuretic drug) on ULTRON ES-OVM Column

Column: Ultron ES-OVM Chiral 702111651
4.6 x 150mm, 5µm
Mobile Phase: 20 mM KH₂PO₄ (pH 4.6)
Flow Rate: 1 mL/min
Temperature: 25°C
Detector: 220 nm





Description	Size (mm)	Particle Size		ES-OVM	ES-Pepsin
		Size (mm)	(µm)		
Semi-Prep	10 x 150		5	722111723	
Analytical	4.6 x 250		10	724111653	
Analytical	4.6 x 150		5	702111651	822111651
Analytical, with Guard	4.6 x 150		5	702111651A	822111631A
Narrow Bore	2.0 x 150		5	702111610	
Guard Column	4.0 x 10		5	712111630	832111630

LC and LC/MS Columns

ChiraDex Chiral Columns/Polymer Analysis

ChiraDex Chiral Columns

- For routine separation of enantiomers
- Available as ChiraDex cartridge columns
- Novel manufacturing process bonds β -cyclodextrin to spherical 5 μm silica gel by means of a chemical spacer
- Enantiomeric separations have been achieved with ChiraDex using simple nonchiral solvent systems such as MeOH/water, MeOH/buffer, and ACN/TEAA

Hardware	Description	Size (mm)	Particle Size (μm)	Part No.
	Cartridge Column	4.0 x 250	5	79925CB-584
	Cartridge Holder			5021-1845

Polymer Analysis

Gel Permeation Chromatography (GPC)—also referred to as Size Exclusion Chromatography (SEC)—is widely used for characterizing polymers in quality control and research laboratories. The technique has applications in many areas because of its ease of automation and quality of the results it produces. It provides average molecular weights and molecular weight distributions, which are calculated from the chromatogram.

Agilent Technologies is a leading supplier of equipment for GPC-SEC, offering a wide range of supplies.

- GPC-SEC start-up kits to get you up and running quickly and easily
- EasyCal Vial calibration standards for rapid and convenient calibration
- Certified/proven columns for organic and aqueous GPC-SEC

GPC-SEC in Quality Control

Quality control of PVC, polystyrenes, and polycarbonates

Monitoring resin quality in paint

Testing polyamide-6, 6

Measuring synthetic polymers such as polyacrylic acids, polyacrylamides, and polystyrenesulfonates

Analysis of biopolymers such as dextran sulfate, starch, and humic acids

Quality control of insulin

LC and LC/MS Columns

GPC-SEC Start-up Kits



GPC-SEC start-up kit

GPC-SEC Start-up Kits

Agilent has developed two GPC-SEC start-up kits—one for organic-soluble polymers and one for water-soluble polymers—to make your entry into the world of GPC-SEC as quick, simple, and trouble-free as possible. The kits contain everything you need to get started: a highly efficient PLgel column, nine vials of ready-to-use mixtures of polymer standards, three vials of a test sample and a manual with step-by-step instructions. The manual includes troubleshooting hints in case things should go wrong.

Organic GPC Start-up Kit

- High performance PLgel Mixed-C column, giving a linear calibration up to at least 3 million Da
- Three mixtures of ready-to-use EasyCal vial calibration standards, based on narrow molecular weight distribution polystyrene and covering a wide MW range (three vials each)
- Broad MW polystyrene test sample (three vials)
- Certificates of analysis for column and calibration standards
- Instruction manual

Aqueous GPC Start-up Kit

- High efficiency PL aquagel-OH Mixed column for water-soluble polymers up to at least 10 million Da
- Three mixtures of ready-to-use EasyCal vial calibration standards based on narrow molecular weight distribution polyethylene oxide and covering a wide MW range (three vials each)
- Broad MW dextran test sample (three vials)
- Certificates of analysis for column and calibration standards
- Instruction manual

GPC-SEC Start-up Kits

Description	Part No.
Organic GPC Start-up Kit Includes PLgel Mixed-C column 7.5 x 300 mm, standards, test sample, and manual	5064-8251
Aqueous GPC Start-up Kit Includes PL aquagel-OH Mixed column 7.5 x 300 mm, standards, test sample, and manual	5064-8252

LC and LC/MS Columns

GPC-SEC Calibration Standards

GPC-SEC Calibration Standards

The EasyCal Vial calibration standards supplied in both kits are ready to use and do not require any special preparation—simply add solvent to the 2 ml vial. EasyCal Vial standards consist of the most widely-used polystyrene and polyethylene oxide standards for GPC-SEC calibration. The polymers are specially prepared to ensure an extremely narrow molecular weight distribution, providing accurate GPC-SEC calibration. In addition, the polymer molecular weights are extremely well characterized using multiple characterization techniques. All standards come with a certificate to give you the assurance of Agilent quality.

These kits contains three vials with three different EasyCal Vial calibration standards. Each vial contains four carefully-selected molecular weight polymers. Each EasyCal Vial calibration standard covers a different molecular weight range. Naturally, you can use all three standards to cover the entire range from low to highest molecular weight polymers. Now, you can calibrate frequently, perhaps even daily, to ensure the accuracy and precision of your results.

Included in each kit is an appropriate test sample to check the effectiveness of your calibration.

The kits contain three vials of each standard mixture and test sample, sufficient for several weeks of work. And each standard mixture is available off-the-shelf when you need it.

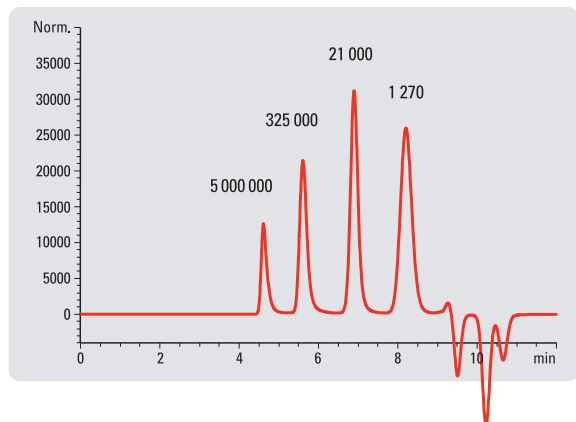
GPC-SEC Calibration Standards

Description	Unit	Part No.
Polystyrene EasyCal Vial standards kit	10 x 3 vials	5064-8281
Polyethylene Oxide EasyCal Vial standards kit	10 x 3 vials	5064-8280

LC and LC/MS Columns

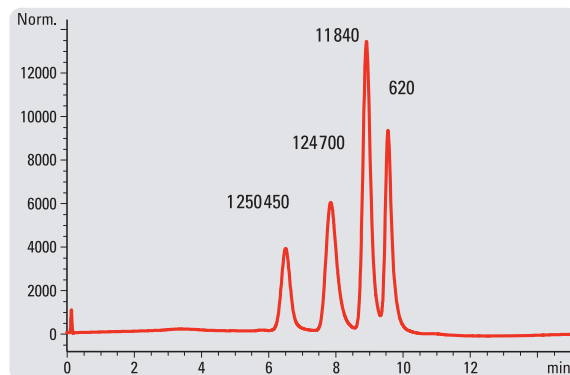
GPC-SEC Calibration Standards

Organic Standard Chromatograms

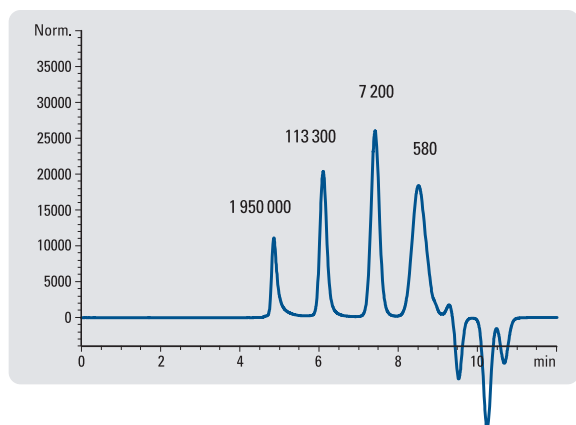


Standards in clear vial with red cap

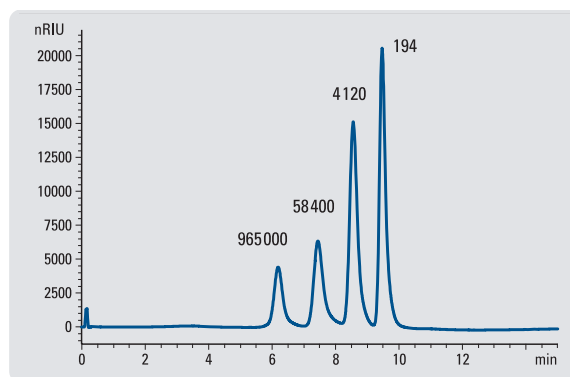
Aqueous Standard Chromatograms



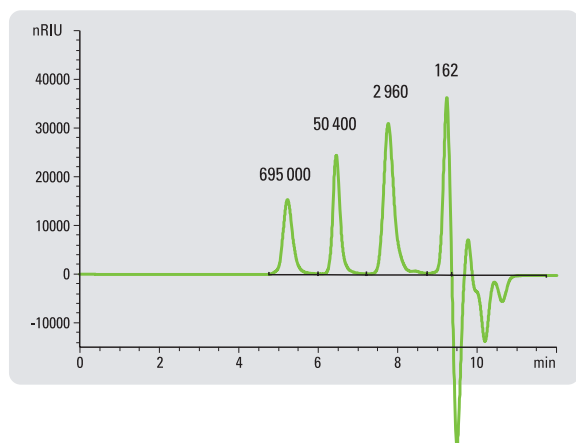
Standards in amber vial with red cap



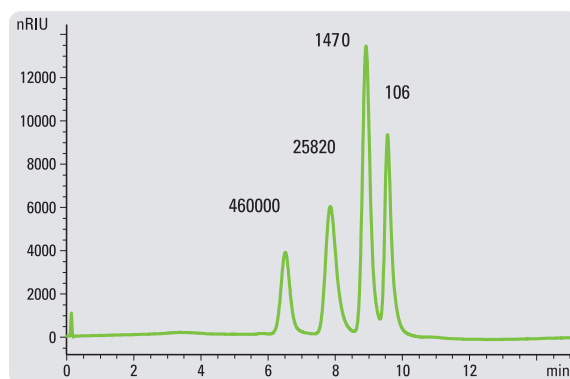
Standards in clear vial with blue cap



Standards in amber vial with blue cap



Standards in clear vial with green cap



Standards in amber vial with green cap

LC and LC/MS Columns

ZORBAX PSM GPC-SEC Columns

ZORBAX PSM GPC-SEC Columns

Agilent ZORBAX PSM Size Exclusion Columns can be used for molecular size separations on most synthetic and natural polymers. The ZORBAX PSM columns are packed with small (5 μm) porous silica microspheres (PSM) and are available in two versions. The deactivated version has been silanized for use with non-polar to relatively polar polymers in nonaqueous or partially aqueous solvents and is denoted by an S following the column name. The untreated version is for use with both nonaqueous and aqueous mobile phases. These rigid, siliceous PSM packings have high mechanical strength and are not swelled or dissolved by any common organic or aqueous (pH 2-7) mobile phases. For samples of wide molecular weight distribution, it is useful to couple columns of one or more pore sizes in series, employing Bimodal Kits. Alternatively, Bimodal columns contain an optimized mixed bed in one column.

ZORBAX PSM GPC-SEC Columns 6.2 mm x 250 mm (5 μm)

Description	MW Range	Silanized	Part No.
PSM 60	$5 \times 10^2 - 1 \times 10^4$	No	880957-801
PSM 60S	$5 \times 10^2 - 1 \times 10^4$	Yes	880957-802
PSM 300	$3 \times 10^3 - 3 \times 10^5$	No	880957-805
PSM 300S	$3 \times 10^3 - 3 \times 10^5$	Yes	880957-806
PSM 1000	$1 \times 10^4 - 1 \times 10^6$	No	880957-807
PSM 1000S	$1 \times 10^4 - 1 \times 10^6$	Yes	880957-808
PSM 3000	$1 \times 10^5 - 1 \times 10^7$	No	880957-809
PSM Bimodal-S	$5 \times 10^2 - 1 \times 10^6$	Yes	880957-814
PSM Bimodal Kit, 2 Columns	$5 \times 10^2 - 1 \times 10^4$	No	880949-903
Bimodal-S Kit, 2 Columns	$5 \times 10^2 - 1 \times 10^4$	Yes	880949-904

Polyurethane Resin Quality

Column: **ZORBAX SIL PSM 60S**
880957-802
6.2 x 250mm, 5 μm

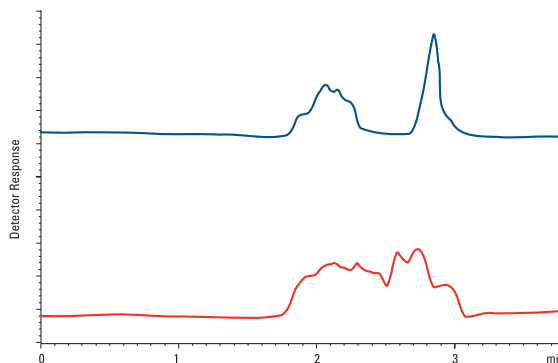
Mobile Phase: Dimethyl Formamide

Flow Rate: 1.9 mL/min

Temperature: Ambient

Detector: RID

Sample: Polyurethane Resins



Rapid GPC analysis provides measure of performance characteristics of polyurethane resins.

PLgel Columns

Agilent Technologies offers a wide range of columns for organic and aqueous GPC-SEC analysis. The PLgel columns, for polymer analysis with organic eluents, are based on a highly crosslinked polystyrene/divinylbenzene matrix and are available with different particle and pore sizes to cover a wide range of polymer molecular weight distributions in organic eluents. The organic GPC start-up kit contains a PLgel Mixed-C column, which is the column of choice for general purpose MW distribution. This column is recommended for initial polymer screening; if greater resolution is required, simply add another PLgel column.

The PLgel Mixed-C column is packed with 5 μm particles of different pore sizes and thus enables the separation of polymers over a wide molecular weight range (from about 200 to 3 million). Such wide ranges usually require sets of several columns, typically between 2 to 3 (up to 6).

PLgel Columns

Size (mm)	Particle Size (μm)	Pore Size \AA	MW Range	Part No.
7.5 x 300	5	50	< 1000	79911GP-500
		100	< 4000	79911GP-501
		500	500-20K	79911GP-502
		1000	1K-40K	79911GP-503
		10000	4K-400K	79911GP-504
		100000	40K-40M	79911GP-505
7.5 x 300	10	50	< 1000	79911GP-100
		100	< 4000	79911GP-101
		500	500-20K	79911GP-102
		1000	1K-40K	79911GP-103
		10000	4K-400K	79911GP-104
		100000	40K-4M	79911GP-105
		1000000	400K-40M	79911GP-106

PLgel Mixed Bed Columns

7.5 x 300	3	Mixed-E	up to 30K	79911GP-MXE
	5	Mixed-D	200-400K	79911GP-MXD
	5	Mixed-C	200-3M	79911GP-MXC
	10	Mixed-B	500-10M	79911GP-MXB
	20	Mixed-A	1000-40M	79911GP-MXA

PLgel Guard Columns

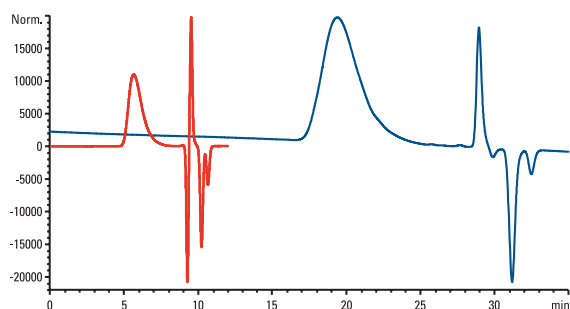
7.5 x 50	5			79911GP-510
7.5 x 50	10			79911GP-110

LC and LC/MS Columns

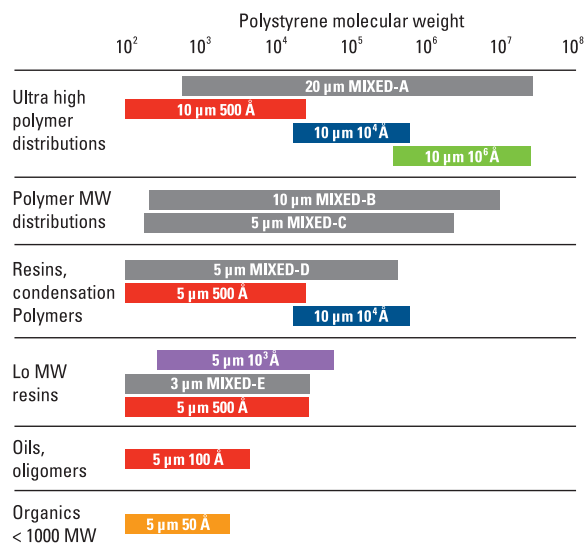
PLgel Columns

Broad Polystyrene with 1 and 3 PLgel Mixed columns

Column: PLgel mixed C
 79911GP-MXC
 7.5 x 300mm, 5µm
 (3 in series)
Mobile Phase: Tetrahydrofuran (THF)
Flow Rate: 1 mL/min
Temperature: 25°C
Detector: RID
Sample: Polystyrene EasyCal standards
 in vials for calibration



The chromatogram shows the analyses of a broad technical polystyrene: part a) with one PLgel Mixed-C column and part b) with a set of three PLgel Mixed-C columns. Due to the better separation of the column set and the reduced influence of band broadening, the calculated molecular weight averages are in the latter case closer to the values determined with reference methods, e.g. light scattering (see table).



Molecular Weight Averages Determined by Reference Methods

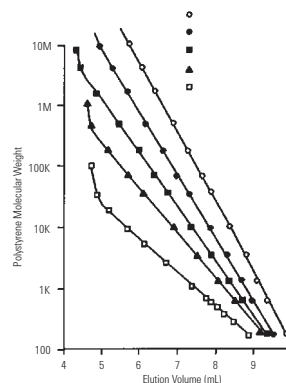
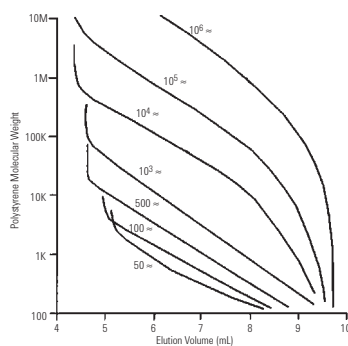
Reference Data	M _n 86000*	M _w 246000**	D 2.86
Difference [%] (1 x PLgel mixed)	9	15	27
Difference [%] (3 x PLgel mixed)	3.1	4.8	2.0

*Measured by GPC
 **Measured by light scattering

Polystyrene: Calibration Curves for PLgel Columns

Mobile Phase: THF
Flow Rate: 1 mL/min
Sample: Polystyrene

20 m MIXED -A
 10 m MIXED -B
 5 m MIXED -C
 5 m MIXED -D
 3 m MIXED -E



PL aquagel-OH Columns

The PL aquagel-OH mixed column, with its extremely hydrophilic polyhydroxyl surface, is suitable for the aqueous SEC analysis of water-soluble polymers over a wide range of molecular weights. The PL aquagel-OH column can handle most neutral hydrophilic polymers, and its capability extends to the analysis of high molecular weight polymers including polyacrylamides and polyethylene oxides. The aqueous SEC start-up kit contains a PL aquagel-OH mixed column, with 8 μm particles, which is the column of choice for MW distribution in aqueous eluents. This column is recommended for first polymer screening: if greater resolution is required, simply add another PL aquagel-OH column.

PL aquagel-OH Columns

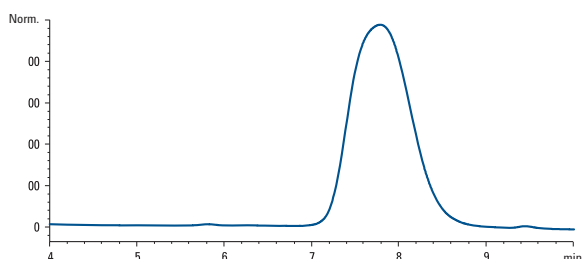
Size (mm)	Particle Size (μm)	Designation	MW Range	Part No.
7.5 x 300	8	30	100-30K	79911GF-083
		40	10K-200K	79911GF-084
		50	50K-1M	79911GF-085
		60	200K-10M	79911GF-086
		Mixed	100-10M	79911GF-MXA

PL aquagel-OH Guard Columns

7.5 x 50	8			79911GF-080
----------	---	--	--	-------------

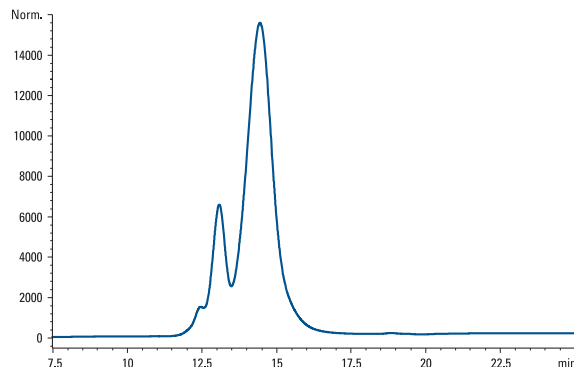
Polymer Standards 1

Column: PL aquagel-OH
 79911GF-MXA
 7.5 x 300mm, 8 μm
Mobile Phase: Water
Flow Rate: 1 mL/min
Temperature: 25°C
Detector: RID
Calibrant: Polyethylene oxide EasyCal
 standards in vials
 for calibration



Polymer Standards 2

Column: PL aquagel-OH
 79911GF-MXA
 7.5 x 300mm, 8 μm
Column: PL aquagel-OH
 79911GF-083
 7.5 x 300mm, 8 μm
Mobile Phase: Water
Flow Rate: 1 mL/min
Temperature: 25°C
Detector: RID
Calibrant: Polyethylene oxide EasyCal
 standards in vials
 for calibration



LC and LC/MS Columns

ZORBAX Gel Filtration Columns

ZORBAX GF-250 and GF-450 Gel Filtration Columns

- High efficiency and reproducibility with short analysis time
- Hydrophilic diol bonded phase for good protein recovery
- Compatible with organic modifiers and denaturants
- Wide usable pH range (pH 3-8)

ZORBAX GF-250 and GF-450 size exclusion (gel filtration) columns are ideal for the size separations of proteins and other biomolecules. The separation range is 4,000-900,000 for globular proteins when using GF-250 and GF-450 columns in series. The GF-250/GF-450 size exclusion columns have a hydrophilic diol bonded phase for high recovery of proteins (typically >90%) and a unique zirconia modification of the silica to extend the pH range from 3-8. The GF-250 and GF-450 columns are packed with precisely sized porous silica microspheres with narrow pore size and particle size distributions. The result is a highly efficient, rugged and reproducible size exclusion column for separations of proteins with flow rates of up to 3 ml/min. These columns are compatible with organic modifiers (<25%) and denaturants in the mobile phase to eliminate protein aggregation for proper size determination. Some common applications include separations of protein monomers, dimers and aggregates, desalting, protein molecular weight estimation and separations of modified proteins.

Column Specifications

Bonded Phase	Pore Size	Particle Size	MW Range	Surface Area	pH Range	Flow Rate	Max Pressure
ZORBAX GF-250	150Å	4 µm	4,000-400,000	140 m ² /g	3.0-8.0	<3.0 ml/min	350 bar
ZORBAX GF-450	300Å	6 µm	10,000-900,000	50 m ² /g	3.0-8.0	<3.0 ml/min	350 bar

Separation of Protein Standards on the ZORBAX GF-250 SEC Column

Column: ZORBAX GF-250
884973-901
9.4 x 250mm, 4µm

Mobile Phase: 200 mM Sodium Phosphate,
pH 7.0

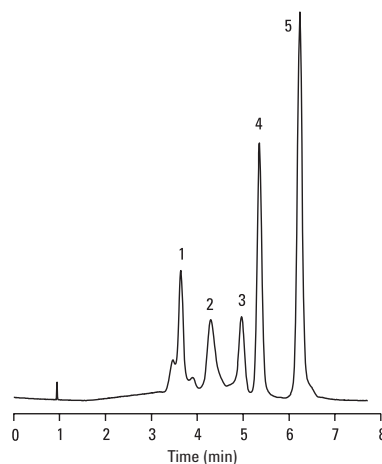
Flow Rate: 2 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: BioRad Gel Filtration Standards
for Size Exclusion

1. Thyroglobulin 670,000 Da
2. Bovine Gamma Globulin 158,000 Da
3. Chicken Ovalbumin 44,000 Da
4. Equine Myoglobin 17,000 Da
5. Vitamin B-12 1,350 Da



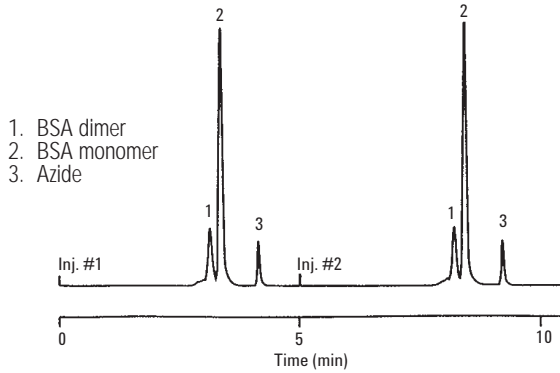
The protein standards separated here are a commonly selected set of standards. The ZORBAX GF-250 column shows excellent resolution for this sample. Additional resolution of the thyroglobulin can be obtained by adding the GF-450 column in series.

LC and LC/MS Columns

ZORBAX Gel Filtration Columns

High-Speed Size Exclusion Separations

A: BSA and BSA Dimers (duplicate injections)



Column: ZORBAX GF-450
884973-902
9.4 x 250mm, 6 μ m

Mobile Phase: PBS (phosphate buffered saline), pH 7.4

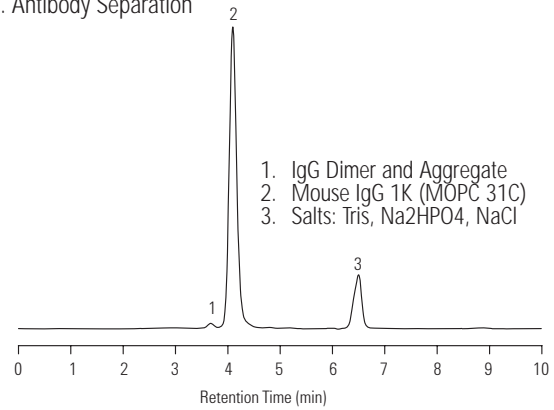
Flow Rate: 3 mL/min

Temperature: Ambient

Detector: 220 nm

Sample: BSA and BSA Dimers

B: Antibody Separation



Column: ZORBAX GF-450
884973-902
9.4 x 250mm, 6 μ m

Mobile Phase: 200 mM Na Phosphate Monobasic pH 7.0/0.1% Azide

Flow Rate: 2 mL/min

Detector: 225 nm

Sample: 10 μ g in 50 mM Sodium Phosphate pH 7.0

Separation of a Protein Mixture on the 9.4 x 250 mm ZORBAX GF-250 Column

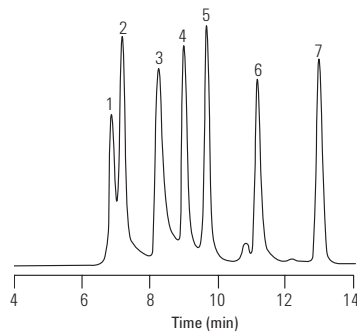
Column: ZORBAX GF-250
884973-701
4.6 x 250mm, 4 μ m

Mobile Phase: 130 mM NaCl/20 mM KCl/50 mM Na₂HPO₄, pH 7.0

Flow Rate: 1 mL/min

Detector: 210 nm

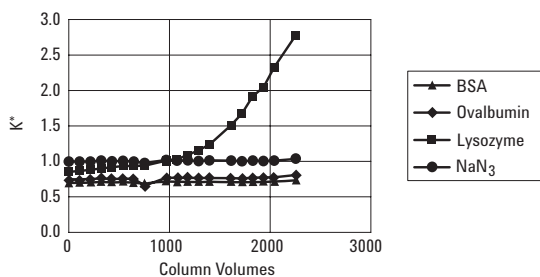
Sample: Protein mixture



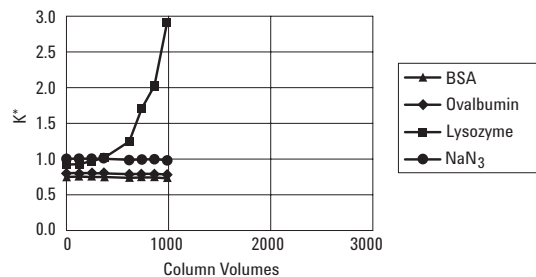
1. Mouse IgM 900,000 Da
2. Bovine Thyroglobulin 670,000 Da
3. Sweet Potato β -Amylase 200,000 Da
4. Bovine Serum Albumin 67,000 Da
5. Chicken Albumin 45,000 Da
6. Bovine RNase 13,700 Da
7. Azide 65 Da

ZORBAX GF-250 Shows Extended Column Lifetime

Stability of GF-250: K^* of Standard Proteins



Stability of Competitor Column: K^* of Standard Proteins



LC and LC/MS Columns

ZORBAX Gel Filtration Columns

ZORBAX GF-250 and GF-450 Gel Filtration Columns

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	GF-250, 150Å	9.4 x 250	4	884973-901
	GF-250, 150Å	4.6 x 250	4	884973-701
	GF-450, 300Å	9.4 x 250	6	884973-902
Guard Columns (hardware required)				
P	GF-250 Diol, Guard Cartridge, 2/pk	9.4 x 15	6	820675-111
ZGC	GF-250 Diol, Guard Cartridge, 4/pk	4.6 x 12.5	6	820950-911
P	GF-450 Diol, Guard Cartridge, 2/pk	9.4 x 15	6	820675-111
ZGC	GF-250 Diol, Guard Cartridge, 4/pk	4.6 x 12.5	6	820950-911
P	Guard Hardware Kit	9.4 x 15		840140-901
ZGC	Guard Hardware Kit			820888-901
PrepHT Columns				
PI	PrepHT GF-250, 150Å	21.2 x 250	6	877974-901
PI	PrepHT GF-450, 300Å	21.2 x 250	6	877974-910
PI	PrepHT Endfittings, 2/pk			820400-901
PI	PrepHT GF-250, Guard Cartridge, 2/pk	17 x 7.5	6	820212-911
PI	PrepHT GF-450, Guard Cartridge, 2/pk	17 x 7.5	6	820212-911
PI	Guard Cartridge Hardware			820444-901

LC and LC/MS Columns

ZORBAX Ion Exchange Columns

ZORBAX Ion Exchange Columns - SAX and SCX

- ZORBAX SAX and 300SCX columns are based on rugged Zorbax silica
- Stable from pH 2-7
- Provide high efficiency, rapid separations
- Compatible with organic mobile phase modifiers
- ZORBAX Bio-SCX Series II for 2-D separations

Zorbax strong ion-exchange columns are available as both Strong Anion Exchange (SAX) and Strong Cation Exchange (300SCX) columns. Each column is packed with bonded, 5 μm , spherical silica particles for optimum efficiency.

Zorbax Strong Anion Exchange packing has a permanently bonded quaternary amine. A trifunctional organo-silane reagent is used in producing this packing to maximize its stability with aqueous mobile phases. This column is ideal for separation of water-soluble compounds such as aromatic and aliphatic carboxylic acids and sulfonic acids.

Zorbax Strong Cation Exchange packing has 300Å pore size silica particles chemically bonded to an aromatic sulfonic acid group. This column is used for separations of basic, water-soluble compounds and bio-molecules.

Zorbax also has Bio-SCX Series II columns designed for optimized 2-D separations of peptides and proteins using LC/MS. This packing is based on ultra-pure 3.5 μm Zorbax silica particles, bonded with a bio-friendly polymer that is functionalized with sulfonic acid groups. This gives strong retention and good peak shape in the ion exchange step of 2-D analysis of peptides and proteins.

Column Specifications

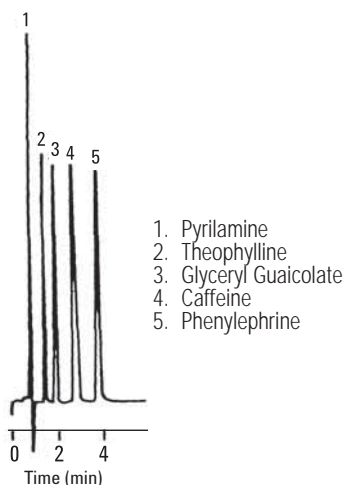
Bonded Phase	Pore Size	Surface Area	pH Range	Functionality	Max Pressure
ZORBAX SAX	70Å	300 m ² /g	2.0-7.0	Quaternary amine	350 bar
ZORBAX 300SCX	300Å	50 m ² /g	2.0-7.0	Sulfonic acid	350 bar
ZORBAX Bio-SCX Series II	300Å	90 m ² /g	2.5-8.5	Sulfonic acid	350 bar

LC and LC/MS Columns

ZORBAX Ion Exchange Columns

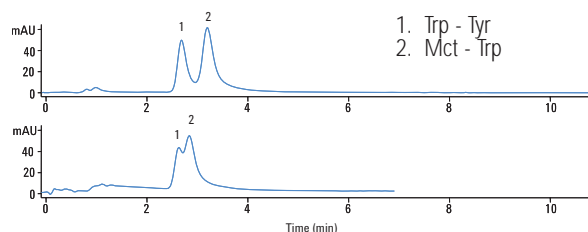
Cough-Cold Remedies—ZORBAX 300SCX

Column: ZORBAX 300ÅSCX
880952-704
4.6 x mm, 5µm
Mobile Phase: 100 mM NaH₂PO₄ (pH 6.5)
Flow Rate: 3 mL/min
Temperature: 20° C
Detector: 210 nm
Sample: Cold remedies



ZORBAX Bio-SCX Series II Provides More Retention of Small Peptides

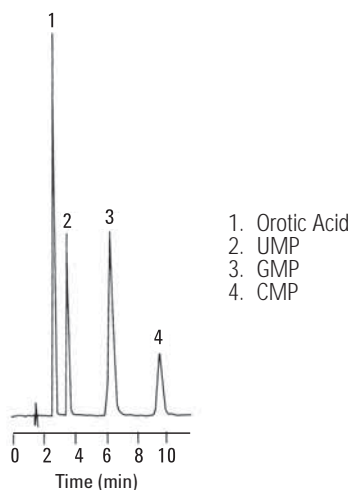
Column: ZORBAX Bio SCX Series II
5065-9912
0.3 x 35mm, 3.5µm
Mobile Phase: 95% 40 mM NaCl; 5% ACN,
0.3% Formic Acid
Flow Rate: 5 µL/min
Detector: 230 nm
Sample: Synthetic Dipeptides



The new ZORBAX Bio-SCX Series II column retains smaller peptides more strongly than some other SCX columns. The result is increased resolution of more hydrophilic peptides fragments and more accurate identification when these columns are used in 2D-HPLC analysis.

Nucleotides: Separation of Mononucleotides

Column: ZORBAX SAX
880952-703
4.6 x 250mm, 5µm
Mobile Phase: 0.1 M NH₄H₂PO₄
Flow Rate: 2.0 mL/min
Temperature: Ambient
Detector: UV 254 nm



LC and LC/MS Columns

ZORBAX and Synchropak Ion Exchange Columns

ZORBAX Ion Exchange Columns - SAX and SCX

Description	Size (mm)	Particle		SAX	300SCX	Bio-SCX Series II
		Size (µm)				
Semi-preparative	9.4 x 250	5		880952-203	880952-204	
Analytical	4.6 x 250	5		880952-703	880952-704	
Analytical	4.6 x 150	5		883952-703	883952-704	
Analytical	4.6 x 50	5			846952-704	
Solvent Saver	3.0 x 50	5			860700-304	
Narrow Bore	2.1 x 150	5			883700-704	
Narrow Bore	2.1 x 50	5			860700-704	
Capillary	0.3 x 35	3.5				5065-9912
Capillary	0.8 x 50	3.5				5065-9942
Guard Cartridge, 4/pk	4.6 x 12.5	6		820950-903	820950-904	
Guard Hardware Kit				820888-901	820888-901	

Synchropak Ion Exchange Columns

For your convenience, Agilent provides silica based SynChropak ion exchange columns for additional choices for ion exchange separations.

Synchropak Ion Exchange Columns

Size (mm)	Particle Size (µm)	pH Range	SynChropak WAX	SynChropak SAX
Anion Exchange Columns				
4.6 x 100	6.5	2-8	79919DE-754	79919QA-754
4.6 x 250	6.5	2-8	79919DE-784	79919QA-784
Size (mm)	Particle Size (µm)	pH Range	SynChropak WCX	SynChropak SCX
Cation Exchange Columns				
4.6 x 100	6.5	2-8	79919CM-754	79919SP-754
4.6 x 250	6.5	2-8	79919CM-784	79919SP-784

LC and LC/MS Columns

ZORBAX Carbohydrate Analysis Columns

ZORBAX Carbohydrate Analysis Columns

- Reproducible—each lot of this application specific aminopropyl column packing material is use-tested for specific monosaccharide and disaccharide separations
- Efficient—uses ZORBAX porous silica microsphere technology. Silica manufacturing, bonding and packing are all performed in Agilent's ISO 9001 facilities.
- Flexible—can handle high volume injections, as much as 50 µl on a 4.6 x 150 mm column

Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Endcapped	Carbon Load
ZORBAX Carbohydrate	70Å	300 m ² /g	2.0-8.0	No	3.5%

ZORBAX Carbohydrate Analysis Columns

Description	Size (mm)	Particle Size (µm)	Part No.
ZORBAX Carbohydrate Analysis column	4.6 x 250	5	840300-908
ZORBAX Carbohydrate Analysis column	4.6 x 150	5	843300-908
ZORBAX NH ₂ Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-908
Guard Hardware Kit			820888-901

Separation of Simple-Sugar and Sugar-Alcohol Standards

Column: ZORBAX Carbohydrate Analysis
843300-908

4.6 x 150mm, 5µm

Mobile Phase: 75% ACN/25% H₂O

Flow Rate: 2 mL/min

Temperature: 30°C

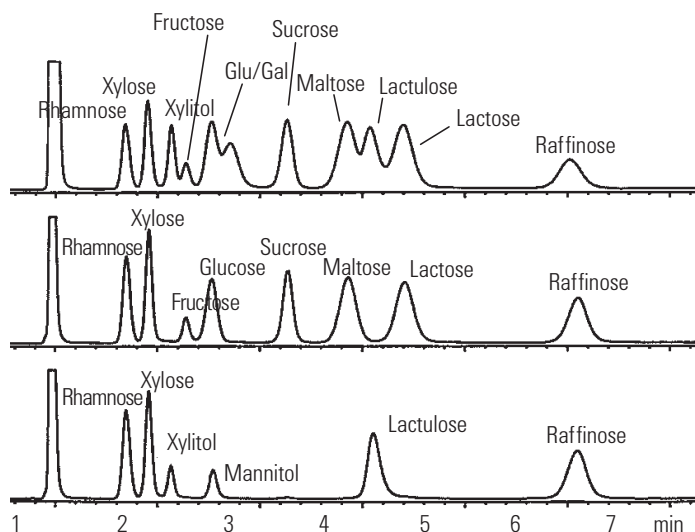
Detector: RID

Det. Temp: 30°C

Sample: Rhamnose, Xylose, Xylitol, Lactulose, Raffinose (54 µg each) Fructose (10 µg), Glucose, Sucrose (36 µg each) Maltose, Lactose (6 µg each), Inj. = 6.3 µL

Rhamnose, Xylose, Raffinose (54 µg each), Fructose (10 µg) Glucose, Sucrose (36 µg each), Maltose, Lactose (60 µg each) Inj. = 6.3 µL

Sample: (54 µg each), Inj. = 6.3 µL



LC and LC/MS Columns

ZORBAX Method Development Kits





ZORBAX Method Development Kits

Agilent offers a series of kits that allow for fast method development at an attractive price. Each kit contains three columns. To study the effect of a change in selectivity on your separation under a given set of conditions, try either the Eclipse kits for applications in the pH range 2-9 or StableBond kits for additional choices at low pH. Try the pH kits if you want to study the effect of pH on your separation over a wide range of pH (1-11.5). The aqueous kits provide a wide range of selectivities with a set of columns that can operate under high aqueous conditions to retain highly polar analytes.

ZORBAX Method Development Kits

Description	Part No.
StableBond Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4624
Fast StableBond Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4625
Eclipse XDB Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: XDB-C18, XDB-C8, XDB-Phenyl phases	5183-4626
Fast Eclipse XDB Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: XDB-C18, XDB-C8 and XDB-Phenyl phases	5183-4627
pH Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5807
Fast pH Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5808
Aqueous Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5809
Fast Aqueous Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5810

ZORBAX Cartridge Column Starter Kits

Hardware Description	Part No.
 ZORBAX C18 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C18 column; one 4.6 x 150 mm, 5 µm StableBond C18 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2021
 ZORBAX C8 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C8 column; one 4.6 x 150 mm, 5 µm StableBond C8 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2022

LC and LC/MS Columns

Amino Acid Analysis Columns and Supplies

Amino Acid Analysis (AAA) Columns and Supplies

ZORBAX Eclipse Amino Acid Analysis (AAA) Columns

- High resolution and rapid analysis of 24 amino acids
- Use tested for amino acid analysis
- Uses well known OPA and FMOC precolumn derivatization chemistry
- Easily automated using a detailed online, derivatization protocol available for use with Agilent 1100/1200 Autosampler

The ZORBAX Eclipse AAA high efficiency column rapidly separates amino acids following an updated and improved protocol. Total analysis from injection to injection can be achieved in as little as 14 min. (9 min. analysis time) on shorter, 7.5 cm length columns and 24 min. (18 min. analysis time) on the 15 cm column length. Exceptional sensitivity (5-50 pmol with DAD, FLD) and reliability are achieved using both OPA and FMOC derivatization chemistries in one fully automated procedure using the Agilent 1100/1200 HPLC instrument.

ZORBAX Eclipse Amino Acid Analysis (AAA) Columns

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	Analytical routine sensitivity	4.6 x 150	5	993400-902
	Analytical routine sensitivity, high-resolution using FLD	4.6 x 150	3.5	963400-902
	Analytical routine sensitivity, high-throughput	4.6 x 75	3.5	966400-902
	Solvent Saver high sensitivity, high resolution	3.0 x 150	3.5	961400-302
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-931
ZGC	Guard Hardware Kit			820888-901

AminoQuant Columns

	Amino Acid Separation Kit Includes AminoQuant Column, guard cartridges, guard cartridge holder, connecting capillary, AA standards and reagents, technical note, method disk			5063-6588
	AminoQuant Column	2.1 x 200	5	79916AA-572
GCS	ODS Guard Cartridge 3/pk	2.1 x 20	5	79916KT-110
GCS	Guard Cartridge Holder (required for use with 79916KT-110)			79900CH-010
	Connecting capillary tubing, 0.12 mm ID, 35 mm			79841-87609

LC and LC/MS Columns

Amino Acid Standards

Amino Acid Standards

Each amino acid standards contains the following amino acids:

- Glycine
- L-cystine
- L-histidine
- L-tyrosine
- L-leucine
- L-methionine
- L-serine
- L-alanine
- L-phenylalanine
- L-glutamic acid
- L-proline
- L-isoleucine
- L-arginine
- L-threonine
- L-valine
- L-lysine
- L-aspartic acid

Amino Acid Standards, 10 x 1 ml ampoules*

Description	Part No.
1 nmol/μl	5061-3330
250 pmol/μl	5061-3331
100 pmol/μl	5061-3332
25 pmol/μl	5061-3333
10 pmol/μl	5061-3334
Amino acids supplement kit Includes 1 g each of norvaline, sarcosine, asparagine, glutamine, tryptophan, and 4-hydroxyproline	5062-2478

*Consider shelf-life and buy limited quantities, 5062-2478 ships as 1 g vials

Amino Acid Separations Reagents

Description	Part No.
OPA reagent, 10 mg/ml each in 0.4 M borate buffer o-phthalaldehyde (OPA) and 3-mercaptopropionic acid, 6 x 1 ml ampoules	5061-3335
FMOC reagent, 2.5 mg/ml in acetonitrile, 9-fluorenylmethylchloroformate, 1 ml, 10 ampoules	5061-3337
Borate buffer, 100 ml	5061-3339
DTDPA (Dithiodipropionic) reagent, for analysis of cysteine, 5 g	5062-2479

LC and LC/MS Columns



PAH and Anion Separations

PAH and Anion Separations

PAH Columns

Description	Size (mm)	Particle Size (µm)	Part No.
LiChrospher PAH	4.6 x 250	5	79925PA-584
LiChrospher PAH	3.0 x 250	5	79925PA-583
LiChrospher PAH	2.0 x 250	5	79925PA-582
Polynuclear aromatic hydrocarbon standard			8500-6035

Anion Chromatography

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	Asahipak ODP-50	4.0 x 125	5	799230P-584
	Cartridge Holder			5021-1845
	Mobile phase additive			5062-2480
	Testmischung mit anorganischen Anionen Enthält je 1000 ppm Fluorid, Chlorid, Bromid, Nitrit und Sulfat sowie 2000 ppm Phosphat			5062-8524

High Resolution of 24 Amino Acids Using ZORBAX Eclipse-AAA Protocol

Column: ZORBAX Eclipse AAA
963400-902
4.6 x 150mm, 3.5µm

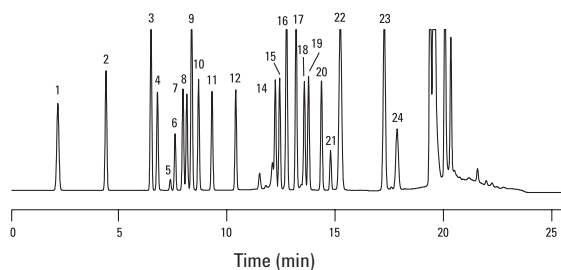
Mobile Phase: A: 40 mM Na₂HPO₄, pH 7.8
B: ACN : MeOH : Water,
45:45:10 v/v

Flow Rate: 2 mL/min

Temperature: 40°C

Detector: Fluorescence

Sample: 24 Amino Acids



- | | |
|---------|---------|
| 1. Asp | 13. Cys |
| 2. Glu | 14. Val |
| 3. Asn | 15. Met |
| 4. Ser | 16. Nva |
| 5. Gln | 17. Trp |
| 6. His | 18. Phe |
| 7. Gly | 19. Ile |
| 8. Thr | 20. Leu |
| 9. Cit | 21. Lys |
| 10. Arg | 22. Hyp |
| 11. Ala | 23. Sar |
| 12. Tyr | 24. Pro |

This high resolution separation of 24 amino acids is done in 18 minutes. If the Rapid Resolution 4.6 x 75 mm Eclipse AAA column is selected, these amino acids are resolved in 9 minutes.

LC and LC/MS Columns

ZORBAX Validation Kits/Custom HPLC Columns

ZORBAX Validation Kits

ZORBAX Validation Kits are supplied to customers who need the same HPLC column type (bonded phase, particle size, configuration) but from different manufacturing lots. To request columns from different lots, contact Agilent Technologies or your local distributor using the following procedure.

- Request Validation Kits (columns from different lots) by using Part Number 899999-888
- Indicate the Part Number of the current column you are using
- Indicate the Lot Number of the current column you are using
- Indicate the number of additional columns needed from different lots (example: you have a current column and may need two additional lots)
- Please fax your request to (302) 993-5354 or email to custom_columns@agilent.com. You will receive a quote from your Customer Service Agent within 1-2 business days. Delivery for your custom column is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom HPLC Column Ordering

Columns not listed can easily be ordered by the following procedure:

- Request a Special Products Quotation (SPQ) using Part Number 899999-999
- Indicate column dimensions (example: 4.6 x 50 mm); bonded phase type (example: StableBond C3); particle size (example: 5 μm); and pore size (example: 80Å)
- Please fax your request to (302) 993-5354 or email to custom_columns@agilent.com. You will receive a quote from your Customer Service Agent within 1-2 business days. Delivery for your custom column is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom columns are priced with a minimal surcharge over the price of stocked columns.



Application Notes

Application notes describe state-of-the-art analyses using Agilent products and solutions. These notes are free and are easily to download from the Agilent website. Go to www.agilent.com/chem/LCLibrary.

LC and LC/MS Troubleshooting

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Baseline disturbance at void time	Positive/negative - Difference in refractive index of injection solvent	Use mobile phase for sample solvent
Detector leaks	Plugged inlet frit	Replace seals/gaskets
Drifting Baseline	Positive direction - Contaminant buildup/elution	Flush column, cleanup sample, use pure solvents
	Positive/negative - Difference in refractive index of injection solvent	Use mobile phase for sample solvent
	Negative direction (gradient) - Absorbance of "A" mobile phase solvent	Use non-absorbing or HPLC-grade solvent
	Positive direction (gradient) - Absorbance of "B" mobile phase solvent	Use non-absorbing or HPLC-grade solvent
	Random - Temperature changes	Insulate column and tubing
	Random - Temperature changes	Thermostat column and tubing
	Wavy or undulating - Temperature changes in room	Monitor room temperature and control in room
Ghost peaks	Peaks from previous injection	Flush column to remove contaminants
	Contamination	Sample cleanup or pre-fractionation
	Unknown interferences in samples	Sample cleanup or pre-fractionation
	Ion pair - Upset equilibrium	Prepare sample in actual mobile phase to minimize disturbance
	Peptide mapping - Oxidation of TFA	Prepare fresh daily; use anti-oxidant
	Reversed phase - Contaminated water	Check suitability of water by running different amount through reversed phase column and measure peak height with elution; use HPLC grade
High column backpressure	Spikes - Bubbles in solvent	de-gas solvents
	Column blockage with irrev, adsorbed sample	Better sample cleanup; use guard column
	Too high mobile phase viscosity	Use lower viscosity solvents or higher temperature
	Particle size too small	Use larger dp packing
	Plugged inlet frit	Replace and fitting
	Plugged inlet frit	Reverse solvent flow
Leak	Subtle; white powder at fitting - loose fitting	Tighten fitting, cut tubing, or replace ferrule
Leak, injection valve	Catastrophic - Worn valve rotor	Replace rotor in valve
Leak, column or other fittings	Catastrophic - Loose fittings	Tighten or replace fitting
Leak, pump	Catastrophic - Pump seal failure	Replace pump seal
Negative peaks	RI-Detector - solute refractive index less than solvent	No problem; reverse polarity to make positive
	UV detector - solute absorbance less than mobile phase	Use mobile phase with lower UV absorbance; do not recycle solvent too long
Noisy baseline	Random - Contaminant buildup	Flush column; cleanup sample; use HPLC-grade solvent
	Continuous - Detector lamp problem	Replace UV lamp (lasts 1000 hrs)
	Occasional - External electrical interference	Use voltage stabilizer for LC system
	Sample volume too large	Injection volume should be 1/6 when mobile phase used for injection

LC and LC/MS Troubleshooting

Symptom Type	Possible Cause	Solution
Peak Doubling	Sample volume too large	Injection volume should be 1/6 when mobile phase used for injection
	Injection solvent too strong	Use weaker injection solvent or mobile phase
	Block frit	Replace and use 0.5 µm porosity in-line filter
	Column void or channeling	Fill in void with glass beads or packing; repack column
	Unswept injector flowpath	Replace injector rotor
Peak tailing	Void at head of column	Top of column with packing or glass beads
	Column overloaded with sample	Use higher capacity stationary phase Increase column diameter Decrease sample size
	Single peak - interfering components	Sample cleanup; prefractionation
	Beginning of peak doubling	See peak doubling
	Unswept dead volumes	Minimize number of connections Ensure injector seal is tight Ensure fittings are properly seated
	Basic compounds - Silanol interaction	Switch to polymeric phase
	Basic substances - Silanol interactions	Use stronger mobile phase or add competing base (e.g. TMA)
	Silica-based - Column degradation	Use speciality column; polymeric column or sterically protected
	Silica-based - Column degradation	Use speciality column; polymeric column or sterically protected
	Peaks are broad	Injection volume too large
Peak dispersion in injector valve		Introduce air bubble in front/back of sample to decrease dispersion
Sampling rate of data system too slow		Increase frequency of sampling
Slow detector time constant		Adjust time constant to match peak width
Mobile phase viscosity too high		Increase column temperature
Detector cell volume too large		Use smallest possible cell volume with no heat exchanger in system
Injector volume too large		Decrease injection volume
Long retention times		Use gradient elution or stronger mobile phase
Pressure fluctuation	Leaky check valve	Replace check valve
	Pump seal leaks	Replace pump seals
	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
Pressure increasing	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
	Water/organic systems - buffer precipitation	Test buffer-organic mixtures; ensure compatibility
Retention beyond total permeation volume	Size exclusion- Specific interactions	Add mobile phase modifiers or change solvent

LC and LC/MS Troubleshooting

Symptom Type	Possible Cause	Solution
Retention times are changing	Column temperature varying	Thermostat column; insulate column; ensure lab temperature constant
	Equilibration time insufficient with gradient run or changes in isocratic mobile phase	Make sure at least 10 column volumes pass through column after solvent change or gradient conclusion
	Selective evaporation of mobile phase component	Less vigorous helium sparging; keep solvent reservoirs covered; prepare fresh mobile phase
	Buffer capacity insufficient	Use >20 mM concentration of buffer
	Inconsistent on-line mobile phase mixing	Ensure gradient system delivering constant composition; check vs. manual prep of mobile phase
	Contamination buildup	Flush column occasionally to remove contaminants
	First few injections? Adsorption on active sites	Condition column by initial injection of concentrated sample
Retention times are decreasing	Flow rate increasing	Check pump to make sure correct; if not, reset
	Column overloaded with sample	Decrease sample size
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
Retention times are increasing	Flow rate is slowing	Fix leaks in liquid lines, replace pump seals, check for pump cavitation or air bubbles
	Active sites on silica packing	Use mobile phase modifier
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
	Mobile phase composition changing	Make sure mobile phase container is covered
	Active sites on silica packing	Add competing base to mobile phase
	Active sites on silica packing	Use higher coverage packing for stationary phase
	Peaks are outside of linear range of detector	Dilute/concentrate to bring into linear region
Sensitivity problem	First few sample injections? Absorption of sample in loop or column	Condition loop/column with concentrated sample
	Autosampler flow lines blocked	Check flow and make sure no blockages
	Injector sample loop underfilled	Make sure that loop is overfilled with sample
	Sample-related losses during preparation	Use internal standard during sample prep; optimize sample prep method
	Slow column equilibration times (ion pairing)	Equilibration time slow for long-chain ion pairing reagents

LC and LC/MS Troubleshooting

LC/MS Troubleshooting

Symptom Type	Solution
No peaks	Spray from the nebulizer Make sure capillary voltage is set correctly Make sure LC/MSD is tuned correctly Make sure LC/MSD pressures are within normal ranges Check drying gas flow and temperature Make sure fragmentor is set correctly
Poor mass accuracy	Recalibrate the mass axis Make sure ions used for tuning span mass range of sample ions and show strong stable signals
Low signal	Check the solution chemistry. Make sure solvent is appropriate for sample Make sure sample is fresh and has been stored correctly Make sure LC/MSD is tuned correctly Check the nebulizer condition Clean the capillary entrance Check the capillary for damage and contamination
Unstable signal	Make sure drying gas flow and temperature are correct for the solvent flow Make sure solvent is thoroughly degassed Make sure LC backpressure is steady; this indicates a steady solvent flow
High spectral noise	Use appropriate mass filter values Check spray shape; nebulizer may be damaged or set incorrectly Make sure drying gas flow and temperature are correct for the solvent flow Make sure solvent is thoroughly degassed Make sure LC backpressure is steady; this indicates a steady solvent flow If you are using water as part of the mobile phase, make sure it is de-ionized (>18MΩ)
Droplets, not spray, exiting the nebulizer	Make sure nebulizing gas pressure is set high enough for the LC flow Check position of needle in nebulizer Stop solvent flow and remove nebulizer assembly Examine end of nebulizer for damage
No flow	Make sure LC is on and there is sufficient solvent in correct bottle Check for LC error messages Check for blockages Repair or replace any blocked components Check for leaks Make sure MS stream selector valve is set to LC to MSD
Undesired fragmentation	(APCI vs. Electrospray) APCI temperature is too high Fragmentor is set too high

LC and LC/MS Applications

BioPharmaceutical

BioPharmaceutical

Combinatorial Chemistry: Fast Gradient Analysis and Re-equilibration

Column: Eclipse XDB-C18
933975-902

4.6 x 30mm, 3.5µm

Mobile: A= 50 mL H₂O + 450 mL MeOH + 2 mL H₃PO₄
Phase: B= 450 mL H₂O + 50 mL MeOH + 2 mL H₃PO₄

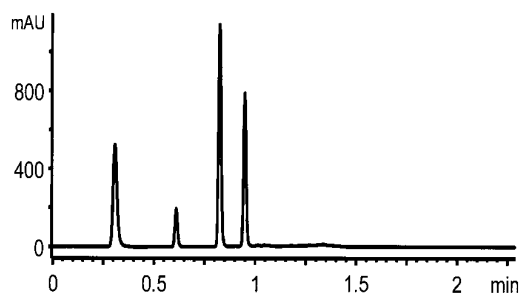
Flow Rate: 4.0 mL / min.

Gradient: 0 to 100% B in 1 min.

Temperature: 23°C

Detector: UV 268 nm

Sample: Proprietary Combichem mixture
~3 mg/mL each compound x 5 µL = 15 µg



Amino Acid Standards

Column: Amino Acid
79916AA-572
2.1 x 200mm, 5µm

Mobile: A = 20 mM sodium acetate, 0.018% TEA,
Phase: pH 7.2, 0.3% THF
B = 100 mM sodium acetate, pH 7.2, acetonitrile,
methanol (1/2/2)

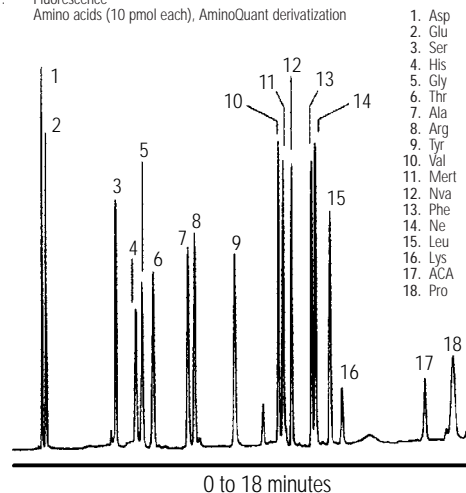
Flow Rate: 0.45 mL/min

Gradient: 0 to 60% B in 17 min

Temperature: 40°C

Detector: Fluorescence

Sample: Amino acids (10 pmol each), AminoQuant derivatization



1. Asp
2. Glu
3. Ser
4. His
5. Gly
6. Thr
7. Ala
8. Arg
9. Tyr
10. Val
11. Met
12. Iva
13. Phe
14. Leu
15. Leu
16. Lys
17. ACA
18. Pro

Analgesics-High-Speed PrepHT Isocratic Separation

Column: PrepHT, ZORBAX SB-C18
870050-902

21.2 x 50mm, 5µm

Mobile: 14% ACN / 1% Formic Acid

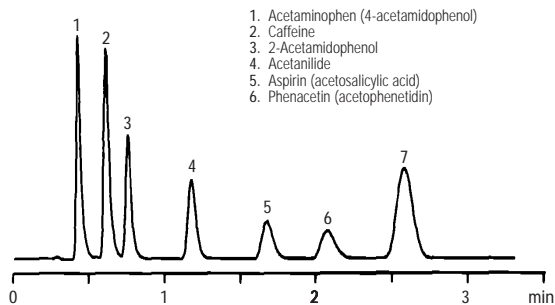
Phase:

Flow Rate: 40 mL/min

Temperature: 70°C

Detector: 275 nm

Sample: 50 µL inj., 0.158 µg/ µL each (caffeine 0.053 µg/ µL)



1. Acetaminophen (4-acetamidophenol)
2. Caffeine
3. 2-Acetamidophenol
4. Acetanilide
5. Aspirin (acetylsalicylic acid)
6. Phenacetin (acetophenetidin)
7. Phenacetin (acetophenetidin)

Separation of Small Molecule Anorectics on Bonus-RP and Traditional Alkyl Phase

Column: ZORBAX Bonus-RP
883668-901

4.6 x 150mm, 5µm

Mobile: 25 mM K₂HPO₄, pH 7.2/MeOH: ACN (50:50), 45/55

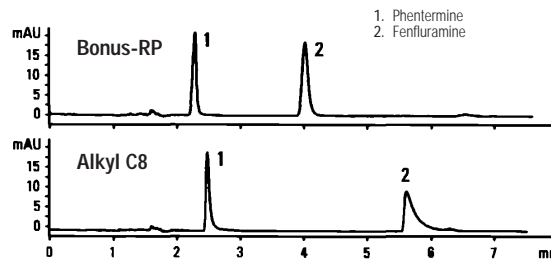
Phase:

Flow Rate: 1 mL/min.

Temperature: Ambient

Detector: UV 254 nm

Sample: Anorectics "Fen-phen", 5 µL



1. Phentermine
2. Fenfluramine

LC and LC/MS Applications

BioPharmaceutical

Antibodies: Fast Separation of IgM and IgG Antibodies

Column: ZORBAX GF-250

884973-701

4.6 x 250mm, 4µm

Mobile: 200 mM Sodium Phosphate (pH 7), 0.01% Azide

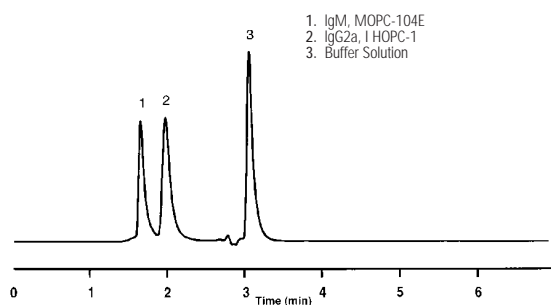
Phase:

Flow Rate: 0.94 mL/min

Temperature: Ambient

Detector: UV 230 nm

Sample: 2.5 µl (1mg/mL)



β-blocker Drugs: Silica-Based Column Aging at pH 11

Column: Eclipse XDB-C8

993967-906

4.6 x 150mm, 5µm

Mobile: 55% MeOH / 45% 1-Methyl-piperidine-HCL buffer, pH

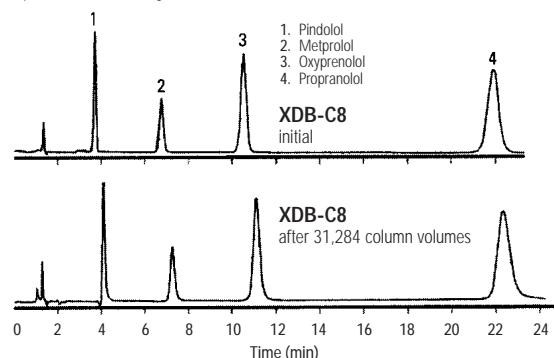
Phase: 11

Flow Rate: 1.0 mL/min

Temperature: 24°C

Detector: UV 215 nm

Sample: β-blocker drugs



Separation of Highly Basic Antidepressants above their pKa in Free Base Form (pKa 9.5-9.7)

Column: ZORBAX Extend-C18

773450-902

4.6 x 150mm, 5µm

Mobile: 75% Methanol / 25% 50 mM Pyrrolidine Buffer, pH 11.5

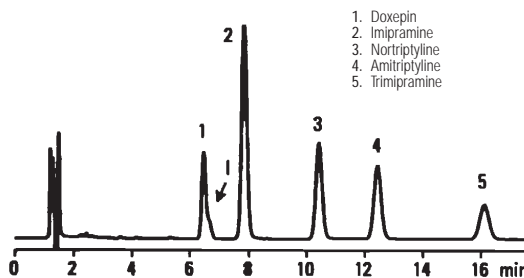
Phase:

Flow Rate: 0.5 mL/min.

Panel A: 1.5 mL/min.; Panel B: 1.0 mL/min.

Temperature: 40°C

Detector: UV 215 nm



Glycosylated proteins - Large Molecules on ZORBAX Poroshell 300SB-C18 and 300SB-18

Mobile: a: 0.1% TFA in H2O

Phase: b: 0.07% TFA in ACN

Flow Rate: a, b: 0.454 mL/min

c: 0.071 mL/min

Gradient: a, b:

0 min 5% B

10 min 100% B

c:

0 min 5% B

50 min 100% B

Temperature: 70°C

Detector: DAD 212nm, 1.7 µl flow cell, <0.01 min peak width

Sample: Large Glycosylated Proteins

Courtesy of:

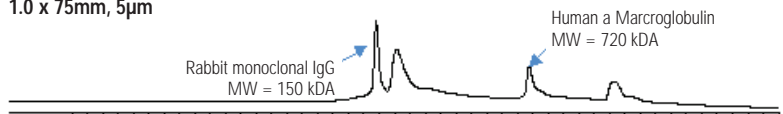
Novartis Parma,

Biotechnology, Basel

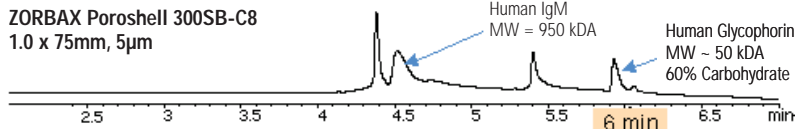
Dr. Kurt Forrer

Patrik Roethlisberger

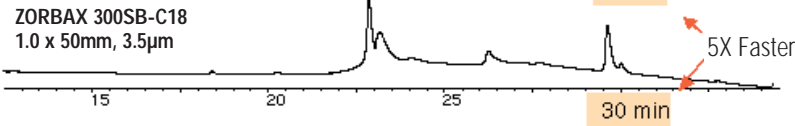
A ZORBAX Poroshell 300SB-C18
1.0 x 75mm, 5µm



B ZORBAX Poroshell 300SB-C8
1.0 x 75mm, 5µm



C ZORBAX 300SB-C18
1.0 x 50mm, 3.5µm



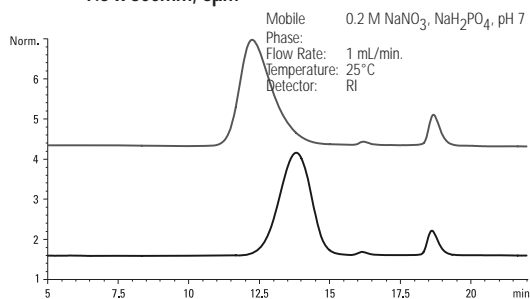
Aligned

LC and LC/MS Applications

BioPharmaceutical

Heparin

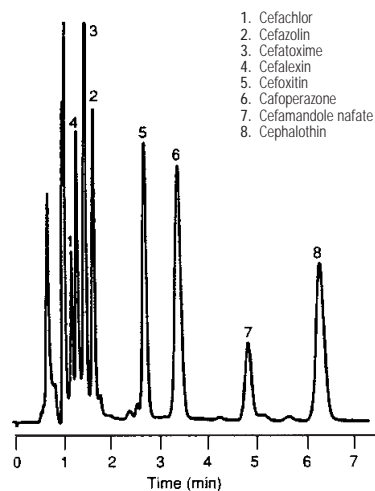
Column: 3 x PL aquagel-OH
79911GF-083
7.5 x 300mm, 8µm



Cephalosporins

Column: ZORBAX C8
883952-706
4.6 x 150mm, 5µm

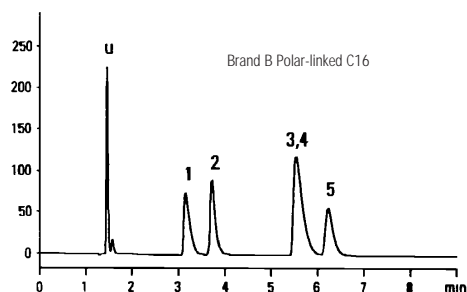
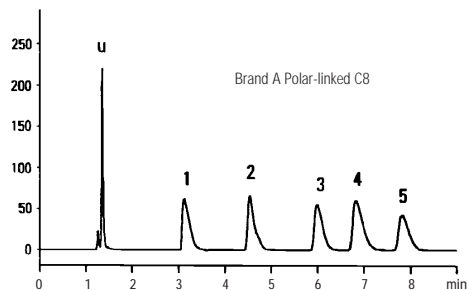
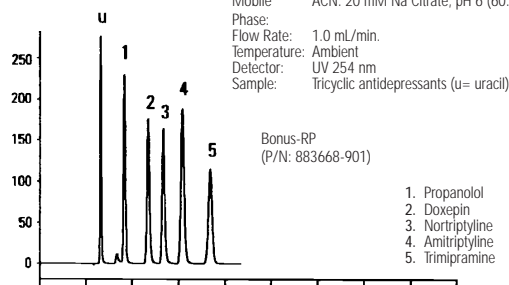
Mobile Phase: 93% buffer (50 mM citric acid + LiOH to pH 3)
0.8% ACN, 6.2% THF
Flow Rate: 3.0 mL/min.
Temperature: 50°C
Detector: UV 254 nm
Sample: Cephalosporin Mixture



Antidepressants, Tricyclic: Comparative Separation

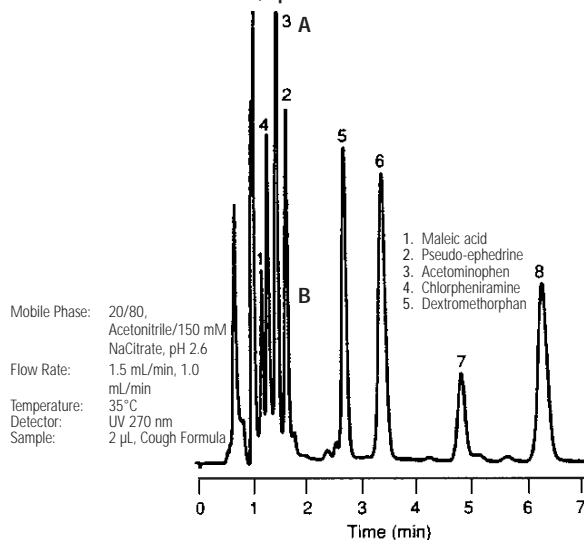
Column: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm

Mobile: ACN: 20 mM Na Citrate, pH 6 (60:40)
Phase:
Flow Rate: 1.0 mL/min.
Temperature: Ambient
Detector: UV 254 nm
Sample: Tricyclic antidepressants (u= uracil)



Cough-formula Mixture-Fast and Efficient Separation

Column A: ZORBAX SB-CN
866953-905
4.6 x 75mm, 3.5µm
Column B: ZORBAX SB-CN
883975-905
4.6 x 150mm, 5µm



LC and LC/MS Applications

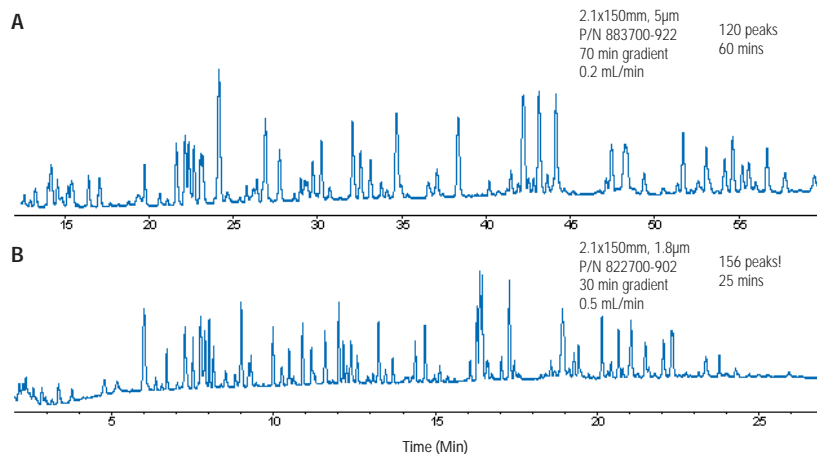
BioPharmaceutical

HSA Tryptic Digest – on ZORBAX Rapid Resolution HT

Column A: ZORBAX SB-C18
883700-922

Column B: ZORBAX SB-C18
822700-902
2.1 x 50mm, 1.8µm

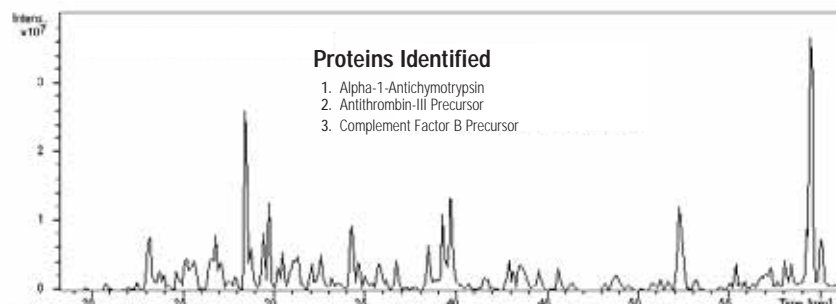
Mobile Phase:
A: Water w/ 0.1% TFA
B: ACN w/0.1% TFA
Flow Rate:
a: 0.2 mL/min
b: 0.5mL/min
Gradient:
a: 2 to 50% B in 70min
b: 2 to 50% B in 30min
Temperature:
50°C
Detector:
UV 214 nm
Sample:
HSA Tryptic Digest, 8 µL of 15pmol/µL
(120 pmol on column)



Human Serum – Low Abundance Protein Isolation and Identification by LC/MS

ZORBAX 300SB-C18
Trap: 0.3 x 5mm, 5µm, 5065-9913
Analytical: 0.3 x 150mm, 5µm,
5064-8263

Mobile Phase:
A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid
Flow Rate:
6 µL/min
Gradient:
0 min 3% B
5 min 3% B (loading)
50 min 45% B
52 min 80% B
57 min 80% B
60 min 3% B
Sample:
Band from 1-D in gel digest

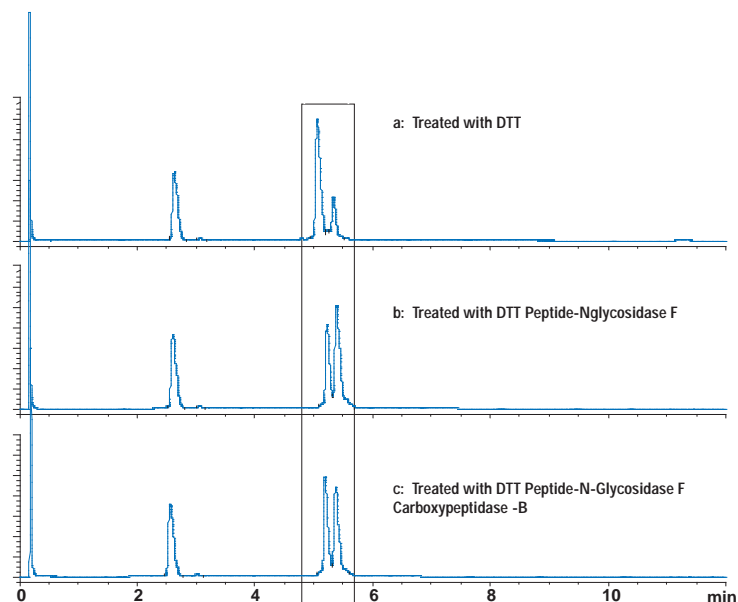


Sample Preparation of Human Serum:
Major serum proteins removed using
Multiple Affinity Removal Column:
4.6 x 100mm, P/N 5185-5985
Followed by 1-D gel digest

Monoclonal IgG1 Chains - Separation on ZORBAX Poroshell 300SB-C8

Column: ZORBAX Poroshell 300SB-C8
660750-906
2.1 x 75mm, 5µm

Mobile Phase:
a: 90% water: 10% ACN + 3 mL/L of MW 300 PEG
b: 10% water: 90% ACN + 3 mL/L of MW 300 PEG
Flow Rate:
1.0 mL/min
Gradient:
0 min 25% B
10 min 40% B
10.1 min 25% B
12 min 25% B
Temperature:
70°C
Sample:
Monoclonal IgG1



Courtesy of:
Novartis Pharma,
Biotechnology, Basel
Dr. Kurt Forrer
Patrik Roethlisberger

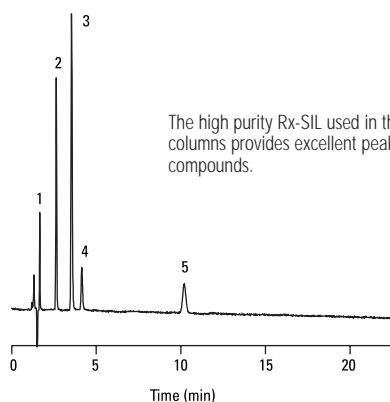
LC and LC/MS Applications

BioPharmaceutical

Excellent Peak Shape

Column: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm

Mobile: 85% 0.1% TFA
Phase: 15% ACN
Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: 210 nm
Sample: 5 µL



The high purity Rx-SIL used in the manufacturing of all StableBond columns provides excellent peak shape of basic and acidic compounds.

Use ZORBAX Extend-C18 for Alternate Selectivity at High pH

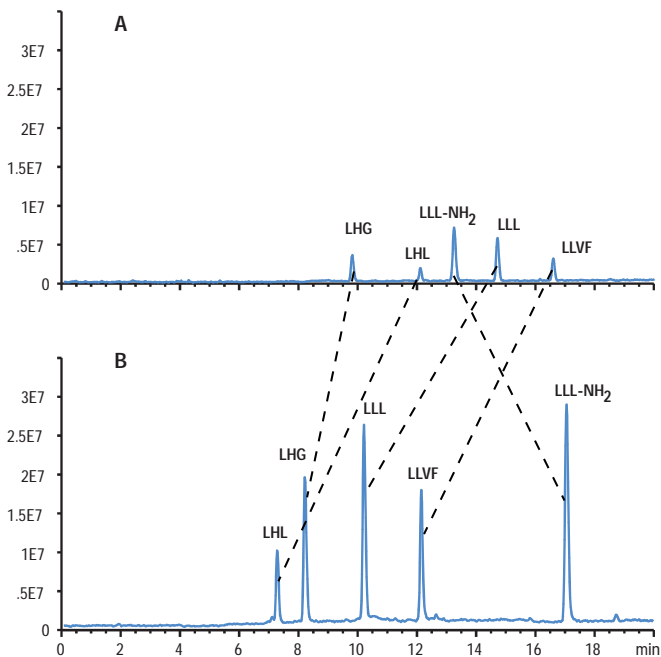
Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5µm

Mobile: A-0.1% TFA in Water
Phase: B-0.085% TFA in 80% ACN

A-20 mM NH₄OH in Water
B-20 mM NH₄OH in 80% ACN

Flow Rate: 0.25 mL/min
Gradient: 5-60% B in 20 min
Temperature: 25°C
MS: Pos. Ion ESI-Vf 70V, Vcap 4.5 kV
Conditions: N2-35 psi, 12L/min, 300°C
4 µL (50 ng each peptide)

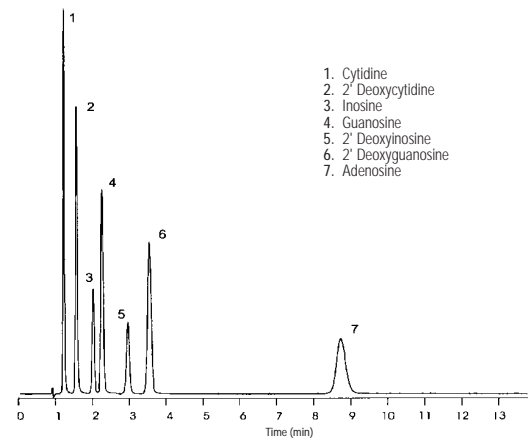
The Extend column can be used for high pH separations of peptides. At high and low pH, very different selectivity can result. Just by changing pH, a complimentary method can be developed and it is possible to determine if all peaks are resolved. The Extend column can be used at high and low pH, so the complimentary separation can be investigated with one column. Better MS sensitivity for this sample is also achieved at high pH.



Nucleosides: Separation of Deoxy and Ribonucleosides

Column: ZORBAX 300SB-C3
883975-909
4.6 x 150mm, 5µm

Mobile: 4mM Ammonium Phosphate (pH 4.0 with Phosphoric Acid)
Phase: Acid
Flow Rate: 2.0 mL/min
Temperature: 35°C
Detector: UV 254 nm
Sample: 2 µL (1.6 µg each)



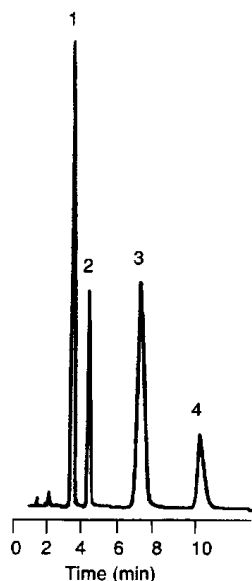
1. Cytidine
2. 2'-Deoxycytidine
3. Inosine
4. Guanosine
5. 2'-Deoxyinosine
6. 2'-Deoxyguanosine
7. Adenosine

Nucleotides: Separation of Mononucleotides

Column: ZORBAX SAX
880952-703
4.6 x 250mm, 5µm

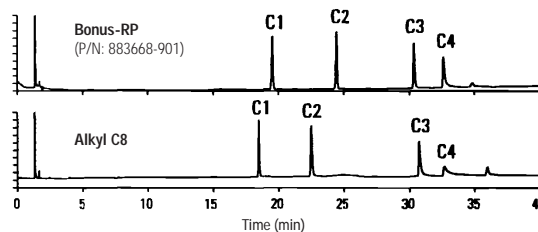
Mobile: 0.1 M NH₄H₂PO₄
Phase:
Flow Rate: 2.0 mL/min
Temperature: Ambient
Detector: UV 254 nm
Sample: Orotic Acid, UMP, GMP, XMP

1. Orotic Acid
2. UMP
3. GMP
4. XMP



Separation of Basic Peptides on Bonus-RP versus Traditional Alkyl Phase

Column: ZORBAX Bonus-RP
883668-901
4.6 x 150mm, 5µm



Mobile: A: 0.010 M ammonium phosphate, pH 7 / 0.050 M sodium perchlorate
Phase: B: 0.010 M ammonium phosphate / 0.050 M sodium perchlorate in 50% ACN
Flow Rate: 1.0 mL/min
Gradient: 0-100% B in 50 min.
Temperature: 40°C
Detector: 215 nm
Sample: Basic 11-residue peptides with net +1, +2, +3, +4 positive charges at neutral pH

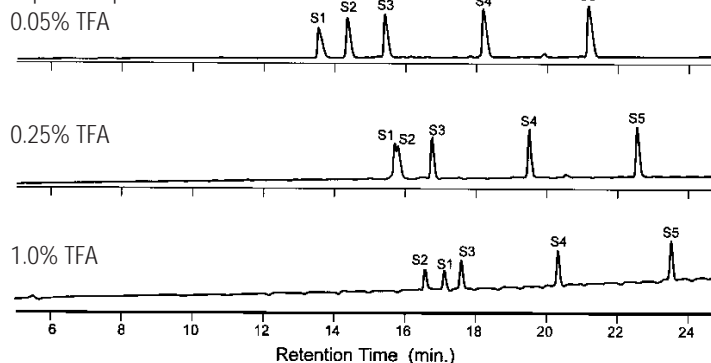
C1: Ac-Gly-Gly-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide
C2: Ac-Lys-Iyr-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide
C3: Ac-Gly-Gly-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide
C4: Ac-Lys-Iyr-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide

Peptides: Effect of TFA Concentration

Column: ZORBAX 300SB-C8
883995-906
4.6 x 150mm, 5µm

Mobile: A = Water and TFA
Phase: B = ACN and TFA
Flow Rate: 1.0 mL/min
Gradient: 0 min 0% B
30 min 30% B
Temperature: 40°C
Detector: UV 254 nm
Sample: Peptide Standards S1-S5, decapeptides differing slightly in hydrophobicity, 6 µL

Peptide Sequence



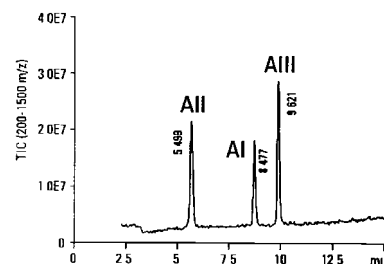
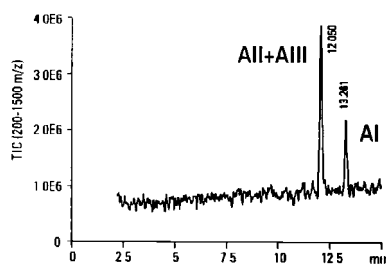
Peptides: Separation of Antiotensins I, II, III with TFA and NH₄OH

Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5µm

Mobile: As Shown
Phase:
Flow Rate: 0.2 mL/min
Gradient: 15-50% B in 15 min
Temperature: 35°C
MS: Pos. Ion ESI - Vt 70V, Vcap 4.5 kV
Conditions: N₂-35 psi, 12 L/min, 325°C
Sample: 2.5 µL sample (50 pmol each)

Acidic Conditions
A - 0.1% TFA in water
B - 0.085% TFA in 80% ACN

Basic Conditions
A - 10 mM NH₄OH in water
B - 10 mM NH₄OH in 80% ACN



LC and LC/MS Applications

BioPharmaceutical

Peptides: Comparison of Mass Spectra of Angiotensin I with TFA and NH₄OH Mobile

Column: ZORBAX Extend-C18
773700-902

2.1 x 150mm, 5µm

Mobile: As indicated

Phase:

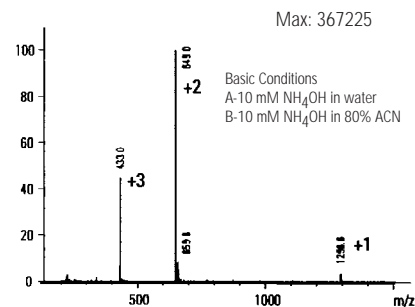
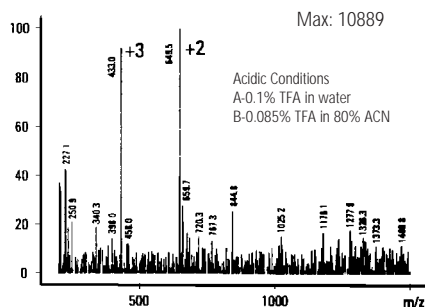
Flow Rate: 0.2 mL/min

Temperature: 35°C: 15-50% B in 15 min

MS: Pos. Ion ESI-Vf 70V, Vcap 4.5 kV, N₂-35 psi, 12 L/min,

Conditions: 325°C

Sample: 2.5 µL Angiotensin I (50 pmol)



Peptides/Proteins: Equivalent Gradient Separations

Column: ZORBAX 300SB-C8
883995-906

4.6 x 150mm, 5µm

Column: ZORBAX 300SB-C8
883750-906

2.1 x 150mm, 5µm

Mobile: A = 95% Water: 5% ACN with 0.1% TFA

Phase: B = 5% Water: 95% ACN with 0.085% TFA

Flow Rate: a: Analytical

1 mL / min

b: Narrow Bore

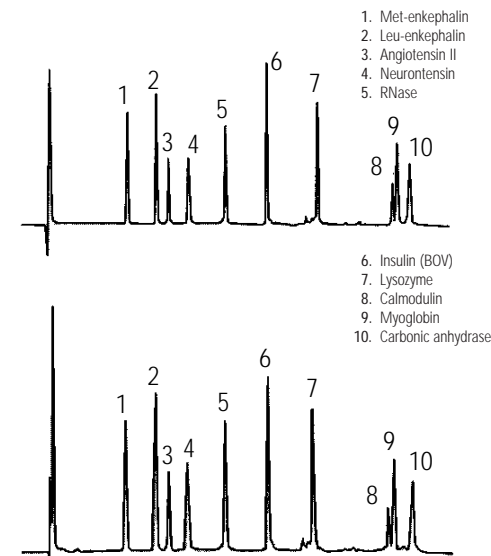
0.2 mL / min

Gradient: 10-60% B in 30 min.

Temperature: 35°C

Detector: UV 215 nm

Sample: 10 µL injection, Concentration 2-6 µg



Reducing Capillary ID to Improve Sensitivity for Concentration-Limited Samples

Column: ZORBAX SB-C18
5064-8255

0.3 x 150mm, 5µm

Column: ZORBAX SB-C18
5064-8256

0.5 x 150mm, 5µm

Mobile: 60% ACN/40% H₂O

Phase:

Flow Rate: 0.3 mm ID - 4 µL/min.

0.5 mm ID - 10 µL/min.

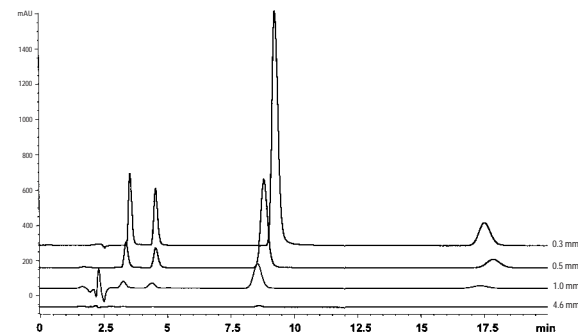
1.0 mm ID - 50 µL/min.

4.6 mm ID - 1.0 mL/min.

Temperature: Ambient

Detector: 254 nm

Sample: 200 ng Biphenyl (100 nL)



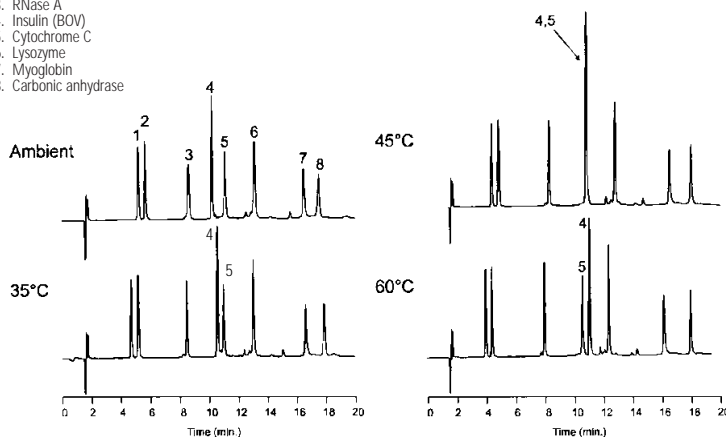
Peptides/Proteins: Effect of Elevated Temperature

Column: ZORBAX 300SB-C3
883995-909

4.6 x 150mm, 5µm

Mobile: A = 5:95 ACN:Water with 0.10% TFA (v/v%)
Phase: B = 95:5 ACN:Water with 0.085% TFA (v/v%)
Flow Rate: 1.0 mL/min
Gradient: 15-53% in 20 min., posttime 12 min.
Temperature: Ambient - 60°C
Detector: UV 215 nm
Sample: Polypeptides

1. Leucine Enkephalin
2. Angiotensin II
3. RNase A
4. Insulin (BOV)
5. Cytochrome C
6. Lysozyme
7. Myoglobin
8. Carbonic anhydrase

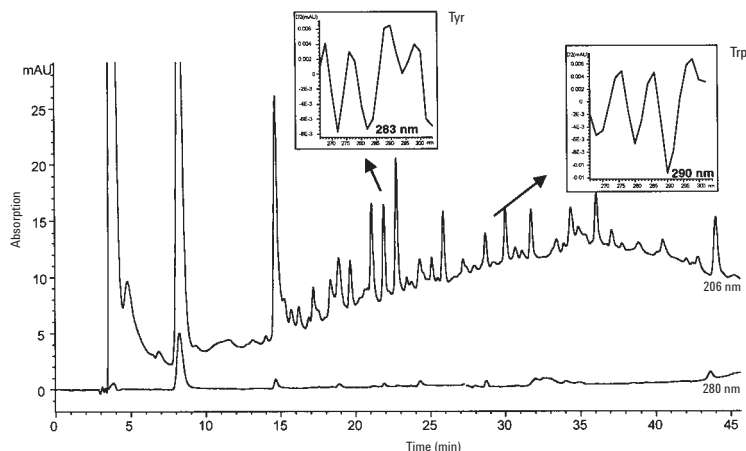


Capillary LC Analysis of a Tryptic Digest- DAD 2nd Derivative Spectra for ID

Column: ZORBAX 300SB-C18
5064-8265

0.3 x 250mm, 5µm

Mobile: A - 0.05% TFA in Water
Phase: B - 0.045% TFA in Acetonitrile
Flow Rate: 4 µL/min
Gradient: 5-60% B in 45 min
Sample: 20 fmol injected

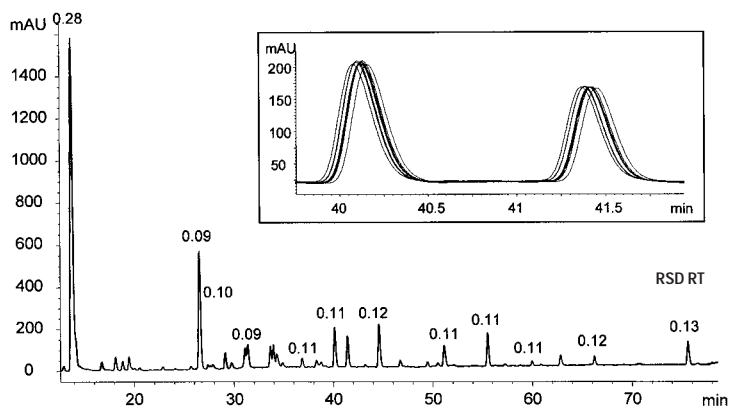


Peptide Map – Electronic Flow Control Reproducibility of 10 Injections on Capillary LC

Column: ZORBAX 300SB-C18
5064-8265

0.3 x 250mm, 5µm

Mobile: A - 0.05% TFA in Water
Phase: B - 0.045% TFA in Acetonitrile
Flow Rate: 5.5 µL/min.
Gradient: 0.5% B/min.
Temperature: 30°C
Detector: UV 206/10 nm, 450/80 nm
Sample: 1.3 µL (myoglobin tryptic digest, 7.5 pmol/µL)



LC and LC/MS Applications BioPharmaceutical

Capillary LC/ESI-MS Concentration Effects on Detection of a Protein Digest

Column A: ZORBAX 300SB-C18
881750-902
2.1 x 250mm, 5µm

Column B: ZORBAX 300SB-C18
861630-902
1.0 x 250mm, 5µm

Column C: ZORBAX 300SB-C18
5064-8265
0.3 x 250mm, 5µm

Mobile Phase:
A- 0.1% TFA in water
B- 0.1% TFA in ACN

Flow Rate: 0-60% B/60 min.

Gradient:

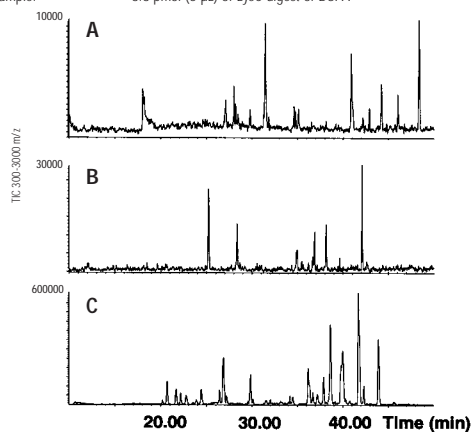
Temperature:

Detector:

MS Conditions: TIC 300-3000 m/z

Publication:

Sample: 6.6 pmol (5 µL) of LysC digest of DSPA



Separation of Polypeptides in Under 1 minute

Column: ZORBAX Poroshell 300SB-C18
660750-902

2.1 x 75mm, 5µm

Mobile: A=0.1% TFA, H₂O

Phase: B=0.07% TFA, ACN

Flow Rate: 3 mL/min.

Gradient: 0-100%B in 1.33 min

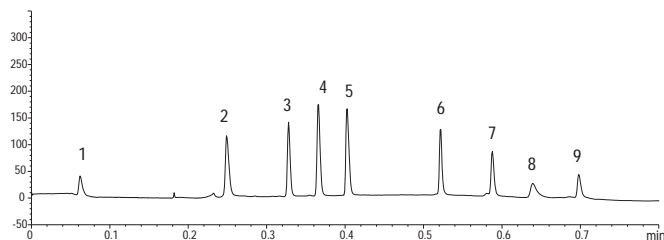
Temperature: 70°C

Detector: DAD 215/16 nm, ref = 310/10 nm

Sample: peptides/proteins, 0.5 µL

Sample (peptides/proteins)

1. gly-tyr	0.125 mg/ml
2. Val-tyr-val	0.5 mg/ml
3. Met-enkephalin	0.5 mg/ml
4. Leu-enkephalin	0.5 mg/ml
5. Angiotensin II	0.5 mg/ml
6. RNase A	1 mg/ml
7. Cytochrome C	1 mg/ml
8. Holotransferrin	1 mg/ml
9. Apomyoglobin	1 mg/ml



Fast, High-Resolution Separation of Peptides and Proteins with Poroshell 300SB-C18

Column: ZORBAX Poroshell 300SB-C18
660750-902

2.1 x 75mm, 5µm

Mobile: A- 0.1% TFA

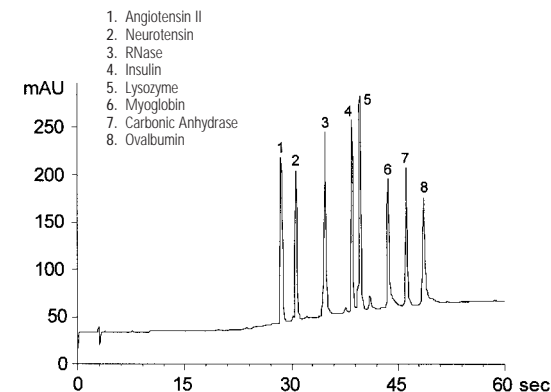
Phase: B- 0.07% TFA in ACN

Flow Rate: 3.0 mL/min (360 bar pressure)

Gradient: 5-100% B in 1.0 min.

Temperature: 70°C

Detector: UV 215 nm



Peptide RP-HPLC/ESI-MS Using NH₄OH Mobile Phase Yields Both Positive and Negative Ion Spectra

Column: ZORBAX Extend-C18
773700-902

2.1 x 150mm, 5µm

Flow Rate: 0.25 mL/min.

Gradient: 5-60% B in 20 min.

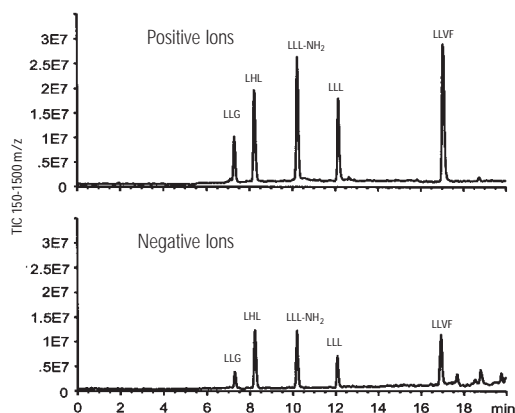
Temperature: 25°C

MS: Pos. Ion ESI- VF 70V, Vcap 4.5 kV,

Conditions: N2- 35 psi, 12 L/min., 300°C

TIC: 150-1500 m/z

Sample: 4 µL (50 ng each peptide)

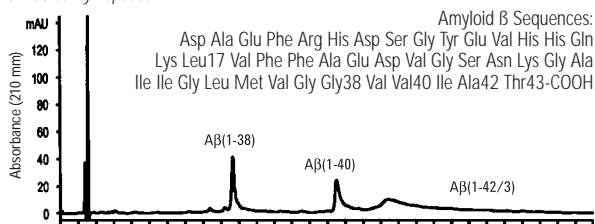


Comparison of A β Peptide RP-HPLC Separations at Low and High pH

Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5 μ m

Mobile: A- 0.1% TFA in water
Phase: B- 0.085% TFA in
80% AcN
Flow Rate: 0.25 mL/min.
Gradient: 33-45% B in 30 min.
Temperature: 25°C
Detector: UV 210 nm
Sample: 5 μ L sample (100 pmol each)

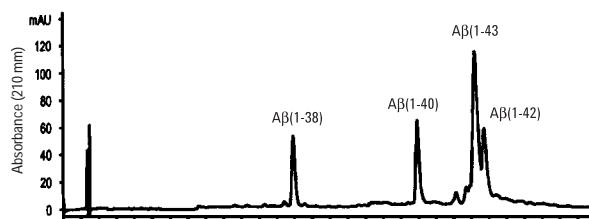
High pH Can be Used for Separating Hydrophobic or Other Low-Solubility Peptides



Comparison of A β Peptide RP-HPLC Separations at Low and High pH 2

Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5 μ m

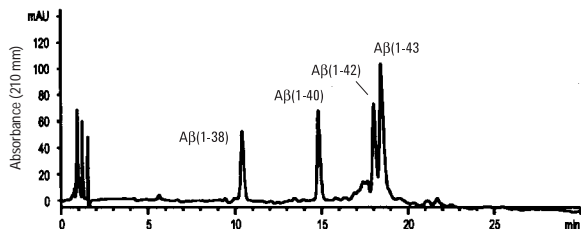
Mobile: A- 0.1% TFA in water
Phase: B- 0.085% TFA in
80% AcN
Flow Rate: 0.25 mL/min.
Gradient: 29-41% B in 30 min.
Temperature: 80°C
Detector: UV 210 nm
Sample: 5 μ L sample (100 pmol each)



Comparison of A β Peptide RP-HPLC Separations at Low and High pH 3

Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5 μ m

Mobile: A- 20 mM NH₄OH in
Phase: water
B- 20 mM NH₄OH in
80% AcN
Flow Rate: 0.25 mL/min.
Gradient: 26-38% B in 30 min.
Temperature: 25°C
Detector: UV 210 nm
Sample: 5 μ L sample (100 pmol each)

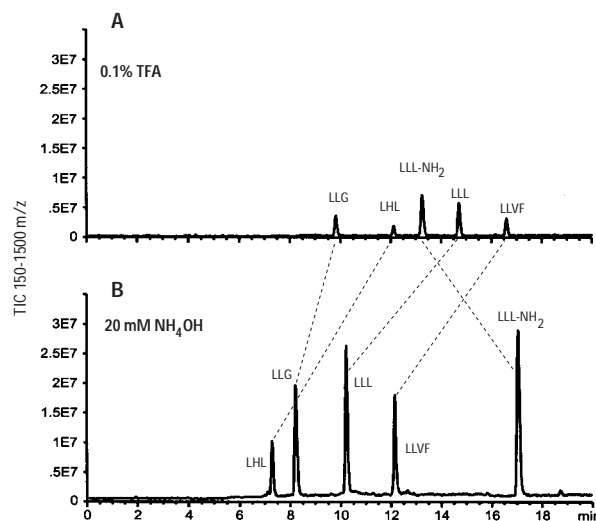


Selectivity Comparison of TFA and NH₄OH for Peptide RP-HPLC/ESI-MS Analysis

Column: ZORBAX Extend-C18
773700-902
2.1 x 150mm, 5 μ m

Mobile: TFA Conditions:
Phase: A- 0.1% TFA in water
B- 0.085% TFA in 80% AcN
NH₄OH Conditions:
A- 20 mM NH₄OH in water
B- 20 mM NH₄OH in 80% AcN

Flow Rate: 0.25 mL/min.
Gradient: 5-60% B in 20 min.
Temperature: 25°C
MS: Pos. Ion ESI- Vf 70V, Vcap 4.5 kV,
Conditions: N2- 35 psi, 12 L/min., 300°C
TIC 150-1500 m/z
Sample: 4 μ L (50 ng each peptide)



LC and LC/MS Applications BioPharmaceutical

Peptide Phosphorylation Sites LC and LC/MS using Capillary LC Columns

Column: **ZORBAX 300SB-C18**
5064-8268

0.5 x 150mm, 3.5µm

Mobile Phase: A: 0.1% formic acid in water

B: 0.1% formic acid in ACN

Flow Rate: 5.5 µL/min

Gradient: 5-55%B in 50 min, to

85% B from 55-57 min

Detector: UV 206 nm

MS Conditions: LC/MS: Pos. Ion ESI with LC/MSD trap

Vcap: 4000 V

Drying gas flow: 7L/min

Drying gas temperature: 250°C

Nebulizer: 15 psi

Capillary Exit Volt: 50 V Max

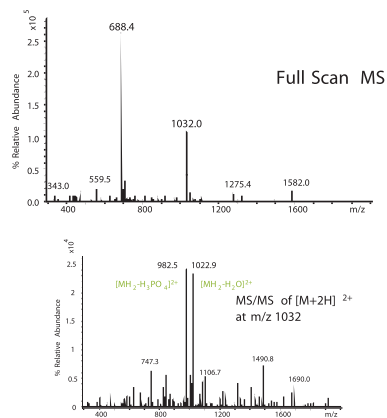
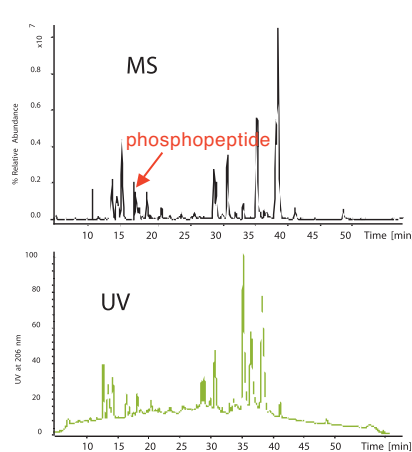
Accum Time: 300 ms

Total Averages: 3

Isolation Width: 3 m/z

Frag Amplitude: 1.0 V

Sample: Beta casein digest, 100 nL (4 pmol)



Proteins: Effect of Bonded Phase, RP

Column A: **ZORBAX 300SB-C8**
883995-906

Column B: **ZORBAX 300SB-CN**
883995-905

4.6 x 150mm, 5µm

Mobile Phase: A = 0.1% TFA in Water,

B = 0.1% TFA in 50/50 ACN/Water

Flow Rate: 1.0 mL/min

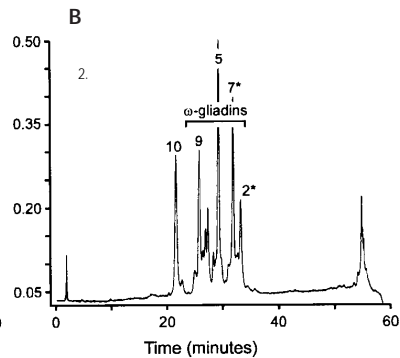
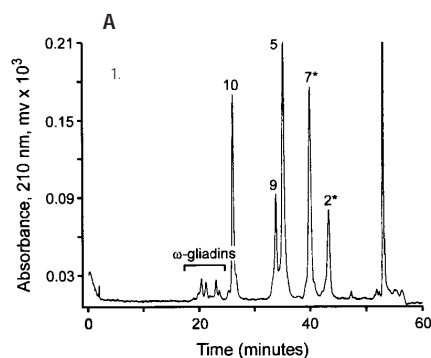
Gradient: 1. 46-96% B in 60 min. 23-48% ACN

2. 50-86%B in 60 min. 25-43% ACN

Temperature: 50°C

Detector: UV 210 nm

Sample: Wheat Proteins, including w-gliadins



LC and LC/MS

Proteins - Semi Preparative Separation on ZORBAX 300SB-C8

Column: **ZORBAX 300SB-C8**
880995-206

9.4 x 250mm, 5µm

Mobile Phase: A: Water + 0.2% TFA

B: Acetonitrile + 0.15% TFA

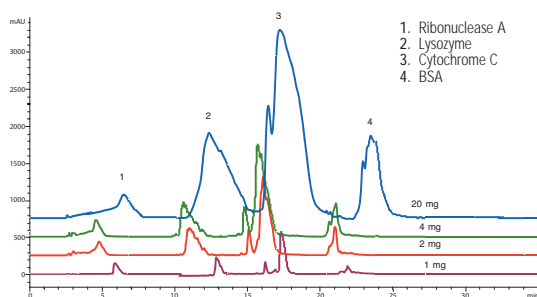
Flow Rate: 4.2 mL/min

Gradient: 26-50% B in 30 minutes

Temperature: 40°C

Detector: UV 280 nm

Sample: Protein mixture, 100 or 500 µL



1. Ribonuclease A
2. Lysozyme
3. Cytochrome C
4. BSA

Proteins: Effect of Flow Rate

Column: **ZORBAX GF-250**
884973-901

9.4 x 250mm, 4µm

Mobile Phase: 200 mM Sodium Phosphate, pH 7.0

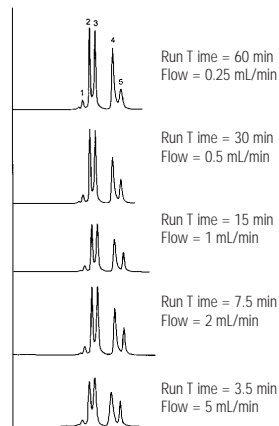
Flow Rate: As indicated

Temperature: Ambient

Detector: UV 225 nm

Sample: 1 mg/mL each protein, 0.1 mg/mL azide, 10 µL

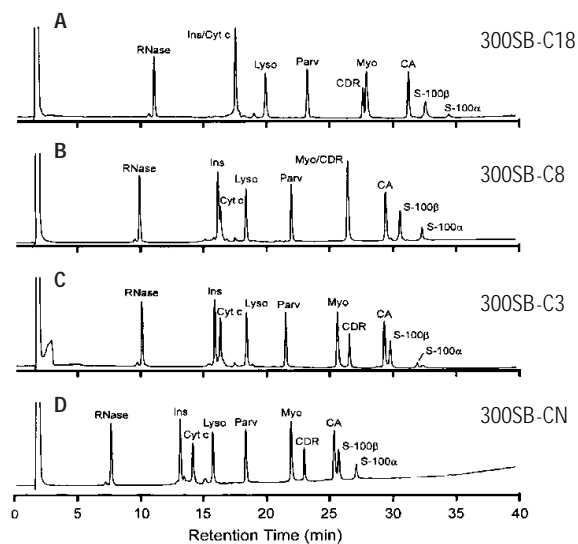
1. BSA - dimer
2. BSA
3. Ovalbumin
4. Lysozyme
5. Sodium Azide



LC and LC/MS Applications BioPharmaceutical

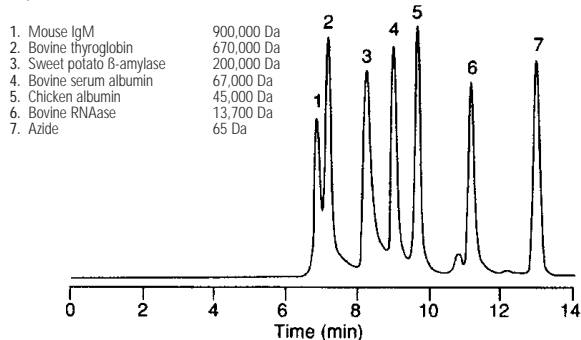
Proteins: Effect of Bonded Phase

Column A: ZORBAX 300SB-C18
883995-902
4.6 x 150mm, 5µm
Column B: ZORBAX 300SB-C8
883995-906
4.6 x 150mm, 5µm
Column C: ZORBAX 300SB-C3
883995-909
4.6 x 150mm, 5µm
Column D: ZORBAX 300SB-CN
883995-905
4.6 x 150mm, 5µm
Mobile Phase: A = 0.1% TFA in H₂O, B = 0.09% TFA in 80%
ACN/20% Water
Flow Rate: 1.0 mL/min
Gradient: 25-70% B in 40 min
Temperature: 60°C
Detector: UV 210 nm
Sample: Polypeptides, 3 µg each



Proteins: Separation by SEC

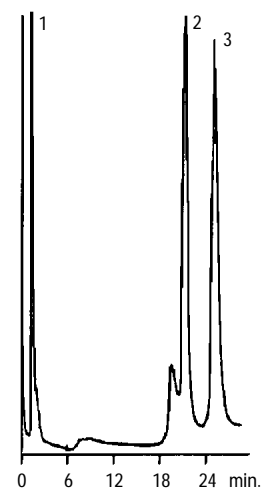
Column: ZORBAX GF-250
884973-901
9.4 x 250mm, 4µm
Mobile: 130 mM NaCl, 20 mM KCl, 50 mM sodium phosphate,
pH 7.0
Phase: pH 7.0
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 210 nm
Sample: Proteins



Proteins: Separation using SynChropak CM 300 Column Mixture

Column: SynChropak WCX
79919CM-754
4.6 x 100mm, 6.5µm
Mobile: A = 0.01 M sodium phosphate, pH 6.0
Phase: B = 0.01 M sodium phosphate in 0.5 M NaCl, pH 6.0
Flow Rate: 1.0 mL/min
Gradient: 0 to 100% B in 30 min
Temperature: Ambient
Detector: UV 254 nm
Sample: Protein

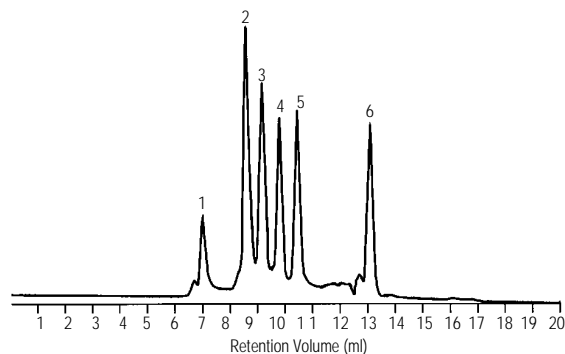
1. BSA
2. Cytochrome C
3. Lysozyme



Proteins: Calibration Standard Mix of Proteins GF-250

Column: ZORBAX GF-250
884973-901
9.4 x 250mm, 4µm
Mobile: 0.2M sodium phosphate, pH 6.8
Phase: pH 6.8
Flow Rate: 1.0 mL/min
Temperature: Ambient (21°C)
Detector: UV 230 nm
Sample: Lyophilized proteins

- | | |
|--------------------------------|-----------|
| 1. Thyroglobin | 6.69 kDa |
| 2. Alcohol Dehydrogenase (ADH) | 150 kDa |
| 3. BSA | 67 kDa |
| 4. Ovalbumin | 43 kDa |
| 5. Myoglobin | 17.8 kDa |
| 6. Azide | 0.045 kDa |



LC and LC/MS Applications

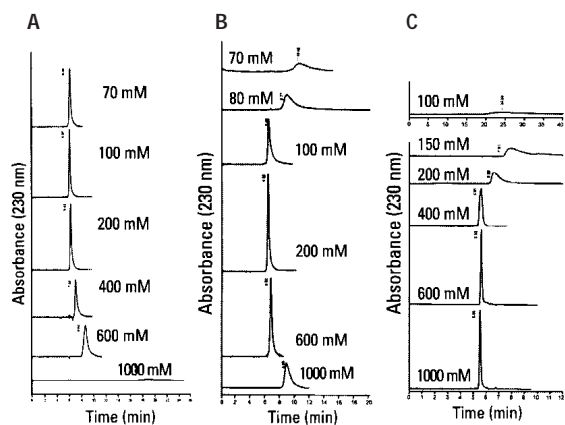
BioPharmaceutical

Proteins: SEC Characteristic Elution Profiles of Basic and Hydrophobic Proteins

Column: ZORBAX GF-250
884973-901

9.4 x 250mm, 4µm

Mobile: Sodium Phosphate, pH 7.0 concentration as indicated
Phase:
Flow Rate: 2 mL/min
Temperature: Ambient
Detector: UV 230 nm
Sample: a: Hydrophobic Protein (Bovine Insulin)
b: Basic & Hydrophobic Protein (Lysozyme)
c: Basic Protein (Cytochrome C)



Deoxynucleosides: Using Rapid Resolution 3.5 µm Columns

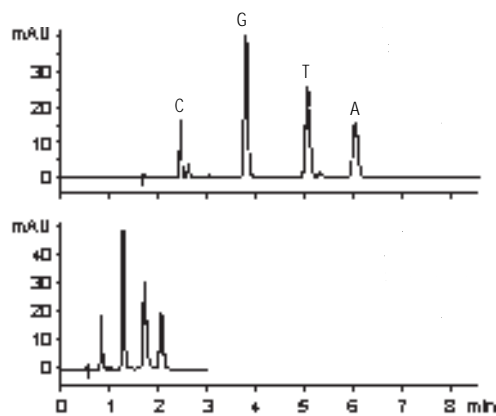
Column: ZORBAX SB-CN
883975-905

4.6 x 150mm, 5µm

Column: ZORBAX SB-CN
835975-905

4.6 x 50mm, 3.5µm

Mobile: A: 0.1% TFA
Phase: B: 90/10 v/v Methanol/Water (0.1% TFA)
Isocratic: 97.5% A, 2.5% B
Flow Rate: 1.0 mL/min.
Temperature: 30°C
Detector: UV 254 nm

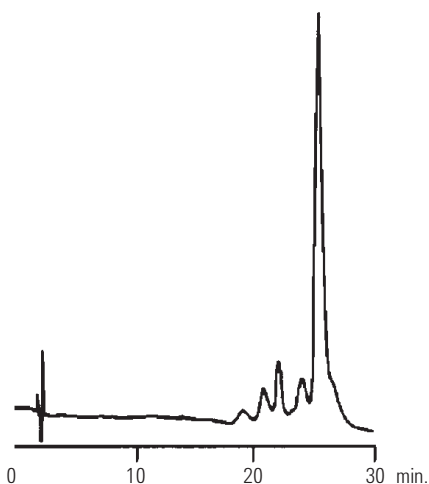


Proteins: Ion Exchange Separation of Commercial Ovalbumin

Column: Synchropak WAX
79919DE-754

4.6 x 100mm, 6.5µm

Mobile: A = 0.02 M tris, pH 7.0
Phase: B = 0.02 M tris in 1.0 M sodium acetate, pH 7.0
Flow Rate: 1.0 mL/min
Gradient: 0 to 100% B in 30 min
Detector: UV 254 nm
Sample: Ovalbumin

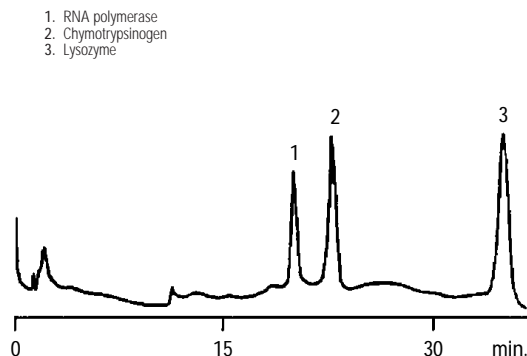


Proteins: Basic Proteins Separated using Ion Exchange

Column: Synchropak SCX
79919SP-754

4.6 x 100mm, 6.5µm

Mobile: A = 0.02 M tris, pH 7.0
Phase: B = 0.02 M tris in 0.5 M sodium acetate, pH 7.0
Flow Rate: 1.0 mL/min
Gradient: 0 to 100% B in 30 min
Detector: UV 254 nm
Sample: Basic Proteins



1. RNA polymerase
2. Chymotrypsinogen
3. Lysozyme

LC and LC/MS Applications

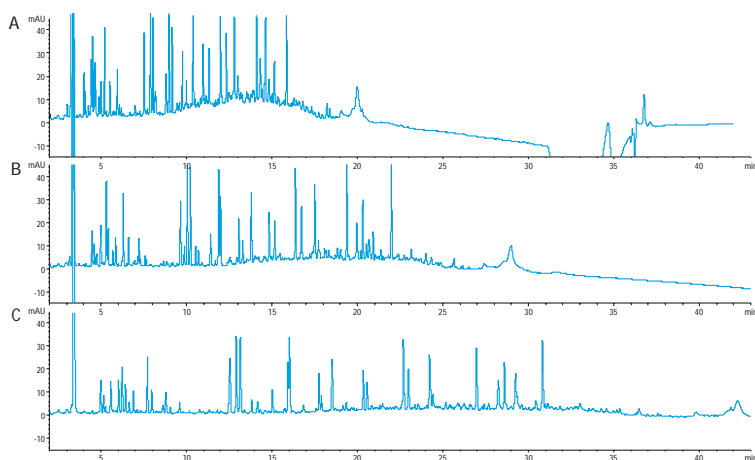
BioPharmaceutical

BSA Tryptic Digest on RRHT

Column: ZORBAX SB-C18
820700-902
2.1 x 150mm, 1.8 μ m

Mobile: A: 0.1% TFA, 5% ACN
Phase: B: 0.08% TFA, 95% ACN
Flow Rate: 0.5 mL/min
Gradient: A: Time 0 %B 5, Time 30 %B 60
B: Time 0 %B 5, Time 45 %B 60
C: Time 0 %B 5, Time 67.5 %B 60

Temperature: 80°C
Detector: UV 214 nm
Sample: BSA Tryptic Digest



LC and LC/MS Applications

Chemical/Industrial

Chemical/Industrial

Alkyd Resin: Gel Permeation Chromatography using PLgel Columns

Column: 3 PLgel columns in series

79911GP-501

7.5 x 300mm, 5µm

79911GP-502

7.5 x 300mm, 5µm

79911GP-504

7.5 x 300mm, 5µm

Mobile: Tetrahydrofuran (THF)

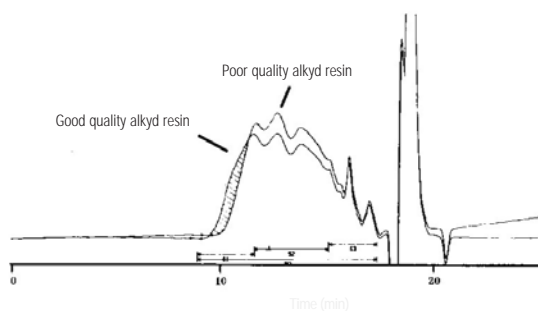
Phase:

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: RI

Sample: Alkyd Resins



Chelating Agents using Purospher

Column: Purospher RP-18

79925PU-564

4.0 x 125mm, 5µm

Mobile: 30/70 Acetonitrile/Water

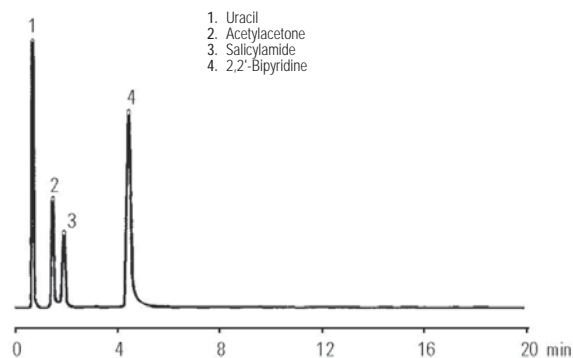
Phase:

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: Chelating Agents



Dextrans Characterization using GPC

Column: ZORBAX SIL PSM 60

880957-801

6.2 x 250mm, 5µm

Column: ZORBAX SIL PSM 300

880957-805

6.2 x 250mm, 5µm

Mobile: 100 mM Sodium Acetate (pH 6.0-6.5) with H₃PO₄

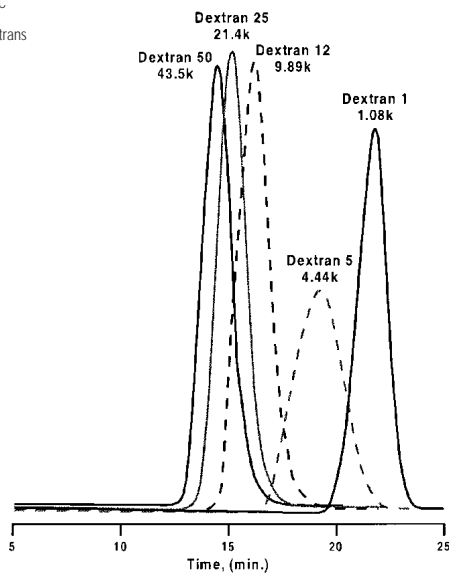
Phase:

Flow Rate: 0.5 mL/min

Temperature: 30°C

Detector: RI

Sample: Dextrans



Epoxy Resins: Detection Comparison

Column: PLgel mixed D

79911GP-MXD

7.5 x 300mm, 5µm

Mobile: Tetrahydrofuran (THF)

Phase:

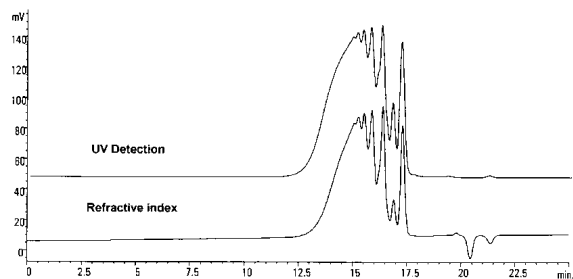
Flow Rate: 1.0 mL/min

Temperature: 20°C

Detector: DAD 254/100 nm, ref = 360/100 nm, & RI

Sample: Epoxy Resin Sample dissolved in 1 mL THF

Epoxy Resin	Mw data	Mn data	Polydispersity
Epikote 1001	3468	1101	3.149
Epikote 1004	5928	2042	2.901
Epikote 1007	10896	3851	2.829



LC and LC/MS Applications

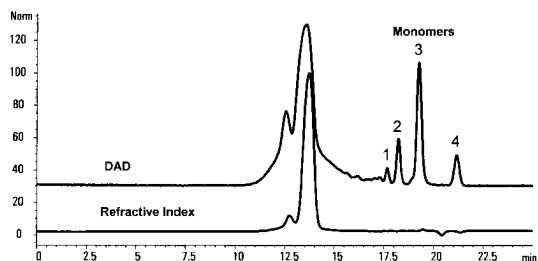
Chemical/Industrial

Polybutadiene: GPC using UV and Refractive Index

Column: PLgel mixed D
79911GP-MXD
7.5 x 300mm, 5µm

Mobile: Tetrahydrofuran (THF)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 20°C
Detector: DAD (254/100 vs. 360/100 reference) UV Detection
Mp = 10000
Mn = 10543
Mw = 12054
Polydispersity = 1.143
Mz = 14804
Mz+1 = 21860
Mv = 11780

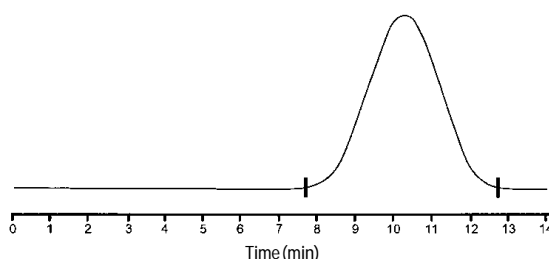
Sample: 33 mg Polybutadiene sample dissolved in 1 mL THF, 20 µL/injection



Polyethylene: Separation by GPC

Column: ZORBAX SIL PSM
880957-814
6.2 x 250mm, 5µm

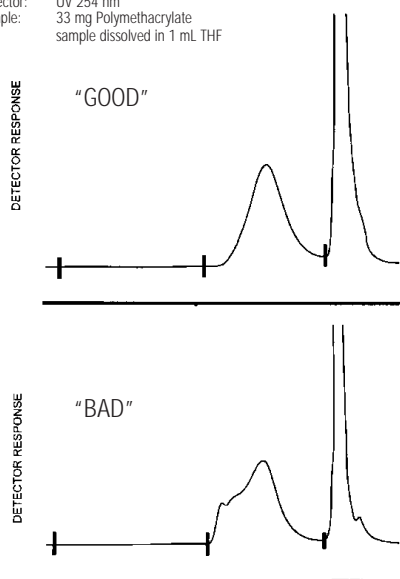
Mobile: o-Dichlorobenzene
Phase:
Flow Rate: 0.75 mL/min
Temperature: 140°C
Detector: Infrared (3.4 µm)
Sample: Commercial polyethylene



Polymethacrylate: GPC Separation

Column: ZORBAX SIL PSM
880957-814
6.2 x 250mm, 5µm

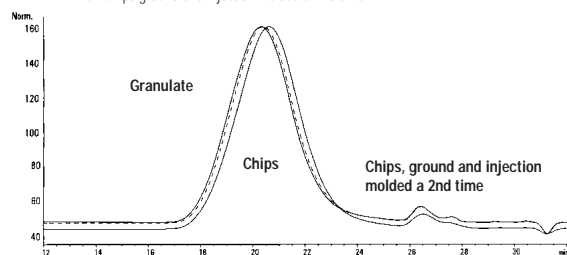
Mobile: Tetrahydrofuran (THF)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: UV 254 nm
Sample: 33 mg Polymethacrylate sample dissolved in 1 mL THF



Polystyrenes, Differently Processed: GPC Analysis

Column: PLgel mixed B
79911GP-MXB
7.5 x 300mm, 10µm

Mobile: Tetrahydrofuran (THF)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 20°C
Detector: RI
Sample: Polystyrenes dissolved in 1 mL THF, 10 µL /injection
A: Granulate
B: Chips
C: Chips ground and injection molded a 2nd time



MWdata	Granulate	Chips	Chips, ground and injection molded a 2nd time
Mp	109776	87563	103049
Mn	59152	49062	55036
Mw	159590	133565	149385
Polydispersity	2.698	2.722	2.714
Mz	327846	297500	311084
Mz+1	545718	539583	533941
Mv	141380	117205	132243

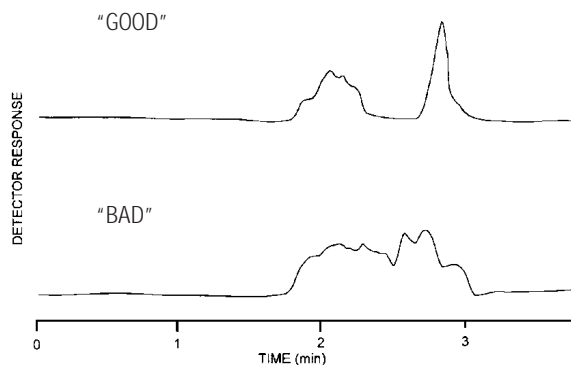
LC and LC/MS Applications

Chemical/Industrial

Polyurethane Resins

Column: ZORBAX SIL PSM 60S
880957-802
6.2 x 250mm, 5 μ m

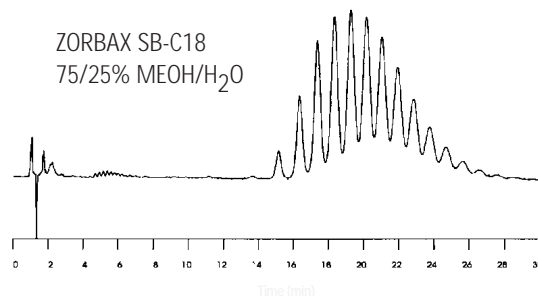
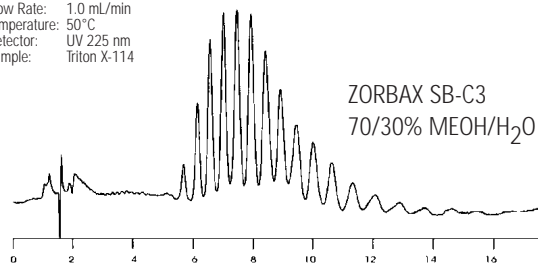
Mobile: Dimethyl Formamide
Phase:
Flow Rate: 1.9 mL/min
Temperature: Ambient
Detector: RI
Sample: Polyurethane Resins



Triton X-114: Decreasing Run-time by Changing Bonded Phase

Column: ZORBAX SB-C3
883975-909
4.6 x 150mm, 5 μ m
Column: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5 μ m

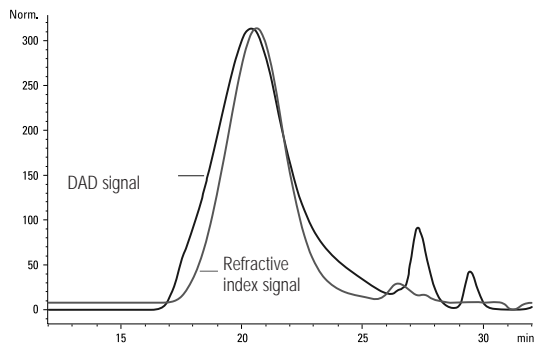
Mobile: MeOH and H₂O (as indicated)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 50°C
Detector: UV 225 nm
Sample: Triton X-114



PMMA Polymer with MW = 316000

Column: PLgel mixed C
79911GP-MXC
7.5 x 300mm, 5 μ m

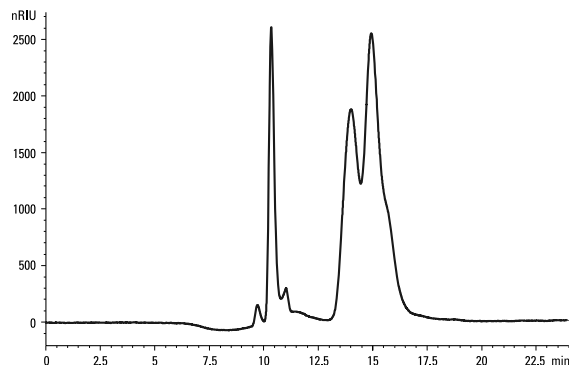
Mobile: Tetrahydrofuran (THF)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 20°C
Detector: RI and DAD
Sample: 26 mg dissolved in 1 mL THF, 10 μ L
Calibrant: Polystyrene EasyCal Vial standard (5064-8281)



Polyethoxylates

Column: PL aquagel-OH in series
79911GF-MXA
7.5 x 300mm, 8 μ m
Column: PL aquagel-OH
79911GF-083
7.5 x 300mm, 8 μ m

Mobile: Water
Phase:
Flow Rate: 1.0 mL/min
Temperature: 25°C
Detector: RI
Sample: Polyethoxylates
Calibrant: Polyethylene Oxide EasyCal Vial standard (5064-8280)



LC and LC/MS Applications

Chemical/Industrial

Polyvinyl Alcohol

Column: PL aquagel-OH
79911GF-083

7.5 x 300mm, 8 μ m

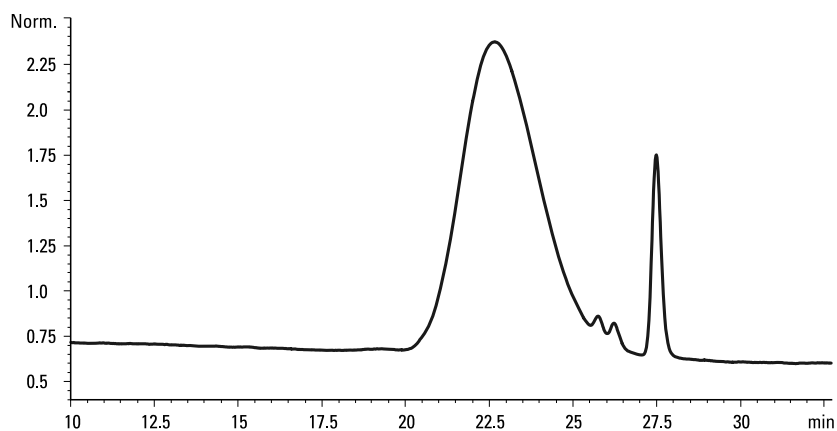
Mobile: 0.2 M NaNO₃, NaH₂PO₄, pH 7

Phase:

Flow Rate: 1.0 mL/min

Temperature: 25°C

Detector: RI



Organic Acids Separated on ZORBAX SB-Aq

Column: ZORBAX SB-Aq
883975-914

4.6 x 150mm, 5 μ m

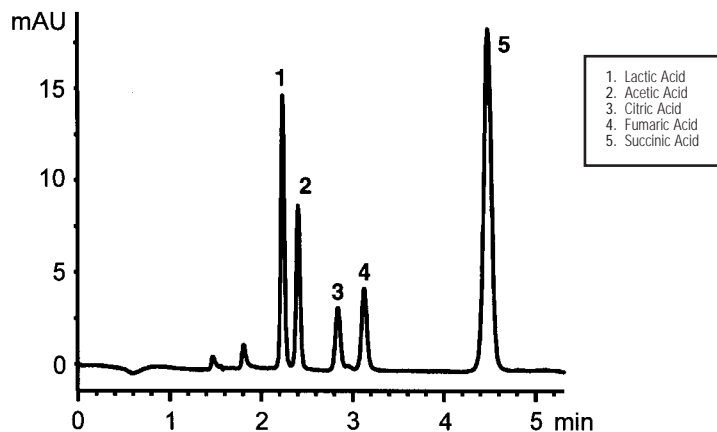
Mobile: 99% 20 mM NaH₂PO₄, pH2, 1% ACN

Phase:

Flow Rate: 1.0 mL/min

Temperature: 35°C

Detector: UV 210 nm



LC and LC/MS Applications Environmental

Environmental

DNPH-Derivatized Aldehydes Obtained from Air

Column: ZORBAX ODS
884950-543

4.6 x 250mm, 5µm

Mobile: A = 100% Water, B = 100% ACN

Phase:

Flow Rate: 1.0 mL/min

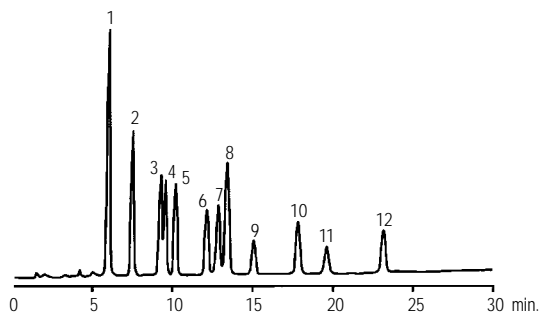
Gradient: 60-75%B in 30 min; Wash: From 75 -100%B in 5 min,
after 5 min return to 60% B

Temperature: 35°C

Detector: UV 230 nm

Sample: DNPH -Derivatized Aldehydes

1. Formaldehyde - DNPH
2. Acetaldehyde - DNPH
3. Acetone - DNPH
4. Acrolein - DNPH
5. Propionaldehyde - DNPH
6. Crotonaldehyde - DNPH
7. 2-Butanone (MEK) -DNPH
8. Methacrolein - DNPH n-Butylaldehyde - DNPH
9. Benzaldehyde - DNPH
10. Valeraldehyde - DNPH
11. m-tolualdehyde - DNPH
12. Hexaldehyde - DNPH



Amitrol in Water by LC/MS, 0.05 ppb

Column: ZORBAX SB-C18
863954-302

3.0 x 150mm, 3.5µm

Mobile: A: 10 mM ammonium acetate

Phase: B: MeOH

Flow Rate: 0.4 mL/min

Gradient: 0 min, 65%B; 10 min, 65% B;

15 min, 100%B; 20 min, 65% B

Temperature: 30 °C

MS Ionization Mode: APCI, positive polarity

Conditions: SIM parameters: Ion: 213 Amitrol

Ion: 259 IS

Fragmentor: 100V

SIM Resolution: Low

Vaporizer: 325°C

Drying Gas (N2): 5.0 L/min

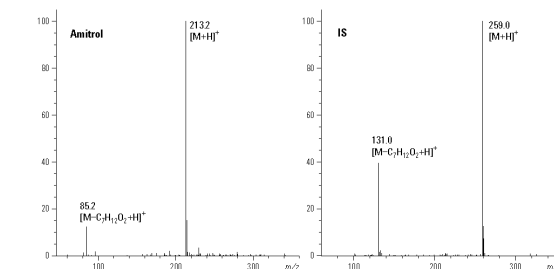
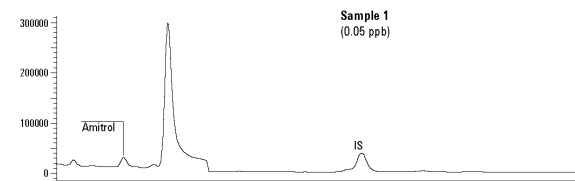
Gas Temperature: 350°C

Nebulizer pressure: 60 psig

Vcap: 4000V

Corona: 4.0 uA

Sample: Amitrol in water, 100 µL



Amines, Substituted

Column: ZORBAX SB-C18
880975-302

3.0 x 250mm, 5µm

Mobile: A = 2.0 mM Potassium Acetate, pH 6.5, B = ACN

Phase:

Flow Rate: 0.35 mL/min

Gradient: 0 min 10% B

2 min 10% B

70 min 45% B

85 min 45% B

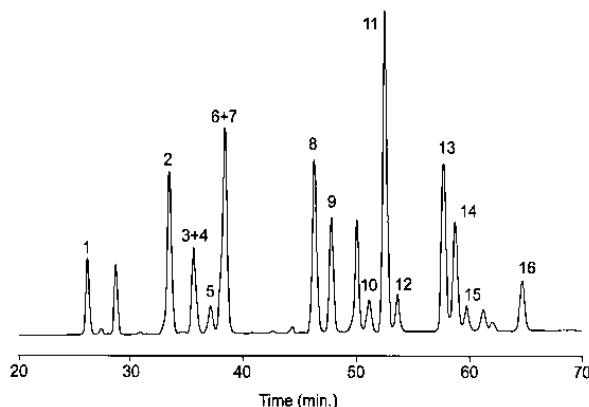
86 min 90% B

93 min 95% B

Temperature: Ambient

Detector: UV 254 nm, ref 460 nm

Sample: Anilines



1. 3-Cl-4-methoxyaniline
2. 4-Chloroaniline
3. 3-Chloroaniline
4. 2-Chloroaniline
5. 2,6-Dimethylaniline
6. 3-Cl-4-Fluoroaniline
7. 4-Bromoaniline
8. 2-Cl-2-methylaniline
9. 3-Cl-4-methylaniline
10. 2-Ethyl-6-methylaniline
11. 3,4-Dichloroaniline
12. 4-Isopropylaniline
13. 2,4-Dichloroaniline
14. 2,5-Dichloroaniline
15. 2,6-Dichloroaniline
16. 2,6-Diethylaniline

Anilines, Substituted: pH Effects

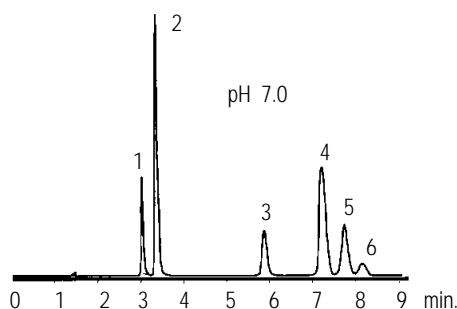
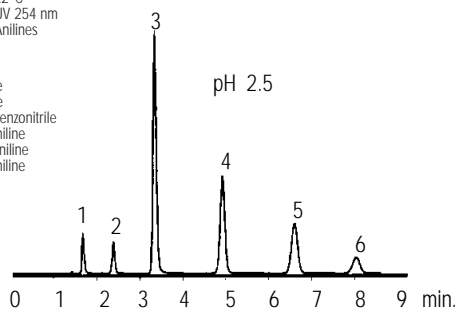
Column: ZORBAX SB-C18
883975-902

4.6 x 150mm, 5µm

Mobile: 42% methanol/58% 25 mM phosphate buffer

Phase:
Flow Rate: 1.0 mL/min
Temperature: 22°C
Detector: UV 254 nm
Sample: Anilines

1. p-Anisidine
2. m-Toluidine
3. 3-Amino-benzonitrile
4. p-Chloroaniline
5. m-Chloroaniline
6. o-Chloroaniline



Anilines, Substituted: Rapid Separation

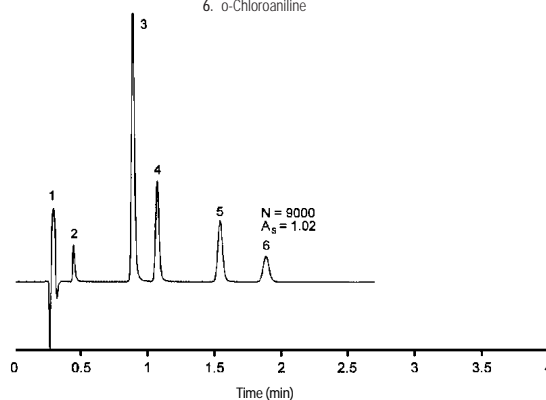
Column: ZORBAX Rx/SB-C8
866953-906

4.6 x 75mm, 3.5µm

Mobile: 20% ACN/80% 25 mM phosphate buffer, pH 2.5

Phase:
Flow Rate: 3.0 mL/min
Temperature: 60°C
Detector: UV 254 nm
Sample: Anilines

1. p-Anisidine
2. m-Toluidine
3. 3-Amino-benzonitrile
4. p-Chloroaniline
5. m-Chloroaniline
6. o-Chloroaniline



Anions With Agilent HPLC Column and Mobile Phase Additive (Indirect UV)

Column: Asahipak ODP-50
799230P-564

4.0 x 125mm, 5µm

Mobile: Water/acetonitrile, 86/14% + modifier (P/N: 5062-2480)

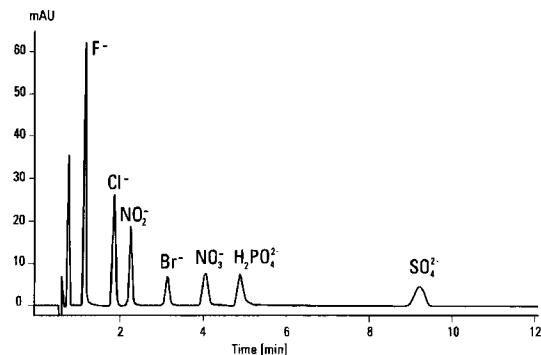
Phase: adjusted to pH 8.6 with carbonate free NaOH

Flow Rate: 1.5 mL/min

Temperature: 40°C

Detector: UV 266 nm

Sample: Anions



Carbazole and Various Metabolites Separated on a Wide-Pore Column

Column: ZORBAX 300SB-C18
883995-902

4.6 x 150mm, 5µm

Mobile: A = H₂O with 0.1% TFA to pH 3 with TEA

Phase: B = ACN with 0.085% TFA

Flow Rate: 1.5 mL/min

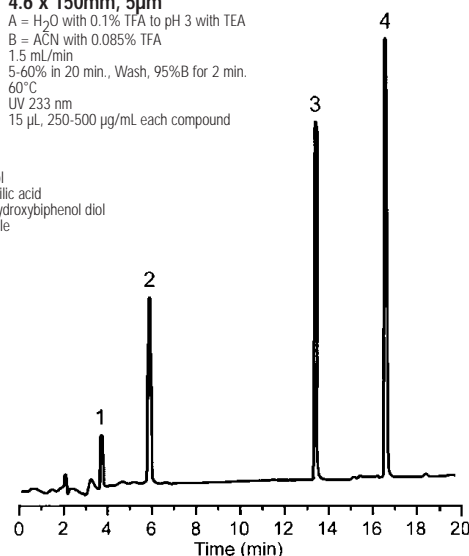
Gradient: 5-60% in 20 min., Wash, 95%B for 2 min.

Temperature: 60°C

Detector: UV 233 nm

Sample: 15 µL, 250-500 µg/mL each compound

1. Catechol
2. Anthranilic acid
3. 2,3-Dihydroxybiphenol diol
4. Carbazole



LC and LC/MS Applications Environmental

Explosives and Related Compounds: Qualitative and Quantitative Analysis

Column: ZORBAX SB-C18
883700-922

2.1 x 150mm, 5µm
Column: ZORBAX SB-CN

883700-905

2.1 x 150mm, 5µm

Mobile Phase: A = ACN + 5% H₂O + 5 mM CF₃COONH₄
B = H₂O + 5% ACN + 5 mM CF₃COONH₄, pH 2.7 (CF₃COOH)

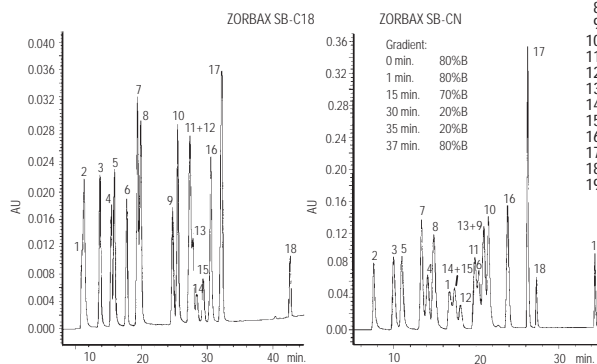
Flow Rate: 0.23 mL/min

Gradient: a: 0 min. 80%B
2 min. 80%B
10 min. 70%B
20 min. 65%B
25 min. 60%B
35 min. 30%B
40 min. 30%B
42 min. 80%B
b: 0 min. 80%B
1 min. 80%B
15 min. 70%B
30 min. 20%B
37 min. 20%B
80%B

Temperature: 18°C

Detector: UV 210, 240, 360 nm, wavelength switching for each compound

Sample: 10 µL of 19 explosive compounds in ACN/H₂O (20/80)



1. Picric acid
2. 4-Amino-2-nitrotoluene
3. 2-Amino-6-nitrotoluene
4. RDX
5. 2-Amino-4-nitrotoluene
6. HMX
7. 1,3-Dinitrobenzene
8. 1,3,5-Trinitrobenzene
9. 2-Amino-4,6-dinitrotoluene
10. 2,4-Dinitrotoluene
11. 4-Amino-4,6-dinitrotoluene
12. 2-Nitrotoluene
13. 2,6-Dinitrotoluene
14. 4-Nitrotoluene
15. 3-Nitrotoluene
16. 2,4,6-Trinitrotoluene
17. Tetryl
18. Diphenylamine
19. Hexyl

Explosives from Soil Extract

Column: ZORBAX SB-C18
880975-302

3.0 x 250mm, 5µm

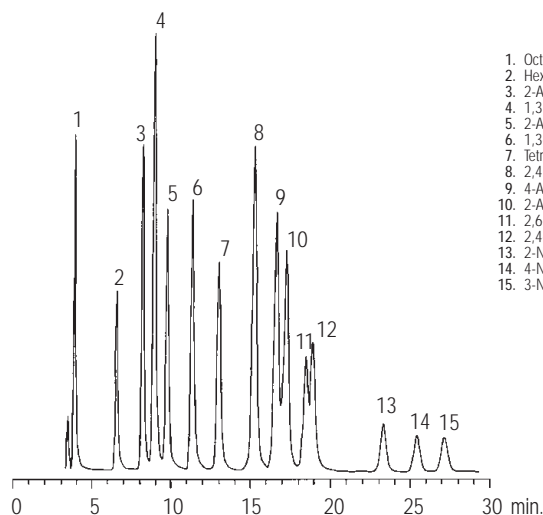
Mobile Phase: Methanol/Water (50/50) (v/v)

Flow Rate: 0.3 mL/min

Temperature: Ambient

Detector: UV 230 nm

Sample: 10 µL Explosives Mix



1. Octogen (HMX)
2. Hexogen (RDX)
3. 2-Amino-6-nitrotoluene
4. 1,3,5-Trinitrobenzene
5. 2-Amino-4-nitrotoluene
6. 1,3-Dinitrobenzene
7. Tetryl
8. 2,4,6-Trinitrotoluene
9. 4-Amino-2,6-dinitrotoluene
10. 2-Amino-4,6-dinitrotoluene
11. 2,6-Dinitrotoluene
12. 2,4-Dinitrotoluene
13. 2-Nitrotoluene
14. 4-Nitrotoluene
15. 3-Nitrotoluene

Herbicides on Different Bonded Phases

Column: ZORBAX SB-CN
883975-905

4.6 x 150mm, 5µm

Column: ZORBAX SB-Phenyl
883975-912

4.6 x 150mm, 5µm

Column: ZORBAX SB-C8
883975-906

4.6 x 150mm, 5µm

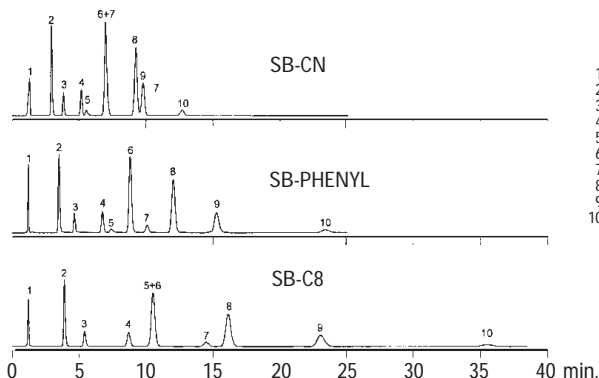
Mobile Phase: 35% ACN, 65% Water

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

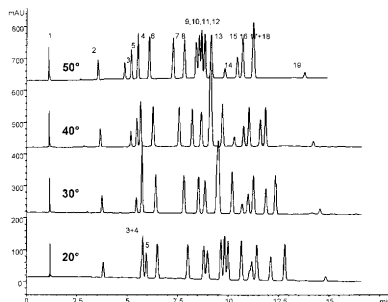
Sample: Herbicides



1. Bentazon
2. Tebuthiuron
3. Simazine
4. Atrazine
5. Prometon
6. Diuron
7. Propazine
8. Propanil
9. Prometryne
10. Metolachlor

Herbicide/Pesticide Standards: Effect of Bonded Phase

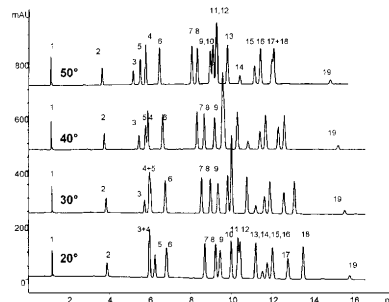
1. Desethyldeisopropylatrazine
2. Desethylatrazine
3. Benzthiazuron
4. Hexazinon
5. Metoxuron
6. Simazine
7. Methabenzthiazuron
8. Simazine
9. Atrazine
10. Isoproturon
11. Diuron
12. Monlinuron
13. Metobromuron
14. Metazachlor
15. Propazine
16. Sebutylazine
17. Terbutylazine
18. Linuron
19. Metolachlor



**Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm**

Mobile: Water/Acetonitrile
Phase:
Flow Rate: 1.0 mL/min
Gradient: 20-60% in 15 min.
Temperature: 50°C
40°C
30°C
20°C

Detector: DAD 240/30
Sample: Herbicide & Pesticide Standards



**Column: Eclipse XDB-C18
993967-902
4.6 x 150mm, 5µm**

Mobile: Water/Acetonitrile
Phase:
Flow Rate: 1.0 mL/min
Gradient: 20-60% in 15 min.
Temperature: 50°C
40°C
30°C
20°C

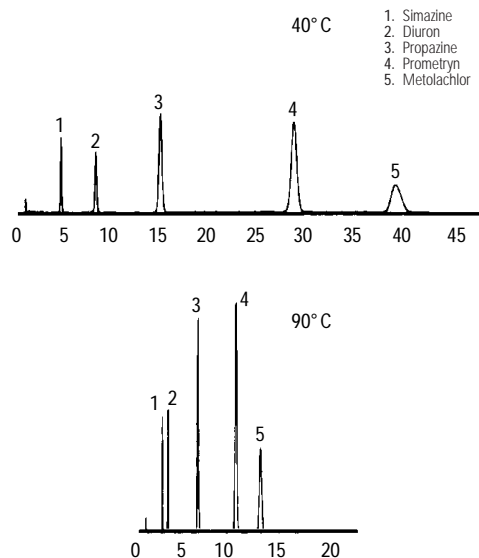
Detector: DAD 240/30
Sample: Herbicide & Pesticide Standards

Herbicides: Effect of Column Temperature

**Column: ZORBAX SB-C18
883975-902**

4.6 x 150mm, 5µm

Mobile: 52/48 0.1 M Sodium Acetate/Methanol, pH 6
Phase:
Flow Rate: 0.45 mL/min
Temperature: 40°C, 90°C
Detector: UV
Sample: Herbicides



Herbicides: Use of Short, Small - Particle Columns for Fast and Efficient Separation

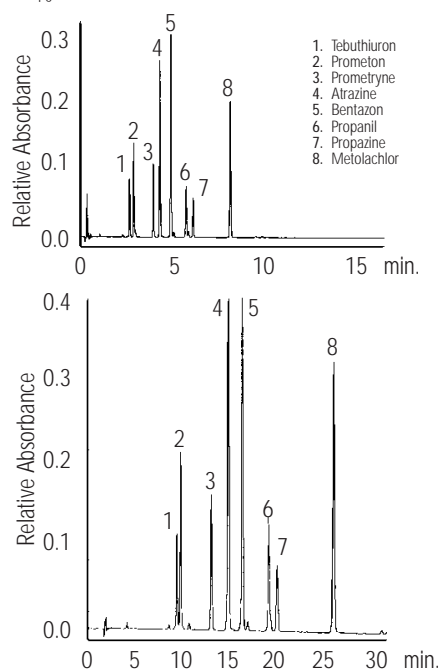
**Column: ZORBAX Rx/SB-C8
866953-906**

4.6 x 75mm, 3.5µm

**Column: ZORBAX SB-C8
883975-906**

4.6 x 150mm, 5µm

Mobile: A = Water to pH 2.0 with TFA; B = ACN
Phase:
Flow Rate: 2.0 mL/min, 1.0 mL/min
Temperature: 35°C
Detector: UV 254 nm
Sample: 0.5 µg each



LC and LC/MS Applications

Environmental

PAHs on 3 mm ID Column

Column: PAH

79925PA-583

3.0 x 250mm, 5µm

Mobile: Gradient - 50:50 Acetonitrile: Water to 100% Acetonitrile

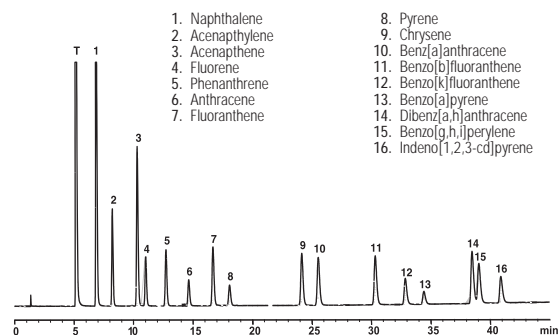
Phase: in 42 minutes

Flow Rate: 1.0 mL/min

Temperature: 25°C

Detector: UV 220 nm

Sample: PAH Standard Mixture (P/N: 8500-6035), 1 µL



Herbicides: Rapid Separation

Column: Eclipse XDB-C18

933975-902

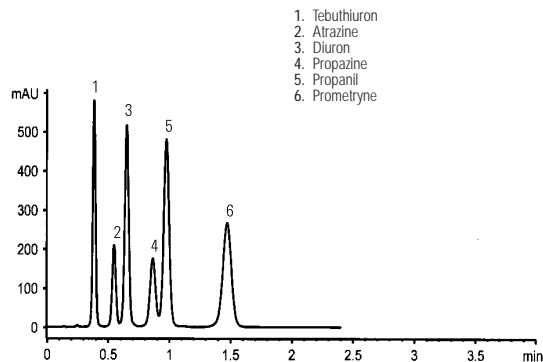
4.6 x 30mm, 3.5µm

Mobile: MeOH and H₂O (60:40)

Phase:

Flow Rate: 2 mL/min

Temperature: Ambient



16 PAHs: Optimized Separation on 3 mm Column

Column: PAH

79925PA-583

3.0 x 250mm, 5µm

Mobile: A: Water

Phase: B: Acetonitrile

Flow Rate: 0.6 mL/min

Gradient: 0.0 min 50% B

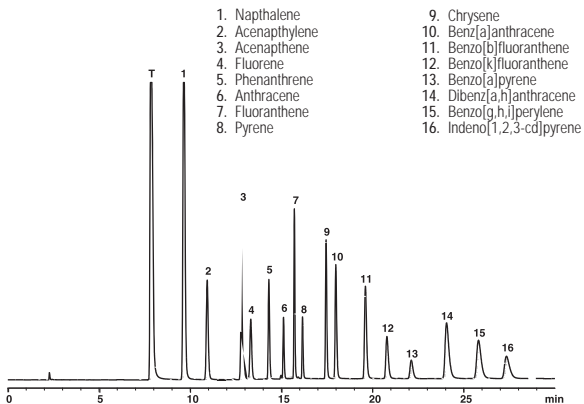
10 min 70% B

13 min 100% B

Temperature: 25°C

Detector: UV 220 nm

Sample: PAH Standard Mixture (P/N: 8500-6035)



Triazine Pesticides on Bonus-RP and Alkyl C8 Phase

Column: ZORBAX Bonus-RP

883668-901

4.6 x 150mm, 5µm

Mobile: MeOH: 0.1% TFA (70:30)*

Phase:

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: Triazine pesticides, 2 µL

1. Prometryne

2. Tebuthiuron

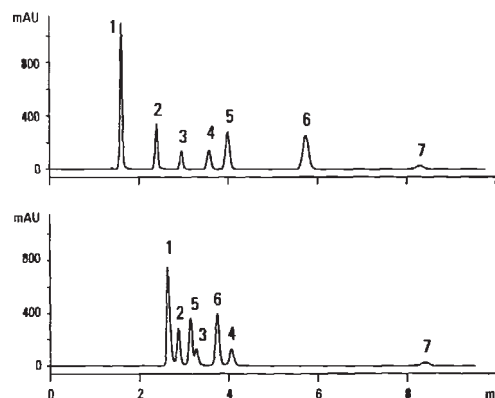
3. Atrazine

4. Propazine

5. Diuron

6. Propanil

7. Dacthal



* For low pH work with Bonus-RP, a TFA mobile phase is often preferred over phosphate, and is compatible with LC/MS.

Pesticides Analysis of Pesticides in Drinking Water

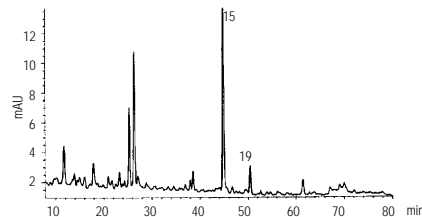
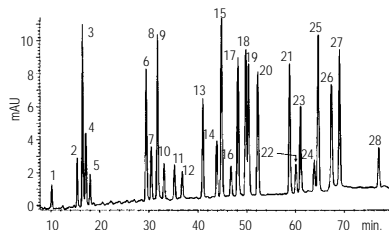
Column: ZORBAX SB-C18

880975-302

3.0 x 250mm, 5µm

Mobile: A = 2 mM Sodium Acetate (pH 6.5) with 5% ACN
Phase: B = 100% Acetonitrile (ACN)
Flow Rate: 0.35 mL/min
Gradient: 2 min, 10% B; 10 to 45% B in 70 min.
Temperature: 40°C
Detector: UV 245 nm
Sample: Pesticides

- | | | |
|-------------------------|---------------------------|-------------------|
| 1. Desisopropylatrazine | 10. Simazine | 19. Isoproturon |
| 2. Metamitron | 11. Metribuzin | 20. Metabromuron |
| 3. Fenuron | 12. Desethylterbutylazine | 21. Metazachlor |
| 4. Chloridazon | 13. Carbutilat | 22. Buturon |
| 5. Desethylatrazine | 14. Methabenzthiazuron | 23. Propazine |
| 6. Metoxuron | 15. Chlortoluron | 24. Dimetfuron |
| 7. Carbetamid | 16. Atrazine | 25. Terbutylazine |
| 8. Bromacl | 17. Monolinuron | 26. Linuron |
| 9. Hexazinon | 18. Diuron | 27. Chlorbromuron |
| | | 28. Chloroxuron |



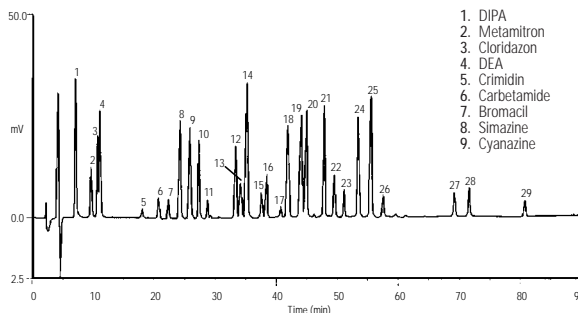
Pesticides using LiChrospher Phase

Column: LiChrospher 100 RP-18

7992518-583

3.0 x 250mm, 5µm

Mobile: A = 1 mM Ammonium acetate, B = Acetonitrile
Phase:
Flow Rate: 0.4 mL/min
Gradient: 0-10 min. 25% B, 70 min. 70% B, 90-100 min. 90% B,
101 min. 25% B
Temperature: 28°C
Detector: UV 220 nm
Sample: Pesticides Standards



- | | |
|----------------|------------------------|
| 1. DIPA | 10. DETBA |
| 2. Metamitron | 11. Karbutyl |
| 3. Chloridazon | 12. Methabenzthiazuron |
| 4. DEA | 13. Chlorotoluron |
| 5. Crimidin | 14. Atrazine |
| 6. Carbetamid | 15. Monolinuron |
| 7. Bromacl | 16. Diuron |
| 8. Simazine | 17. Metabromuron |
| 9. Cyanazine | 18. Dimetfuron |
| | 19. Sebutylazine |
| | 20. Propazine |
| | 21. Terbutylazine |
| | 22. Linuron |
| | 23. Chloroxuron |
| | 24. Prometyn |
| | 25. Terbutyn |
| | 26. Metalächer |
| | 27. Pencyuron |
| | 28. Bifenox |
| | 29. Pendimethalin |

Phenols, Substituted

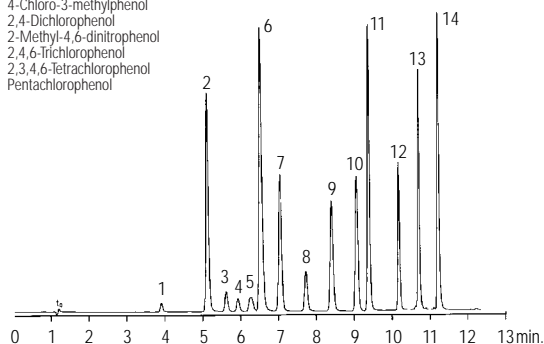
Column: ZORBAX SB-C18

883975-902

4.6 x 150mm, 5µm

Mobile: 20% ACN/80% 0.01 M H₃PO₄ to 45% ACN in 7.5 min.
Phase:
Flow Rate: 1.5 mL/min
Gradient: 80% ACN in 2.0 min.
Temperature: 35°C
Detector: UV 254 nm
Sample: Phenols

1. Phenol
2. 4-Nitrophenol
3. m-Cresol
4. o-Cresol
5. 2-Chlorophenol
6. 2,4-Dinitrophenol
7. 2-Nitrophenol
8. 2,4-Nimethylphenol
9. 4-Chloro-3-methylphenol
10. 2,4-Dichlorophenol
11. 2-Methyl-4,6-dinitrophenol
12. 2,4,6-Trichlorophenol
13. 2,3,4,6-Tetrachlorophenol
14. Pentachlorophenol



Phenoxyacetic Acids

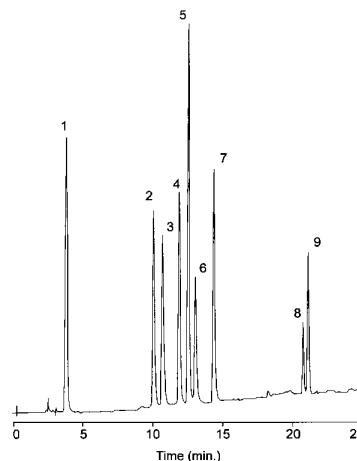
Column: ZORBAX SB-C18

880975-902

4.6 x 250mm, 5µm

Mobile: A = 20mM KH₂PO₄, B = ACN
Phase:
Flow Rate: 1.0 mL/min
Gradient: 0 min 10% B
2 min 10% B
25 min 65% B
Temperature: 40°C
Detector: UV 245 nm
Sample: Phenoxyacetic Acids

- | |
|-------------|
| 1. Dicamba |
| 2. 2,4-D |
| 3. MCPA |
| 4. 2,4-DP |
| 5. MCPP |
| 6. 2,4,5-T |
| 7. 2,4,5-TP |
| 8. 2,4-DB |
| 9. MCPB |



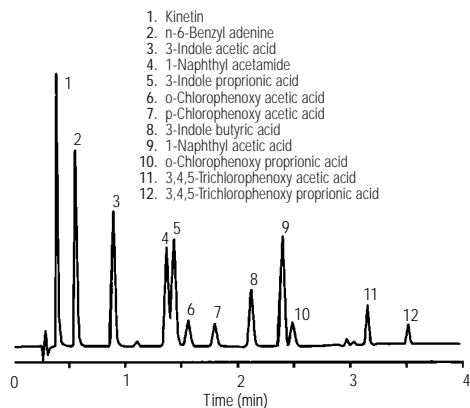
LC and LC/MS Applications

Environmental

Plant Hormones: Rapid Gradient Elution Separation

Column: ZORBAX Rx/SB-C8
866953-906
4.6 x 75mm, 3.5µm

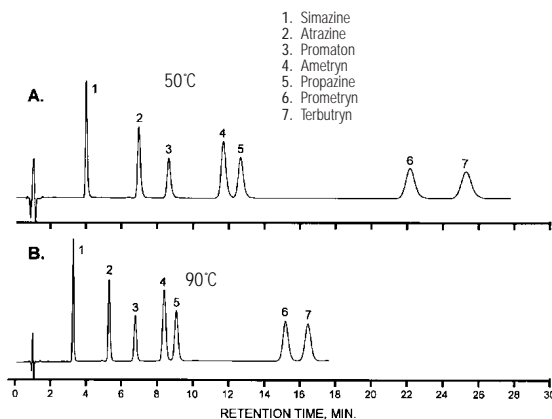
Mobile A = water with 0.1% TFA
Phase: B = Acetonitrile with 0.1% TFA
Flow Rate: 3.0 mL/min
Temperature: 60°C
Detector: UV 245 nm
Sample: Plant hormones



Triazines: Effect of Temperature

Column: ZORBAX SB-C18
883975-902
4.6 x 150mm, 5µm

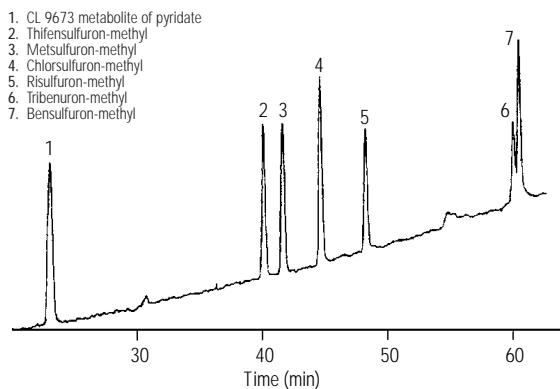
Mobile 33/67 Acetonitrile/0.1 M Sodium acetate buffer, pH 6.0
Phase:
Flow Rate: 1.5 mL/min
Temperature: A: 50°C; B: 90°C
Detector: UV 210 nm
Sample: 5 µg each; 5 µL, Triazine Mix



Sulfonylurea Pesticides: High Resolution Separation

Column: ZORBAX SB-C18
880975-302
3.0 x 250mm, 5µm

Mobile A = 0.01% Acetic Acid in Water,
Phase: B = Acetonitrile, 0.01% Acetic Acid
Flow Rate: 0.5 mL/min
Temperature: 40°C
Detector: UV 230, 270 nm
Sample: Sulfonylurea Pesticides

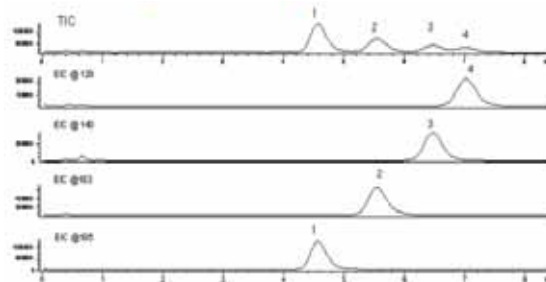


VX Nerve Agent Metabolites by LC/MS-IS Standard (C13 labeled)

Column: ZORBAX NH2
860700-708
2.1 x 50mm, 5µm

Mobile 1:1 (20 mM Ammonium Acetate pH 4.5 / Acetonitrile)
Phase:
Flow Rate: 0.5 mL/min, 1 µl injection (prepared std in ACN)
Temperature: 350 °C
Detector: ESI-Negative Ion, Gas Flow 12 l/min, Nebulizer 60 psi
Sample: MW

1. Cyclohexyl methylphosphonic acid 178
2. Pinacolyl methylphosphonic acid 180
3. Isopropyl methylphosphonic acid 138
4. Ethyl methylphosphonic acid 124



LC and LC/MS Applications

Food and Consumer Products

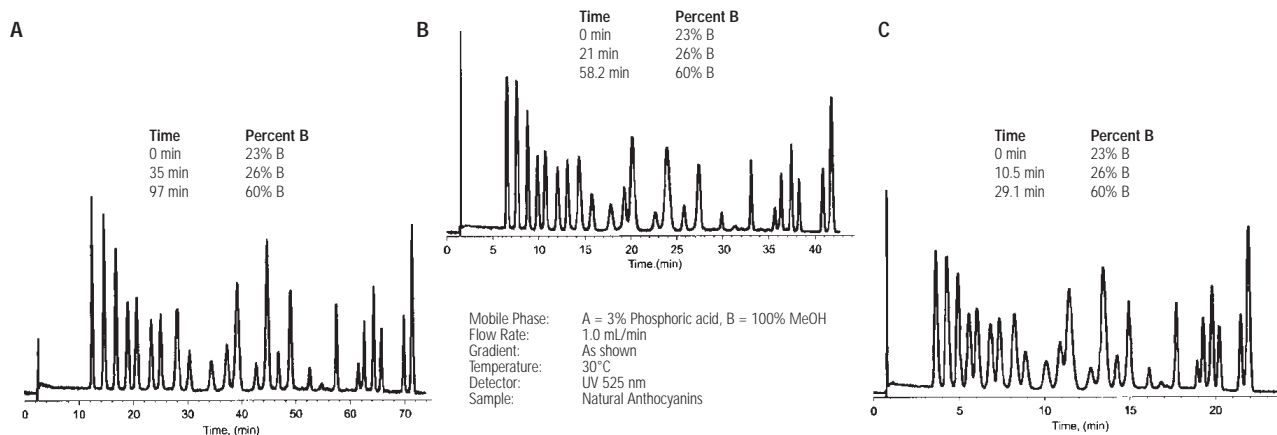
Food and Consumer Products

Anthocyanins from Blueberries: High-Efficiency High-Speed Separation

Column A: ZORBAX SB-C18
880975-902
4.6 x 250mm, 5µm

Column B: ZORBAX SB-C18
863953-902
4.6 x 150mm, 3.5µm

Column C: ZORBAX SB-C18
866953-902
4.6 x 75mm, 3.5µm

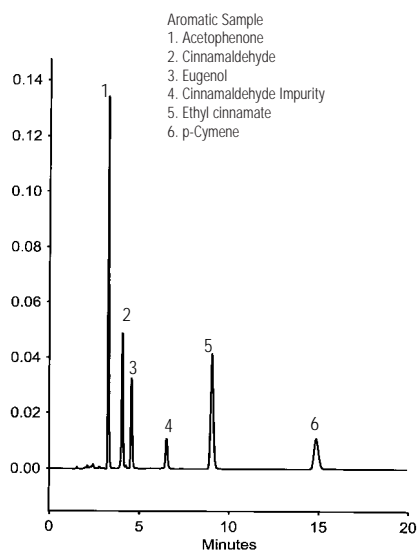


Aromatics

Column: Eclipse XDB-Phenyl
963967-912
4.6 x 150mm, 3.5µm

Mobile Phase: H₂O : MeOH, 40:60

Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: 254 nm
Publication: FD13

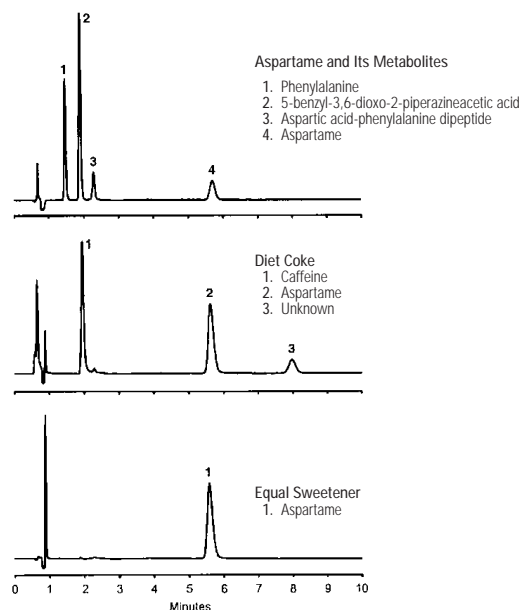


Aspartame: Metabolites and Applications

Column: ZORBAX SB-C18
866953-902
4.6 x 75mm, 3.5µm

Mobile Phase: 85/15, 0.1% TFA/ACN

Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: UV 210 nm
Sample: Aspartame



LC and LC/MS Applications

Food and Consumer Products

B Vitamins

Column: Purospher RP-18
79925PU-564
4.0 x 125mm, 5µm

Mobile: 70/30, 0.04 M Phosphate buffer pH 3.5/Methanol

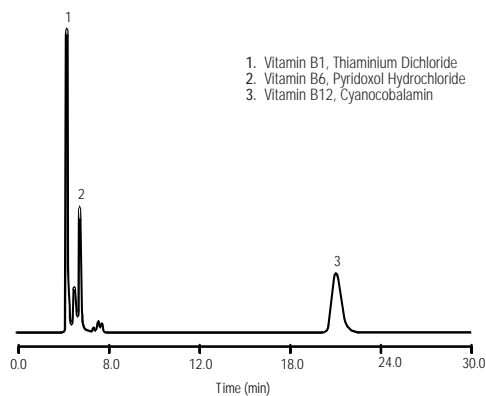
Phase:

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: Vitamin B Complex



Carbohydrates: Carbohydrate Standards

Column: ZORBAX Carbohydrate Analysis
843300-908
4.6 x 150mm, 5µm

Mobile: 63% CH3CN/H2O)

Phase:

Flow Rate: 0.5 mL/min

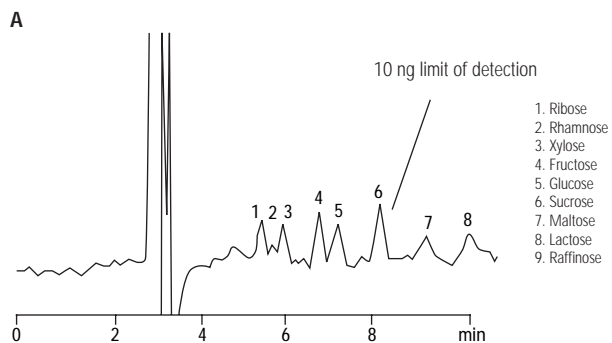
Detector: Agilent RID

Sample: Carbohydrate standard:

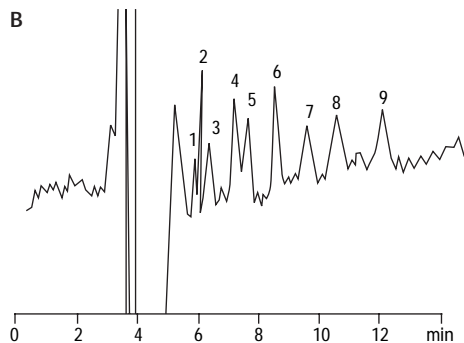
A: 25 ng/ L, 1 µL injected

B: 500 pg/ L, 50 µL injected

Carbohydrates: Separation Showing High Sensitivity



Sensitivity of High Injection Volume (50 µl)



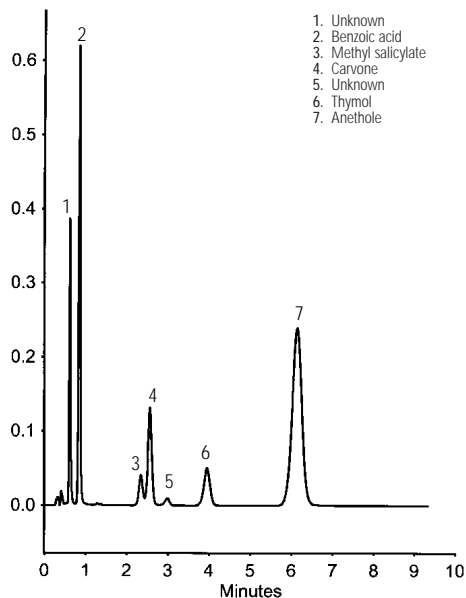
LC and LC/MS Applications

Food and Consumer Products

Flavoring Agents

Column: ZORBAX SB-Phenyl
860975-912
2.1 x 50mm, 5µm

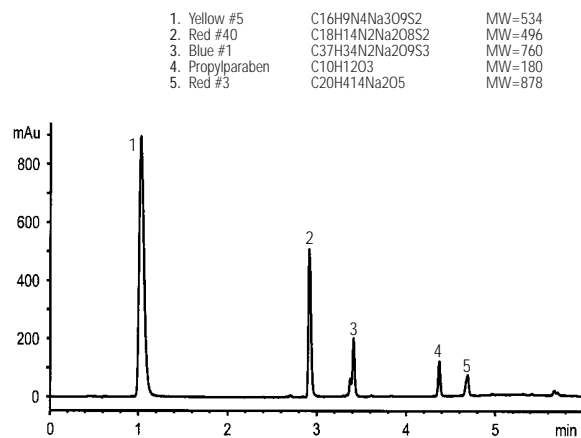
Mobile: 0.3% TFA: ACN, 65:35
Phase:
Flow Rate: 0.3 mL/min.
Temperature: Ambient
Detector: UV 254 nm
Sample: Cool Mint Listerine Sample



Food Colors, FD&C

Column: Eclipse XDB-C18
935967-902
4.6 x 50mm, 3.5µm

Mobile: A: 0.1% TF A, pH to 4.4 with TEA, B: MeOH
Phase:
Flow Rate: 1.0 mL/min
Gradient: 17 to 100% B/4 min
Temperature: Ambient
Detector: UV 254 nm
Publication: LI FD16



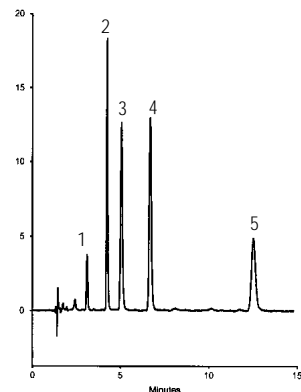
Neutraceuticals: Extract from Green Tea

Column: ZORBAX SB-C8
863953-906
4.6 x 150mm, 3.5µm

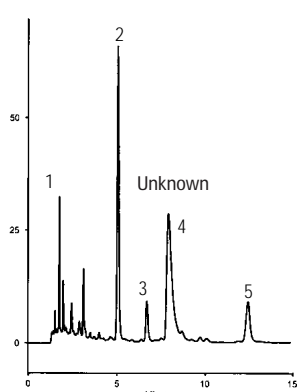
Mobile: 75% 0.1% Trifluoroacetic acid: 25% Methanol
Phase:
Injection: 1 mL/min
Temperature: 40°C
Detector: UV 280 nm
Sample: Green tea extract, 5 µL

1. Epigallocatechin
2. Epicatechin
3. Epigallocatechin gallate
4. Catechol
5. Epicatechin gallate

Catechin Mixture



Green Tea Extract

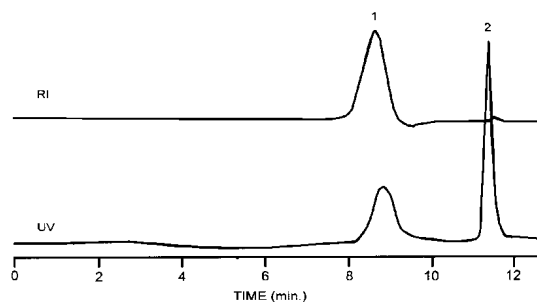


Polysaccharide—Size Separation

Column: ZORBAX Bimodal Kit, Unsilanized, 2 columns
880949-903

6.2 x 250mm, 5µm

Mobile: 8.5 g NaCl per liter water
Phase:
Flow Rate: 2.0 mL/min
Temperature: 35°C
Detector: UV 205 nm and RI
Sample: 1. MW = 40,000 polysaccharide (Rheomacrodex)
2. Glucose

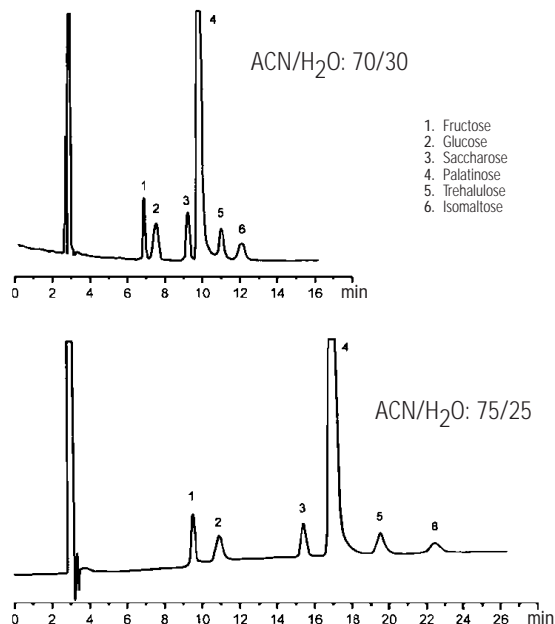


LC and LC/MS Applications

Food and Consumer Products

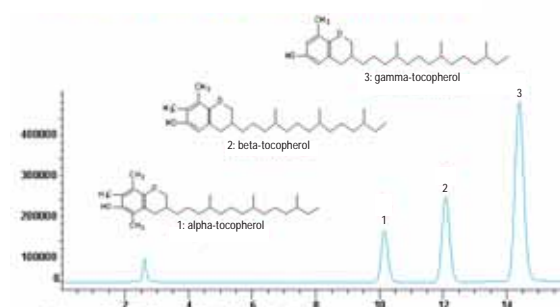
Carbohydrates: Effect of Mobile Phase Strength

Column: ZORBAX NH₂
880952-708
4.6 x 250mm, 5µm
Mobile: ACN/Water, as indicated
Phase:
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: RI
Sample: Mono- and Disaccharides



Tocopherols by LC/MS with APPI

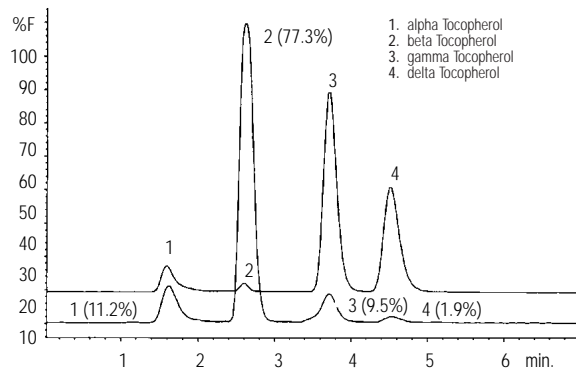
Column: Eclipse XDB-C18
993967-302
3.0 x 150mm, 5µm
Mobile: 97% MeOH: 3% 10mM CH₃COONH₄
Phase:
Flow Rate: 0.5ml/min
Temperature: 40°C
MS: Agilent 1100MSD SL
Conditions: Ionization: APPI(Positive)
Scan range: m/z 100-500
Vcap: 1500 V
SIM ion: base peak
Drying gas: 7 l/min at 350°C
Nebulizer gas: 60psi
Vaporizer temp: 350°C
Fragmentor: 140 V
EM gain: 4
Sample Volume: 10 µl



LC and LC/MS

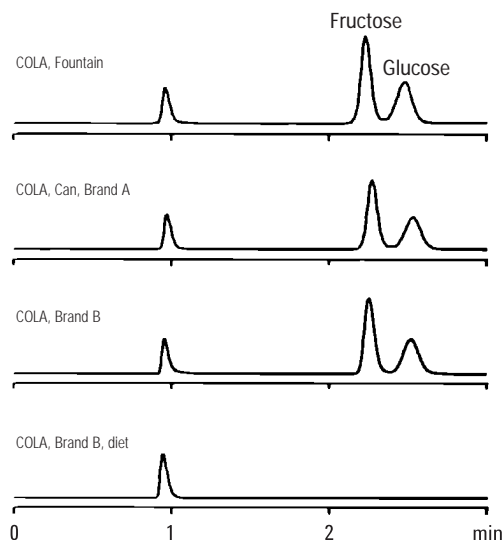
Tocopherols: Analysis of Margarine with Fluorescence Detection

Column: LiChrospher 100 Diol
79925DI-564
4 x 125mm, 5µm
Mobile: Hexane + 2% Isopropanol
Phase:
Flow Rate: 1.0 mL/min
Temperature: 25°C
Detector: Fluorescence, Ex = 295, Em = 330
Sample: a: Standard
b: Margarine



Carbohydrates in Colas

Column: ZORBAX Carbohydrate Analysis
843300-908
4.6 x 150mm, 5µm
Mobile: 75% ACN:25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: No dilution



LC and LC/MS Applications

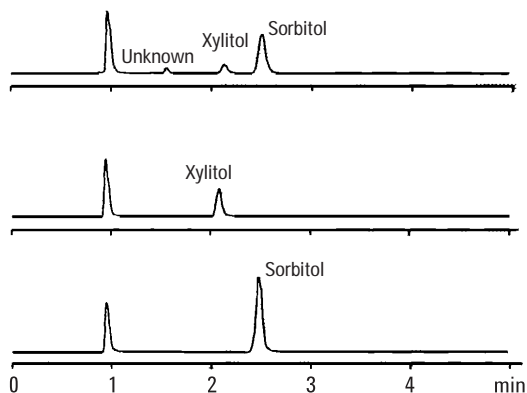
Food and Consumer Products

Carbohydrates: Sugar Alcohols

Column: ZORBAX Carbohydrate Analysis
843300-908

4.6 x 150mm, 5µm

Mobile: 75% ACN/25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: Chewing gum, sugar-free

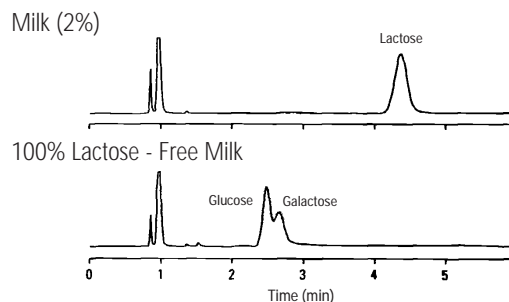


Carbohydrates in Milk

Column: ZORBAX Carbohydrate Analysis
843300-908

4.6 x 150mm, 5µm

Mobile: 75% ACN/25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: Partitioned between MeCl₂: H₂O

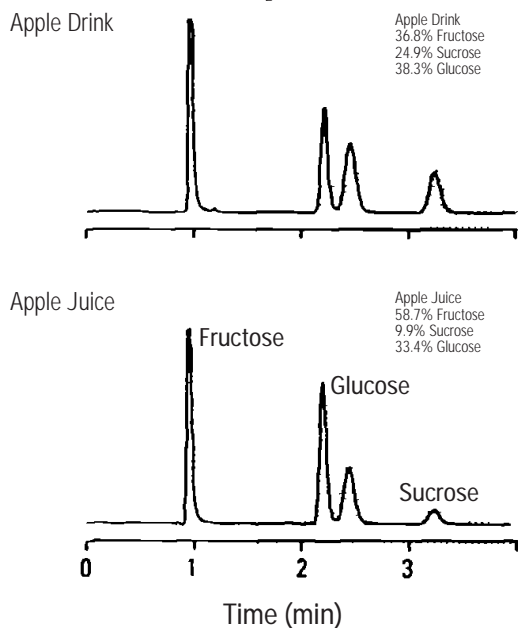


Carbohydrates in Juices

Column: ZORBAX Carbohydrate Analysis
843300-908

4.6 x 150mm, 5µm

Mobile: 75% ACN/25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: diluted to 0.1X in 50:50 ACN:H₂O

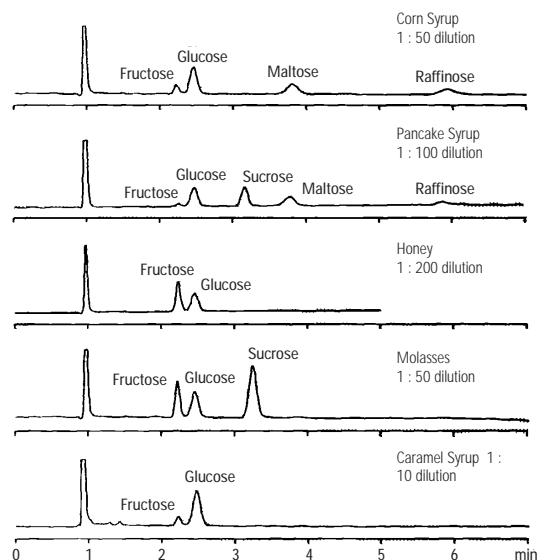


Carbohydrates: Syrups and Honey

Column: ZORBAX Carbohydrate Analysis
843300-908

4.6 x 150mm, 5µm

Mobile: 75% ACN/25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: As Shown



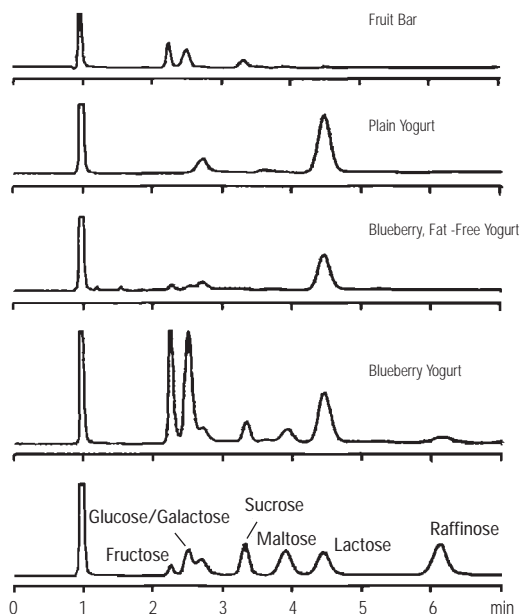
LC and LC/MS Applications

Food and Consumer Products

Carbohydrates: Yogurts

Column: ZORBAX Carbohydrate Analysis
843300-908
4.6 x 150mm, 5µm

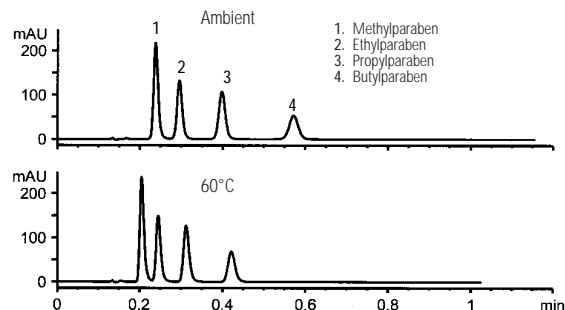
Mobile: 75% ACN/25% H₂O
Phase:
Flow Rate: 2.0 mL/min
Temperature: 30°C
Detector: RID
Sample: As Shown



Parabens: High Speed Separation

Column: ZORBAX SB-C18 cartridge column
833975-902
4.6 x 30mm, 3.5µm

Mobile: 0.1% H₃PO₄: ACN, (50:50)
Phase:
Flow Rate: 2 mL/min
Temperature: As Shown
Detector: UV 254 nm with standard flow cell (13 µL)
Sample: Parabens, 1 µL

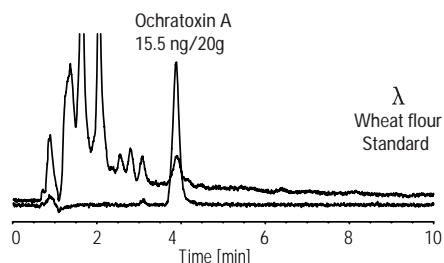


Ochratoxin: Analysis in Wheat Flour, Analysis with Derivatization in Fig Extract

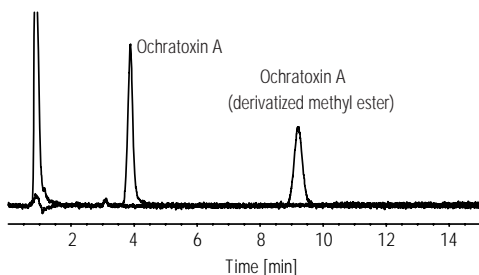
Column: LiChrospher 100 RP-18
799250D-564-3
4.0 x 125mm, 5µm

Mobile: Water with 2% acetic acid/Acetonitrile, 1 : 1
Phase:
Flow Rate: 1.0 mL/min
Temperature: 40°C
Detector: Fluorescence λ ex 247 nm, λ ex 480 nm
Sample: Ochratoxin in Wheat Flour & Fig Extract (as indicated)

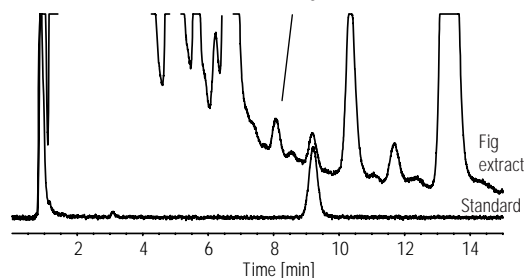
A. Neat sample, wheat flour



B. Standard



C. Derivatized sample, fig extract Ochratoxin A (derivatized methyl ester) 25.77ng/mL



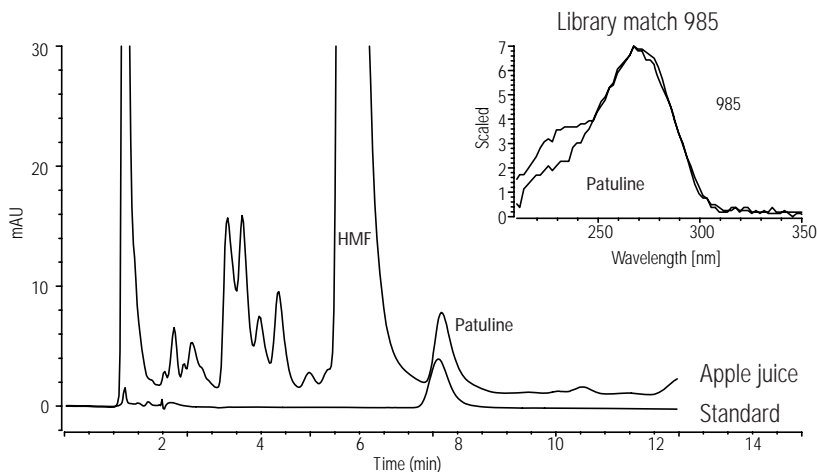
LC and LC/MS Applications

Food and Consumer Products

Patuline in Apple Juice

Column: LiChrospher 100 Diol
79925DI-564
4 x 125mm, 5µm

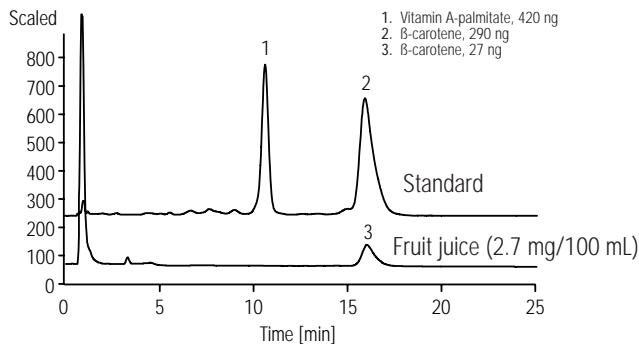
Mobile: Hexane-isopropanol 95:5 as isocratic mixture
Phase:
Flow Rate: 0.6 mL/min
Temperature: 30°C
Detector: DAD 270/20 nm
Confirmation: spectral information and retention times
Sample: As Shown



Vitamin A and Beta Carotene

Column: LiChrospher 100 RP-18
79925OD-564-3
4.0 x 125mm, 5µm

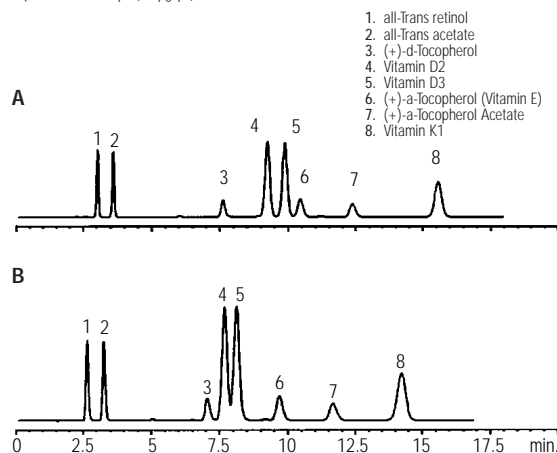
Mobile: Methanol + 5 g/L Lithiumperchlorate + 1 g/L Acetic Acid
Phase:
Flow Rate: 1.5 mL/min
Temperature: 30°C
Detector: Amperometric, 1 V (range 0.5 µA, ref. AgCl/KCl)
Sample: β-carotene in fruit juice



Fat-Soluble Vitamins: Separation of Vitamin D2 from D3

Column A: ZORBAX ODS
884950-543
4.6 x 250mm, 5µm
Column B: ZORBAX ODS
883952-702
4.6 x 150mm, 5µm
Mobile Phase: 75/25 ACN/MeOH

Flow Rate: 1.0 mL/min
Temperature: 40°C
Detector: UV 325 nm for 4 min, 280 nm after
Sample: 5 µL (10 µg/µL), Fat Soluble Vitamin Standard



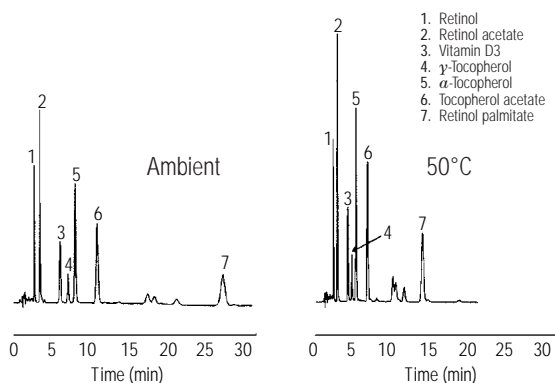
LC and LC/MS Applications

Food and Consumer Products

Fat-Soluble Vitamins on ZORBAX Eclipse XDB-C8

Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm

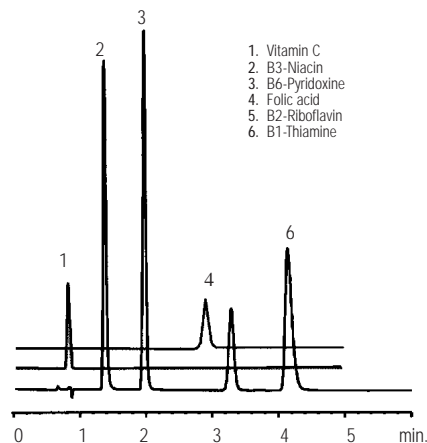
Mobile: 5/95 Water/MeOH
Phase:
Flow Rate: 1.0 mL/min
Temperature: a: Ambient
b: 50°C
Detector: UV 280 nm
Sample: Fat Soluble Vitamins



Water-Soluble Vitamins: High Speed Separation using Ion-Pairing

Column: ZORBAX Rx/SB-C8
866953-906
4.6 x 75mm, 3.5µm

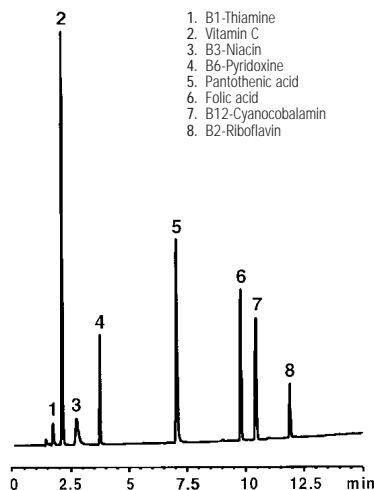
Mobile: 10 mM Hexane Sulfonate with 0.1%
Phase: Phosphoric Acid: MeOH (74:26)
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 245 nm
Sample: Water soluble vitamins



Water-Soluble Vitamins

Column: ZORBAX SB-C8
883975-906
4.6 x 150mm, 5µm

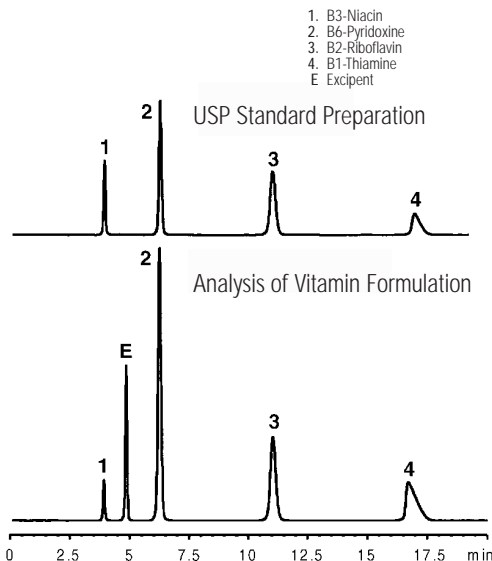
Mobile: A = 50 mM Sodium Phosphate, pH 2.5/MeOH (90/10)
B = 50 mM Sodium Phosphate, pH 2.5/MeOH (10/90)
Phase:
Flow Rate: 1.0 mL/min
Gradient: 0 min 0% B
18 min 70% B
Temperature: Ambient
Detector: UV 245 nm
Sample: Water soluble vitamins



Water-Soluble Vitamins using the USP 23 Method

Column: ZORBAX SB-C18
880975-902
4.6 x 250mm, 5µm

Mobile: 7.2 mM Hexane Sulfonate/MeOH/Acetic Acid
Phase: (73/27/1) (ratio to 101)
Flow Rate: 1.0 mL/min
Temperature: 30°C
Detector: UV 280 nm
Sample: Water soluble vitamins

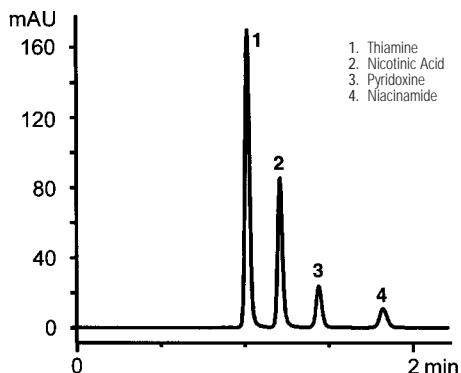


LC and LC/MS Applications

Food and Consumer Products

Water Soluble Vitamins Separated on ZORBAX SB-Aq

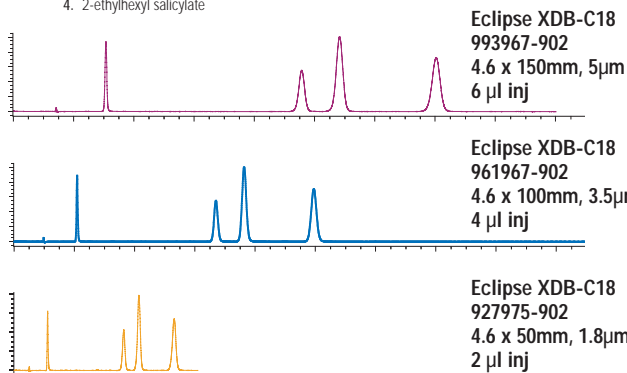
Column: ZORBAX SB-AQ
883975-914
4.6 x 150mm, 5µm
Mobile: 5% MeOH/95% TFA (0.1%)
Phase:
Flow Rate: 2.0 mL/min
Temperature: 35°C
Detector: UV 254 nm



Perform conventional, fast and ultra-fast separations on the same column family

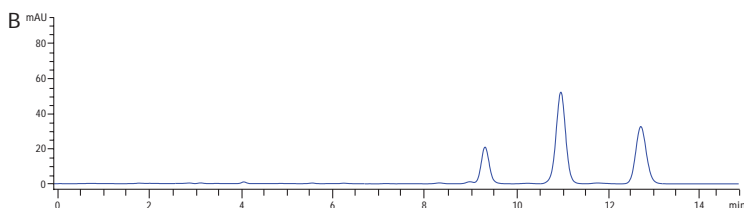
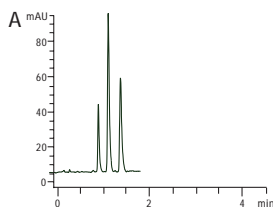
Mobile: A: 15% water
Phase: B: 85% MeOH
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 254 nm
Publication: 5989-4721EN
Sample: Sunscreens

- 2-hydroxy-4-methoxybenzophenone
- Padimate O
- 2-ethylhexyl trans-4-methoxycinnamate
- 2-ethylhexyl salicylate



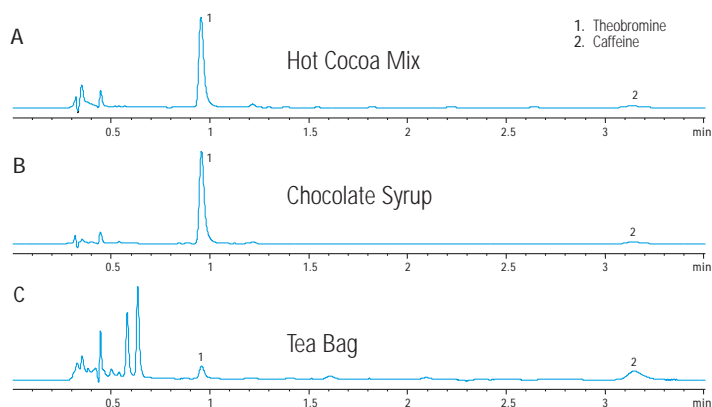
Fast Vitamin E Analysis on Rapid Resolution HT

Column A: Eclipse XDB-C18
927975-902
4.6 x 50mm, 1.8µm
Column B: Eclipse XDB-C18
993967-902
4.6 x 150mm, 5µm
Mobile Phase: A: 5% water
B: 95% MeOH
Flow Rate: 3 mL/min, 1 mL/min
Temperature: Ambient



Theobromine in Beverages

Column: SB-C18
827975-902
4.6 x 50mm, 1.8µm
Mobile: A: 92% 0.1% formic acid
Phase: B: 8% 0.1% formic acid in ACN
Flow Rate: 1.5 mL/min
Temperature: Ambient
Detector: UV 254 nm, flow cell 2 µl, 3 mm flow path
Sample: Theobromine



LC and LC/MS Applications

Pharmaceutical

Pharmaceutical

Xanthines - Higher Resolution, Same Selectivity with RRHT

Column A: ZORBAX SB-C18

846975-902

4.6 x 50mm, 5 μ m

Column B: SB-C18

827975-902

4.6 x 50mm, 1.8 μ m

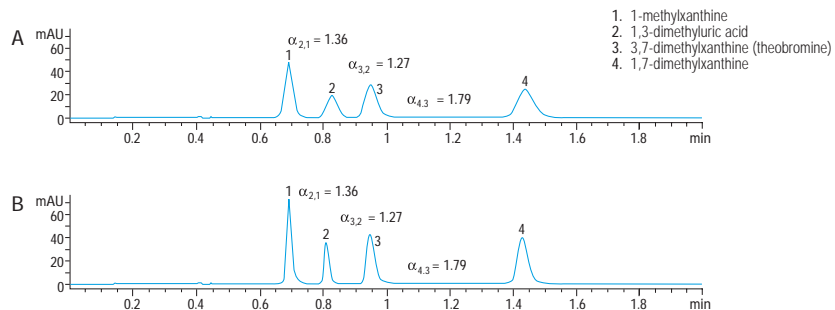
Mobile Phase: A: 92% 0.1% formic acid
B: 8% 0.1% formic acid in ACN

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: Xanthines



Antihistamines - Fast Separations on RRHT Extend-C18

Column A: ZORBAX Extend-C18

773450-902

4.6 x 150mm, 5 μ m

Column B: ZORBAX Extend-C18

727975-902

4.6 x 50mm, 1.8 μ m

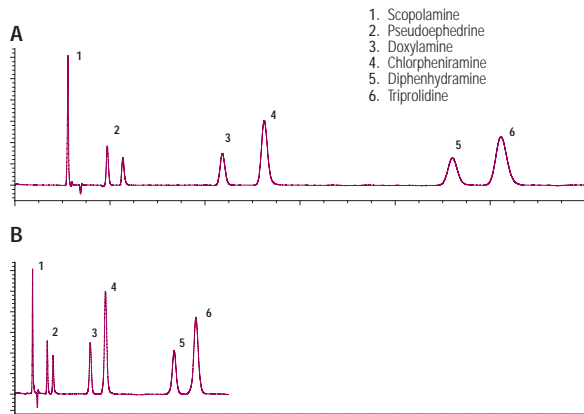
Mobile Phase: A: 30% 50 mM pyrrolidine buffer
B: 70% MeOH

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 220 nm

Sample: Antihistamines



Ibuprofen - Optimizing Selectivity with RRHT Columns

Column A: SB-C8

827975-906

4.6 x 50mm, 1.8 μ m

Column B: Eclipse XDB-C8

927975-906

4.6 x 50mm, 1.8 μ m

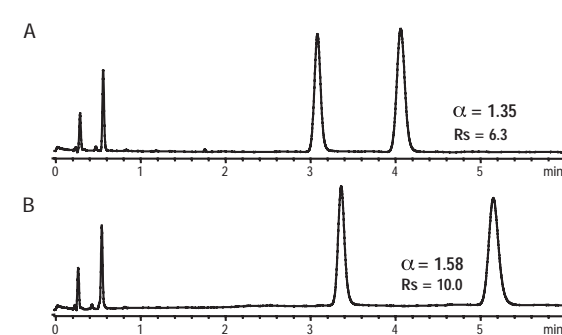
Mobile Phase: A: 63% water
B: 37% acetonitrile + 1.8 mL H3PO4

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: Ibuprofen Oral Suspension

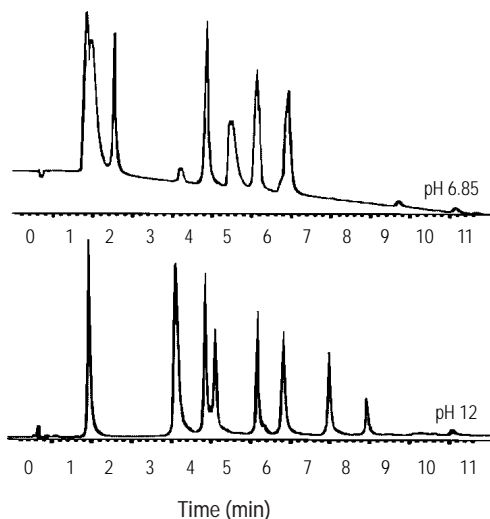


LC and LC/MS Applications Pharmaceutical

Chromatographic Improvement at High pH using Amines

Column: **Asahipak ODP-50**
799230P-584
4.0 x 250mm, 5µm

Mobile Phase: A = 0.05% Ammonium Acetate, pH - see chromatograms
Phase: B = Acetonitrile
C = Methanol
Flow Rate: 1.0 mL/min
Gradient: Ternary Gradient 75/10/15 to 35/40/25 A/ B/ C in 10 min
Temperature: Ambient
Detector: UV 254 nm
Sample: Test Mix, 8 components containing nitrogen



Anesthetics, Local: Bonded Phase Selectivity

Column A: **ZORBAX SB-C18**
883975-902
4.6 x 150mm, 5µm

Column B: **ZORBAX SB-C8**
883975-906
4.6 x 150mm, 5µm

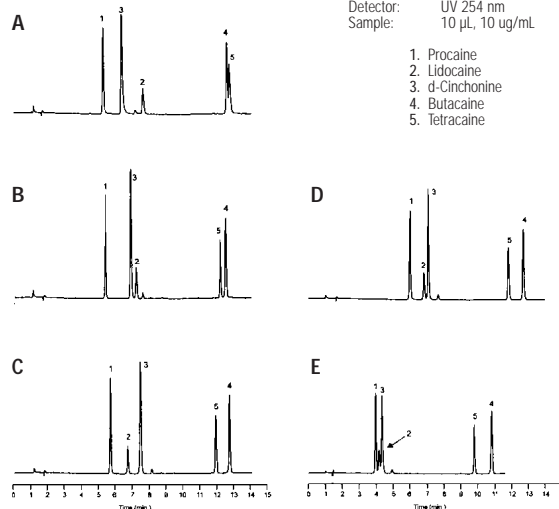
Column C: **ZORBAX SB-C3**
883975-909
4.6 x 150mm, 5µm

Column D: **ZORBAX SB-Phenyl**
883975-912
4.6 x 150mm, 5µm

Column E: **ZORBAX SB-CN**
883975-905
4.6 x 150mm, 5µm

Mobile Phase: A = 50 mM NaH₂PO₄ pH 2.5 in 95% H₂O/ 5% ACN
B = 50 mM NaH₂PO₄ pH 2.5 in 47% H₂O/ 53% ACN

Flow Rate: 1.5 mL/min
Gradient: 0-100% B in 18.8 min
Temperature: 26°C
Detector: UV 254 nm
Sample: 10 µL, 10 µg/mL

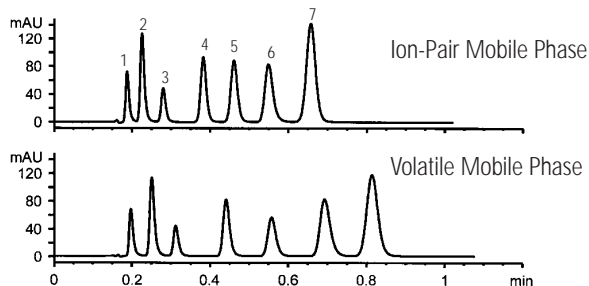


Analgesics: High Speed Separation

Column: **ZORBAX SB-C18**
833975-902
4.6 x 30mm, 3.5µm

Mobile Phase: 1 mM octane sulfonic acid, Na salt, pH 2.5, or 1% formic acid: ACN (80:20)
Flow Rate: 2 mL/min
Temperature: 70°C
Detector: UV 275 nm with standard flow cell (13 µL)
Sample: Analgesics, 1 µL

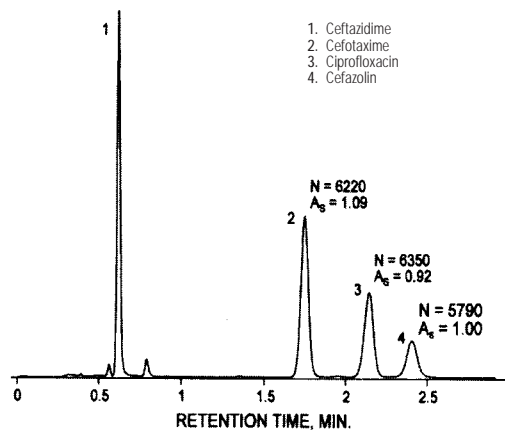
1. Acetaminophen (4-acetamidophenol)
2. Caffeine
3. 2-acetamidophenol
4. Acetanilide
5. Aspirin (acetosalicylic acid)
6. Salicylic acid
7. Phenacetin (acetophenetidin)



Antibiotics: High Speed Separation

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75mm, 3.5µm

Mobile Phase: 8.0% acetonitrile/92% 0.1% aqueous TFA
Flow Rate: 3.0 mL/min
Gradient: 45-70%B in 35 min.
Temperature: 60°C
Detector: UV 260 nm
Sample: 1 µL containing 0.40, 0.36, 0.10 and 0.37 µg ea. of 1-4 resp.



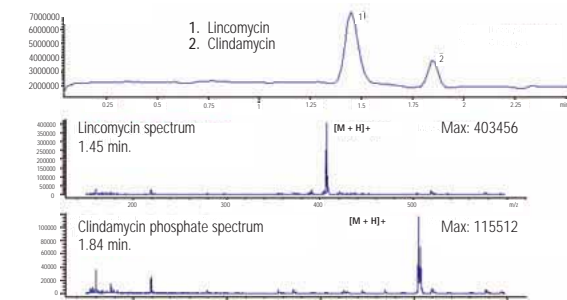
LC and LC/MS Applications Pharmaceutical

Antibiotics: Lincomycin and Clindamycin by LC-APCI-MS LC-TIC

Column: ZORBAX SB-C18 cartridge
823700-902

2.1 x 30mm, 1.8µm

Mobile Gradient: 15 - 50% B in 1 min, hold for 1.5 min,
Phase: A: 0.2% formic acid pH, 2.8 B: ACN + 0.2% formic acid
Flow Rate: 0.5 mL/min
Gradient: Post time: 1.5 min
Temperature: Ambient
HPLC: Agilent 1100 with WPSN and ADVR on
Detector: APCI, Positive ion
MS Peakwidth: 0.10 min
Conditions: Scan: 150 - 600 Da, step 0.1
Fragmentor: 70
Gas Temp: 350° C
Vaporizer: 350° C
Drying gas: 12 l/min
Nebulizer pres: 50 psi
Vcap +3000V
Corona: 4.0 µA
Sample: Antibiotics, 1 µL



Antihistamines

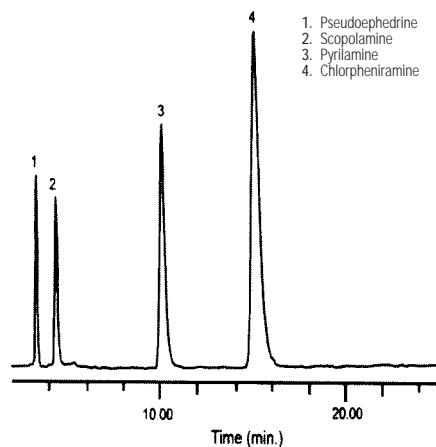
Column: ZORBAX Rx-C8
883967-901

4.6 x 150mm, 5µm

Column: ZORBAX SB-C8
883975-906

4.6 x 150mm, 5µm

Mobile 10% ACN, 90% 50 mM, KH₂PO₄, pH 2.5
Phase:
Flow Rate: 2.0 mL/min
Temperature: 25°C
Detector: UV 254 nm
Sample: Antihistamines

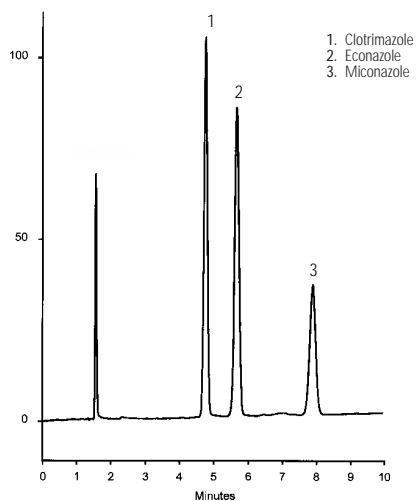


Antifungal Medications

Column: ZORBAX Bonus-RP
883668-901

4.6 x 150mm, 5µm

Mobile 35% 25 mM NaH₂PO₄, Dibasic (pH 6.5 with H₃PO₄):
Phase: 65% ACN
Flow Rate: 1 mL/min
Temperature: Ambient
Detector: UV 220 nm
Publication: LI PH46
Sample: Antifungals, 2 µL

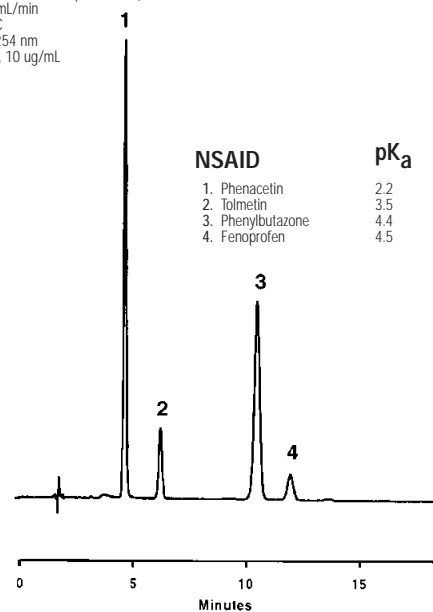


Analgesics: Non-steroidal Anti-inflammatory Drugs: Narrow Bore Separation

Column: Eclipse XDB-C8
993700-906

2.1 x 150mm, 5µm

Mobile 50/50, 25 mM Sodium Phosphate
Phase: (pH 7.0 with Phosphoric Acid), MeOH
Flow Rate: 0.2 mL/min
Temperature: 35°C
Detector: UV 254 nm
Sample: 2 µL, 10 ug/mL



Aromatic Acids/Benzoic Acids—Selectivity Differences

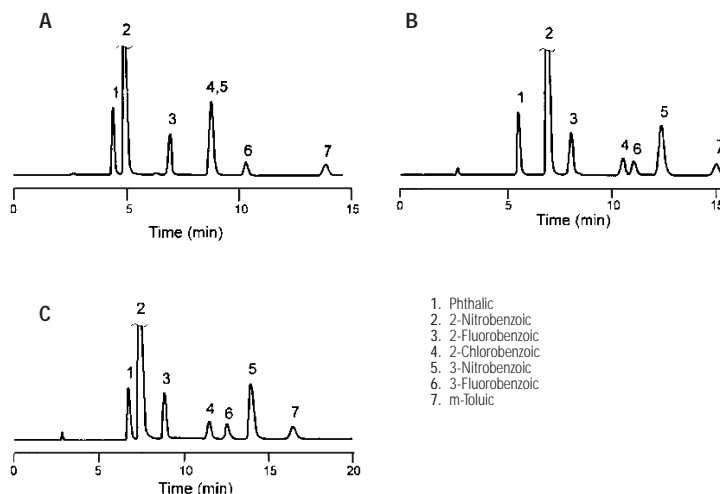
Column A: ZORBAX SB-C8
880975-906
4.6 x 250mm, 5µm

Column B: ZORBAX SB-Phenyl
880975-912
4.6 x 250mm, 5µm

Column C: ZORBAX SB-CN
880975-905
4.6 x 250mm, 5µm

Mobile Phase: 30-45% methanol (above) in 25 mM Na Phosphate, pH 2.5
a: 45% Methanol
b: 40% Methanol
c: 30% Methanol

Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: UV 254 nm
Sample: Benzoic acids



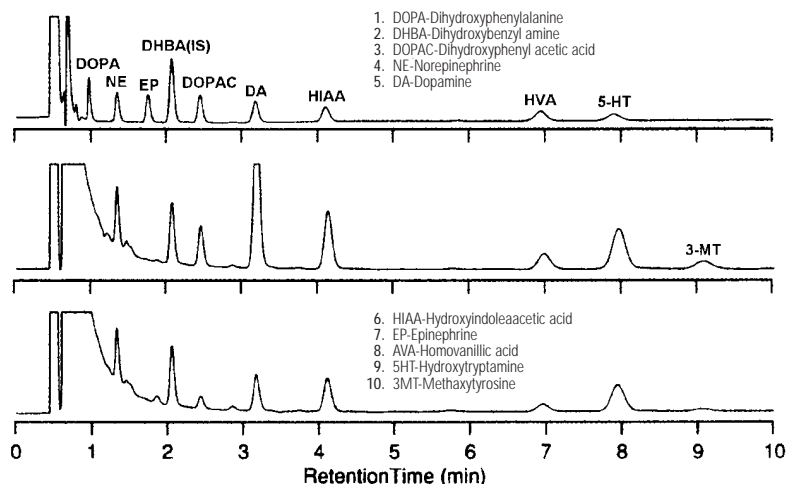
Catecholamines/Biogenic Amines: Rapid Separation using Ion Pair Reagents

Column: ZORBAX Rx/SB-C8
866953-906
4.6 x 75mm, 3.5µm

Mobile Phase: 0.14 M sodium phosphate, 20 mM EDT A, 0.75 mM octyl sulfonate, 9% methanol pH 3.5

Flow Rate: 1.5 mL/min
Temperature: 26°C
Detector: 0.75 V vs Ag/AgCl with electro-chemical detection

Sample: 10 µg/mL each standard; volume 20 µL (2 g tissue sample)
A. Standards (2pmol): DHBA 5pmol
B. Mouse Sratium
C. Mouse Neocortex

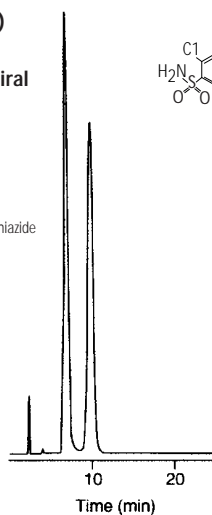
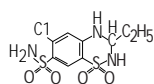


Chiral Ethiazide (Diuretic Drug) Separation on Ultron ES-OVM

Column: Ultron ES-OVM Chiral
702111651
4.6 x 150mm, 5µm

Mobile Phase: 20 mM KH₂PO₄ (pH 4.6)

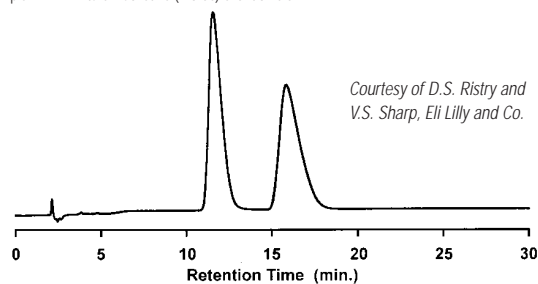
Flow Rate: 1.0 mL/min
Temperature: 25°C
Detector: UV 220 nm
Sample: 20 µL containing 0.35 µg Ethiazide



Chiral Separation of Fluoxetine Enantiomers (Prozac) using Ultron ES-OVM

Column: Ultron ES-OVM Chiral
702111651
4.6 x 150mm, 5µm

Mobile: 25/75 (v/v) EtOH / 20 mM KH₂PO₄, pH 5.5
Phase: (adjusted with NaOH)
Flow Rate: 0.8 mL/min
Temperature: Ambient
Detector: UV 225 nm
Sample: Mixture Fluoxetine (Prozac) enantiomers

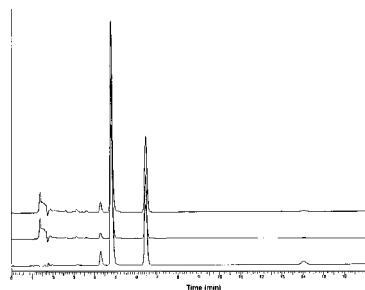


Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.

LC and LC/MS Applications Pharmaceutical

Goldenseal and Related Alkaloids on a Rapid Resolution Eclipse XDB-C18 Column

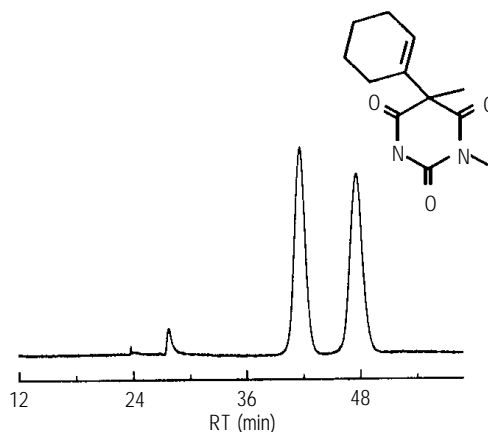
Column: Eclipse XDB-C18
963967-902
4.6 x 150mm, 3.5 μ m
Mobile: 68% 30 mM ammonium acetate, 14 mM TEA, pH -4.85
Phase: 32% Acetonitrile
Flow Rate: 1.0 mL/min
Temperature: 30°C
Detector: 230 nm
Sample: Goldenseal and related Alkaloids



Alkaloids, such as the active components in Goldenseal and other related plants, are quickly and accurately separated using isocratic conditions on an Eclipse XDB-C18 Rapid Resolution column.

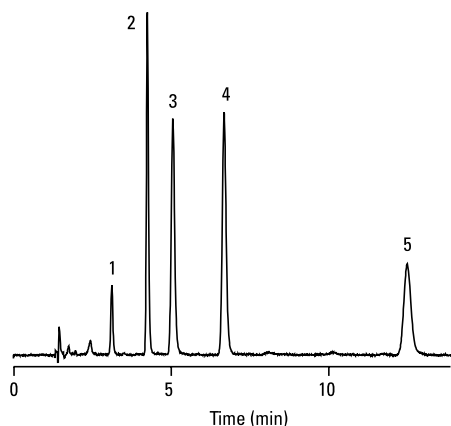
Chiral Separation of Hexobarbital

Column: Chiradex
79925CB-584
4.0 x 250mm, 5 μ m
Mobile: Methanol/water, 20:80
Phase:
Flow Rate: 1.0 mL/min
Detector: UV 220 nm
Sample: Hexobarbital



Components of Green Tea Separated on a Rapid Resolution StableBond SB-C8 Column

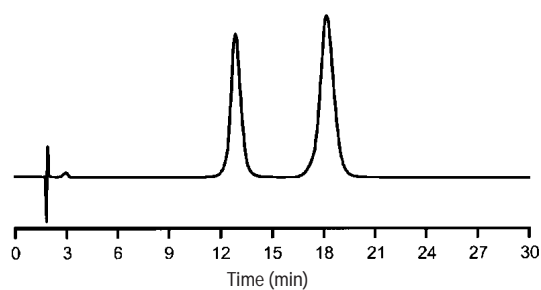
Column: ZORBAX SB-C8
863953-906
4.6 x 150mm, 3.5 μ m
Mobile: 75% 0.1% TFA : 25% MeOH
Phase:
Flow Rate: 1.0 mL/min
Temperature: 40°C
Detector: 280 nm
Sample: Green tea



Nutraceuticals, such as the components of green tea, are quickly separated on a StableBond SB-C8 Rapid Resolution column.

Chiral Separation of S- and R- Norfluoxetine using Ultron ES-Pepsin

Column: Ultron ES-OVM Chiral
724111653
4.6 x 250mm, 10 μ m
Mobile: 6/94 (v/v) MeOH / 20 mM KH₂PO₄
Phase:
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 225 nm
Sample: 50 μ g/mL of 2:3 mixture R- : S -Norfluoxetine

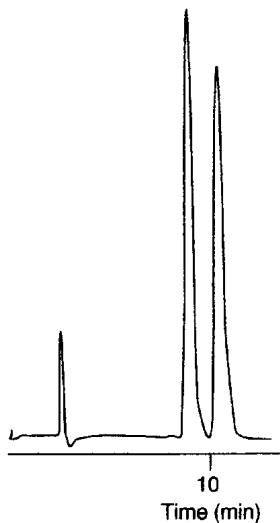


Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.

Chiral Separation of Salbutamol on Ultron ES- Pepsin

Column: Ultron ES-Pepsin
822111631A
4.6 x 150mm, 5µm

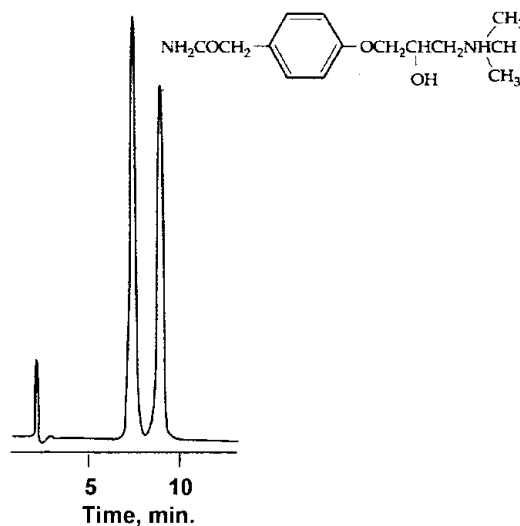
Mobile: 20 mM phosphate buffer, pH 6.0
Phase:
Flow Rate: 1.0 mL/min
Temperature: 25° C
Detector: UV 220 nm
Sample: 20 µL containing 0.35 µg Salbutamol Mixture



Chiral Separation of Atenolol on Ultron ES - Pepsin

Column: Ultron ES-Pepsin
822111631A
4.6 x 150

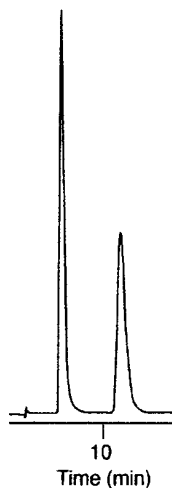
Mobile: 20 mM phosphate buffer, pH 6.0/Ethanol (99/1)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 25° C
Detector: UV 220 nm, 0.04 AUFS
Sample: 1.5 µL, 0.25 mg/mL, Atenolol Racemic Mixture



Chiral Separation of Tolperison Enantiomers on Ultron ES-OVM

Column: Ultron ES-OVM Chiral
702111651
4.6 x 150mm, 5µm

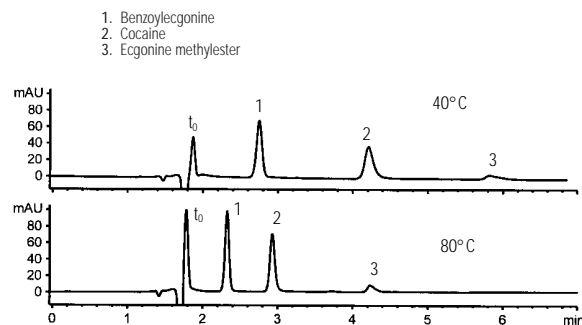
Mobile: 20 mM KH₂PO₄ (pH 5.5), C 2H₅OH (100/4 v/v)
Phase:
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 220 nm, 0.04 AUFS
Sample: Tolperison, 5 µL



Cocaine and Metabolites

Column: ZORBAX Rx-SIL
883975-901
4.6 x 150mm, 5µm

Mobile: MeOH: NH Acetate, 25 mM, pH 6 (70:30)
Phase:
Flow Rate: 1.0 mL/min
Temperature: 40 and 80° C
Detector: UV 210 nm
Publication: LI PH42



LC and LC/MS Applications

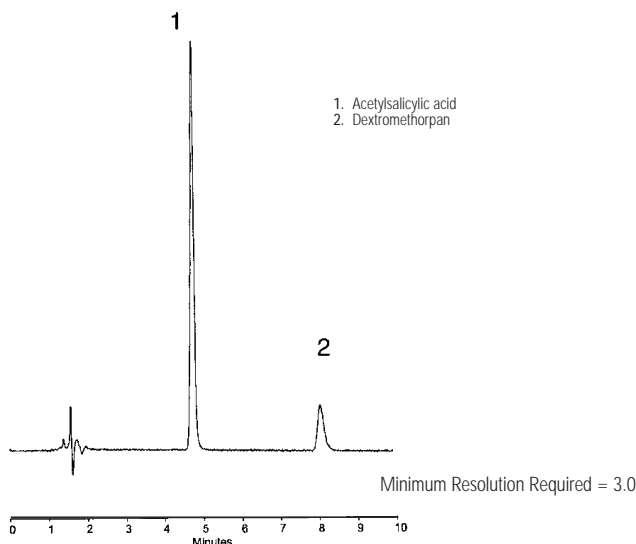
Pharmaceutical

Aspirin and Cough Remedy on ZORBAX Eclipse XDB-C8

Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm
(75:25) 25 mM Na₂HPO₄ (pH 3.0) :ACN

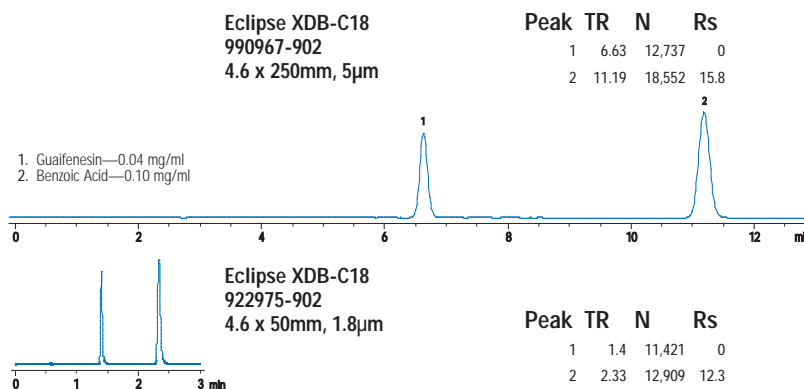
Mobile Phase:

Flow Rate: 1.0 mL/min
Temperature: 40°C
Detector: UV 254 nm
Sample: 5 µL, 10 µg/mL



Guaifenesin- USP Analysis of Guaifenesin

Mobile Phase: 40% Methanol:60% Water:1.5% Glacial Acetic Acid
Flow Rate: 1.0 mL/min
Temperature: 25°C
Sample: Guaifenesin
a: 8 µL
b: 2mL



Metronidazole: Updating USP Methods

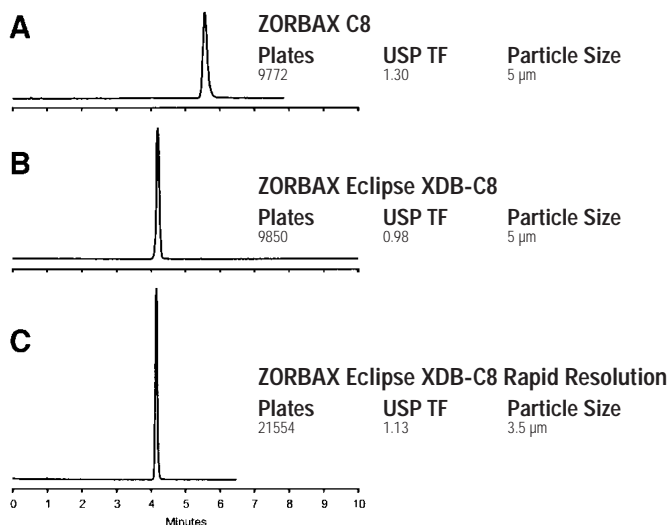
Column A: ZORBAX C8
883952-706
4.6 x 150mm, 5µm

Column B: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm

Column C: Eclipse XDB-C8
963967-906
4.6 x 150mm, 3.5µm

Mobile Phase: 80/20, Water/Methanol

Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 254 nm
Sample: Metronidazole



Morphine and Metabolites: Extracted Blood Plasma Sample Separation

Column: ZORBAX SB-C18

863953-902

4.6 x 150mm, 3.5µm

Mobile: 97/3 70 mM KH₂PO₄ + 1 mM EDTA/ACN, pH 4.5

Phase:

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: a: Electrochemical, 720 mV

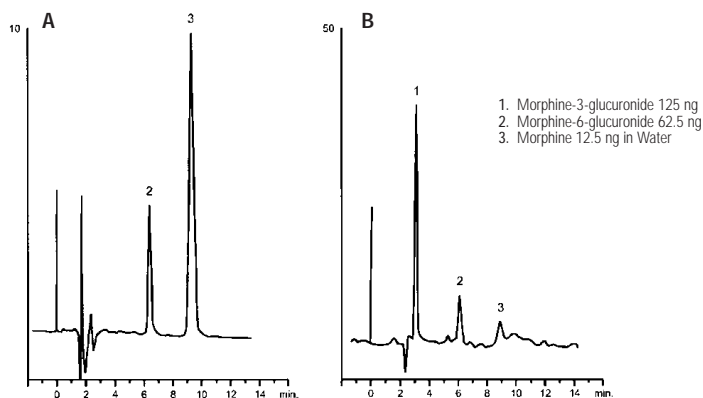
b: Fluorescence, Ex = 285 nm, Em = 352 nm

Sample: 50 µL

Morphine-3-glucuronide 125 ng

Morphine-6-glucuronide 62.5 ng

Morphine 12.5 ng in Water



Courtesy of J. Visser, Center for Pharmacy Univ. Groningen, The Netherlands.

Opiates (Drugs of Abuse) by LC/MS

Column: ZORBAX SB-AQ

830990-914

2.1 x 150mm, 3.5µm

Mobile: A: Acetonitrile with 0.1% formic acid

B: Water with 0.1% formic acid

Flow Rate: 0.25 mL/min

Gradient: 0 min 10% B

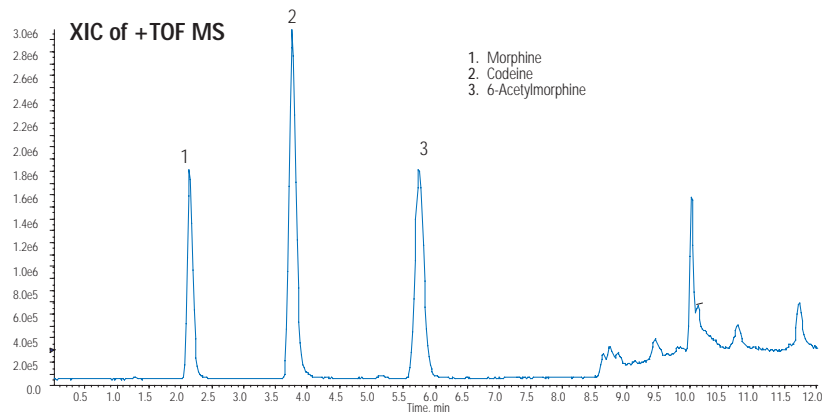
5 min 35% B

5.1 min 100% B

MS: Time of Flight (TOF)

Conditions: Standard with calibrant delivery system providing constant low flow of ~ 2 µM purine and HP-921 calibrant to dual ESI for continuous auto-calibration

Sample: Opiates



Neutraceuticals: Hypericin Separation in St. John's Wort

Column: Eclipse XDB-C8

993967-906

4.6 x 150mm, 5µm

Mobile: 23% 25 mM Na₂HPO₄, Dibasic (pH 7.0 with H₃PO₄)

Phase: 77% MeOH

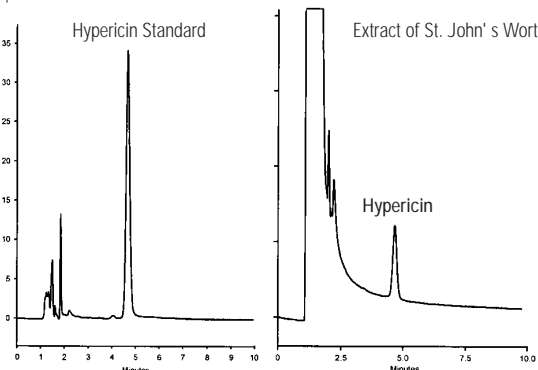
Flow Rate: 1.0 mL/min

Temperature: 35°C

Detector: 254 nm

Publication: LI PH47

Sample: Neutraceuticals



Opiate Drugs, Basic Compounds Showing Good Peak Shape

Column: ZORBAX Rx-C8

883967-901

4.6 x 150mm, 5µm

Column: ZORBAX SB-C8

883975-906

4.6 x 150mm, 5µm

Mobile: 7% ACN / 93% 25 mM KH₂PO₄, pH 3.5

Phase:

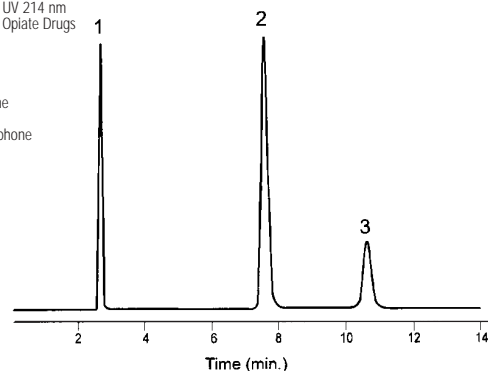
Flow Rate: 1.5 mL/min

Temperature: 25°C

Detector: UV 214 nm

Sample: Opiate Drugs

1. Morphine
2. Codeine
3. Oxycodone



LC and LC/MS Applications Pharmaceutical

Pharmaceuticals - Rapid, High Sensitivity LC and LC/MS of 11 Drugs

Column: Eclipse XDB-C18

925700-902

2.1 x 50mm, 1.8µm

Mobile: A: 10mM NH4 Formate (pH=3.6) B: ACN with 10mM

Phase: NH4 Formate

Flow Rate: 0.6ml/min

Gradient: 5% B to 70% B in 7.5 min, to 95% B in 8.5 min.

Temperature: 65°C

Detector: UV 230 nm and MSD Trap SL

MS: Pos. Dry Gas: 345°C

Conditions: Neb.: 45psi

HV Cap: 3500V

Range: 100-700

Average: 5 Spectra

ICC: 30000

Charge Con: On

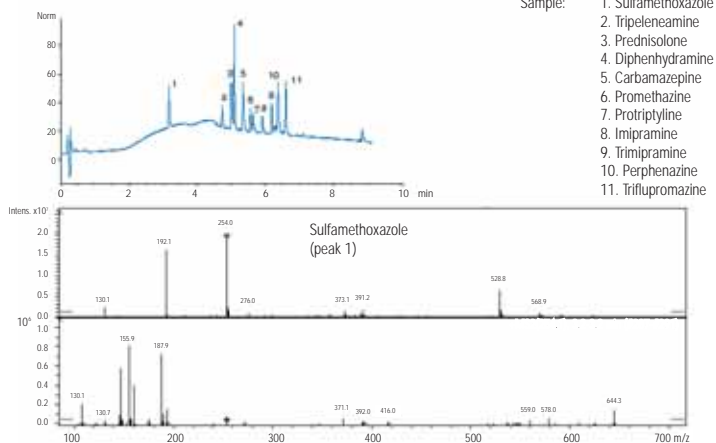
Smart Par. Settings: Tar Mas: 250m/z

Comp. Stab: 100%

Trap Drive: 100%

Frag. Options: Smart Frag: On

Frag. Width: 10m/z



Oxindole Alkaloids

Column: ZORBAX Rx-C18

880967-902

4.6 x 250mm, 5µm

Mobile: A = 10 mM Phosphate Buffer pH 6.6

Phase: B = (1:1) MeOH :ACN

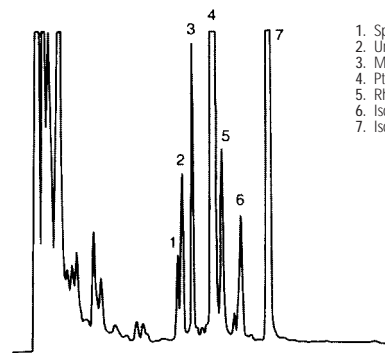
Flow Rate: 1.0 mL/min

Gradient: 45-70%B in 35 min.

Temperature: 15°C

Detector: UV 245 nm

Sample: 10 µL, Oxindole Alkaloid Mix



1. Spectiophyllin
2. Uncarin F
3. Mitraphyllin
4. Pteropodin
5. Rhynchophyllin
6. Isorhynchophyllin
7. Isopteropodin

Courtesy of Dr. H. Stuppner, Inst. Pharmacognosy, Univ. Innsbruck, Austria.

Procainamides and Metabolites Separated at High pH

Column: Asahipak ODP-50

799230P-584

4.0 x 250mm, 5µm

Mobile: A = Buffer pH 12, 1:19 diluted

Phase: B = Acetonitrile

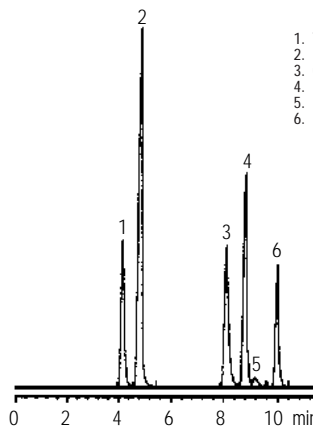
Flow Rate: 1.0 mL/min

Gradient: 10-70% B in 8 min

Temperature: 50°C

Detector: UV

Sample: Basic Drugs



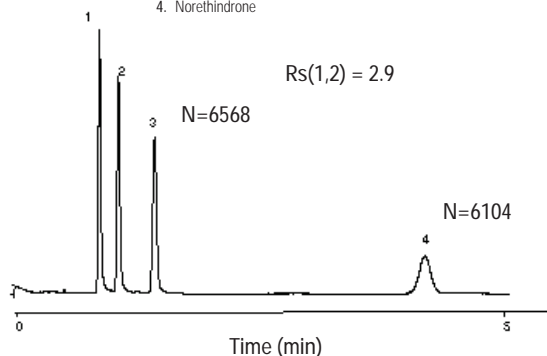
1. Tocainamide
2. Procainamide
3. Quinine
4. Disopyramide
5. Dihydroquinine
6. Diphenhydramine

Hormones/Steroids on ZORBAX Rapid Resolution HT SB-C18

Column: ZORBAX SB-C18 RRHT cartridge
823975-902
4.6 x 30mm, 1.8µm

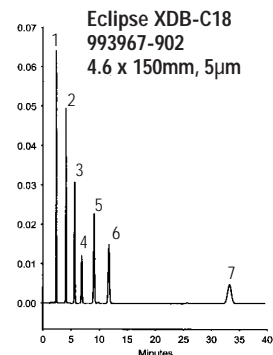
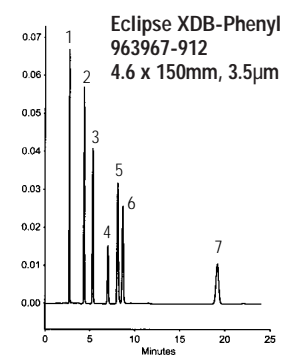
Mobile: 50% 20 mM NaH₂PO₄, pH 2.8; 50% ACN
Phase:
Flow Rate: 1.0 mL/min
Temperature: RT
Detector: UV 230 nm
Sample: Hormones/Steroids

1. Estradiol
2. Ethinylestradiol
3. Dienestrol
4. Norethindrone



Steroids

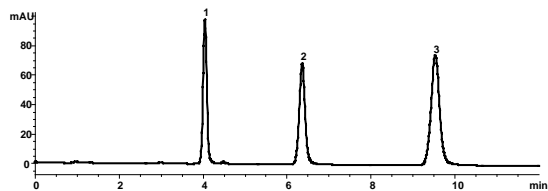
Mobile: H₂O : ACN, 60:40
Phase:
Flow Rate: 1.0 mL/min
Temperature: 35°C
Detector: 254 nm
Publication: LI PH36
Sample: Steroid Sample
1. Prednisolone
2. Corticosterone
3. 11 -hydroxyprogesterone
4. Cortisone acetate
5. Deoxycorticosterone
6. 17 hydroxyprogesterone
7. Progesterone



Steroids: Separation on Eclipse XDB-CN

Column: Eclipse XDB-CN
993967-905
4.6 x 150mm, 5µm

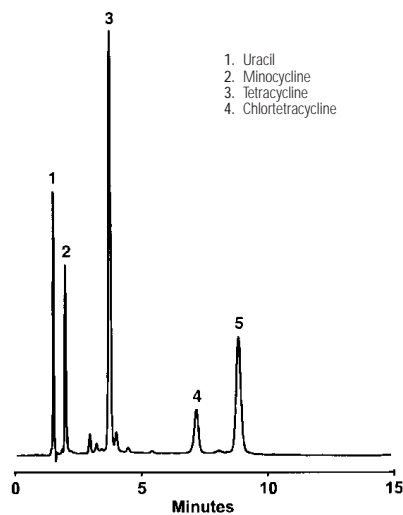
Mobile: 40:60 ACN:Water
Phase:
Flow Rate: 1.0 mL/min
Temperature: 25°C
Detector: UV 205 nm
Sample: Norethindrone 0.514 mg/mL
Progesterone 0.407 mg/mL
Mestranol 0.057 mg/mL



Tetracyclines

Column: ZORBAX Rx-C8
883967-901
4.6 x 150mm, 5µm

Mobile: 75/25 0.1% TFA/Acetonitrile
Phase:
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV 254 nm
Sample: Tetracyclines

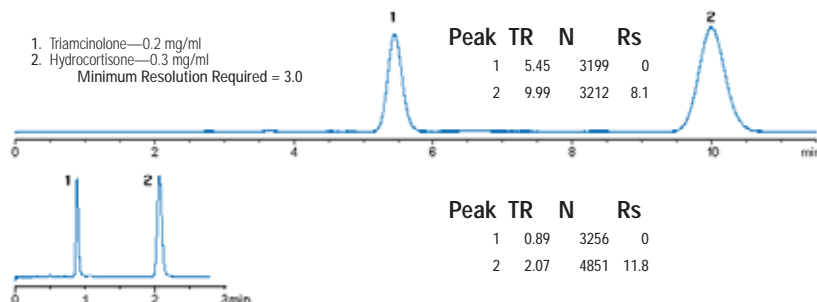


LC and LC/MS Applications Pharmaceutical

Triamcinolone - USP Analysis of Triamcinolone

Column: Eclipse XDB-C18
923975-902
4.6 x 30mm, 1.8µm

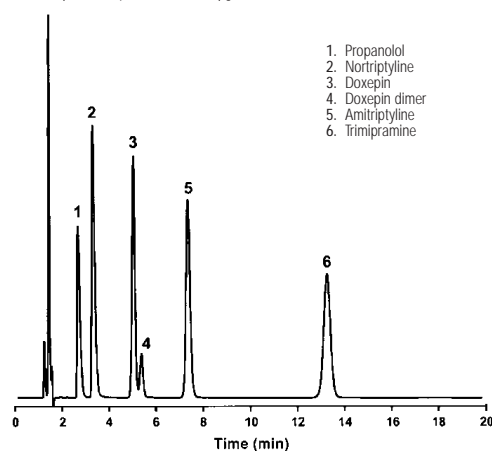
Mobile: 47% Methanol:53% Water
Phase:
Flow Rate: 1.5 mL/min
Temperature: 25°C
Sample: Triamcinolone, 1 µL



Tricyclic Antidepressants

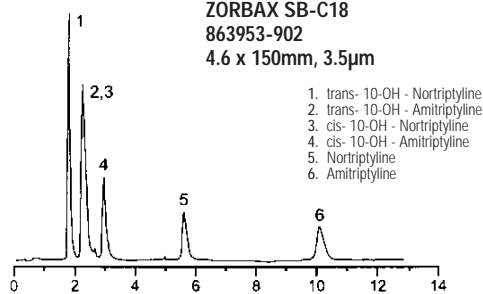
Column: Eclipse XDB-C8
993967-906
4.6 x 150mm, 5µm

Mobile: 38/62 THF/25 mM Potassium Phosphate, pH7
Phase:
Flow Rate: 1.0 mL/min
Temperature: 23°C
Detector: UV 254 nm
Sample: 10 µL, Antidepressant Mix, 10 µg/mL

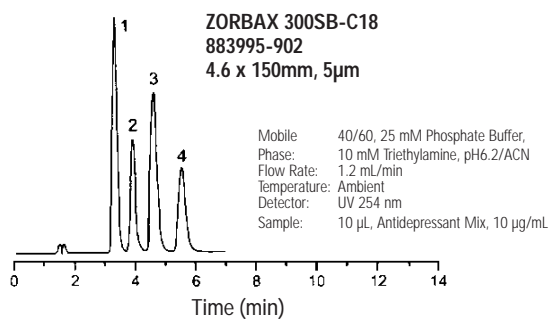


Tricyclic Antidepressants and Metabolites: Effect of Pore Size

ZORBAX SB-C18
863953-902
4.6 x 150mm, 3.5µm



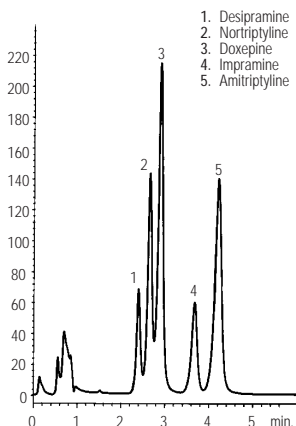
ZORBAX 300SB-C18
883995-902
4.6 x 150mm, 5µm



Tricyclic Antidepressants, Screening Application at High pH

Column: Asahipak ODP-50
799230P-584
4.0 x 250mm, 5µm

Mobile: Phosphate buffer pH 12, Acetonitrile
Phase:
Flow Rate: 1.0 mL/min
Temperature: 50°C
Detector: UV
Sample: Tricyclic Antidepressants



LC and LC/MS Applications Pharmaceutical

Ulcer Treatment Drugs at Intermediate pH

Column: ZORBAX Bonus-RP

883668-901

4.6 x 150mm, 5µm

Mobile: Na citrate, 20 mM, pH 6.1; MeOH, (80:20)

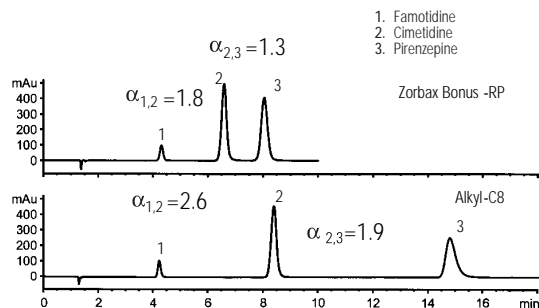
Phase:

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 220 nm

Sample: Ulcer treatment drugs



USP Method: Glyburide and Internal Standard, Progesterone

Column: Eclipse XDB-C8

990967-906

4.6 x 250mm, 5µm

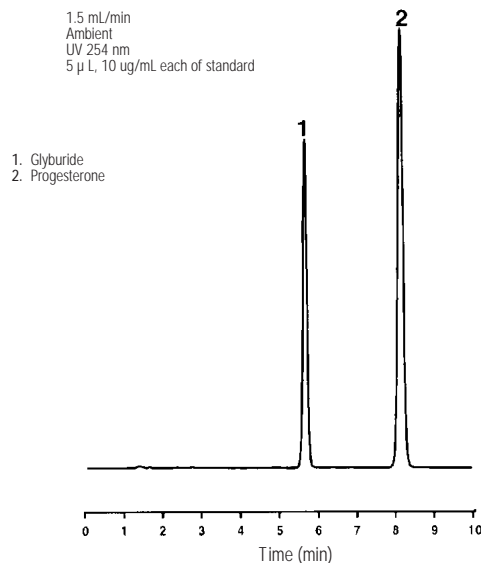
Mobile Phase: 45/55, 50 mM Ammonium Phosphate / ACN, Final pH 5.35

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: 5 µL, 10 µg/mL each of standard



Urine, LSD Analysis by LC/MS

Column: Eclipse XDB-C8

960967-906

2.1 x 50mm, 5µm

Mobile: 15 : 85, ACN : 10 mM Ammonium Formate, pH 3.7

Phase:

Flow Rate: 0.3 mL/min

Temperature: 30° C

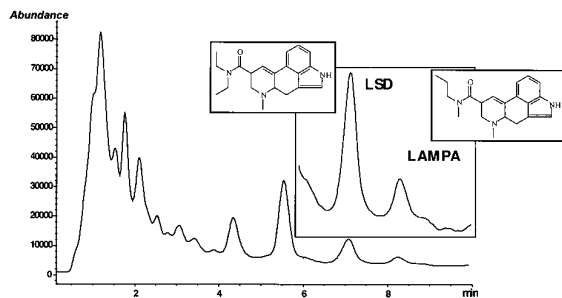
Detector: MS

MS: SIM mode, Ions: 324.2, 223.1, 208.1

Conditions: Fragmentor (dynamically ramped) 100V at 324.2, 148V at 223.1, 170V at 208.1

Publication: LJ PH35

Sample: LSD



Hughes, J.M., C.A. Miller and S.M. Fischer, "Development of a Method for the Forensic Analysis of LSD in Urine", presented at the ASMS, Palm Springs, June 1997.

Dexamethasone, USP Method: Rapid Analysis

Column A: ZORBAX SB-C8

880975-906

4.6 x 250mm, 5µm

Column B: ZORBAX Rx/SB-C8

866953-906

4.6 x 75mm, 3.5µm

Mobile Phase: A = Water, B = ACN; Isocratic 30% B

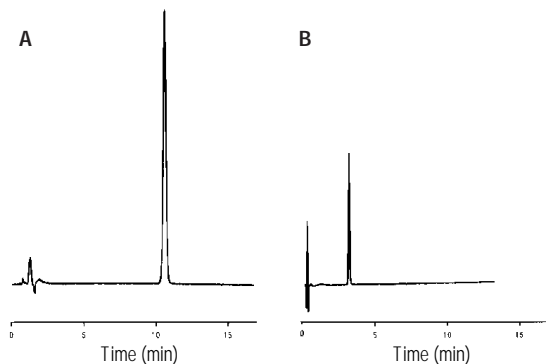
Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Sample: Dexamethasone

10 µL and 5 µL, 10 µg/mL

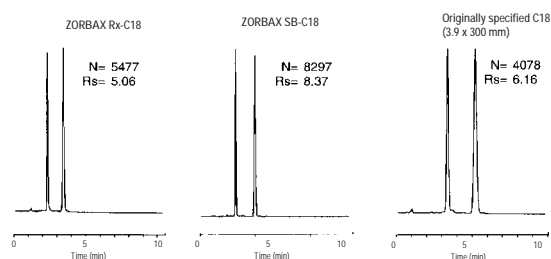


LC and LC/MS Applications Pharmaceutical

USP Method: Triamcinolone and Internal Standard, Hydrocortisone

Column: ZORBAX Rx-C18
880967-902
4.6 x 250mm, 5µm
Column: ZORBAX SB-C18
880975-902
4.6 x 250mm, 5µm
Mobile: Water: MeOH, 40/60
Phase:
Flow Rate: 2.0 mL/min
Temperature: Ambient
Detector: UV 254 nm
Sample: 10 µL, 10 ug/mL

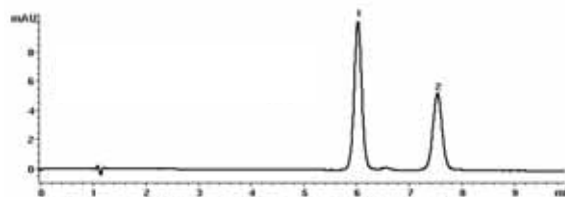
1. Triamcinolone
2. Hydrocortisone



Warfarin: USP Chromatographic Purity Method Using Eclipse XDB-CN

Column: Eclipse XDB-CN
993967-905
4.6 x 150mm, 5µm
Mobile: 32:68:1 Acetonitrile:Water:Glacial Acetic Acid
Phase:
Flow Rate: 1.5 mL/min
Temperature: 25°C
Detector: UV 260 nm
Sample: Warfarin, 2 µL

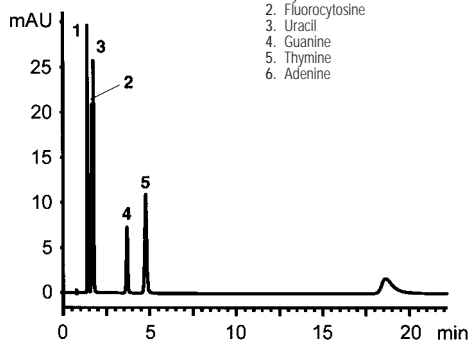
1. Warfarin (0.128 mg/ml)
2. Warfarin Related Compound A (0.118 mg/ml)



Hydrophilic Purine/Pyrimidine Separation

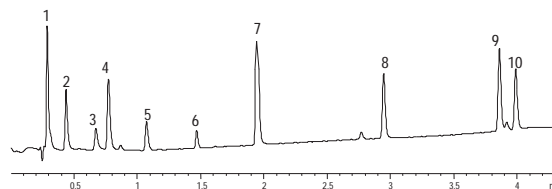
Column: ZORBAX SB-AQ
883975-914
4.6 x 150mm, 5µm
Mobile: 50 mM NaOAc, pH 4.6
Phase:
Flow Rate: 2.0 mL/min
Temperature: 35°C
Detector: UV 254 nm

1. Cytosine
2. Fluorocytosine
3. Uracil
4. Guanine
5. Thymine
6. Adenine



Ten Cardiac Drugs on Rapid Resolution HT SB-C18

Column: SB-C18
829975-902
4.6 x 150mm, 1.8µm
Mobile: A: 0.1% TFA, 5% ACN
Phase: B: 0.08% TFA, 95% ACN
Flow Rate: 2 mL/min
Gradient: 0.0 min 12.5% B
10.5 min 60% B
12.0 min 60% B
Temperature: 70°C
Detector: UV 230 nm
Sample: Cardiac Drugs



LC and LC/MS Applications Pharmaceutical

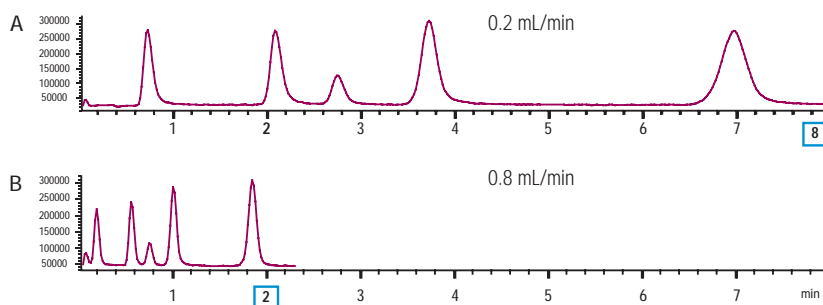
Sulfonamides - Fast Analysis with RRHT Columns

Column: SB-C18
824700-902
2.1 x 30mm, 1.8 μ m

Mobile Phase:
A: 90% 0.1% formic acid
B: 10% 0.1% formic acid in MeOH

Flow Rate:
A: 0.2 mL/min
B: 0.8 mL/min

Temperature: 35°C
Detector: TIC, Single Quad
Sample: Sulfonamides



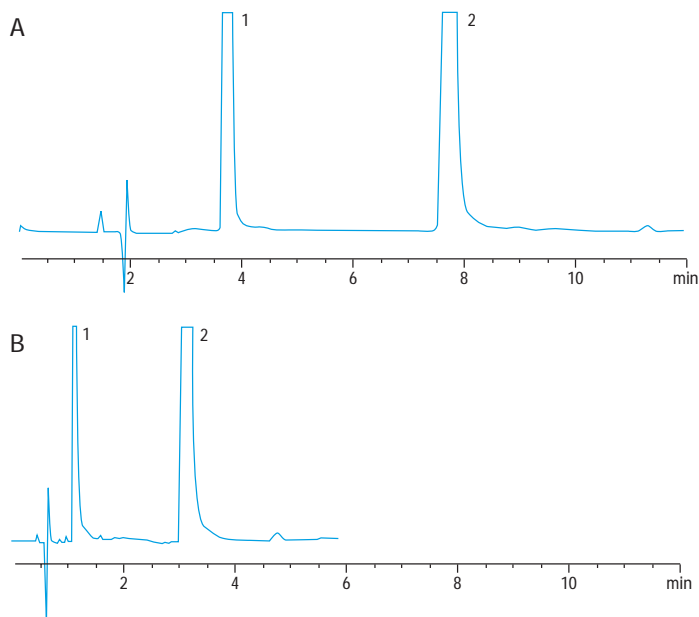
Fast Analysis of Pindolol

Column A: ZORBAX SB-CN
863953-905
4.6 x 150mm, 3.5 μ m

Column B: ZORBAX SB-CN
827975-905
4.6 x 50mm, 1.8 μ m

Mobile Phase:
A: 70% 50 mM NaAcetate
B: 30% ACN

Flow Rate: 1 mL/min
Temperature: Ambient
Detector: UV 219 nm
Sample: Pindolol, 2 μ L



CE and CE/MS

CE Solution Kits	674-677
CE Capillaries	677-682
CE Instrument Parts and Supplies	683-689



CE and CE/MS

Delivering the analytical capabilities you need for consistent results

Agilent's Capillary Electrophoresis System is a highly flexible tool for analyzing a wide range of compounds over varying applications. Moreover, it is backed by decades of Agilent quality and expertise. The system features a unique High-Sensitivity Detection Cell, which improves detection sensitivity an amazing ten-fold over standard capillaries. The result is HPLC-caliber sensitivity, ruggedness, and reproducibility that can help you produce your numbers more reliably than ever before.

Additionally, Agilent offers specific solution kits – designed for both organic and inorganic analysis – that feature robustness, repeatability, and ease of use. You can also choose from a comprehensive selection of buffer formulations conveniently ready to use right from the bottle.

CE and CE/MS



Solutions Kits for CE

Agilent Technologies CE Solutions Kits include all you need to begin your CE analysis: buffers, capillaries, conditioning solutions, test samples and methods. Each kit is designed to take advantage of the automation of the Agilent CE system to make your time in the laboratory more efficient. All kits are prepared using the same quality procedures as our buffers and are thoroughly tested and supported.

While the kits have been optimized for use with the Agilent CE system, they may be used with virtually any commercial or home-built CE system.

Inorganic Anion Solutions Kit

Component	Unit	Part No.
Inorganic Anion Solutions Kit		5063-6511
Inorganic anion buffer	250 ml	8500-6797
Ultra pure CE water	500 ml	5062-8578
0.1 N sodium hydroxide	250 ml	5062-8575
1.0 N sodium hydroxide	250 ml	5062-8576
Bare fused-silica capillary, 50 µm ID, 72 cm long	2/pk	G1600-62211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, boronide, nitrite, sulfate and 2000 ppm phosphate	10 ml	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm ID capillary (P/N G1600-60210)

Organic Acids Solution Kit

Component	Unit	Part No.
Organic Acids Solution Kit		5063-6510
Organic acids buffer	250 ml	8500-6785
Ultra pure CE water	500 ml	5062-8578
1.0 N sodium hydroxide	250 ml	5062-8576
Bare fused-silica capillary, 75 µm ID, 72 cm long	2/pk	G1600-62311
Organic acids test mixture Includes 1000 ppm each of malate, succinate, and lactate	20 ml	8500-6900

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for 75 µm ID capillary (P/N G1600-60310)

CE and CE/MS Solutions Kits

Forensic Anions Solutions Kit

Component	Unit	Part No.
Forensic Anions Solutions Kit		5064-8208
Basic anion buffer	5 x 50 ml	5064-8209
Ultra pure CE water	500 ml	5062-8578
Bare fused silica capillary, 50 µm ID, 104 cm long	2/pk	G1600-64211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, borate, nitrite, sulfate and 2000 ppm phosphate	10 ml	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm ID capillary (P/N G1600-60210)

Cation Solutions Kit

Component	Unit	Part No.
Cation Solutions Kit		5064-8206
Cation buffer	250 ml	5064-8203
Ultra pure CE water	500 ml	5062-8578
Bare fused silica capillary, extended light path bubble factor (3), 50 µm ID, 56 cm long	2/pk	G1600-61232
Cation test mixture	25 ml	5064-8205

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm ID extended light path capillary (P/N G1600-60230)

μPAGE Gel-filled Capillaries for High Resolution DNA Fragments Analysis

μPAGE poly-acrylamide gel-filled capillaries are the most direct vehicles to transfer all of your applications from slab gel to CE, enjoying the automation, high speed, high resolution, and quantitative advantages of CE. The capillaries are ideal for high resolution separations of oligonucleotides, single-stranded and double-stranded DNA fragments, polymerase chain reaction (PCR) products, sequencing reaction products and oligosaccharides.

μPAGE capillaries are available in three different pore sizes. The size of the molecular sieving pores is controlled by the monomer concentration (%T) and the degree of polymer crosslinking (%C). Gels with higher %T and %C values have smaller pores and are, therefore, more effective at resolving smaller molecules. μPAGE-10 (10%T, 0%C) capillaries provide high resolution capabilities for separation of antisense therapeutic agents, primers and probes as well as oligonucleotides.

μPAGE-5 (5%T, 5%C) allows single base resolution of oligonucleotides [pd(A)] ranging from 20-150 bases while μPAGE-3 allows fast analysis of larger DNA fragments.

Three different μPAGE kits are available. For your convenience, μPAGE capillaries and μPAGE buffers can be purchased together or separately. To achieve the highest reproducibility and provide optimal capillary longevity, use μPAGE buffer with μPAGE capillaries.

μPAGE Starter Kits

Include 3 μPAGE capillaries, 75 cm total length, 50 cm effective length
μPAGE pd(A)_{25-30, 40-60} oligonucleotide standard for μPAGE-3 and μPAGE-5 kits
μPAGE pd(A)₂₅₋₃₀ oligonucleotide standard for μPAGE-10 kit
μPAGE buffer, 2 x 237 mL

μPAGE capillary in Kit

Description	ID (μm)	Part No.
μPAGE-10 (10% T, 0% C)	100	192-1311
μPAGE-5 (5% T, 5% C)	75	192-5211
μPAGE-3 (3% T, 3% C)	75	192-3211

μPAGE Basic Kits

Includes 3 μPAGE capillaries, 75 cm total length, 50 cm effective length
μPAGE pd(A)_{25-30, 40-60} oligonucleotide standard for μPAGE-3 and μPAGE-5 kits
μPAGE pd(A)₂₅₋₃₀ oligonucleotide standard for μPAGE-10 kit

μPAGE capillary in Kit

Description	ID (μm)	Part No.
μPAGE-10 (10% T, 0% C)	100	191-1311
μPAGE-3 (3% T, 3% C)	75	191-3211
μPAGE-5 (5% T, 5% C)	75	191-5211

Note: The μPAGE capillaries are not pre-aligned for the P/N G1600A CE system. To cut them to the correct length use the P/N 5183-4669 CE column cutter.

μPAGE Buffer Solutions and Oligo Standards

Description	Part No.
μPAGE Tris-borate and urea buffer for μPAGE-10, 4 x 237 ml	590-4005
μPAGE Tris-borate and urea buffer for μPAGE-3 and μPAGE-5, 4 x 237 ml	590-4001
μPAGE pd(A) _{25-30, 40-60} oligonucleotide standard for μPAGE-3 and μPAGE-5, 3 x 50 μl	590-4000

Standard Bare Fused-Silica Capillaries

Fused-silica capillaries are the heart of CE. Pre-aligned capillaries from Agilent Technologies are designed and optimized for ease of use and reliability. All capillary ends are cut to a smooth, mirror-like finish. In addition, the polyimide outer-coating is removed from the ends. These processes ensure minimal sample adsorption and help maintain sharp peak shapes. All capillaries have a pre-made detection “window” and a built-in alignment stopper which allows rapid and precise insertion in the alignment interface.

Standard Bare Fused-Silica Capillaries, 2/pk

ID (μm)	Total Length (cm)	Effective Length (cm)	Color Code	Part No.
50	33	24.5	Green	G1600-63211
	48.5	40	Green	G1600-60211
	64.5	56	Green	G1600-61211
	80.5	72	Green	G1600-62211
	112.5	104	Green	G1600-64211
75	33	24.5	Blue	G1600-63311
	48.5	40	Blue	G1600-60311
	64.5	56	Blue	G1600-61311
	80.5	72	Blue	G1600-62311
	112.5	104	Blue	G1600-64311
100	33	24.5	Gray	G1600-63411
	48.5	40	Gray	G1600-60411
	64.5	56	Gray	G1600-61411
	80.5	72	Gray	G1600-62411
	112.5	104	Gray	G1600-64411

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries

Use Agilent Technologies extended light path capillaries ("bubble" cell capillaries) to improve sensitivity 3- to 5-fold over standard capillaries. With extended light path capillaries the inner diameter is increased only at the detection window, offering the sensitivity of a wide inner diameter capillary and the low current generation of a narrow one.

Resolution is not sacrificed when used with Agilent Technologies' matching optical alignment interfaces.

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
25	48.5	40	5	125	Black	G1600-60132
	64.5	56	5	125	Black	G1600-61132
	80.5	72	5	125	Black	G1600-62132
50	43.5	35	3	150	Red	G1600-60233
	48.5	40	3	150	Red	G1600-60232
	64.5	56	3	150	Red	G1600-61232
	80.5	72	3	150	Red	G1600-62232
	112.5	104	3	150	Red	G1600-64232
75	48.5	40	2.7	200	Yellow	G1600-60332
	64.5	56	2.7	200	Yellow	G1600-61332
	80.5	72	2.7	200	Yellow	G1600-62332
	112.5	104	2.7	200	Yellow	G1600-64332

Universal Bare Fused-Silica Capillaries

These are capillaries with a window and 75 cm effective length and 363 µm od, fitting into any CE instrument. To cut them to the correct length we recommend using the P/N 5183-4669 CE column cutter.

Universal Bare Fused-Silica Capillaries

ID (µm)	Total Length (cm)	Effective Length (cm)	Part No.
20	100	75	190-0431
50	100	75	190-0131
75	100	75	190-0231
100	100	75	190-0331

Bulk Fused-Silica Capillaries, 363 µm OD

Capillary ID (µm)	Total Length (m)	Part No.
20	5	160-2660-5
50	5	160-2650-5
75	5	160-2644-5

Poly Vinyl Alcohol (PVA) Coated Capillaries

PVA coated capillaries contain a permanently adsorbed layer of poly(vinyl alcohol). This coating minimizes hydrophobic and electrostatic solute/wall interactions and eliminates electroosmotic flow (EOF). Using a proprietary deposition process, the PVA coating is stable over a wide pH range even under basic conditions from 2.5 to 9.5. This stability allows use of a wide range of common CE buffers. Because the silica surface is covered, many proteins and amines can be analyzed without the peak tailing found with uncoated capillaries. In addition, since EOF is eliminated, cumbersome washing procedures are unnecessary and migration time reproducibility can be improved.

Each batch of PVA coated capillaries is rigidly tested by Agilent Technologies and includes a representative electropherogram to assure quality.

The color coding of the capillary (alignment stopper) and the alignment interfaces allows you to easily combine the correct interface with the capillary. Capillaries for non-Agilent CE system users have removable alignment stoppers without color code.

Agilent Capillary Electrophoresis System Users*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
50	64.5	56	0	50	Green	G1600-61219
	64.5	56	3	150	Red	G1600-61239
	125	21.5	0	50	Blue	G1600-67219
75	64.5	56	0	1200		G1600-68319
	125	21.5	0	75	Blue	G1600-67319
100	48.5	40	0	100	Gray	G1600-60419
	64.5	56	0	100	Gray	G1600-61419

*Not compatible with Borate buffers

Note: The PVA capillaries for CE/MS have a blue alignment stopper matching the blue color code of the alignment interface for MS-UV Det. The alignment stopper of the 50 µm ID PVA capillary for CE/MS has a black dot for easy identification.

Non-Agilent Capillary Electrophoresis System Users*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Part No.
50	71	60	0	50	G160U-61219
	71	60	3	150	G160U-61239
100	56	45	0	100	G160U-60419
	71	60	0	100	G160U-61419

*Not compatible with Borate buffers

Note: When extended pathlength capillaries are used in non-Agilent systems, loss of resolution may be found if the axial slit width is not reduced. In Agilent systems the alignment interface contains properly matched slits to maintain resolution.

CEP Coated Capillaries

CEP capillaries contain a permanently bonded polymer coating. This CEP coating shields the silanol functionality of the capillary surface and helps prevent sample adsorption. Additionally, EOF is nearly eliminated, making the capillary ideal for applications such as DNA separations with sieving polymer buffers.

Elimination of EOF also simplifies analysis of anions and organic acids by direct UV detection. Without EOF-reduction, highly mobile ions such as nitrate can migrate in the opposite direction as the slower, longer chain acids.

The CEP coated capillary is stable from pH 2 to 7-8. It can be used with borate buffers offering a different surface functionality to help alleviate sample adsorption. Each batch of CEP coated capillaries is rigidly tested by Agilent Technologies and each capillary includes a representative electropherogram to assure quality.

CEP Coated Capillaries, 2/pk

ID (μm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (μm)	Part No.
75	80.5	72	0	75	G1600-62318

Cross-linked and Bonded μ SIL Capillaries

μ SIL-FC and μ SIL-DNA Capillaries with Windows

A series of coated capillaries specifically designed for CE which are prepared by cross-linking and bonding a novel, proprietary fluorocarbon (FC) polymer. μ SIL-FC capillaries are chemically inert, hydrophobic, and stable from pH 2.5-10.0.

These capillaries are a must-have for cIEF, protein, peptide and carbohydrate separations, as well as replaceable gel CE applications such as oligonucleotides, DNA fragments, and PCR product separations.

μ SIL-DNA capillaries are also coated with an FC polymer but have a 75 μ m ID to accommodate the viscosity of entangled polymer solutions. All μ SIL capillaries are batch tested to ensure the highest performance and reproducibility.

μ SIL-WAX Capillaries with Windows

μ SIL-WAX features a modified, polyethylene oxide, hydrophilic coating made through a special cross-linking and bonding process. The coating effectively masks active silanol sites, offering exceptional efficiency, resolution, peak shape and reproducibility. The highly stable coating and near-zero EOF of μ SIL-WAX makes the capillary ideal for CE-MS, and protein and peptide separations from pH 2-5.

Capillary	ID (μ m)	Total Length (cm)	Effective Length (cm)	Film Thickness (μ m)	Unit	Part No.
μ SIL-FC	50	80	50	0.075	3/pk	194-8111
μ SIL-DNA	75	65	50	0.075	2/pk	199-2602
μ SIL-WAX	50	100	75	0.1	2/pk	196-7203
μ SIL-WAX	100	100	75	0.1	2/pk	197-7202

Bulk μ SIL-DB Capillaries

The μ SIL-DB coated capillaries are available as μ SIL-DB-1 and μ SIL-DB-17. In combination with a cellulose based buffer system, μ SIL-DB coated capillaries have been widely used in cIEF applications, PCR product and DNA fragment separation and many other CE applications which require reduced EOF.

Capillary	ID (μ m)	Length (m)	Film Thickness (μ m)	Part No.
μ SIL-DB-1	50	10	0.05	126-1012
μ SIL-DB-1	50	10	0.20	126-1013
μ SIL-DB-1	100	10	0.10	127-1012
μ SIL-DB-17	50	10	0.10	126-1713
μ SIL-DB-17	100	10	0.10	127-1712
μ SIL-DB-17	100	10	0.20	127-1713

Capillary Electrochromatography (CEC) Capillaries

Capillary electrochromatography is a hybrid of CE and LC and can be performed in the Agilent CE system. Using CE capillaries packed with LC stationary phases, CEC offers the loadability and selectivity of LC and the high efficiency of CE.

Using the high pressure capabilities of the Agilent CE system, both ends of the CEC capillary can be pressurized. This process prevents outgassing upon application of high voltage and significantly extends capillary lifetime.

Standard Packed CEC Capillaries, 2/pk

Description	ID (μm)	Total Length (cm)	Effective Length (cm)	Color Code*	Part No.
C18, 3μm	100	33.5	25	Gray	5063-6512
	100	48.5	40	Gray	5063-6513
C8, 3μm	100	33.5	25	Gray	5063-6535
	100	48.5	40	Gray	5063-6540
Phenyl, 3μm	100	33.5	25	Gray	5063-6536
	100	48.5	40	Gray	5063-6541

*The color coding of the capillary (alignment stopper) and the interface allows you to easily combine the correct alignment interface with the capillary.

CE System Start-up and Test Kits

Chemical test kits and validation packages are available to help comply with regulatory and quality standards. The Installation Qualification (IQ) Chemical Kit and Hardware Start-Up Kit which are shipped with new instruments are useful for rapidly verifying system functionality. For rigorous testing, the Operational Qualification (OO)/Performance Verification (PV) Kit can be used to verify DAD noise, drift, linearity, and wavelength accuracy, and replenishment functionality. The OO/PV kit is only part of the validation services available from Agilent Technologies. When implemented by qualified Agilent personnel, our service packages can be used to help validate your Agilent CE system.

Description	Part No.
Agilent CE Capillary Start-Up Kit Includes Extended Light Path capillary (L 64.5 cm, ID 50 µm), one standard capillary (L 56 cm, ID 50 µm), one test capillary (L 48.5 cm, I 40 cm, ID 50 µm), one alignment interface for standard capillaries (ID 50 µm), and one alignment interface for Agilent Extended Light Path capillaries (ID 50 µm)	G1600-68706
CE Installation Qualification (IQ) Kit Includes buffer (20 mM borate, pH 9.3, 100 ml), test sample (4-(hydroxy)-acetophenone, 2 ml), capillary conditioning solution (0.1 N sodium hydroxide, 100 ml)	5063-6514
CE Operational Qualification Performance Verification (OO/PV) Chemical Kit Includes buffer (20 mM borate, pH 9.3, 100ml), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 ml ea.), capillary conditioning solution (0.1 N sodium hydroxide, 100 ml), test capillary (L 48.5 cm, I 40 cm, ID 50 µm), diskette with methods, sequence, spectral library, and instruction manual.	5063-6515
CE OO/PV Chemicals Only Kit Includes buffer (20 mM borate, pH 9.3, 100 ml), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 ml ea.)	5063-6520

CE and CE/MS Instrument Parts and Supplies



High Sensitivity Detection Cell

The Agilent high sensitivity detection cell – a technological leap which extends sensitivity by an order of magnitude – provides a solution to sensitivity limitations often encountered in CE. This improvement will substantially increase the utility of CE for impurity analysis of chiral drugs, biologicals, and compounds of environmental interest, among others.

The high linear range allows quantification of both <0.1% impurities and the main component in one run. This is useful for all impurity determinations and is especially useful for determining chiral excess.

The Agilent high sensitivity detection cell can be used in all Agilent CE systems.

Helpful Hint: Increased sensitivity also means increased visibility of impurities. To ensure maximum performance use only buffers and solvents of the highest quality. All Agilent buffers and reagents are of electrophoresis grade to meet your system needs.

High Sensitivity Detection Cell

Description	Part No.
High sensitivity cell kit Includes detection cell, 75 µm ID inlet capillary (72 cm) and outlet capillary (8.5 cm) pair, capillary cassette, fittings (3 fitting screws with seals, 2 fitting caps), cleaning solution, CE Partner CD-ROM	G1600-68723
CE Cell Fitting Kit Includes 3 fitting screws, 2 fitting caps	G1600-63200
Replacement detection cell	G1600-60027
Cell cleaning solution	5062-8529

Replacement Capillary Kits

Description	Effective Length (cm)	Part No.
75 µm capillary kit with 8.5 cm outlet	56	G1600-68716
	72	G1600-68715
	88	G1600-68714
PVA coated 75 µm capillary kit with 8.5 cm outlet	56	G1600-68319

CE and CE/MS Instrument Parts and Supplies

CE/MS Accessories

The CE/MS adapter kit simplifies coupling the Agilent CE system with MS systems equipped with an electrospray ionization source. Integral to this kit is the CE/MS cassette which completely thermostats the capillary until it exits the CE system. The cassette offers multiple capillary paths which vary the capillary length. A methods development configuration uses on-line diode array detection and MS. For rapid or routine MS analysis the detector can be bypassed to decrease the total capillary length and reduce analysis time.

The CE/MS adapter kit can be used with the Agilent 1100 Series MSD, MSD-Trap, or virtually any electrospray-MS platform.

CE/MS Adapter Kit

Description	Part No.
CE/MS Adapter Kit For interfacing the Agilent CE system with a mass spectrometer. Includes parts below, which can be ordered separately.*	G1603A
CE/MS interface cassette, metallic	G1600-60013
CE/MS alignment interface for 360 µm od capillaries, nonmetallic	G1600-60400
Bare fused-silica, 50 µm ID, 125 cm long, 2/pk	G1600-67311

*Interfacing the capillary requires an electrospray needle which is not included in this kit.

CE-ESI-MS Nebulizer Kit

Description	Unit	Part No.
CE-ESI-MS Nebulizer Kit		G1607A
ES needle assembly		G1607-60041
CE-ESI sprayer		G1607-60001
Splitter assembly		G1607-60000
PEEK ferrule, 360 µm for CE/MS Sprayer		5022-2141
Nut, fingertight fitting and ferrule	2/pk	0100-1543
Flex loc element	2/pk	1520-0401
Gasket	2/pk	G1607-20030
Ion kit (ammonium acetate)	5 x 5 ml	8500-4410

CE/MS Capillaries

Description	Color Code	Unit	Part No.
Bare fused-silica, 50 µm ID, 125 cm long	Green	2/pk	G1600-67311
PVA coated capillary, 50 µm ID, 125 cm long	Blue	1/pk	G1600-67219
PVA coated capillary, 75 µm ID, 125 cm long	Blue	1/pk	G1600-67319

CE and CE/MS

Instrument Parts and Supplies

CE Standards & Reagents

Premade buffers help eliminate the time-consuming buffer preparation process. All Agilent Technologies buffers and reagents are designed to meet the stringent demands of CE. To maintain high reproducibility, all buffer solutions are standardized to 0.02 pH units under "class 10" clean room conditions. Superior quality control ensures reproducible results bottle-to-bottle and batch-to-batch.

Ultra pure CE water

Description	Volume (ml)	Part No.
Ultra pure CE water	500 ml	5062-8578

Capillary Conditioning Solutions

Description	Volume (ml)	Part No.
0.1 N sodium hydroxide	250 ml	5062-8575
1.0 N sodium hydroxide	250 ml	5062-8576
0.1 N phosphoric acid	250	5062-8577

CZE Buffers for Charged Analytes

Description	Volume (ml)	Part No.
50 mM sodium phosphate buffer, pH 2.5	250	5062-8571
50 mM sodium phosphate buffer, pH 7.0	250	5062-8572
50 mM sodium tetraborate buffer, pH 9.3	250	5062-8573
20 mM sodium tetraborate buffer, pH 9.3	100	8500-6782

CZE Buffers for Proteins

Description	Volume (ml)	Part No.
50 mM phosphate, 0.05% hydroxyethyl cellulose buffer, pH 2.5	250	8500-6786
150 mM phosphate, 200 mM ammonium sulfate buffer, pH 7.0	250	8500-6787

MEKC Buffers for Neutral and Charged Analytes

Description	Volume (ml)	Part No.
50 mM sodium tetraborate, 100 mM sodium dodecyl sulfate buffer, pH 9.3*	250	5062-8574

*Dilute with 50 mM sodium tetraborate, pH 9.3 (P/N 5062-8573) to reduce SDS concentration without affecting the tetraborate composition or pH.

CE and CE/MS Instrument Parts and Supplies

Plating bath analysis buffer

Description	Volume (ml)	Part No.
Plating bath analysis buffer	250	5064-8236

Vials and Caps for CE

Description	Unit	Part No.
Crimp/snap top vial, 1ml, Polypropylene	100/pk	5182-0567
Clear wide opening crimp/snap top vial, 2 ml	100/pk	5182-9697
Clear wide opening crimp/snap top vial, 2 ml	500/pk	5183-4623
Amber wide opening crimp/snap top vial, write-on spot, 2 ml	100/pk	5183-4619
Crimp/snap top vial, 300 µl	1000/pk	9301-0978
Snap caps PEO (polyethylene olefin for chemical resistance)	100/pk	5181-1507
Snap caps PEO (polyethylene olefin for chemical resistance)	500/pk	5181-1513
Snap caps PUR (polyurethane for resealing)*	100/pk	5181-1512
Snap caps PUR (polyurethane for resealing)*	500/pk	5042-6491

*PUR caps are recommended to help prevent sample or buffer evaporation even after multiple injections



Instrument Supplies

Description	Unit	Part No.
Deuterium lamp		2140-0585
Electrode assembly, standard		G1600-60007
Electrode assembly, short		G1600-60033
Electrode O-ring, silicone	5/pk	5062-8544
Electrolyte bottle, 500 ml		9300-1748
Electrolyte bottle cap		9300-1747
Bottle sealing o-ring		0905-1163
Glass filter, solvent inlet, 20 µm		5041-2168
Filter frit adapter, 3 mm	4/pk	5062-8517
Bottle cap plug		G1600-23223
Air filter, 5 µm		3150-0619
Pre-puncher		G1600-67201
Screws for pre-puncher/insulation plate holding	10/pk	G1600-62402

CE and CE/MS

Instrument Parts and Supplies

Accessories

Description	Part No.
CE accessory kit Includes electrode tool, screwdriver, fuses, air filter, glass frit, vials and caps	G1600-68701
Optical filter for DAD 260 nm, for DNA analysis with polyacrylamide filled capillaries and oligonucleotide analysis	G1600-62700
Rack for 12 mm, 2 mL vials, 5/pk	9301-0722
CE column cutter	5183-4669
Diamond blade replacement kit for CE column cutter	5183-4670
Capillary tubing cutter, 4/pk	5181-8836

Window Etching Tool

The window etching tool is designed for fast, convenient and reproducible preparation of detection windows on fused silica capillaries. The polyimide coating is removed without destroying the inner polymeric coating. It contains 3 glass blocks with fine grooves controlling precisely the size of the windows.

Description	Part No.
Window etching tool, 3/pk	590-3003



Application Notes

More information is a click away. CE applications can be found on the Agilent website at www.agilent.com/chem/CEApplications.



Capillary Cassette

Alignment Interfaces and Capillary Cassette

Agilent Technologies alignment interfaces are an integral part of the Agilent diode-array detection system. These interfaces contain optical slits which are precisely matched to the capillary inner diameter for optimized sensitivity and linear detection range.

In combination with the capillary cassette, alignment interfaces simplify capillary exchange, protect the fragile detection window and ensure exact alignment of the window in the detector. Quick-change cassette allows capillary exchange in less than a minute.

Note: The color code of the alignment interface must match with the color code of the capillary's built-in alignment stopper.

Description	ID (µm)	Color Code	Corresponding Capillary	Part No.
Alignment interface for standard capillary	50	Green	Green	G1600-60210
	75	Blue	Blue	G1600-60310
	100	Gray	Gray	
	150	Brown	Brown	
Alignment interface for Agilent Extended Light Path capillaries	25	Black	Black	G1600-60150
	50	Red	Red	G1600-60230
	75	Yellow	Yellow	G1600-60330
CE/MS alignment interface for 360 µm od capillaries, nonmetallic		Blue	Blue Gray	G1600-60400

Note: 75, 100 and 150 µm ID standard capillaries use the same interface (color blue). PVA coated 50 and 75 µm ID capillary for CE-MS use the same nonmetallic interface with color code blue for use with standard and extended light path capillaries, and the high sensitivity detector cell.

Capillary cassette

Description	Part No.
Capillary cassette	G1600-60002

Optical filter for DAD

Description	Part No.
Optical filter for DAD 260 nm, for DNA analysis with polyacrylamide filled capillaries and oligonucleotide analysis	G1600-62700

ICP-MS

ICP-MS Supplies	692-707
ICP-MS Standards.....	708-709



ICP-MS



ICP-MS

The ultimate in sensitivity and performance

Agilent's 4500 and 7500-series ICP-MS systems set the industry standard for reliability, flexibility, sensitivity – and simplicity. All to make your analysis easier. All from the experts who help you get the results you need.

This section lists virtually every part or supply you will ever need for your Agilent ICP-MS system – including gas lines, peristaltic pump supplies, nebulizers, vacuum equipment, and interface apparatus – plus single and multiple element reference standards. They are all readily available and competitively priced, making Agilent your single-source ICP-MS supplier.

In addition, all Agilent ICP-MS parts and supplies are designed, manufactured, and tested to the most rigorous specifications. Plus they are backed by four decades of design and technical expertise, comprehensive services, and 24-hour technical support by phone or Web.



ICP-MS

Gas Line Supplies

Gas Line Supplies

Description	Specs	Use	Unit	Part No.
Common Supplies				
Inner sleeve for carrier/aux/blend gas line	CTFE	For gas line connection to connector	5/pk	5042-0922
Inner sleeve for plasma gas line	CTFE	For gas line connection to connector	5/pk	5042-0923
Argon gas tubing assembly	1/4in OD, 5 m, inner sleeve, connector	For option gas line		G1820-65023
7500 Only				
Tubing for carrier/blend gas, PTFE	3 mm ID, 4 mm OD, 35 cm	For gas line connection to torch	2/pk	G1833-65414
Plasma and auxiliary gas line tubing	3.17 mm ID, 6.35 mm OD, 35 cm (plasma) 2.38 mm ID, 3.96 mm OD, 35 cm (aux)	For gas line connection to torch	2/pk	G3270-65021
4500 Only				
Tubing for carrier/blend gas, PTFE	3 mm ID, 4 mm OD, 38 cm	For gas line connection to nebulizer	4/pk	G1820-65004
Tubing for carrier/blend gas, PTFE	3 mm ID, 4 mm OD, 1m (cut to appropriate length)	For gas line connection to nebulizer		G1820-65008
Tubing for plasma/aux gas, Tygon	3.17 mm ID, 6.35 mm OD, 40 cm (plasma) 2.38 mm ID, 3.96 mm OD, 40 cm (aux)	For gas line connection to torch	2/pk	G1820-65003

Gas Regulators - US only

Description	Part No.
Regulator for Helium Gas	0101-1398
Regulator for Hydrogen Gas	0101-1399
Regulator for Argon Gas	0101-1400
Regulator for NH ₃ /He Gas	5188-5374

Ultra Clean ICP-MS Traps

Description	Part No.
Triple Filter Cartridge for Super Clean Gas Purification systems, baseplate type	5182-9705
Replacement O-Rings for gas filters, 8/pk, 4 each of 2 sizes	5182-3423

ICP-MS Connectors

Connectors

Description	Specs	Use	Unit	Part No.
Common Supplies				
Connector for end cap and gas line		For gas line connection to nebulizer		5063-5263
Connectors for plasma/aux gas lines, PTFE	6 mm and 4 mm	For gas line connection to torch	1/ea	G1820-65027
Connector for carrier gas line, PTFE	For 4 mm tubing, includes ferrule and o-ring	For gas line connection to Babington nebulizer		G1820-65214
Connector for carrier gas line, polypropylene	For 4 mm tubing, includes ferrule and o-ring	For gas line connection to concentric nebulizer		G1820-65052
Connector for blend gas line, polypropylene	For 4 mm tubing	For gas line connection to cross flow/Babington nebulizer		G1820-65119
Connector for makeup gas line, polypropylene	For 4 mm tubing, Luer type	For gas line connection to cross flow/Babington nebulizer		G1833-65477
4500 Only				
Connectors for carrier/blend gas lines	For 4mm tubing Teflon (carrier), polypropylene (blend)	For gas line connection to G1820-65033 cross flow nebulizer	1/ea	G1820-65144



G1820-65027



G1820-65052



G1820-65214



G1820-65119

ICP-MS

ICP-MS

Peristaltic Pump Tubing and Supplies

Peristaltic Pump Tubing and Supplies

Description	Specs	Use	Unit	Part No.
Common Supplies				
Peri pump sample tubing, Tygon	1.02 mm ID, 40 cm	Standard for sample introduction	12/pk	G1833-65569
Peri pump ISTD tubing, Tygon	0.19 mm ID, 40 cm	For online ISTD addition, replace when tubing is stretched	12/pk	G1833-65571
Peri pump drain tubing, Ismaprene	1.52 mm ID, 0.75 wall, 40 cm	Peri pump tubing to drain spray chamber, replace when tubing is stretched	12/pk	G1820-65216
Peri pump drain tubing, Ismaprene, stronger stops	1.52 mm ID, 0.75 wall, 40 cm	Peri pump tubing to drain spray chamber, replace when tubing is stretched	12/pk	G1833-65570
Sample tubing, PFA	0.5 mm ID, 1.6 mm OD, 5m	Used for standard sample introduction. Replace when tubing is bent, damaged, or when there are serious memory effects in the sample introduction area.		G1820-65105
Sample tubing, PFA	0.2 mm ID, 1.6 mm OD, 70 cm		3/pk	G1833-65573
Sample tubing, PFA	0.15 mm ID, 1.6 mm OD, 70 cm		3/pk	G1833-65572
Sample tubing with PEEK guide, PFA	0.3 mm ID, 1.6 mm OD, 70 cm		5/pk	G1820-65531
Sample tubing with PEEK guide, PFA	0.2 mm ID, 1.6 mm OD, 70 cm		5/pk	G1820-65527
Sample tubing with PEEK guide, PFA	0.15 mm ID, 1.6 mm OD, 70 cm		5/pk	G1820-65526
ISTD tubing, PFA	0.3 mm ID, 1.6 mm OD, 3 m	For online ISTD addition		G1820-65478
Drain tubing	4 mm ID, 250 cm	Tubing between peri pump tubing and drain tank		G1820-65515
Drain tank	with PVC connector			G1820-65016
Drain tank for organic solvents	with polypropylene connector			G1820-65505
Drain tank, polyethylene, 4L				5042-4769
7500 Only				
Online ISTD Addition Kit		For grounding and mixing ISTD		G1833-65071
Drain tubing kit	2 connectors, 1 bushing, 1 tubing (4 mm ID, 12 cm)	Tubing between spray chamber and peri pump tubing		G1833-65411
4500 Only				
Online ISTD Addition Kit		Permits mixing of sample solution with internal standard solution at a fixed rate using peristaltic pump		G1820-65479
Drain tubing kit	3 connectors, 1 bushing, 3 tubing (2 mm ID, 5 mm OD, 32 cm; 0.8 mm ID, 1.5 mm OD, 40 cm; 3.2 mm ID, 6.4 mm OD, 120 cm)	For draining spray chamber to waste		G1820-65221



Tips & Tools

Use Agilent's drain tubing kit to replace a heavily contaminated drain tubing assembly or when pumping efficiency is low. To extend the lifetime of your tubing, Agilent recommends releasing the peristaltic pump tubing when the system is not in use.

ICP-MS

Nebulizers and Nebulizer Supplies

Nebulizers and Nebulizer Supplies

Description	Specs	Use	Unit	Part No.
Common Supplies				
Sample tubing	0.25 mm ID, 700 mm, with connector	For MicroMist Nebulizer	10/pk	G3266-80010
Sample tubing	0.5 mm ID, 700 mm, with connector	For MicroMist Nebulizer	10/pk	G3266-80011
Carrier gas connector		For MicroMist Nebulizer		G3266-80015
Babington nebulizer	Includes Viton O-ring, PTFE sample tubing, and connector	Use to introduce samples with high matrix and high total salts. Clean when contaminated or when orifices are clogged.		G1820-60453
End cap for Babington nebulizer, polypropylene	Includes Viton O-rings	Replace when memory effects do not disappear after cleaning. Insert nebulizer in middle of end cap all the way through. Attach end cap to spray chamber with "TOP" mark facing up.		G1833-65476
Babington nebulizer removal tool				G1820-65345
Concentric nebulizer, Pyrex	Use with P/N G1820-65052 Argon gas connector, P/N G1820-60160 Connector kit, P/N G1820-65121 end cap	Use with clean samples only. Not resistant to hydrochloric acid. Clean with a 5% HNO ₃ (v/v) bath; do not use ultrasonic bath.		G1820-65030
Concentric nebulizer, quartz	Use with P/N G1820-65337 Quartz spray chamber, P/N G1820-80237 Quartz connecting pipe	Recommended for trace analysis of clean samples. Lower contamination level than Pyrex. Clean using 5% HNO ₃ (v/v) bath; do not use ultrasonic bath.		G1820-65138
Sample tubing with connector, Teflon	Tool included	For Babington nebulizer, replace when heavily contaminated by high matrix samples		G1820-65276
Sample tubing kit for cross flow nebulizer	PFA tubing (0.6 mm ID, 1.1 mm OD, 15 cm) Tygon tubing (10 cm) PFA tubing (0.5 mm ID, 1.6 mm OD)	Replace when tubing is bent, damaged, or when there are serious memory effects in the sample introduction area.		G1820-65141
Sample line connector	Includes Viton O-ring	Connects Concentric Nebulizer with sample line. Port with large hole connects to nebulizer; smaller port connects with sample tubing.		G1820-60160
Connector for micro flow nebulizer			2/pk	G1833-65583
Ferrule and Viton O-ring kit for carrier gas line connector		For Babington/concentric nebulizer		G1820-65533
O-rings for Babington nebulizer, Viton		Used to create seal between Babington Nebulizer and end cap.	4/pk	G1820-65199
O-ring kit for concentric nebulizer, Viton	2 sizes, 10 each		20/pk	G1820-65491
O-rings for concentric nebulizer, for organic solvents (3 types)			4/pk	G1820-65520
O-rings for end cap, Viton		Use for the end cap of the Babington Nebulizer, Cross Flow Nebulizer and Concentric Nebulizer.	5/pk	G1820-65198
O-rings for end cap, for organic solvents			2/pk	G1820-65518

ICP-MS

Nebulizers and Nebulizer Supplies

Nebulizers and Nebulizer Supplies

Description	Specs	Use	Unit	Part No.
7500 Only				
Cross flow nebulizer	Includes bushing, carrier gas line connector, blend gas line connector, sample tubing, and gas line tubings with inner sleeves	Standard nebulizer for the inert kit. Resistant to hydrofluoric acid. Set carrier gas pressure to 500 kPa (5 kg/cm ²). Clean with 5% HNO ₃ (v/v) bath. Replace when memory effects remain after cleaning.		G1833-65462
End cap for concentric nebulizer, PTFE	Includes Viton O-rings	Connects the Concentric Nebulizer (Pyrex or Quartz) with the spray chamber. For MicroMist, MicroFlow, and other concentric nebulizers.		G1833-65475
4500 Only				
Babington nebulizer kit with end cap				G1820-65356
Cross flow nebulizer				G1820-65033
End cap for concentric nebulizer	Includes blend gas connectors, O-rings for end cap, O-rings for fittings to end cap, PTFE	Connects the Concentric Nebulizer (Pyrex or Quartz) with the spray chamber. Replace when the capillary is broken or the nebulizer is damaged.		G1820-65121
O-ring kit for concentric nebulizer end cap	2 sizes, 2 each	Smaller O-rings seal between the Concentric Nebulizer and center hole of the end cap; larger O-rings seal between the end cap and spray chamber. Replacement required when seal no longer effective.		G1820-65075

ICP-MS



G1820-60453



G1833-65463

ICP-MS Spray Chambers

Inert Sample Introduction Kit Supplies

Description	Part No.
End cap	G3285-80020
Spray chamber	G3285-80021
Drain tube	G3285-80022
Connector tube	G3285-80023
Sapphire injector, 2.5 mm ID	G3285-80030
Platinum injector, 2.5 mm ID	G3285-80031
Sapphire injector with O ₂ port, 1.5 mm ID	G3285-80032
Platinum injection with O ₂ port, 1.5 mm ID	G3285-80033
Torch	G3285-80050

Spray Chambers

Description	Use	Unit	Part No.
Common Supplies			
Spray chamber, quartz	Used for Babington, Concentric, and Micro-Concentric Nebulizers. Replace when memory effects remain after cleaning.		G1820-65337
Bushing at spray chamber drain, Viton		5/pk	G1820-65482
Bushing at spray chamber drain, for organic solvents	For use with organic solvents		G1820-65504
Connector for spray chamber Drainage, polypropylene			G1820-65503
7500 Only			
Spray chamber, polypropylene (sapphire tube)	Same usage as Quartz spray chamber and is resistant to hydrofluoric acid. Replace when memory effects remain after cleaning.		G1833-65463
Connector, quartz	Between spray chamber and torch		G1833-65426
Connector, polypropylene	Between spray chamber and torch		G1833-65464
T-Connector for optional gas introduction, quartz	Between spray chamber and torch		G1833-65427
O-rings for polypropylene connector, Viton		10/pk	G1833-65480
Clamps	Used to hold connectors	2/pk	G1833-65430
4500 Only			
Spray chamber, Pyrex	For Babington, concentric and MC nebulizers, not recommended for trace analysis due to impurities in Pyrex		G1820-65336
Spray chamber, polypropylene	For Babington, concentric and MC nebulizers, resistant to hydrofluoric acid		G1820-65343
Spray chamber, Pyrex	For Cross Flow nebulizer, not recommended for ultra-trace analysis due to impurities in Pyrex		G1820-65338
Spray chamber, quartz	For Cross Flow nebulizer		G1820-65339
Spray chamber, polypropylene	For Cross Flow nebulizer, standard for inert kit, low boron background		G1820-65342
Tygon tubing, 23 mm	For polypropylene spray chamber	10/pk	G1820-65164
Ball joint connector, Pyrex			G1820-80235
Ball joint connector, quartz			G1820-80237
T-connector for additional gas, quartz	Between spray chamber and torch		G1820-80512
Clamp		2/pk	G1820-65007
Connector kit for Inert Kit			G1820-65163

ICP-MS

Torch and Components

Torch and Components

Description	Specs	Use	Part No.
7500 Only			
Torch, quartz	2.5 mm ID	Not suitable for samples containing hydrofluoric acid. Must be completely dried before installing and igniting the plasma. Replace if chipped, cracked, or distorted.	G1833-65423
Torch, quartz	1.5 mm ID, taper type	Not suitable for samples containing hydrofluoric acid. Must be completely dried before installing and igniting the plasma. Replace if chipped, cracked, or distorted.	G1833-65424
Torch, quartz	1.0 mm ID, taper type	Not suitable for samples containing hydrofluoric acid. Must be completely dried before installing and igniting the plasma. Replace if chipped, cracked, or distorted.	G1833-65425
Inert torch, quartz, without injector		Quartz torch for inert sample introduction. Resistant to hydrofluoric acid. Torch must be completely dried before installing and igniting plasma.	G1833-65422
Shield plate, long life		Use with the bonnet	G1833-65419
Bonnet (quartz ring for shield torch)		Use with shield plate (P/N G1833-65406 or P/N G1833-65419) for Shield Torch system. Replace if bonnet is cracked or damaged.	G1833-65421
Platinum Injector for Inert Torch	2.0 mm ID		G1833-65409
Platinum Injector for Inert Torch	2.5 mm ID		G1833-65415
Platinum Injector for Inert Torch	1.5 mm ID		G1833-65416
Work Coil			G1833-65432



G1833-65423



G1833-65422

ICP-MS Torch and Components

Torch and Components

Description	Specs	Use	Part No.
4500 Only			
Torch, quartz	1.0 mm ID		G1820-65528
Torch, quartz, tapered	1.5 mm ID		G1820-65529
Torch, quartz	2.5 mm ID		G1820-65028
Inert torch, without Pt inner tubing			G1820-65035
Adapter for Inert Torch			G1820-65015
Platinum Inner Tubing for Inert Torch		Use with inert torch (P/N G1820-65035) and adapter (P/N G1820-65015) for inert torch assembly.	G1820-65013
Shield Plate for Shield Torch System, 2/pk			G1820-65185
Shield plate, long life			G1820-65357
Bonnet (quartz ring for shield torch)			G1820-65026
RF return strip		Located between the interface and torch box	G1820-65060
Work coil		Cooling water flows through coil to reduce torch temperature.	G1820-65061
Sapphire Inner Tubing		Use with inert torch (P/N G1820-65035) and adapter (P/N G1820-65015) for inert torch assembly.	G1820-65361
Bonnet (for ShieldTorch, w/alignment projection)			G1820-65497
Attachment Tool for Bonnet G1820-65497			G1820-65498
Platinum Inner Tubing for Inert Torch	1.5 mm ID		G1820-65501
Platinum Inner Tubing for Inert Torch	2.5 mm ID		G1820-65502



G1820-65061

ICP-MS

Interface Cones

Interface Cone Guide for Agilent ICP-MS Mainframes

Description	Part No.	4500	7500a	7500i	7500s	7500c	7500ce	7500cs	T-mode
Sampling cone									
Nickel sampling cone	G1820-65238	Std	Std	Std	◆	Std	Std	◆	
Platinum sampling cone, 10 mm insert	G1820-65239	◆	◆	◆	Std	◆	◆	Std	
Platinum sampling cone, 18 mm insert	G1820-65360	◆	◆	◆	◆	◆	◆	◆	
Nickel sampling cone for T-mode	G1820-65480	T-mode	T-mode	T-mode	T-mode				◆
Skimmer cone									
Nickel skimmer cone	G1820-65050	◆	Std	Std	◆				
Nickel skimmer cone	G3270-65024						Std		
Nickel skimmer cone	G1833-65497					Std		◆	
Platinum skimmer cone	G1820-65237	◆	◆	◆	Std				
Platinum skimmer cone	G1833-65092					◆			
Platinum skimmer cone	G1833-65132						◆	Std	
Nickel skimmer cone for T-mode	G1820-65481	T-mode	T-mode	T-mode	T-mode				◆
Skimmer base									
Stainless steel base for Nickel skimmer	G1833-65407		Std	Std	◆				◆
Stainless steel base for Nickel skimmer	G1833-65591						Std	◆	
Stainless steel base for Nickel skimmer	G1833-65498					Std			
Stainless steel base for Nickel skimmer	G1820-60376	◆							
Brass base for Platinum skimmer	G1833-65408		◆	◆	Std				
Brass base for Platinum skimmer	G1833-65505					◆			
Brass base for Platinum skimmer	G1833-65590						◆	Std	
Brass base for Platinum skimmer	G1820-60104	Std							

Key

◆: Compatible Part

Std: Fitted as standard when instrument shipped from factory

Notes:

- 18 mm Pt cone insert is recommended for measuring H₂SO₄ above 2%
- Pt T-mode cones are not available
- T-mode is not used with ORS models

Skimmer Cone Supplies/Ion Lens Components



Sampling and Skimmer Cones

Sampling and Skimmer Cone Supplies

Description	Part No.
Common Supplies	
Screws for skimmer base	G1820-65435
Interface wrench, round type	G1833-65079
O-ring for sampling cone, Viton	G1820-65025
Cone cleaning detergent, 1 gallon	5188-5359
7500 Only	
Sampling cone wrench	G1833-65405
4500 Only	
Sampling and skimmer cone wrench	G1820-60393



G1833-65417



G1833-65413

Ion Lens System Components

Description	Part No.
7500a/i/s/c/cs	
Plate Bias (for Eagle Q-pole)	G1833-65494
Plate Bias (for Slim ring Q-pole)	G1833-65444
Polishing paper kit	G1833-65404
Waterproofed sheets, #400 and #1200, 5 of each	
7500a/i/s	
Extraction Lens 1	G1833-65417
Extraction Lens 2	G1833-65413
Omega Lens Assembly	G1833-65418
Screw kit for Extraction Lens	G1833-65024
Screw kit for Omega Lens	G1833-65025
7500c	
Einzel Lens 1	G1833-65500
Einzel Lens 2	G1833-65501
Einzel Lens 3	G1833-65502
Extraction Lens	G1833-65499
Octopole	G1833-65094
Octopole Assembly (includes Cell Entrance/Exit without O-ring)	G1833-65503
Screw and Spacer Kit for Extraction Einzel Lens	G1833-65578
Screw kit for Reaction Cell	G1833-65088
Tubing for Reaction Gas, 2/pk	G1833-65089
7500ce	
O-ring for Reaction Cell	G1833-66035
Extraction Omega Lens Assembly	G3270-65023
Extraction Lens 1	G3270-65028
Extraction Lens 2	G3270-65029
Omega lens	G3270-65030
Omega bias lens	G3270-65031
Screw and spacer kit for 7500ce Extraction & Omega Assembly	G3270-60639

ICP-MS

Ion Lens System Components/Electron Multipliers

ICP-MS

Ion Lens System Components

Description	Part No.
7500cs	
Extraction Lens 1	G1833-65592
Extraction Lens 2	G1833-65593
Extraction-Omega Lenses Assembly	G1833-65596
Omega Bias Lens	G1833-65594
Omega Lens	G1833-65595
Screw and Spacer kit for Ion Lens	G1833-65125
Cell Entrance Lens	G1833-65598
Cell Exit Lens	G1833-66000
Cell Focus Lens	G1833-65597
7500cs/ce	
Focus Lens for Q-pole	G1833-65599
Octopole	G1833-65133
Octopole Assembly (includes Cell Focus, Cell Entrance/Exit, and QP Focus)	G1833-65134
Reaction Cell Assembly	G1833-66001
Screw and Spacer kit for Reaction Cell	G1833-65138
Plate bias for S/N JP14100050 - JP14100313	G1833-65513
Plate bias for S/N JP14100314	G1833-65562
4500 Only	
Einzel Lens Assembly	G1820-65062
Extraction Lens 1	G1820-65110
Extraction Lens 2	G1820-65358
Omega Lens Assembly	G1820-60399
Polishing Paper kit	G1820-65044
Waterproofed sheets, #400 and #1200, 5 of each	
Screw/Spacer Set for Extract Lens	G1820-65494
Screw/Spacer Set for Ion Lens	G1820-65057



5184-1983

Electron Multipliers

Description	Part No.
7500 Only	
Electron Multiplier (ETP)	5184-1983
Electron Multiplier (HPK)	G1833-65575
4500 Only	
Electron Multiplier	G1820-80386

Rotary Pumps and Vacuum System Supplies

- The oil level on the pump should be checked every three months, when the plasma is ON.
- Maintain the oil level between the Max and Min levels on the gauge.
- Standard frequency for changing the oil is approximately every 4,500 hours.

Warning: Be careful when changing oil because the oil may have absorbed dangerous substances. The oil in the rotary pump on the interface side of a 7500 equipped with a hydrofluoric acid resisting introduction system is especially dangerous. DO NOT TOUCH THE OIL WITH BARE HANDS.

Description	Unit	Part No.
Common Supplies		
Oil Mist Filter Element for E2M18		1535-4970
Oil mist filter kit for E2M18		3162-1056
O-Ring for Vacuum chamber, Viton		5042-0901
Odor Element for Oil Mist Filter, for E2M18	5/pk	5063-9153
Rotary pump oil, 4L	1 gal	6040-0798
Rotary pump oil, 1L	1 liter	6040-0834
Electrode Kit for Penning Gauge		G1820-81013
7500 Only		
Tube AIM Gauge		G1820-81012
O-rings for vent valve, Viton	2/pk	G1833-65332
4500 Only		
Oil mist filter element for E2M8		5063-5213
Oil mist filter kit for E2M8		5063-5224

ICP-MS

Integrated Autosampler Supplies

Integrated Autosampler Supplies

Description	Unit	Part No.
Type A Tray 89 Position for 6 ml vial (includes 200 x 6 mL vials)		G3160-65300
Type A Tray 89 Position for 6 ml vial		G3160-65310
Type B Tray 53 Position for 18 mL Vial (includes 55 x 18 mL vials)		G3160-65301
Type B Tray 53 Position for 18 mL Vial		G3160-65311
Type C Tray 18 Position for 50 mL Vial (includes 20 x 50 mL vials)		G3160-65302
Type C Tray 18 Position for 50 mL Vial		G3160-65312
Tray D 79 x 2 ml + 10 x 18 ml positions (includes 200 x 2 mL vials and 10 x 18 mL vials)		G3160-65308
Tray D 79 x 2 ml + 10 x 18 ml positions		G3160-65313
Tray E 79 x 6 mL + 10 x 18 mL positions (includes 200 x 6 mL vials and 10 x 18 mL vials)		G3160-65309
Tray E 79 x 6 mL + 10 x 18 mL positions		G3160-65314
PFA vial, 1.5 ml	10/pk	G3160-65317
6 ml vials	200/pk	G3160-65303
18 ml vials	55/pk	G3160-65304
50 ml vials	20/pk	G3160-65305
Polyethylene vial, 2 ml	200/pk	G3160-65315
PFA needle, 0.3 mm ID		G3160-65306
Rinsing bottle, 100 ml	6/pk	G3160-65307
Tray cover		G3160-65321
Fluid inlet/outlet tubing, fittings		G3160-65320
PFA Needle, 0.8 mm ID		G3160-65324
Tubing holder, PEEK		G3160-65325
Needle holder		G3160-80041
Arm assembly		G3160-80044
Holder for carry tray cover		G3160-60015
Peristaltic pump tubing set with connectors	1 set	G3160-65326
Peristaltic pump tubing set with connectors	5 sets	G3160-65327
Drain tubing, Tygon, from peristaltic pump to rinse bottle or drain bottle	2 pieces	G3160-65328

ASX-500 Series Autosampler Supplies

Description	Part No.
Sample probe, 0.8 mm ID (red band)	G3286-80100
Sample probe, 0.3 mm ID (black band)	G3286-80101
Sample probe, 0.5 mm ID (blue band)	G3286-80102
Rinse/drain tubing hookup kit	G3286-80117
Drain pump tubing and connector kit (Tygon)	G3286-80118

ISIS Supplies

Description	Specs	Unit	Part No.
Common Supplies			
Peristaltic pump tubing, Tygon	0.89 mm ID, 3 stops	12/pk	5064-8014
Peristaltic pump tubing, Tygon	0.25 mm ID, 3 stops	12/pk	5064-8034
Peristaltic pump tubing, Tygon	0.25 mm ID, 2 stops	12/pk	5064-8015
Peristaltic pump tubing, Tygon	1.02 mm ID, 2 stops	12/pk	5064-8028
Sample tubing, ETFE	0.8 mm ID, 1.6 mm od		5064-8016
Sample tubing, PTFE	2 mm ID, 3 mm OD		5064-8020
Sample tubing, PFA	0.5 mm ID, 1.6 mm OD, 5 m		G1820-65105
ISTD tubing, PFA	0.3 mm ID, 1.6 mm OD, 3 m		G1820-65478
Tee joint			5064-8017
Cross joint			5064-8018
Union joint			5064-8019
Teflon nut	For 3 mm OD tubing	10/pk	5064-8021
Front and back ferrule	For 3 mm OD tubing	10/pk	5064-8022
Teflon nut	For 1.6 mm OD tubing	10/pk	5064-8023
Front and back ferrule	For 1.6 mm OD tubing	10/pk	5064-8024
Peristaltic pump tubing adapter			5064-8026
Tubing adapter			G3138-65158
Tubing clamp			5064-8027
Spiral tubing, 5m			5064-8029
Wrench for valve maintenance			5064-8032
Tag for tubing identification		10/pk	5064-8033
Joint Holder			G3138-65102
Joint holder			G3138-65103
Sample line connector			G3138-65104
Rotor seal for valve			G3138-65117
Nut for valve		6/pk	G3138-65118
Ferrule for valve		6/pk	G3138-65119
Mixer			G3138-65121
Sample loop, 100 µl			G3138-65122
Plastic tray			G3138-65125
7500 Only			
ISIS Comprehensive Spares			G3138-65006
ISIS Tubing Kit (high throughput)			G3138-65023
ISIS Tubing Kit (auto dilution)			G3138-65024
ISIS Tubing Kit (discrete sampling)			G3138-65025
ISIS Tubing Kit			G3138-65000
4500 Only			
ISIS Comprehensive Spares			G3138-65003

ICP-MS

Hydride Generation Accessory Supplies

Hydride Generation Accessory Supplies

Description	Specs	Unit	Part No.
Inner sleeve for carrier/aux/blend gas line	CTFE	5/pk	5042-0922
Sample tubing, PFA	0.5 mm ID, 1.6 mm OD, 5 m		5064-8012
Sample tubing, PFA	0.3 mm ID, 1.6 mm OD, 5 m		5064-8013
Peristaltic pump tubing, Tygon	0.89 mm ID, 3 stops	12/pk	5064-8014
Cross joint			5064-8018
Union joint			5064-8019
Sample tubing, PTFE	2 mm ID, 3 mm OD		5064-8020
Teflon nut	For 1.6 mm OD tubing	10/pk	5064-8023
Front and back ferrule	For 1.6 mm OD tubing	10/pk	5064-8024
Peristaltic pump tubing adapter			5064-8026
Peristaltic pump tubing, Tygon	1.02 mm ID, 2 stops	12/pk	5064-8028
Peristaltic pump tubing, PharMed	2.54 mm ID, 2 stops	6/pk	G3138-65128
Tag for tubing identification		10/pk	5064-8033
Sample line connector			G1820-60160
Connector for carrier gas line, polypropylene	For gas line connection to concentric nebulizer		G1820-65052
Mixer			G3138-65121
Plug for cross joint		3/pk	G3138-65129
Gas/Liquid Separator Set Includes separator gas chamber, O-ring for the filter, separator holder, exclusive concentric nebulizer, O-ring for nebulizer, cyclone chamber, and filter (5/pk)			G3138-65130
Separator gas chamber			G3138-65131
O-ring for filter			G3138-65132
Separator holder			G3138-65133
Exclusive concentric nebulizer			G3138-65134
O-ring for nebulizer		2/pk	G3138-65135
Cyclone chamber			G3138-65136
Filter		10/pk	G3138-65137
Tubing for gas line	3 mm ID, 4 mm ID, 5 m		G3138-65138
Reducing union connector	6 x 3 mm		G3138-65139
Reducing union connector	6 x 4 mm		G3138-65140
Plug for carrier gas connector	4 mm OD	3/pk	G3138-65141
Y connector for pump tubing	2.5 mm ID	5/pk	G3138-65143
Reducing union connector	8 x 4 mm		G3138-65144

ICP-MS

Miscellaneous Supplies

Miscellaneous Supplies

Description	Part No.
Common Supplies	
Filter for cooling water	G1820-65018
Water filter connector	G1820-80430
Gas filter	G1820-80341
LC Connection kit	G1833-65200
APG remote cable, 5 m	5064-8046
7500 Only	
Plastic Tray for Sample Intro area	G1833-65412
Cooling water hose, 10 m	G1833-65429
Strainer for cooling water	G1833-66024
Inert Sample Introduction kit (Pt Injector)	G1833-65036
4500 Only	
Filter kit for cooling water	G1820-65017
Tool kit	G1820-65019
O-ring, for vacuum chamber	G1820-65031
O-ring, for vacuum release, 5/pk	G1820-65032
Air filter, for bottom	G1820-65073
Air filter, for side panel	G1820-65074
Inert Sample Introduction kit (Pt Injector)	G1820-65201
O-ring for water filter cartridge	G1833-66042

7500 ESI Supplies

Description	Part No.
PFA Endcap	G3139-65002
PFA Spray Chamber	G3139-65003
PFA Connector	G3139-65004
Pt Injector (2 mm) with PFA Base	G3139-65005
Quartz Torch for Pt Injector	G3139-65006

GC Interface Supplies

Description	Part No.
Injector assembly	G3158-65001
Torch	G3158-65007
Silco steel pipe	G3158-65003

ICP-MS Standards

Installation and Checkout Standards

Description	Part No.
ICP-MS Checkout Solutions for 7500ce/cs system installation kit Contains tuning solution, dual mode (1), dual mode (2), wash, and water blank solutions	5185-5850
ICP-MS Checkout Solutions for 7500s system installation kit Contains tuning solution, dual mode (1), dual mode (2), abundance sensitivity (1), abundance sensitivity (2), detection limit solution, high sensitivity tune, wash, and water blank solutions	5184-3564
ICP-MS Checkout Solutions for 7500a/i/c system installation kit Contains tuning solution, dual mode (1), dual mode (2), wash, and water blank solutions	5184-3565

Tuning Solutions

Description	Part No.
Stock Tuning Solution: Li, Y, Ce and Tl; 100 mL, 10 mg/L; matrix=2% HNO ₃	8500-6943
Tuning Solution: Li, Y, Ce, Tl and Co; 2 x 500 mL, 10 µg/L; matrix= 2% HNO ₃	5184-3566
Tuning Solution: Li, Mg, Y, Ce, Tl, Co; 2 x 500mL, 1 µg/L; matrix= 2% HNO ₃	5185-5959

Multi-Element Calibration Standards

Description	Part No.
Multi-Element Calibration Standard-1: Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Th, Tm, Y, Yb; 100 mL, 10 mg/L; matrix=5% HNO ₃	8500-6944
Multi-Element Calibration Standard-2A: Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Ti, U, V, Zn; 100 mL, 10 mg/L; matrix=5% HNO ₃	8500-6940
Multi-Element Calibration Standard-3: Sb, Au, Hf, Ir, Pd, Pt, Rh, Ru, Te, Sn; 100 mL, 10 mg/L; matrix=10% HCl/1% HNO ₃	8500-6948
Multi-Element Calibration Standard-4: B, Ge, Mo, Nb, P, Re, S, Si, Ta, Ti, W, Zr; 100 mL, 10 mg/L; matrix=H ₂ O/trace HF	8500-6942

Single Element Standards

Description	Part No.
Bismuth, 100 mL, 10 mg/L	8500-6936
Cobalt, 100 mL, 10 mg/L	8500-6947
Gold, 100 mL, 10 mg/L	8500-7000
Indium, 100 mL, 10 mg/L	8500-6946
Mercury, 100 mL, 10 mg/L	8500-6941
Rhodium, 100 mL, 10 mg/L	8500-6945

ICP-MS Standards

Interference Check Mixes

Description	Part No.
6020 Interference Check Mix 1: Cl, C, Ca, Fe, K, Al, Mg, Na, P, S, Mo, Ti at various concentrations; 100 mL; matrix=5% HNO ₃ /trace HF	8500-6998
6020 Interference Check Mix 2: Ag, As, Cd, Co, Cr, Cu, Mn, Ni, Zn; 100 mL, 10 µg/ml, matrix=2% HNO ₃	8500-7001

Environmental Standards

Description	Part No.
Environmental Calibration Standard: 1,000 mg/L: Fe, K, Ca, Na, Mg; 10 mg/L: Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, V, Zn, Th, U; matrix = 10% HNO ₃ , 100 mL	5183-4688
Initial Calibration Verification Standard: 1,000 mg/L: Fe, K, Ca, Na, Mg, Sr; 10 mg/L: Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, V, Zn, Th, U; matrix = 5% HNO ₃ , 100 mL	5183-4682
Internal Standard Mix : 10 mg/L: ⁶ Li, Sc, Ge, Y, In, Tb, Bi; matrix = 5-10% HNO ₃ , 500 mL	5183-4680
Internal Standard Mix: 10 mg/L: ⁶ Li, Sc, Ge, Y, In, Tb, Bi; matrix = 5-10% HNO ₃ , 100 mL	5183-4681
Environmental Spike Mix: 1,000 mg/L: Fe, K, Ca, Na, Mg; 100 mg/L: Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, V, Zn, U; matrix = 5% HNO ₃ ; 100 mL	5183-4687

UV-Vis

Cells and Cell Accessories	712-716
Tubing and Fittings	716
Instrument Parts and Supplies	717-718
Dissolution Testing Supplies	719
Standards and Reagents	720



UV-Vis

Keeping your system operating at optimum levels

Cells and supplies are critical to the performance of your Agilent 8453 UV/Visible Spectroscopy System. That is why Agilent is constantly working to ensure that every product meets the most stringent testing standards.

This section will help you identify the cells and supplies that fit your application exactly—including the spectrophotometer equipment, tubing, fittings, and dissolution testing supplies you need to enhance your lab's productivity. All are backed by four decades of design and technical expertise, flexible, comprehensive services, and 24/7 technical support by phone or Web.



Cells

Macro Cells

The macro cell which is defined by DIN 58963 as a rectangular cell with an inner width greater than 5 mm has emerged as the standard for photometry. The most widely used macro cell is a rectangular cell with outer dimensions of 45 x 12.5 mm (height x width). The length of the cell is dependent on the desired path length.

Macro Cells with PTFE Lid

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µl)	Part No. Glass	Part No. Quartz
1	45 x 12.5 x 3.5	44.5 x 9.5	350	5063-6546	5061-3384
2	45 x 12.5 x 4.5	44.5 x 9.5	700	5063-6547	5061-3385
5	45 x 12.5 x 7.5	44.5 x 9.5	1750	5063-6548	5061-3386
10	45 x 12.5 x 12.5	44.5 x 9.5	3500	5063-6549	5061-3387
10	45 x 12.5 x 12.5	44.5 x 9.5	3500	5063-6550*	1000-0544*
20	45 x 12.5 x 22.5	44.5 x 9.5	7000	5063-6551	5063-6553
50	45 x 12.5 x 52.5	44.5 x 9.5	17500	5063-6552	5063-6554

*Matched pair



Macro Cell with PTFE Lid



Macro Cell with PTFE Stopper

Macro Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µl)	Part No. Glass	Part No. Quartz
5	48 x 12.5 x 7.5	42 x 9.5	1750		5063-6557
10	48 x 12.5 x 12.5	42 x 9.5	3500	5063-6556	5062-2477

Spacers are required for cells with an outer depth of less than 12.5 mm to hold them securely in the cell holder.

Semi-micro Cells

Semi-micro and micro cells have an inner width of 4 mm to 2 mm. The thickness of the base is 9 mm. All semi-micro and micro cells are for use with spectrophotometers having a beam height of 15 mm.

For applications with a wave length range of interest in the visible range use our low cost Agilent optical quality glass cells, made from exceptionally pure raw materials. Quartz glass gives transmission values of >80% between 200 nm and 2500 nm for an empty cell. Optical glass gives transmission values of >80% between 320 nm and 2500 nm for an empty cell.



Semi-Micro Cell with PTFE Lid

Semi-micro Cells with PTFE Lid

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µl)	Part No. Glass	Part No. Quartz
10	45 x 12.5 x 12.5	41.8 x 2	700	5063-6558	5061-3391
		36 x 4	1000		5063-6559



Semi-Micro Cell with PTFE Stopper

Semi-micro Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µl)	Part No. Glass	Part No. Quartz
10	46 x 12.5 x 12.5	37 x 4	1000	5063-6560	5063-6561

UV-Vis Cells



Ultra-Micro PTFE Stopper



Ultra-Micro Cell with Eppendorf Filling

Ultra-micro Cells

These cells are specifically designed for use in the μL range (down to $50\mu\text{L}$). These cells fit into any standard cell holder and have the advantage of requiring much smaller sample volumes than standard cells. The cells are constructed so that filling and emptying can be easily accomplished with commonly available pipette tips. Ultra-micro cells with Eppendorf pipette filling/emptying are designed to handle extremely small volumes. When only a minimum amount of sample is available, these cells provide a filling volume only slightly larger than the measuring chamber volume.

Ultra-micro Cells with PTFE Stopper

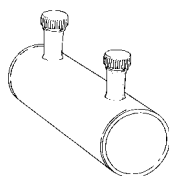
Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (μL)	Filling Volume (μL)	Part No. Quartz
2	45 x 12.5 x 12.5	2.5 x 2	15	10	20	5062-2497
10	45 x 12.5 x 12.5	2.5 x 2	15	50	70	5062-2496

Ultra-micro Cells with Eppendorf pipette filling/emptying

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (μL)	Filling Volume (μL)	Part No. Quartz
0.1	40 x 12.5 x 12.5	1 x 5	15	0.5	5	5063-6562
1	40 x 12.5 x 12.5	1 x 5	15	5	10	5063-6563
5	40 x 12.5 x 12.5	0.8 round	15	2.5	5	5063-6564
10	40 x 12.5 x 12.5	0.8 round	15	5	10	5063-6565

Cylindrical Cells

A cylindrical cell is a cell with plane-parallel optical surfaces whose inner volume is cylindrical in shape and has a longitudinal axis parallel to the direction of the radiation beam.



Cylindrical Cell with PTFE Stoppers

Cylindrical Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (μL)	Part No. Glass	Part No. Quartz
100	102.5 x 22	19	28000	5063-6566	5061-3392

Flow-through Cells

Until recently, flow-through cells had measuring chambers that were either rectangular or circular in shape. These shapes were dictated by limitations in the manufacturing process and did not offer the best geometry for clean flushing and reduction of contamination. Now Agilent has developed new oval aperture cells that combine low volume with excellent flow characteristics. These oval flow cells are strongly recommended for automated analyses such as dissolution testing. Black quartz is used in the vicinity of the aperture to ensure that no light passes through the side walls of the cell.



Round Aperture Flow Cell

Flow-through cells with round aperture and screw fitting connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µl)	Part No. Quartz
10	35 x 12.5 x 12.5	2	15	30	0100-1224
10	35 x 12.5 x 12.5	3	15	80	0100-1225



Rectangular Aperture Flow Cell

Flow-through cells with rectangular aperture and screw fitting connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µl)	Part No. Quartz
1	35 x 12.5 x 12.5	17.5 x 3.5	15	62	5061-3396
2	35 x 12.5 x 12.5	17.5 x 3.5	15	124	5061-3397
5	35 x 12.5 x 12.5	17.5 x 3.5	15	230	5065-9918
10	35 x 12.5 x 12.5	11 x 3.5	15	390	5061-3398
10	35 x 12.5 x 12.5	8 x 2	15	160	5062-2476



Oval Aperture Flow Cell

Flow-through cells with oval aperture and screw fitting connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µl)	Part No. Quartz
1	39 x 12.5 x 12.5	8 x 3	15	40	5063-6570
1	40 x 12.5 x 12.5	8 x 3	15	40	5065-9907
2	39 x 12.5 x 12.5	8 x 3	15	80	5063-6571
5	39 x 12.5 x 12.5	8 x 3	15	200	5063-6572
10	39 x 12.5 x 12.5	8 x 3	15	430	5063-6573

Note: Flow-through cells do not include tubing/fittings.

UV-Vis

Tubing and Fittings

Cell Accessories

Spacers*

Description	Part No.
Spacer for 1 mm cell	5061-3388
Spacer for 2 mm cell	5061-3389
Spacer for 5 mm cell	5061-3390

*Spacers are required to hold cells with an outer depth of less than 12.5 mm in the cell holder.



Cell Tray

Miscellaneous

Description	Unit	Part No.
Magnetic stirring bar*	2/pk	9301-1161
Cell cleaning solution	1 L	5062-8529
Lens cleaning paper, lint free	50/pk	9300-0761
Tray for 16 Spectrophotometer cells	10 mm	5063-6577

*For use with Agilent 89054A cell-stirring multicell transport and Agilent 89090A Peltier temperature controller. Stirring bars are used with cells having internal dimensions of 10 x 10 mm (W x D) and cell holders with magnetic stirring capability.

UV-Vis

Tubing and Fittings



Description	Unit	Part No.
Teflon tubing, 1.6 mm OD	10 m	5041-2191
Pump tubing, 2.06 mm ID	12/pk	5041-2166
Pump tubing, 1.3 mm ID	12/pk	5041-2184
Pump tubing, 2.8 mm ID	12/pk	5041-2185
Tefzel ferrules and SS lock rings, 1/16 in.	10/pk	5022-2154
Union, 1/4 - 28 threads, Polypropylene	10/pk	5022-2155
Cell fittings, black (4 short and 4 long)	8/pk	5022-2156
Conical adapter kit	2/pk	5022-2157
Connects Teflon tubing to pump tubing		
Teflon nuts for 1/16 in. OD tubing	10/pk	5022-2158
Tubing, heat exchanger, FEP	12 cm	5042-1336
1/16 in. PEEK fittings and ferrules for 8-port valve	10/pk	5042-1337
Mounting tool for flangeless nut		0100-1710

Instrument Parts and Supplies

Cell Holder Supplies

Description	Part No.
Optical Filter Wheel Prevents photosensitive samples from being irradiated by UV light. Includes three filters (265 and 295 nm cut-off, and UV roll-off filter). Can be mounted on standard cell holder (08451-60104), thermostatable cell holder (89054A) and adjustable cell holder (89070A)	08451-60302
Magnetic stirring bar for use with 10 x 10 mm (W x D) cells, 2/pk	9301-1161
Standard cell holder	08451-60104
Long Path-length Cell Holder	89076C

89075C 7-Position Multicell Transport Supplies

Description	Part No.
Cell holder	G1120-62301
Stirring module kit	G1120-60006
Optical Filter Wheel Prevents photosensitive samples from being irradiated by UV light. Includes two filters with cut-off Wavelength at 265 and 295 nm and one UV roll-off filter.	89075-60002

G1120A 8-Position Multicell Transport Supplies

Description	Part No.
Optical filter kit Set of three optical filters to prevent photosensitive samples from being irradiated by UV light (265 and 295 nm cut-off and UV roll-off filter)	G1120-68707
Stirring module kit Stirrer is driven by circulating water from water bath (not included)	G1120-60006
Magnetic stirring bar for use with 10 x 10 mm (W x D) cells, 2/pk	9301-1161
Multicell transport adjustment tool	89075-23800
Plastic cover kit	G1120-68708

UV-Vis

Spectrophotometer Supplies/Sipper/Lamps

89090A Peltier Temperature Controller Supplies

Description	Part No.
Union, cell holder	5021-1870
Flow cell, 10 mm, 8 x 2 mm aperture, 160 µl	5062-2476
Quartz cuvette, 10mm, with PTFE stopper	5062-2477
Tubing, heat exchanger, FEP	5042-1336

Autosampler Supplies

Description	Part No.
Needle, beveled edge for G1811A	G1811-23200
Guide, Teflon tubing for 89072A	1535-4878
Test tubes, 12x100 mm, 250/pk	5022-6531

Sipper Supplies

Description	Part No.
Sipper tubing kit for 8452	5042-1333
Sipper/sampler tubing and fittings kit for 8453	5042-1334
Flow cell, 10 mm, 80 µl	0100-1225
Cassette, fixed pressure	5041-2167
Cassette, variable pressure	5042-1356

Dissolution Testing Supplies



Multicell Tubing Kit, 5042-1330



Valve Tubing Kit, 5042-1331

Description	Part No.
Multicell system tubing kit	5042-1330
Valve tubing kit for one bath	5042-1331
Dissolution probes kit, 0.9 mm ID, tubes with fittings	5042-1332
1/16 in. PEEK fittings and ferrules for 8-port valve, 10/pk	5042-1337
Valve for 89079 valve unit	5063-6575
Rotor seal for 5063-6575 valve (UV-vis) dissolution system	5067-1539
Dissolution filters for 1/8 in. probe, 45 µm pore size, 1000/pk	5181-1246

UV-Vis

Chemical Standards and Accessory Kits



UV-Vis Standards & Reagents

Our chemical standards and accessory kits provide an inexpensive and time-saving solution for operational qualification and performance verification (OO/PV) of UV-visible spectrophotometers. The kits are designed for analysts who need to conform closely to both quality and regulatory requirements when performing UV-visible measurements.

The chemical kits can be used with any UV-visible spectrophotometer and consist of pre-prepared solutions in sealed ampoules. The solutions are those specified by the United States Pharmacopeia (USP) and European Pharmacopeia (EP) and include holmium oxide for wavelength accuracy measurement; potassium dichromate for photometric accuracy measurement; sodium nitrite, sodium iodide and potassium chloride for stray light measurements at 340, 220 and 200 nm; and toluene in hexane for resolution measurement. Each standard includes a Certificate of Analysis for traceability.

Certified Calibration Standards and Accessory Kits

Description	Part No.
OO/PV Chemical Standards Kit I (for photometric accuracy, stray light and resolution measurements) Contains 10 ampoules 10 mL each of 2 Dichromate, 2 Sulfuric Acid, 1 Sodium Nitrite, 1 Sodium Iodide, 1 Potassium Chloride, 1 Toluene in Hexane, 2 Hexane	5063-6503
OO/PV Chemical Standards Kit II (for wavelength accuracy) Contains two ampoules 10 mL each of 2 Perchloric Acid, 1 Holmium Oxide in Perchloric Acid	5063-6521
OO/PV Hardware Kit Contains 2 flow cells, cell passivating fluid, tubing kit, MCT adjustment tool, temperature sensor support, syringes and OO/PV manual	5063-6523
Tubing Kit for UV-VIS OO/PV Test Contains tubings, fittings and adapter to flush flow cell	5063-6522
Caffeine OO/PV sample for dissolution test, 150 mg/L caffeine in water, 500 mL	5042-6476

Checkout Samples

Description	Part No.
Holmium oxide glass filter	08450-60117
Test sample for UV-Vis (Caffeine solution, 10 µg/mL in water)	5063-6524

Part Number Index

009-4003.....	139	0100-1859.....	456	0101-1232.....	455
009-4004.....	139	0100-1860.....	456	0101-1233.....	456
009-4005.....	139	0100-1921.....	457	0101-1234.....	458
0100-0091.....	106	0100-1922.....	457	0101-1235.....	458
0100-0118.....	104, 107	0100-1923.....	457	0101-1236.....	458
0100-0119.....	104, 107	0100-1924.....	457	0101-1237.....	458
0100-0121.....	108	0100-2051.....	498	0101-1238.....	458
0100-0124.....	107	0100-2087.....	460, 482	0101-1239.....	458
0100-0126.....	107	0100-2088.....	472, 475	0101-1240.....	458
0100-0128.....	107	0100-2089.....	460, 472, 475, 482	0101-1241.....	458
0100-0132.....	107	0100-2175.....	449	0101-1242.....	458
0100-0133.....	107	0100-2195.....	478	0101-1243.....	457
0100-0161.....	106	0100-2231.....	472, 483	0101-1244.....	457
0100-0241.....	108	0100-2233.....	460, 482	0101-1245.....	457
0100-0420.....	106	0100-2298.....	450	0101-1246.....	457
0100-0542.....	106	0100-2304.....	496-497	0101-1247.....	457
0100-0782.....	106	0100-2410.....	478	0101-1248.....	457
0100-0900.....	107, 450, 473, 490, 500-501	0100-2415.....	472	0101-1249.....	457
0100-0969.....	106, 496-497	0100-2441.....	450, 483	0101-1250.....	457
0100-0985.....	106	0101-0030.....	102	0101-1251.....	457
0100-1017.....	500-501	0101-0113.....	102	0101-1252.....	457
0100-1104.....	174	0101-0282.....	181, 477	0101-1253.....	455
0100-1224.....	715	0101-0299.....	181	0101-1254.....	456
0100-1225.....	715, 718	0101-0300.....	181	0101-1255.....	456
0100-1259.....	449	0101-0301.....	181	0101-1256.....	456
0100-1316.....	107	0101-0302.....	181	0101-1257.....	472
0100-1324.....	174	0101-0303.....	181	0101-1258.....	482
0100-1325.....	174	0101-0355.....	181	0101-1267.....	472, 478
0100-1326.....	174	0101-0376.....	457	0101-1268.....	472, 478
0100-1331.....	174, 209	0101-0377.....	457, 477	0101-1288.....	460
0100-1332.....	174, 200, 209	0101-0378.....	457, 477	0101-1290.....	460
0100-1342.....	174	0101-0379.....	457, 477	0101-1343.....	482
0100-1344.....	174	0101-0403.....	181	0101-1358.....	460
0100-1375.....	174	0101-0584.....	180	0101-1359.....	460
0100-1378.....	174	0101-0585.....	180	0101-1360.....	482
0100-1379.....	174	0101-0594.....	178	0101-1361.....	460, 482
0100-1381.....	174	0101-0595.....	178	0101-1362.....	460
0100-1389.....	61	0101-0620.....	456	0101-1363.....	460
0100-1511.....	180	0101-0623.....	456	0101-1364.....	460
0100-1512.....	180	0101-0624.....	456	0101-1365.....	460
0100-1513.....	180	0101-0633.....	181	0101-1385.....	472, 478
0100-1514.....	180	0101-0636.....	180	0101-1390.....	472, 478
0100-1515.....	180	0101-0637.....	180	0101-1398.....	692
0100-1516.....	449, 494, 496-497, 523	0101-0638.....	180	0101-1399.....	692
0100-1527.....	180	0101-0639.....	180	0101-1400.....	692
0100-1543.....	685	0101-0920.....	482	0101-1409.....	460, 482
0100-1631.....	449, 483	0101-0921.....	472	0101-1415.....	482
0100-1710.....	463-464, 716	0101-1050.....	472, 475	0101-1416.....	472
0100-1847.....	450	0101-1051.....	482	0101-1417.....	460, 472, 482
0100-1849.....	472	0101-1219.....	457	0101-1419.....	482
0100-1850.....	460, 472, 482	0101-1226.....	458	0101-1420.....	482
0100-1851.....	472, 482	0101-1227.....	458	0101-1421.....	482
0100-1852.....	482	0101-1228.....	458	0101-1422.....	472
0100-1853.....	472	0101-1229.....	458	0101-2415.....	478
0100-1854.....	460, 482, 498	0101-1230.....	458	01010-80002.....	500-501
0100-1855.....	460, 482, 498	0101-1231.....	455	01018-22707.....	466

Part Number Index

01018-23702.....	463	03394-60540.....	125-126	0890-1762.....	448, 483
01018-60025.....	470, 500-501	03394-60560.....	125-126	0890-1763.....	448, 483
01018-67305.....	446	03394-60600.....	125	0890-1915.....	448, 496-497
01018-68722.....	466	03396-40050.....	123	0905-0970.....	500-501
01019-82702.....	500-501	03396-60550.....	125	0905-1163.....	687
01037-60002.....	503	03396-60560.....	125-126	0905-1175.....	466
01046-28101.....	503	03396-60650.....	125-126	0905-1194.....	500-501
01046-28103.....	503	03396-61010.....	125-126	0905-1259.....	500-501
01046-60010.....	503	03396-61020.....	126	0905-1284.....	199
01046-60210.....	126	0350-1402.....	449	0905-1294.....	473
01046-67101.....	503	0410103101.....	187-188	0905-1420.....	467
01046-67102.....	503	0410105007.....	187-188	0905-1516.....	471
01046-67103.....	503	0410105010.....	187-188	0905-1599.....	478
01046-68702.....	503	0410105017.....	187-188	0905-1610.....	202
01048-87302.....	446	0410205001.....	187-188	0905-2580.....	199
01049-24705.....	504	0460-1266.....	95	0960-0376.....	221-222
01049-25701.....	504	0490-1849.....	456	0960-0897.....	221-222
01049-27305.....	504	0515-0502.....	500-501	100-2000.....	325-328
01049-27306.....	504	0515-0655.....	199	1000-0488.....	490-491, 503
01049-27604.....	504	0515-0680.....	202	1000-0544.....	712
01049-27708.....	504	0515-0683.....	203	1000-0953.....	491
01049-28801.....	504	0515-1046.....	218	1000-1437.....	203
01049-28802.....	504	0515-1056.....	491	1000-1438.....	203
01049-45201.....	504	0515-1084.....	202	10833B-2310.....	127
01049-47102.....	504	0515-1446.....	218	10833G-2310.....	127
01049-60013.....	504	0515-2495.....	199	10834A-2310.....	127
01049-62901.....	504	0535-0071.....	218	112-2032.....	306
01049-62902.....	504	05890-61090.....	181	112-2112.....	307
01049-64105.....	504	05890-61095.....	181	112-2132.....	307
01049-67001.....	504	05890-61260.....	93	112-2133.....	307
01049-68700.....	504	05921-21170.....	174, 216-217	112-2162.....	307
01049-92101.....	504	05970-60045.....	227	112-2532.....	279
01078-87302.....	473	05971-20126.....	218	112-2562.....	279
01080-68702.....	116, 495	05971-20130.....	218	112-5432.....	308
01080-68704.....	116, 495	05971-20134.....	218	112-5462.....	308
01080-83202.....	106, 449	05971-20143.....	218	112-6632.....	279
01090-27609.....	453	05971-20305.....	218	112-8837.....	262
01090-60008.....	500-501	05971-60140.....	219-220	112-8867.....	262
01090-61105.....	500-501	05971-60170.....	218	112-88A7.....	262
01090-68702.....	453	05971-60561.....	216	113-2032.....	306
01090-68703.....	453	05971-80102.....	222-224	113-2132.....	307
01090-87301.....	500-501	05971-80103.....	222-224, 496-497	113-2132E.....	310-313
01090-87303.....	500-502	05980-20018.....	216	113-2133.....	307
01090-87304.....	446	05980-60051.....	216	113-2532.....	279
01090-87305.....	446	05988-20066.....	174, 216-217	113-3032.....	308
01090-87307.....	503	05990-60075.....	227	113-3112.....	300
01090-87308.....	446, 484	07673-20570.....	188	113-3132.....	300
01090-87317.....	500-501	07673-40180.....	48, 188	113-3133.....	300
01090-87322.....	503	07673-60840.....	188	113-3162.....	300
01090-87603.....	500-501	07675-80050.....	181	113-3432.....	303
01090-87606.....	500-501	08450-60117.....	118, 720	113-4302.....	300
01090-87610.....	446	08450-60300.....	118	113-4312.....	300
01090-87611.....	446	08451-60104.....	717	113-4332.....	300, 325-328
01090-87615.....	500-501	08451-60302.....	717	113-4362.....	300, 325-328
01100-68700.....	463	0854-0141.....	202, 210	113-5432.....	308
03394-20500.....	123	0890-1761.....	448	113-6632.....	279

Part Number Index

115-2132	307, 325-328	122-0761	269	122-1962	254
115-3113	300	122-0762	269	122-2012	314-317
115-3133	300	122-0763	269	122-2032	263, 314-317
115-3332	298	122-0766	269	122-2033	263, 314-317
115-3352	298	122-1011	236-238, 314-317	122-2212	265
115-3412	303	122-1012	236-238, 314-317	122-2231	265
115-3422	303	122-1013	236-238, 314-317	122-2232	265
115-3432	303	122-1022	236-238	122-2312	261
115-3432E	310-313	122-1031	236-238, 314-317	122-2331	261
115-34H2	303	122-1032	236-238, 314-317	122-2332	261
115-3532	299, 325-328	122-1032E	310-313	122-2361	261
115-3552	299, 325-328	122-1032G	233	122-2362	261, 325-328
12-0507-024TMR	183	122-1033	236-238, 314-317	122-2461	290
121-0713	269	122-1033E	310-313	122-2461E	310-313
121-1012	236-238, 314-317	122-103E	236-238	122-2462	290
121-1013	236-238, 314-317	122-1052	236-238	122-2912	266, 314-317
121-101A	236-238	122-1061	236-238, 314-317	122-2932	266, 314-317, 325-328
121-1022	236-238, 314-317	122-1062	236-238, 314-317	122-2962	266, 314-317
121-1023	236-238, 314-317	122-1063	236-238, 314-317	122-3212	276
121-1043	236-238, 314-317	122-106E	236-238, 325-328	122-3232	276
121-1222	254, 314-317	122-10A6	289, 325-328	122-3233	276
121-1232	254, 314-317	122-10A6E	310-313	122-3262	276
121-1324	267, 294, 325-328	122-10AE	236-238	122-3263	276
121-1524	293, 325-328	122-10G3	236-238	122-3812	256, 314-317
121-1544	293	122-1111	281	122-3831	256
121-1712	314-317	122-1131	281	122-3832	256, 314-317, 325-328
121-1722	258, 314-317	122-1211	254, 314-317	122-3862	256, 314-317
121-1723	258, 314-317	122-1212	254, 314-317	122-4711	259
121-2223	265	122-1231	254, 314-317	122-4712	259, 314-317
121-2323	261	122-1232	254, 314-317, 325-328	122-4731	259
121-4722	259, 314-317	122-1232G	233	122-4732	259, 314-317
121-5012	245, 314-317	122-1233	254	122-4762	259, 314-317
121-5013	245, 314-317	122-1236	254, 314-317	122-5011	245, 314-317
121-5022	245, 314-317	122-1262	254, 314-317	122-5012	245, 314-317, 325-328
121-5023	245, 314-317	122-1332	268	122-5013	245, 314-317
121-5042	245	122-1333	268	122-501E	245
121-5522	249, 314-317	122-1334	267, 294	122-5022	245
121-5542	249, 314-317	122-1334E	310-313	122-5031	245, 314-317
121-5622	291	122-1362	268	122-5032	245, 314-317, 325-328
121-7012	119, 272, 314-317	122-1363	268	122-5032E	310-313
121-7022	272, 314-317	122-1363E	310-313	122-5033	245, 314-317
121-7023	272, 314-317	122-1364	267, 294, 325-328	122-503E	245
121-7043	272, 314-317	122-1364E	310-313	122-5052	245
122-0112	242, 314-317	122-1534	293	122-5061	245, 314-317
122-0131	242, 314-317	122-1564	293, 325-328	122-5062	245, 314-317
122-0132	242, 314-317	122-1564E	310-313	122-5063	245, 314-317
122-0162	242, 314-317	122-1711	258, 314-317	122-506E	245
122-0212	264	122-1712	258, 314-317	122-5511	249, 314-317
122-0232	264	122-1713	258, 314-317	122-5512	249, 314-317
122-0233	264	122-1731	258, 314-317	122-5513	249, 314-317
122-0712	269	122-1732	258, 314-317	122-5516	249
122-0713	269	122-1733	258, 314-317	122-5522	249
122-0731	269	122-1762	258, 314-317	122-552A	249
122-0732	269	122-1811	282	122-5531	249, 314-317
122-0732E	310-313	122-1831	282	122-5532	249, 314-317
122-0733	269	122-1932	254	122-5532G	233

Part Number Index

122-5533.....	249	123-1014.....	236-238	123-1932.....	254
122-5533E.....	310-313	123-1015.....	236-238	123-1933.....	254
122-5533G.....	233	123-1022.....	236-238, 325-328	123-2032.....	263, 314-317
122-5536.....	249, 314-317	123-1026.....	236-238, 314-317	123-2033.....	263, 314-317
122-5536G.....	233	123-1027.....	236-238	123-2232.....	265
122-5552.....	249	123-102F.....	236-238	123-2332.....	261
122-5561.....	249, 314-317	123-1031.....	236-238, 314-317	123-2362.....	261
122-5562.....	249, 314-317	123-1032.....	236-238, 314-317	123-2932.....	266, 314-317
122-5562G.....	233	123-1033.....	236-238, 314-317, 325-328	123-3212.....	276
122-5563.....	249	123-1033E.....	310-313	123-3223.....	276
122-5631.....	291	123-1034.....	236-238	123-3232.....	276, 325-328
122-5631G5.....	233	123-1035.....	236-238	123-3232E.....	310-313
122-5632.....	291	123-103B.....	236-238	123-3233.....	276
122-5633.....	291	123-103E.....	236-238	123-3234.....	276
122-5661.....	291	123-1052.....	236-238	123-3253.....	276
122-5711.....	281	123-1055.....	236-238	123-3262.....	276
122-5731.....	281	123-1056.....	236-238	123-3263.....	276
122-6432.....	307	123-105C.....	236-238	123-3264.....	276
122-6462.....	307	123-105F.....	236-238	123-3812.....	256
122-6832.....	286	123-1061.....	236-238, 314-317	123-3832.....	256, 314-317
122-7012.....	272, 314-317	123-1062.....	236-238, 314-317	123-4712.....	259, 314-317
122-7013.....	272, 314-317	123-1063.....	236-238, 314-317	123-4732.....	259, 314-317
122-7031.....	272, 314-317	123-1064.....	236-238	123-5011.....	245, 314-317
122-7032.....	272, 314-317, 325-328	123-1065.....	236-238	123-5012.....	245, 314-317
122-7032E.....	310-313	123-1065E.....	310-313	123-5012E.....	310-313
122-7033.....	272, 314-317	123-106B.....	236-238	123-5013.....	245, 314-317
122-7033E.....	310-313	123-106E.....	236-238, 325-328	123-5022.....	245
122-7061.....	272, 314-317	123-106G.....	236-238	123-5026.....	245, 314-317
122-7062.....	272, 314-317	123-1111.....	281	123-502D.....	245
122-7063.....	272, 314-317	123-1131.....	281	123-502F.....	245
122-7332.....	273	123-1232.....	254, 314-317	123-5031.....	245, 314-317
122-7333.....	273	123-1236.....	254	123-5032.....	245, 314-317
122-7362.....	273	123-1262.....	254, 314-317	123-5032E.....	310-313
122-7363.....	273	123-1332.....	268	123-5033.....	245, 314-317, 325-328
122-7732.....	286, 325-328	123-1333.....	268	123-503B.....	245
123-0112.....	242, 314-317	123-1334.....	267, 294	123-503E.....	245
123-0131.....	242, 314-317	123-1334E.....	310-313	123-5052.....	245
123-0132.....	242, 314-317	123-1363.....	268	123-5053.....	245, 314-317
123-0162.....	242, 314-317	123-1364.....	267, 294	123-5056.....	245
123-0213.....	264	123-1364E.....	310-313	123-5062.....	245, 314-317
123-0232.....	264	123-1464.....	294	123-5063.....	245, 314-317
123-0233.....	264	123-1534.....	293, 325-328	123-5511.....	249, 314-317
123-0712.....	269	123-1564.....	293	123-5512.....	249, 314-317
123-0713.....	269	123-1632.....	295, 325-328	123-5513.....	249, 314-317
123-0731.....	269	123-1711.....	258, 314-317	123-5526.....	249, 314-317
123-0732.....	269	123-1712.....	258, 314-317	123-5531.....	249, 314-317
123-0732E.....	310-313	123-1713.....	258, 314-317	123-5532.....	249, 314-317
123-0733.....	269	123-1730.....	286, 325-328	123-5532E.....	310-313
123-0733E.....	310-313	123-1731.....	258, 314-317	123-5533.....	249
123-0753.....	269	123-1732.....	258, 314-317	123-5533G.....	233
123-0762.....	269	123-1732E.....	310-313	123-5536.....	249, 314-317
123-0763.....	269	123-1733.....	258, 314-317	123-5561.....	249, 314-317
123-0763E.....	310-313	123-1762.....	258	123-5562.....	249, 314-317
123-1011.....	236-238, 314-317	123-1811.....	282	123-5563.....	249
123-1012.....	236-238, 314-317	123-1831.....	282	123-5566.....	249
123-1013.....	236-238, 314-317	123-1861.....	282		

Part Number Index

123-5632.....	291	125-1005.....	236-238	125-1932.....	254
123-5711.....	281	125-100B.....	236-238	125-1937.....	254
123-5731.....	281	125-1011.....	236-238	125-2032.....	263
123-6133.....	307	125-1011E.....	310-313	125-2212.....	265
123-6412.....	307	125-1012.....	236-238	125-2232.....	265
123-6432.....	307	125-1012E.....	310-313	125-2237.....	265
123-6462.....	307	125-1014.....	236-238	125-2312.....	261
123-7012.....	272, 314-317	125-1015.....	236-238	125-2332.....	261
123-7013.....	272, 314-317	125-1017.....	236-238	125-2814.....	287, 325-328
123-7031.....	272, 314-317	125-101J.....	236-238	125-3212.....	276
123-7032.....	272, 314-317	125-101K.....	236-238	125-3217.....	276
123-7032E.....	310-313	125-1025.....	236-238	125-3231.....	276
123-7033.....	272, 314-317	125-102J.....	236-238	125-3232.....	276
123-7033E.....	310-313	125-1032.....	236-238	125-3233.....	276
123-7062.....	272, 314-317, 325-328	125-1034.....	236-238, 325-328	125-3237.....	276
123-7063.....	272, 314-317	125-1034E.....	310-313	125-3262.....	276
123-7063E.....	310-313	125-1035.....	236-238, 325-328	125-32H2.....	276
123-7312.....	273	125-1035E.....	310-313	125-3832.....	256
123-7314.....	273	125-1037.....	236-238	125-3837.....	256
123-7332.....	273	125-1039.....	236-238	125-5012.....	245
123-7333.....	273	125-103B.....	236-238	125-5017.....	245
123-7334.....	273	125-103J.....	236-238	125-501J.....	245
123-7354.....	273	125-103K.....	236-238	125-501K.....	245
123-7362.....	273	125-1055.....	236-238	125-5025.....	245
123-7363.....	273	125-1062.....	236-238	125-5032.....	245, 325-328
123-7364.....	273, 325-328	125-1064.....	236-238	125-5032E.....	310-313
123-7722.....	286	125-1065.....	236-238	125-5034.....	245
123-7732.....	286	125-106J.....	236-238	125-5035.....	245
123-9134.....	283	125-10B5.....	236-238	125-5037.....	245
123-9234.....	283	125-10H5.....	236-238	125-503B.....	245
124-0034.....	295	125-10HB.....	236-238	125-503D.....	245
124-1032.....	236-238	125-1212.....	254	125-503J.....	245
124-1034.....	236-238	125-1232.....	254	125-503K.....	245
124-1334.....	267, 294, 325-328	125-1312.....	268	125-5062.....	245
124-1374.....	267, 294	125-1332.....	268	125-5065.....	245
124-1534.....	293, 325-328	125-1333.....	268	125-50HB.....	245
124-1574.....	293, 325-328	125-1334.....	267, 294, 325-328	125-5512.....	249
124-1730.....	286	125-1334E.....	310-313	125-5532.....	249
124-3232.....	276, 325-328	125-1334G5.....	233	125-5537.....	249
124-5012.....	245	125-1364.....	267, 294	125-5537G.....	233
124-5032.....	245	125-1374.....	267, 294	125-553J.....	249
124-5037.....	245	125-1374E.....	310-313	125-6837.....	286
124-7032.....	272, 325-328	125-14A4.....	294	125-7012.....	272
125-0034.....	295	125-1704.....	258	125-7017.....	272
125-0034E.....	310-313	125-1710.....	286	125-7031.....	272
125-0212.....	264, 325-328	125-1711.....	258	125-7032.....	272, 325-328
125-0232.....	264	125-1712.....	258	125-7032E.....	310-313
125-0712.....	269	125-1713.....	258	125-7037.....	272
125-0731.....	269	125-1717.....	258	125-7062.....	272
125-0732.....	269	125-1730.....	286, 325-328	125-7312.....	273
125-0732E.....	310-313	125-1731.....	258	125-7314.....	273
125-0732G.....	233	125-1732.....	258	125-7332.....	273
125-0733.....	269	125-1733.....	258	125-7333.....	273
125-0737.....	269	125-1737.....	258	125-7334.....	273
125-0762.....	269	125-1762.....	258	125-7362.....	273
125-1002.....	236-238	125-1912.....	254	125-7732.....	286

Part Number Index

125-9134.....	283	128-5552.....	249, 314-317	160-2205-10.....	318
125-9234.....	283	128-7022.....	272	160-2205-5.....	318
126-1012.....	236-238, 681	128-7032.....	272	160-2250-10.....	319
126-1013.....	236-238, 681	128-7052.....	272	160-2250-5.....	319
126-1713.....	258, 681	128-7323.....	273	160-2255-1.....	318
126-7012.....	272	128-8522.....	141, 284	160-2255-10.....	318
126-7013.....	272	12A-1015.....	236-238	160-2255-30.....	318
127-0112.....	242	12A-5015.....	245	160-2255-5.....	194, 318
127-0113.....	242	1300502506.....	187-188	160-2320-10.....	319
127-0122.....	242	1300530001.....	187-188	160-2320-5.....	319
127-0123.....	242	1300530010.....	187-188	160-2325-1.....	318
127-0722.....	269	14-0036-050TMR.....	184	160-2325-10.....	318
127-0723.....	269	14-0216-016TMR.....	184	160-2325-30.....	318
127-100A.....	236-238	14-0739-016TMR.....	184	160-2325-5.....	194, 205, 318
127-1012.....	236-238, 681	14-0857-016TMR.....	184	160-2450-10.....	319
127-1012E.....	310-313	14-2087-016TMR.....	184	160-2450-5.....	319
127-1013.....	236-238	14-2261-016TMR.....	184	160-2455-1.....	318
127-1013E.....	310-313	14-3123-016TMR.....	184	160-2455-10.....	318
127-1022.....	236-238	14-3124-016TMR.....	184	160-2455-5.....	318
127-1022E.....	310-313	14-3137-200TMR.....	184	160-2530-10.....	176, 319
127-1023.....	236-238	14-3195-053TMR.....	183	160-2530-5.....	319
127-1043.....	236-238	14-3197-100TMR.....	184	160-2535-1.....	318
127-1046.....	236-238	14-3198-100TMR.....	184	160-2535-10.....	318
127-1712.....	258, 681	14-3914-016TMR.....	184	160-2535-30.....	318
127-1713.....	258, 681	14-3965-016TMR.....	184	160-2535-5.....	194, 318
127-1722.....	258	14-3979-016TMR.....	184	160-2610-10.....	319
127-2222.....	265	14-5186-153TMR.....	183	160-2610-5.....	319
127-5012.....	245	14-5681-102.....	183	160-2615-1.....	318
127-5013.....	245	1400-0015.....	199	160-2615-10.....	318
127-501E.....	245	1400-3166.....	456	160-2615-5.....	318
127-501N.....	245	145-1001.....	288, 325-328	160-2625-1.....	179, 318
127-5022.....	245	145-1011.....	304, 325-328	160-2625-10.....	179, 318
127-5023.....	245	145-1334.....	304	160-2625-5.....	179, 318
127-7012.....	272, 310-313	145-2814.....	304	160-2634-10.....	319
127-7012E.....	310-313	145-7032.....	304	160-2634-5.....	319
127-7013.....	272	1460-1914.....	111	160-2635-1.....	318
127-7022.....	272	1460-2571.....	496-497	160-2635-10.....	318
127-7023.....	272	1520-0401.....	685	160-2635-5.....	318
127-7023FF.....	272	1530-2163.....	181	160-2644-10.....	319
128-0112.....	242, 314-317	1530-2167.....	181	160-2644-5.....	319, 678
128-0122.....	242, 314-317	1535-4046.....	456	160-2650-10.....	319
128-1012.....	236-238, 314-317	1535-4048.....	502	160-2650-5.....	319, 678
128-1022.....	236-238, 314-317	1535-4545.....	115	160-2655-1.....	318
128-1052.....	236-238, 314-317	1535-4546.....	115	160-2655-10.....	318
128-1056.....	289, 325-328	1535-4860.....	457, 477	160-2655-5.....	318
128-1212.....	254, 314-317	1535-4878.....	718	160-2660-5.....	319, 678
128-1222.....	254, 314-317	1535-4900.....	502	160-2815-5.....	319
128-1324.....	267, 294	1535-4952.....	181	160-2825-5.....	319
128-3812.....	256	1535-4954.....	181	160-2845-10.....	319
128-3822.....	256, 314-317	1535-4970.....	703	160-2845-5.....	319
128-5012.....	245, 314-317	160-1010-1.....	318	160-2855-10.....	319
128-5022.....	245, 314-317	160-1010-10.....	318	160-2855-5.....	319
128-5052.....	245, 314-317	160-1010-5.....	318	160-2865-10.....	319
128-50H7.....	245	160-2200-10.....	319	160-2865-5.....	319
128-5512.....	249, 314-317	160-2200-5.....	319	160-4535-5.....	319
128-5522.....	249, 314-317	160-2205-1.....	318	18587-60560.....	186

Part Number Index

18596-40015.....	188	188-1610.....	135	19091-80060.....	111
18710-20119.....	197-199, 207-208	188-1620.....	135	19091A-002.....	251
18710-60170.....	120, 196-197, 200, 207	188-1650.....	135	19091A-005.....	251
18711-60060.....	120, 209	188-1656.....	135	19091A-012.....	251
18713-60040.....	120, 202, 209	188-1660.....	135	19091A-015.....	251
18713-60050.....	202	188-2110.....	137	19091A-101.....	251
18740-20800.....	190-191, 204	188-2120.....	137	19091A-102.....	251
18740-20880.....	170, 190-191, 204	188-2150.....	137	19091A-102E.....	310-313
18740-20885.....	190-191	188-2156.....	137	19091A-105.....	251
18740-20950.....	209	188-2160.....	137	19091A-112.....	251
18740-20960.....	209	188-2210.....	137	19091A-115.....	251
18740-60830.....	190-191, 204, 206	188-2220.....	137	19091B-002.....	252
18740-60835.....	190-192, 195, 204, 206	188-2250.....	137	19091B-005.....	252
18740-60840.....	167, 204-205	188-2256.....	137	19091B-012.....	252
18740-80190.....	167	188-2260.....	137	19091B-012E.....	310-313
18740-80200.....	167	188-2310.....	138	19091B-015.....	252
18740-80220.....	167	188-2320.....	138	19091B-101.....	252
18789-60060.....	120, 199, 208	188-2350.....	138	19091B-102.....	252
18789-80070.....	198, 208	188-2356.....	138	19091B-102E.....	310-313
188-0110.....	133	188-2360.....	138	19091B-105.....	252
188-0120.....	133	188-2410.....	138	19091B-112.....	252
188-0150.....	133	188-2420.....	138	19091B-115.....	252
188-0156.....	133	188-2450.....	138	19091F-102.....	277
188-0160.....	133	188-2456.....	138	19091F-105.....	277
188-0350.....	131	188-2460.....	138	19091F-105E.....	310-313
188-0356.....	131	188-2920.....	141	19091F-112.....	277
188-0360.....	131	188-2946.....	141	19091F-112E.....	310-313
188-0510.....	132	188-3060.....	132	19091F-115.....	277
188-0550.....	132	189-0102.....	139	19091F-115E.....	310-313
188-0556.....	132	189-0302.....	139	19091F-413.....	277
188-0560.....	132	189-0502.....	139	19091F-433.....	277
188-0610.....	133	189-0602.....	139	19091F-433E.....	310-313
188-0620.....	133	189-0702.....	139	19091G-113.....	255
188-0650.....	133	189-1002.....	139	19091G-131.....	255
188-0656.....	133	189-1302.....	139	19091G-133.....	255
188-0660.....	133	189-1502.....	139	19091G-213.....	255
188-0710.....	134	189-1602.....	139	19091G-B133.....	280
188-0720.....	134	189-2102.....	139	19091G-B213.....	280
188-0750.....	134	189-2302.....	139	19091G-B233.....	280
188-0756.....	134	189-2402.....	139	19091J-002.....	247
188-0760.....	134	18900-20250.....	181	19091J-005.....	247
188-1010.....	134	18900-20280.....	181	19091J-012.....	247
188-1020.....	134	18900-20281.....	181	19091J-015.....	247
188-1050.....	134	18900-20300.....	181	19091J-101.....	247
188-1056.....	134	18900-20850.....	180	19091J-102.....	247
188-1060.....	134	18900-60640.....	121	19091J-102E.....	310-313
188-1310.....	131	18900-80255.....	181	19091J-105.....	247
188-1320.....	131-132	190-0131.....	678	19091J-112.....	247
188-1350.....	131	190-0231.....	678	19091J-112E.....	310-313
188-1356.....	131	190-0331.....	678	19091J-113.....	247
188-1360.....	131	190-0431.....	678	19091J-115.....	247
188-1510.....	135	19091-20050.....	319	19091J-202.....	247
188-1520.....	135	19091-21050.....	319	19091J-205.....	247
188-1550.....	135	19091-60312.....	240-241	19091J-212.....	247
188-1556.....	135	19091-60620E.....	318	19091J-213.....	247
188-1560.....	135	19091-63000.....	61, 193, 205	19091J-213E.....	310-313

Part Number Index

19091J-215	247	19091P-MS7	301	19091W-105	306
19091J-216	247	19091P-MS8	301	19091Y-012	305
19091J-231	247	19091P-Q03	302	19091Y-015	305
19091J-233	247	19091P-Q04	302	19091Y-102	305
19091J-236	247	19091P-Q04E	310-313	19091Z-002	240-241
19091J-236E	310-313	19091P-S12	298	19091Z-005	240-241
19091J-313	247	19091P-S15	298	19091Z-008	240-241
19091J-333	247	19091P-S33	298	19091Z-012	240-241
19091J-411	247	19091P-U04	303	19091Z-012E	310-313
19091J-413	247	19091R-303	295	19091Z-015	240-241
19091J-413E	310-313	19091R-306	295	19091Z-102	240-241
19091J-416	247	19091R-316	295	19091Z-102E	310-313
19091J-431	247	19091R-319	295	19091Z-105	240-241
19091J-433	247	19091S-001	288, 325-328	19091Z-112	240-241
19091J-433E	310-313	19091S-001E	310-313	19091Z-112E	310-313
19091J-436	247	19091S-010	285	19091Z-115	240-241, 325-328
19091J-436E	310-313	19091S-101	250	19091Z-115E	310-313
19091L-101	260	19091S-102	250	19091Z-202	240-241
19091L-113	260	19091S-102E	310-313	19091Z-205	240-241, 288
19091L-133	260	19091S-105	250	19091Z-211	240-241
19091L-333	260	19091S-112	250	19091Z-212	240-241
19091L-413	260	19091S-113	250	19091Z-213	240-241
19091L-413E	310-313	19091S-133	250	19091Z-213E	310-313
19091L-416	260	19091S-213	250, 325-328	19091Z-215	240-241
19091L-431	260	19091S-231	250	19091Z-216	240-241
19091L-433	260	19091S-233	250	19091Z-216E	310-313
19091N-013	275	19091S-233E	310-313	19091Z-231	240-241
19091N-033	275	19091S-313	250	19091Z-233	240-241
19091N-036	275	19091S-331	250	19091Z-233E	310-313
19091N-102	275	19091S-333	250	19091Z-236	240-241, 325-328
19091N-105	275	19091S-336	250	19091Z-236E	310-313
19091N-111	275	19091S-413	250, 325-328	19091Z-313	240-241
19091N-113	275, 325-328	19091S-416	250	19091Z-331	240-241
19091N-113E	310-313	19091S-431	250	19091Z-333	240-241
19091N-116	275, 325-328	19091S-433	250, 325-328	19091Z-411	240-241
19091N-131	275	19091S-433E	310-313	19091Z-411E	310-313
19091N-133	275	19091S-436	250	19091Z-413	240-241
19091N-133E	310-313	19091S-510	284	19091Z-413E	310-313
19091N-136	275, 325-328	19091S-510E	310-313	19091Z-416	240-241
19091N-136E	310-313	19091S-602	243	19091Z-431	240-241
19091N-202	275	19091S-612	243	19091Z-433	240-241
19091N-205	275	19091S-633	243	19091Z-433E	310-313
19091N-213	275	19091S-713	243, 325-328	19091Z-436	240-241
19091N-213E	310-313	19091S-733	243	19091Z-513	240-241
19091N-216	275, 325-328	19091S-833	243	19091Z-513E	310-313
19091N-216E	310-313	19091S-911	243	19091Z-530	240-241, 288, 325-328
19091N-231	275	19091S-913	243	19091Z-530E	310-313
19091N-233	275	19091S-916	243	19091Z-613	240-241, 325-328
19091N-233E	310-313	19091S-931	243	19091Z-713	240-241
19091N-236	275	19091S-933	243	19091Z-713E	310-313
19091P-K15	297	19091S-933E	310-313	19091Z-716	240-241
19091P-K15E	310-313	19091S-936	243	19095F-120	277
19091P-K33	297	19091S-936E	310-313	19095F-120E	310-313
19091P-M15	299	19091W-012	306	19095F-121	277
19091P-MS4	301	19091W-015	306	19095F-123	277
19091P-MS4E	310-313	19091W-102	306	19095F-123E	310-313

Part Number Index

19095J-023	247	19095Z-123E	310-313	19244-80610	196-197, 199, 208
19095J-023E	310-313	19095Z-220	240-241	19244-80620	198, 208
19095J-121	247	19095Z-221	240-241	19245-20510	193-194, 205
19095J-121E	310-313	19095Z-221E	310-313	19245-20515	193-194, 205
19095J-123	247	19095Z-321	240-241	19245-20525	193-194, 205
19095J-123E	310-313	19095Z-323	240-241	19245-20580	193-194, 205
19095J-321	247	19095Z-323E	310-313	19245-20670	205
19095J-323	247	19095Z-421	240-241	19245-20780	193-194, 205
19095J-323E	310-313	19095Z-421E	310-313	19245-40050	193, 205
19095J-621	247	19095Z-423	240-241	19245-60760	193, 205
19095J-623	247, 325-328	19095Z-423E	310-313	19245-80520	205
19095L-021	260	19095Z-621	240-241, 325-328	19245-80521	193-194
19095L-023	260	19095Z-623	240-241	19246-60526	211
19095L-023E	310-313	19095Z-623E	310-313	19246-60560	211
19095L-121	305	19095Z-626	240-241, 325-328	19246-60570	211
19095L-523	260	19095Z-627	240-241, 325-328	19246-60580	211
19095N-121	275	191-1311	676	19246-60620	211
19095N-121E	310-313	191-3211	676	19246-60630	211
19095N-123	275	191-5211	676	19246-60690	211
19095N-123E	310-313	19199M	94	19251-00100	190-191, 204
19095N-126	275	19199N	94	19251-20620	204
19095P-K23	297, 325-328	192-1311	676	19251-60540	167, 190-191, 204-205
19095P-K25	297, 325-328	192-3211	676	19251-60575	190-191, 204
19095P-M23	299	192-5211	676	19251-80525	204
19095P-M25	299	19231-20910	196-197, 207	19251-80680	112, 204-205
19095P-MS0	301, 325-328	19231-20940	196-197, 207	19251C	93
19095P-MS0E	310-313	19231-20950	207	19256-00090	203
19095P-MS5	301	19231-20960	207	19256-00200	203
19095P-MS6	301	19231-20970	207	19256-00320	203
19095P-MS6E	310-313	19231-21050	196-197, 207	19256-20550	202
19095P-MS9	301, 325-328	19231-21060	196-197, 207	19256-20580	202
19095P-Q03	302, 325-328	19231-21080	207	19256-20590	202
19095P-Q03E	310-313	19231-60680	196-197, 207	19256-20690	202
19095P-Q04	302, 325-328	19231-60690	207	19256-20705	202
19095P-Q04E	310-313	19231-60790	93	19256-20900	203
19095P-S21	298	19231-80520	196-197, 199, 208	19256-20910	203
19095P-S23	298, 325-328	19231-80530	196-197, 199, 208	19256-60500	210
19095P-S25	298, 325-328	19231-80590	93	19256-60510	203
19095P-S25E	310-313	19232-60676	209	19256-60590	210
19095P-U03	303	19232-80550	209	19256-60700	202, 210
19095P-U04	303, 325-328	19233-20625	202, 209	19256-60800	202
19095P-U04E	310-313	19233-20755	202, 209	19256-80000	203, 210
19095R-420	295	19233-80565	209	19256-80010	203, 210
19095R-429	295	19234-60540	208	19256-80030	202, 210
19095S-100	240-241	19234-60720	195, 199, 202, 207	19256-80045	202
19095S-100E	310-313	19243-00070	190-191, 204	19256-80060	210
19095V-420	284	19243-60500	206	19256-80560	202
19095V-420E	310-313	19243-60505	206	19256-80570	210
19095W-121	306	19243-60570	206	19256-80590	210
19095W-123	306	19243-80510	206	19256-80600	202
19095Z-020	240-241, 325-328	19243-80520	206	19258-20830	187-188
19095Z-021	240-241, 325-328	19243-80530	195, 206	19258-20870	187-188
19095Z-023	240-241	19243-80540	195, 206	19298-60500	120
19095Z-121	240-241	19243-80570	195, 206	19301-00150	196-197
19095Z-121E	310-313	19244-80540	195, 206	19301-20720	196-197, 207
19095Z-123	240-241	19244-80560	197-199, 207-208	19301-60660	196-197, 207-208

Part Number Index

19301-80530.....	209	2321700003.....	187-188	35900-60750.....	125-126
19302-80020.....	209	2321700004.....	187-188	35900-60900.....	126
19305-60580.....	120, 210	2322590004.....	187-188	35900-60920.....	126
19320-60656.....	211	2322590005.....	187-188	3600500001.....	187-188
19320-80625.....	193, 205	2322700011.....	187-188	3600500002.....	187-188
19325-60660.....	181	280959-001.....	527	3980-0672.....	500-501
19350-60540.....	123	280959-006.....	527	410910-101.....	591
19354-60510.....	120	280959-904.....	453, 527	410910-102.....	591
19361-60566.....	211	280959-905.....	527	410910-301.....	591
19362-60510.....	211	280959-907.....	453	410910-302.....	591
19362-60515.....	211	300-301-HSP.....	187-188	410910-501.....	591
19362-60520.....	211	301-011-HSP.....	187-188	410910-502.....	591
19362-60525.....	211	301-013-HSP.....	187-188	413910-101.....	591
19362-60530.....	211	301-015-HSP.....	187-188	413910-102.....	591
19362-60535.....	211	301-016-HSP.....	187-188	413910-301.....	591
19362-60540.....	211	301-017-HSP.....	187-188	413910-302.....	590-591
19362-60545.....	211	301-152-HSP.....	187-188	413910-501.....	591
19362-60555.....	211	301-169-HSP.....	187-188	413910-502.....	590-591
19362-60565.....	211	301-170-HSP.....	187-188	419910-301.....	591
19362-60575.....	211	301-205-HSP.....	187-188	419910-302.....	591
19363-60506.....	211	301-211-HSP.....	187-188	419910-501.....	591
194-8111.....	681	301-212-HSP.....	187-188	419910-502.....	591
196-7203.....	681	301-220-HSP.....	187-188	420-1000.....	111
197-7202.....	681	3050-0891.....	218	420212-901.....	591
199-2602.....	681	3150-0509.....	454	420212-902.....	591
200-0010.....	119	3150-0576.....	454	420420-901.....	526, 591
200-0032.....	119	3150-0577.....	454	420910-901.....	591
200-0070.....	119	3150-0602.....	192	420910-902.....	591
200-0110.....	119	3150-0619.....	687	430-1020.....	113
200-0113.....	119	3150-0753.....	149	430-2000.....	111
200-0185.....	119	3150-0754.....	149	430-3000.....	111
200-0310.....	119	3150-0944.....	468, 471	440-1000.....	114
200-0370.....	119	3150-0958.....	483	440905-901.....	591
210-3003.....	167	3162-0178.....	496-497	440905-902.....	591
210-3003-5.....	167	3162-1056.....	221-223, 498, 703	443905-101.....	591
210-4004-5.....	168	3162-1057.....	498	443905-102.....	590-591
210-4022-5.....	168	321-002-HSP.....	187-188	443905-901.....	591
2140-0549.....	503	321-055-HSP.....	187-188	443905-902.....	590-591
2140-0585.....	687	321-056-HSP.....	187-188	446905-101.....	591
2140-0590.....	490	321-057-HSP.....	187-188	446905-102.....	591
2140-0600.....	494	325-024-HSP.....	187-188	446905-301.....	591
2140-0813.....	486, 490	325-045-HSP.....	187-188	446905-302.....	591
2140-0820.....	490	325-0506.....	102	446905-501.....	591
2190-0584.....	202	325-062-HSP.....	187-188	446905-502.....	591
220-1170.....	99	325-132-HSP.....	187-188	446905-901.....	591
220-1171-E.....	99	325-185-HSP.....	187-188	446905-902.....	591
220-1171-U.....	99	330-055-HSP.....	187-188	446910-102.....	591
230-2533141-EHS.....	187-188	330-086-HSP.....	187-188	449905-101.....	591
2302532140.....	187-188	3395B.....	124	449905-102.....	591
2302533140.....	187-188	3396C.....	124	449905-301.....	591
2304533140.....	187-188	35900-60600.....	125-126	449905-302.....	591
2307230001.....	187-188	35900-60610.....	125-126	449905-501.....	591
2307833901.....	187-188	35900-60630.....	125-126	449905-502.....	591
232-2790010-EHS.....	187-188	35900-60670.....	127	449905-901.....	591
232-2790012-EHS.....	187-188	35900-60700.....	127	449905-902.....	591
2321390008.....	187-188	35900-60710.....	126	450-1000.....	114

Part Number Index

460-1002.....	113	5022-2184.....	450, 490, 492	5042-6461.....	448
480-0003.....	114	5022-2185.....	453, 470	5042-6462.....	448
500-1200.....	176	5022-2188.....	471	5042-6463.....	448
500-2114.....	173, 194	5022-2192.....	471	5042-6470.....	479
500-2118.....	173	5022-6503.....	482	5042-6476.....	118, 495, 720
5001-3702.....	482	5022-6508.....	447	5042-6491.....	687
5001-3707.....	466-467	5022-6509.....	447	5042-6500.....	449
5001-3708.....	467	5022-6510.....	447	5042-8502.....	476, 480
5001-3743.....	466	5022-6531.....	479, 718	5042-8507.....	466
5001-3755.....	54	5022-6532.....	479	5042-8517.....	450, 481
5001-3756.....	54	5022-6533.....	479	5042-8518.....	450, 481
5001-3758.....	54	5022-6534.....	479	5042-8519.....	450, 481
5001-3759.....	54	5022-6536.....	485	5042-8544.....	480
5020-8292.....	174	5022-6538.....	476, 480	5042-8586.....	469
5020-8293.....	174	5022-6539.....	476, 478, 480	5042-8922.....	464
5020-8294.....	174, 204-205	5022-6541.....	481	5060-9077.....	75
5021-1816.....	446-447	5022-6542.....	481	5060-9084.....	75
5021-1817.....	446-447	5022-6543.....	481	5060-9086.....	121
5021-1818.....	446-447	5022-6544.....	481	5060-9096.....	79, 94
5021-1819.....	446-447	5022-6546.....	481	5061-3303.....	449, 494
5021-1820.....	446-447	5023-0208.....	481	5061-3304.....	447
5021-1821.....	446-447	5023-0209.....	481	5061-3315.....	447
5021-1822.....	446-447	5023-0213.....	481	5061-3327.....	494, 503
5021-1823.....	446-447	5023-0214.....	481	5061-3328.....	494, 503
5021-1845.....	521-522, 542, 548-549, 592-595, 598, 600, 618	5023-0215.....	481	5061-3329.....	494, 503
5021-1846.....	522	5023-0238.....	481	5061-3330.....	617
5021-1849.....	522	5041-2166.....	716	5061-3331.....	617
5021-1866.....	463	5041-2167.....	718	5061-3332.....	617
5021-1867.....	504	5041-2168.....	464, 468, 687	5061-3333.....	617
5021-1870.....	718	5041-2184.....	716	5061-3334.....	617
5021-7107.....	104	5041-2185.....	716	5061-3335.....	617
5021-7133.....	177	5041-2191.....	716	5061-3337.....	617
5021-7134.....	177	5041-8339.....	500-501	5061-3339.....	617
5021-7136.....	177	5042-0901.....	703	5061-3349.....	54
5021-7137.....	177	5042-0922.....	692, 706	5061-3354.....	149
5021-7146.....	177	5042-0923.....	692	5061-3361.....	447
5021-7148.....	177	5042-1330.....	719	5061-3362.....	447
5021-7164.....	177	5042-1331.....	719	5061-3363.....	149
5021-7166.....	177	5042-1332.....	719	5061-3364.....	149
5021-7168.....	177	5042-1333.....	718	5061-3365.....	149
5021-7169.....	177	5042-1334.....	718	5061-3366.....	149
5021-7170.....	177	5042-1336.....	716, 718	5061-3370.....	39
5022-2133.....	450	5042-1337.....	716, 719	5061-3384.....	712
5022-2141.....	685	5042-1356.....	718	5061-3385.....	712
5022-2145.....	450	5042-1370.....	149	5061-3386.....	712
5022-2146.....	492	5042-1385.....	476, 480	5061-3387.....	712
5022-2154.....	716	5042-1386.....	68, 476, 480	5061-3388.....	716
5022-2155.....	464, 716	5042-1388.....	68, 476, 480	5061-3389.....	716
5022-2156.....	716	5042-1389.....	68, 476, 480	5061-3390.....	716
5022-2157.....	716	5042-1391.....	149	5061-3391.....	713
5022-2158.....	716	5042-1392.....	149	5061-3392.....	714
5022-2159.....	495	5042-1393.....	149	5061-3396.....	715
5022-2165.....	453	5042-4769.....	694	5061-3397.....	715
5022-2166.....	453	5042-6454.....	68, 476, 480	5061-3398.....	715
5022-2175.....	475	5042-6458.....	479	5061-5801.....	176
		5042-6459.....	479	5061-5804.....	176

Part Number Index

5061-5805.....	176	5062-8575.....	674, 686	5063-6571.....	715
5061-5806.....	176	5062-8576.....	674, 686	5063-6572.....	715
5061-5867.....	210	5062-8577.....	686	5063-6573.....	715
5061-5869.....	190-191, 204-205	5062-8578.....	674-675, 686	5063-6574.....	522
5061-5886.....	203, 210	5062-8587.....	473	5063-6575.....	719
5061-5889.....	210	5062-8588.....	482	5063-6577.....	716
5061-5890.....	203, 210	5062-9508.....	180	5063-6586.....	467, 473
5061-5891.....	210	5062-9509.....	180	5063-6588.....	616
5061-5896.....	216	5062-9510.....	180	5063-6589.....	467, 473
5062-2418.....	449, 485-486	5062-9511.....	180	5063-6591.....	449, 483
5062-2461.....	500-501	5063-5213.....	703	5063-6592.....	492
5062-2462.....	448, 494	5063-5224.....	221-223, 703	5063-6593.....	485-486, 492
5062-2463.....	448, 474, 494	5063-5263.....	693	5063-6597.....	116, 494
5062-2474.....	504	5063-6502.....	455	5063-6598.....	464
5062-2476.....	715, 718	5063-6503.....	118, 720	5063-6599.....	464
5062-2477.....	712, 718	5063-6505.....	467	5063-9153.....	703
5062-2478.....	617	5063-6506.....	474	5064-8012.....	706
5062-2479.....	617	5063-6510.....	674	5064-8013.....	706
5062-2480.....	618	5063-6511.....	674	5064-8014.....	705-706
5062-2483.....	448, 464	5063-6512.....	682	5064-8015.....	705
5062-2484.....	466	5063-6513.....	682	5064-8016.....	705
5062-2485.....	466-467	5063-6514.....	117, 683	5064-8017.....	705
5062-2486.....	463	5063-6515.....	683	5064-8018.....	705-706
5062-2494.....	500-501	5063-6519.....	522	5064-8019.....	705-706
5062-2495.....	54	5063-6520.....	117, 683	5064-8020.....	705-706
5062-2496.....	714	5063-6521.....	118, 720	5064-8021.....	705
5062-2497.....	714	5063-6522.....	720	5064-8022.....	705
5062-3506.....	173, 216-217	5063-6523.....	118, 720	5064-8023.....	705-706
5062-3507.....	173	5063-6524.....	118, 720	5064-8024.....	705-706
5062-3508.....	173, 216-217	5063-6526.....	482	5064-8026.....	705-706
5062-3511.....	173	5063-6531.....	469	5064-8027.....	705
5062-3512.....	173	5063-6535.....	682	5064-8028.....	705-706
5062-3513.....	173	5063-6536.....	682	5064-8029.....	705
5062-3514.....	173, 205	5063-6540.....	682	5064-8032.....	705
5062-3525.....	177, 192	5063-6541.....	682	5064-8033.....	705-706
5062-3538.....	173	5063-6546.....	712	5064-8034.....	705
5062-3561.....	123	5063-6547.....	712	5064-8046.....	707
5062-3580.....	173, 178	5063-6548.....	712	5064-8203.....	675
5062-3581.....	173, 178	5063-6549.....	712	5064-8205.....	675
5062-3587.....	167, 190-191, 204-205	5063-6550.....	712	5064-8206.....	675
5062-8515.....	500-501	5063-6551.....	712	5064-8208.....	675
5062-8517.....	468, 687	5063-6552.....	712	5064-8209.....	675
5062-8522.....	446, 486	5063-6553.....	712	5064-8211.....	110, 463
5062-8524.....	618, 674-675	5063-6554.....	712	5064-8220.....	116, 495
5062-8529.....	684, 716	5063-6556.....	712	5064-8221.....	149
5062-8530.....	503	5063-6557.....	712	5064-8222.....	149
5062-8534.....	149, 464	5063-6558.....	713	5064-8236.....	687
5062-8535.....	446, 486	5063-6559.....	713	5064-8251.....	601
5062-8541.....	449	5063-6560.....	713	5064-8252.....	601
5062-8544.....	687	5063-6561.....	713	5064-8253.....	548-549, 584
5062-8553.....	490-491	5063-6562.....	714	5064-8254.....	548-549, 584
5062-8562.....	467	5063-6563.....	714	5064-8255.....	548-549, 580-581, 584
5062-8571.....	686	5063-6564.....	714	5064-8256.....	548-549, 581, 584
5062-8572.....	686	5063-6565.....	714	5064-8257.....	548-549, 584
5062-8573.....	686	5063-6566.....	714	5064-8258.....	548-549, 584
5062-8574.....	686	5063-6570.....	715	5064-8259.....	552-553, 584

Part Number Index

5064-8260	548-549, 584	5065-9912	584, 612-613	5080-8872	208
5064-8261	548-549, 584	5065-9913	552-553, 583-584	5080-8894-100	159
5064-8262	548-549	5065-9914	552-553, 584	5080-8896-50	159
5064-8263	551-553, 584	5065-9915	552-553, 584	5080-8898	195, 206
5064-8264	552-553, 584	5065-9918	715	5180-0841	502
5064-8265	552-553, 584	5065-9922	455, 471	5180-0842	63, 65, 502
5064-8266	552-553, 584	5065-9923	552-553, 584	5180-0843	502
5064-8267	552-553, 580, 584	5065-9924	552-553, 584	5180-0844	502
5064-8268	552-553	5065-9926	447	5180-4102	105
5064-8269	542, 584	5065-9927	447	5180-4103	105, 108, 200-201, 204, 209
5064-8270	552-553, 584	5065-9930	447	5180-4105	105, 108, 195, 199-200, 206, 208-209
5064-8271	542, 584	5065-9931	447	5180-4108	105, 449, 494
5064-8273	453, 470	5065-9932	447	5180-4109	105, 108, 204
5064-8280	602	5065-9933	447	5180-4111	105, 108
5064-8281	602	5065-9935	447	5180-4114	105, 449, 494
5064-8286	542, 584	5065-9937	451	5180-4115	105, 108, 204
5064-8287	542, 584	5065-9938	451	5180-4117	105, 108
5064-8288	542	5065-9939	451	5180-4120	105, 108
5064-8291	542, 580, 584	5065-9942	584, 613	5180-4121	94, 105, 108
5064-8293	475	5065-9947	451	5180-4124	105, 108
5064-8294	552-553, 584	5065-9948	478	5180-4125	105, 108
5064-8295	552-553, 584	5065-9950	478	5180-4127	107-108
5064-8296	542, 584	5065-9963	447	5180-4128	107-108
5064-8297	542, 584	5065-9964	447	5180-4129	106, 108
5064-8298	542, 584	5065-9967	449	5180-4130	108
5064-8300	552-553, 584	5065-9971	448, 450	5180-4131	108
5065-4402	476, 480	5065-9972	483	5180-4134	108
5065-4410	475, 485-486	5065-9976	448	5180-4135	108
5065-4420	116, 495	5065-9978	448, 466	5180-4143	107
5065-4421	471	5065-9979	447	5180-4145	107
5065-4422	485, 492	5065-9980	447	5180-4148	106
5065-4423	485	5067-1503	455-456	5180-4149	105
5065-4426	449	5067-1539	719	5180-4150	196-197, 207
5065-4427	584	5067-1540	449	5180-4152	196-197, 207
5065-4445	471, 475	5080-4978	196-197, 208	5180-4153	114, 190-191, 197, 204, 207
5065-4454	449	5080-5400	114, 216	5180-4160	94, 106, 108
5065-4459	552-553, 584	5080-8716	121	5180-4161	95, 108
5065-4460	552-553, 580, 584	5080-8728-100	159	5180-4162	109
5065-4461	552-553, 584	5080-8728-50	159	5180-4168	169, 190-191, 204-205
5065-4462	552-553, 584	5080-8732	195, 206	5180-4173	169, 190-191, 204-205
5065-4463	552-553, 584	5080-8750	94, 105	5180-4181	93, 204-205
5065-4464	564, 580, 584	5080-8751	105	5180-4196	94-95, 104
5065-4465	564, 584	5080-8752	105	5181-1210	39
5065-4466	564, 584	5080-8753	105	5181-1211	39
5065-4467	564, 584	5080-8755	121	5181-1212	39
5065-4468	555, 584	5080-8756	121	5181-1213	54
5065-4493	495	5080-8759	121	5181-1214	54
5065-4498	472	5080-8761	120	5181-1215	39
5065-4499	467	5080-8768	121	5181-1216	39
5065-4500	453, 471	5080-8769	121	5181-1217	39
5065-9901	453, 471	5080-8773	173, 199-200, 204-205, 208-209	5181-1219	123
5065-9907	715	5080-8774	195, 199-200, 202, 206, 208-210	5181-1220	123
5065-9908	116, 495	5080-8800	123	5181-1246	719
5065-9909	471	5080-8846	210	5181-1255	123
5065-9910	552-553, 584	5080-8853	173, 193, 199-200, 204-205, 208-209	5181-1260	159
5065-9911	551-553, 583-584	5080-8858	119	5181-1261	159

Part Number Index

5181-1263-100.....	159	5181-8810.....	56	5182-0729.....	35
5181-1263-50.....	159	5181-8811.....	57	5182-0730.....	35
5181-1267.....	56	5181-8813.....	57	5182-0731.....	35
5181-1270.....	43	5181-8815.....	160	5182-0732.....	35
5181-1273.....	56	5181-8816.....	160	5182-0733.....	35
5181-1283-100.....	159	5181-8818.....	167, 190-191, 204-205	5182-0734.....	35
5181-1283-50.....	159	5181-8822.....	185	5182-0735.....	35
5181-1291.....	181	5181-8827.....	54	5182-0736.....	35
5181-1292.....	105, 181	5181-8830.....	174, 190-191, 193-195, 199-200, 204-205, 208- 209, 216-217	5182-0737.....	35
5181-1507.....	687	5181-8833.....	160	5182-0746.....	183
5181-1512.....	687	5181-8836.....	111, 204-205, 688	5182-0771.....	184
5181-1513.....	687	5181-8837.....	206	5182-0772.....	184
5181-1530.....	490	5181-8838.....	190-191, 204-205	5182-0773.....	184
5181-1541.....	481	5181-8839.....	160	5182-0774.....	184
5181-3308.....	173	5181-8863.....	216	5182-0775.....	184
5181-3311.....	196-197, 207	5181-8866.....	58	5182-0778.....	184
5181-3315.....	167	5181-8872.....	43	5182-0779.....	184
5181-3316.....	167, 190-191	5182-0540.....	42	5182-0780.....	184
5181-3316i.....	167	5182-0541.....	42, 63, 65	5182-0781.....	184
5181-3317.....	204-205	5182-0542.....	42	5182-0783.....	184
5181-3319.....	56	5182-0543.....	37	5182-0788.....	183
5181-3321.....	56	5182-0544.....	40, 63	5182-0789.....	183
5181-3322.....	173	5182-0545.....	40	5182-0792.....	183
5181-3323.....	173, 205, 216-217	5182-0546.....	40, 65	5182-0793.....	183
5181-3351.....	302	5182-0547.....	42	5182-0794.....	183
5181-3352.....	302	5182-0548.....	42	5182-0795.....	183
5181-3354.....	56	5182-0549.....	43	5182-0796.....	183
5181-3356.....	56	5182-0550.....	42	5182-0815.....	92
5181-3358.....	56-57	5182-0551.....	48, 188	5182-0816.....	91
5181-3360.....	56	5182-0552.....	39, 65	5182-0817.....	92
5181-3361.....	56	5182-0553.....	36	5182-0818.....	92
5181-3365.....	56	5182-0554.....	36	5182-0820.....	92
5181-3375.....	37, 63, 65	5182-0555.....	36	5182-0821.....	91
5181-3376.....	37	5182-0556.....	36	5182-0830.....	57
5181-3377.....	43	5182-0557.....	36	5182-0831.....	58, 194
5181-3382.....	195, 206	5182-0558.....	36	5182-0832.....	56, 58, 194
5181-3383-100.....	159	5182-0564.....	42	5182-0833.....	58, 194
5181-3383-50.....	159	5182-0566.....	42	5182-0834.....	57
5181-3388.....	178	5182-0567.....	41, 687	5182-0835.....	56
5181-3389.....	178	5182-0714.....	32, 63, 65	5182-0836.....	58
5181-3390.....	178	5182-0715.....	32	5182-0837.....	49
5181-3391.....	178	5182-0716.....	32	5182-0838.....	49, 187-188
5181-3392.....	178	5182-0717.....	34	5182-0839.....	51
5181-3393.....	178	5182-0718.....	34	5182-0840.....	51
5181-3394.....	93, 204-205	5182-0719.....	34	5182-0844.....	183
5181-3395.....	176	5182-0720.....	34, 63, 65	5182-0845.....	183
5181-3396.....	176, 194, 205	5182-0721.....	34	5182-0846.....	183
5181-3397.....	176	5182-0722.....	34	5182-0847.....	183
5181-3398.....	176	5182-0723.....	34	5182-0848.....	183
5181-3400.....	39	5182-0724.....	34	5182-0849.....	183
5181-7459.....	181	5182-0725.....	34	5182-0850.....	183
5181-7460.....	181	5182-0726.....	34	5182-0851.....	183
5181-8801.....	39	5182-0727.....	34	5182-0852.....	183
5181-8806.....	57	5182-0728.....	34	5182-0853.....	160
5181-8808.....	57			5182-0864.....	36
5181-8809.....	57			5182-0865.....	36

Part Number Index

5182-0866.....	36	5182-9640.....	59	5182-9791.....	86
5182-0867.....	35	5182-9641.....	59	5182-9792.....	86
5182-0868.....	35	5182-9642.....	60	5182-9793.....	86
5182-0869.....	35	5182-9643.....	60	5182-9795.....	86
5182-0871.....	39	5182-9644.....	62, 459	5182-9799.....	58
5182-0875.....	57	5182-9645.....	61	5183-0314.....	56
5182-0893.....	183	5182-9651.....	59	5183-0316.....	57
5182-0894.....	183	5182-9652.....	170, 190-191, 204	5183-0318.....	57
5182-0895.....	183	5182-9658.....	62, 459	5183-0379.....	120
5182-3423.....	91, 692	5182-9661.....	60-61	5183-1907.....	86
5182-3428.....	59	5182-9671.....	60-61	5183-1941.....	104
5182-3438.....	160	5182-9673.....	201	5183-2007.....	199
5182-3439.....	160	5182-9676.....	201	5183-2009.....	123
5182-3442.....	160	5182-9677.....	201	5183-2021.....	615
5182-3444.....	160	5182-9679.....	201	5183-2022.....	615
5182-3445.....	160	5182-9683.....	59	5183-2030.....	33
5182-3449.....	204-205	5182-9689.....	185	5183-2036.....	169
5182-3450.....	197, 207	5182-9697.....	687	5183-2037.....	169
5182-3453.....	95	5182-9703.....	91	5183-2038.....	169
5182-3454.....	38	5182-9704.....	91	5183-2041.....	169
5182-3457.....	42	5182-9705.....	92, 692	5183-2042.....	56
5182-3458.....	42	5182-9706.....	92	5183-2058.....	57
5182-3459.....	42	5182-9707.....	92	5183-2067.....	32
5182-3465.....	94, 110	5182-9709.....	60-61	5183-2068.....	32
5182-3466.....	94, 110, 216-217	5182-9710.....	61, 496-497	5183-2069.....	32
5182-3477.....	201	5182-9711.....	61	5183-2070.....	33
5182-3495.....	60	5182-9712.....	59	5183-2071.....	33
5182-3496.....	60	5182-9713.....	92	5183-2072.....	33
5182-3498.....	60	5182-9719.....	459	5183-2073.....	33
5182-3499.....	59	5182-9720.....	459	5183-2074.....	35
5182-9604.....	60	5182-9722.....	199	5183-2075.....	34
5182-9605.....	59	5182-9725.....	459	5183-2076.....	34, 65
5182-9606.....	60	5182-9733.....	120, 187-188	5183-2077.....	34
5182-9608.....	60	5182-9734.....	58	5183-2078.....	34
5182-9609.....	60	5182-9747.....	192	5183-2079.....	35
5182-9610.....	60	5182-9748.....	192	5183-2080.....	35
5182-9612.....	60	5182-9749.....	192	5183-2081.....	35
5182-9613.....	62, 459	5182-9754.....	192	5183-2082.....	36
5182-9615.....	59	5182-9756.....	192	5183-2083.....	36
5182-9619.....	62, 459	5182-9757.....	192	5183-2085.....	43
5182-9620.....	61	5182-9758.....	192	5183-2086.....	43
5182-9621.....	60	5182-9759.....	192	5183-2087.....	43
5182-9622.....	58	5182-9760.....	192	5183-2088.....	46
5182-9623.....	59	5182-9761.....	192	5183-2089.....	46
5182-9624.....	62, 459	5182-9762.....	192	5183-2090.....	46
5182-9625.....	59	5182-9763.....	192	5183-2096.....	216
5182-9626.....	58	5182-9765.....	114	5183-4428.....	44
5182-9627.....	59	5182-9768.....	192	5183-4429.....	44
5182-9628.....	62, 459	5182-9769.....	192	5183-4432.....	44
5182-9629.....	60	5182-9770.....	192	5183-4433.....	44
5182-9630.....	61, 183	5182-9775.....	192	5183-4436.....	45
5182-9633.....	61	5182-9776.....	86	5183-4437.....	45
5182-9635.....	59	5182-9777.....	86	5183-4438.....	45
5182-9636.....	59	5182-9778.....	86	5183-4442.....	45
5182-9638.....	60	5182-9779.....	86	5183-4448.....	48
5182-9639.....	61	5182-9780.....	86	5183-4450.....	48

Part Number Index

5183-4459.....	48	5183-4606.....	62	5183-4735.....	185
5183-4460.....	48	5183-4607.....	86	5183-4736.....	185
5183-4461.....	48	5183-4608.....	86	5183-4737.....	185
5183-4464.....	48	5183-4613.....	62	5183-4738.....	185
5183-4474.....	50	5183-4614.....	62	5183-4741.....	185
5183-4475.....	50	5183-4619.....	687	5183-4742.....	185
5183-4476.....	51	5183-4620.....	111	5183-4743.....	185
5183-4477.....	50	5183-4621.....	111	5183-4744.....	185
5183-4478.....	50	5183-4623.....	687	5183-4745.....	185
5183-4479.....	50	5183-4624.....	615	5183-4746.....	185
5183-4480.....	50	5183-4625.....	615	5183-4757.....	157, 190-191, 195, 204-206
5183-4487.....	63, 65	5183-4626.....	615	5183-4757-100.....	157
5183-4491.....	37	5183-4627.....	615	5183-4758.....	157, 193, 205
5183-4492.....	37	5183-4641.....	103	5183-4759.....	158
5183-4493.....	37	5183-4642.....	103	5183-4759-100.....	158
5183-4494.....	37	5183-4643.....	103	5183-4760.....	158, 193, 205
5183-4495.....	37	5183-4644.....	103	5183-4761.....	158
5183-4496.....	37	5183-4645.....	103	5183-4761-100.....	158
5183-4497.....	38	5183-4647.....	167, 190-191	5183-4762.....	158
5183-4498.....	39	5183-4649.....	127	5183-4763.....	53
5183-4499.....	39	5183-4669.....	688	5183-4769.....	92
5183-4500.....	39	5183-4670.....	688	5183-4770.....	92
5183-4504.....	40	5183-4680.....	709	5183-4771.....	92
5183-4505.....	40	5183-4681.....	709	5183-4774.....	91
5183-4506.....	40	5183-4682.....	709	5183-4779.....	98
5183-4507.....	40	5183-4687.....	709	5183-4780.....	98
5183-4508.....	40	5183-4688.....	709	5183-4781.....	98
5183-4509.....	40	5183-4691.....	167	5183-4789.....	114
5183-4510.....	41	5183-4692.....	167	5183-4799.....	53
5183-4511.....	42	5183-4693.....	167	5184-1983.....	702
5183-4518.....	44	5183-4694.....	167	5184-3539.....	122
5183-4519.....	52	5183-4695.....	167	5184-3541.....	122
5183-4521.....	52	5183-4696.....	167, 190-191	5184-3542.....	122
5183-4523.....	52	5183-4697.....	167	5184-3543.....	122
5183-4524.....	52	5183-4698.....	167	5184-3544.....	122
5183-4526.....	52	5183-4699.....	167	5184-3545.....	122
5183-4528.....	52	5183-4700.....	167	5184-3546.....	122
5183-4530.....	52	5183-4701.....	167	5184-3547.....	122
5183-4532.....	52	5183-4702.....	167, 190-191	5184-3548.....	122
5183-4534.....	52	5183-4703.....	167	5184-3557.....	41
5183-4536.....	52	5183-4704.....	167	5184-3564.....	708
5183-4537.....	52	5183-4705.....	167	5184-3565.....	708
5183-4538.....	459	5183-4706.....	167	5184-3566.....	708
5183-4539.....	459	5183-4707.....	167	5184-3567.....	53
5183-4540.....	459	5183-4708.....	167	5184-3569.....	216-217
5183-4547.....	62	5183-4709.....	167	5184-3570.....	216-217
5183-4548.....	62	5183-4710.....	167	5184-3571.....	173, 216-217
5183-4549.....	61	5183-4711.....	167	5184-3572.....	53
5183-4550.....	61	5183-4712.....	167	5184-3573.....	53
5183-4551.....	61	5183-4713.....	167	5185-5754.....	142
5183-4552.....	61	5183-4728.....	57	5185-5755.....	142
5183-4553.....	61	5183-4729.....	57	5185-5756.....	142
5183-4554.....	61	5183-4730.....	57	5185-5757.....	142
5183-4598.....	86	5183-4732.....	174, 190-191, 200	5185-5758.....	143
5183-4599.....	86	5183-4733.....	185	5185-5759.....	143
5183-4600.....	86	5183-4734.....	185	5185-5760.....	142

Part Number Index

5185-5761.....	142	5188-2744.....	454	5188-6462.....	67
5185-5762.....	142	5188-2745.....	454	5188-6463.....	67
5185-5763.....	143	5188-2746.....	454	5188-6464.....	67
5185-5764.....	143	5188-2753.....	50, 64, 187-188	5188-6465.....	67
5185-5765.....	142	5188-2757.....	47	5188-6466.....	67
5185-5766.....	142	5188-2758.....	47	5188-6467.....	67
5185-5767.....	142	5188-2759.....	50-51, 64	5188-6468.....	67
5185-5768.....	142	5188-2788.....	41	5188-6469.....	67
5185-5771.....	142	5188-2790.....	184	5188-6470.....	67
5185-5772.....	142	5188-2791.....	184	5188-6474.....	92
5185-5773.....	142	5188-2792.....	184	5188-6475.....	91
5185-5791.....	143	5188-2793.....	184	5188-6476.....	67
5185-5792.....	143	5188-2794.....	184	5188-6477.....	67
5185-5793.....	143	5188-2795.....	184	5188-6478.....	67
5185-5794.....	143	5188-2796.....	184	5188-6479.....	68
5185-5795.....	143	5188-2797.....	184	5188-6486.....	67
5185-5807.....	615	5188-5241.....	190-191, 204	5188-6487.....	67
5185-5808.....	615	5188-5244.....	120	5188-6488.....	67
5185-5809.....	615	5188-5245.....	120	5188-6489.....	67
5185-5810.....	615	5188-5246.....	57	5188-6490.....	67
5185-5811.....	132	5188-5247.....	57	5188-6491.....	67
5185-5812.....	132	5188-5295.....	132	5188-6492.....	67
5185-5813.....	132	5188-5311.....	169	590-3003.....	688
5185-5814.....	132	5188-5312.....	174	590-4000.....	677
5185-5815.....	132	5188-5313.....	169	590-4001.....	677
5185-5816.....	139	5188-5314.....	173	590-4005.....	676-677
5185-5817.....	122	5188-5315.....	173	5958-9441.....	186
5185-5820.....	34	5188-5316.....	121	5958-9442.....	186
5185-5821.....	38	5188-5317.....	121	5958-9443.....	186
5185-5823.....	34	5188-5321.....	476, 480	5958-9444.....	186
5185-5824.....	34	5188-5322.....	476, 480	5958-9445.....	186
5185-5829.....	34	5188-5323.....	568	5958-9450.....	186
5185-5830.....	149	5188-5324.....	568	5965-0027.....	110, 494
5185-5831.....	149	5188-5328.....	568	5965-0028.....	110, 494
5185-5832.....	149	5188-5356.....	169	59864B.....	221-222
5185-5833.....	149	5188-5357.....	120	59987-20040.....	496-497
5185-5834.....	149	5188-5359.....	701	6040-0468.....	226
5185-5835.....	149	5188-5361.....	173, 175, 179	6040-0621.....	221-223
5185-5836.....	149	5188-5362.....	173, 175, 179	6040-0730.....	226
5185-5837.....	149	5188-5363.....	173, 175, 179	6040-0798.....	221-223, 226, 498, 703
5185-5838.....	34	5188-5364.....	139	6040-0809.....	221-222
5185-5850.....	708	5188-5365.....	169, 190-191, 204-205, 210	6040-0819.....	226
5185-5861.....	34	5188-5366.....	169, 189	6040-0834.....	221-223, 226, 498, 703
5185-5862.....	34	5188-5367.....	170, 190-191, 204-205	660750-902.....	513, 554-555
5185-5863.....	34	5188-5369.....	47	660750-906.....	555
5185-5864.....	34	5188-5372.....	196-197	660750-909.....	555
5185-5865.....	34	5188-5374.....	692	661750-902.....	555, 579
5185-5916.....	42	5188-5375.....	480	661750-906.....	555, 579
5185-5920.....	546-549, 552-553, 575, 579	5188-5386.....	39, 63	661750-909.....	555, 579
5185-5921.....	540-542, 574, 579	5188-5390.....	65	670750-902.....	555
5185-5922.....	558, 575, 579	5188-5392.....	50, 64, 187-188	671750-902.....	555, 579
5185-5923.....	561, 575, 579	5188-5953.....	120	700-4004.....	140
5185-5959.....	708	5188-6457.....	67	700-4005.....	140
5185-5968.....	555, 579	5188-6458.....	67	700-4006.....	140
5188-2717.....	189-191	5188-6460.....	67	700-4007.....	140
5188-2743.....	454	5188-6461.....	67	700-4008.....	140

Part Number Index

700-4014.....	140	770450-902.....	561	79881-27102.....	502
700-4015.....	140	770995-902.....	564	79881-28101.....	502
700-4016.....	140	773450-302.....	561, 577	79881-67301.....	503
700-4034.....	140	773450-902.....	560-563	79881-67302.....	503
700-4035.....	140	773700-902.....	561, 563	79883-22301.....	490-491, 503
700-4036.....	140	773995-902.....	564	79883-22402.....	490-491, 503
702111610.....	599	79835-04123.....	500-501	79883-22404.....	491
702111651.....	599	79835-25211.....	500-501	79883-27101.....	491
702111651A.....	599	79835-27717.....	500-501	79883-28801.....	490-491, 503
705-0825.....	176	79835-62701.....	500-501	79883-28802.....	491
705-0903.....	176	79835-65213.....	500-501	79883-60002.....	503
705-0905.....	176	79835-65216.....	500-501	79883-60091.....	503
705-0925.....	176	79835-67101.....	500-501	79883-60092.....	503
707-0027.....	113	79835-67102.....	500-501	79883-68700.....	491, 503
712111630.....	599	79835-67302.....	500-501	79883-68701.....	503
722111723.....	599	79835-67304.....	500-501	79883-68702.....	491, 503
722600-902.....	571	79835-67305.....	500-501	79883-68703.....	490-491
722975-902.....	561, 572	79835-67306.....	500-501	79883-80022.....	503
724111653.....	599	79835-67307.....	500-501	79883-80024.....	503
724700-902.....	561, 571	79835-67308.....	500-501	79883-80028.....	503
724975-302.....	561, 571	79835-68701.....	500-501	79883-87303.....	503
724975-902.....	561, 571	79835-87330.....	500-501	79883-87305.....	503
726700-902.....	561, 571	79835-87638.....	446	79883-87306.....	503
726975-302.....	561, 571	79841-87609.....	616	79900CH-010.....	616
726975-902.....	561, 571	79846-24501.....	500-501	79911-60500.....	115
727700-902.....	561, 571	79846-24502.....	500-501	79911-60501.....	115
727975-302.....	561, 571	79846-27101.....	500-501	79911-60502.....	115
727975-902.....	561, 571	79846-27103.....	500-501	79911GF-080.....	607
728600-902.....	571, 579	79846-27303.....	500-501	79911GF-083.....	607
728700-902.....	561, 571	79846-67101.....	500-502	79911GF-084.....	607
728975-302.....	561, 571	79846-67902.....	500-501	79911GF-085.....	607
728975-902.....	561, 571	79846-68701.....	502	79911GF-086.....	607
735700-902.....	561, 575	79846-68702.....	502	79911GF-MXA.....	607
735953-902.....	561, 575	79846-87201.....	500-501	79911GP-100.....	605
735954-302.....	561, 577	79846-87202.....	500-501	79911GP-101.....	605
746450-902.....	561	79846-87600.....	500-501	79911GP-102.....	605
760450-902.....	561	79846-87601.....	500-502	79911GP-103.....	605
761600-902.....	561, 575, 579	79846-87604.....	500-501	79911GP-104.....	605
761753-902.....	561, 575	79846-87605.....	500-502	79911GP-105.....	605
761775-902.....	564	79846-87609.....	500-501	79911GP-106.....	605
761973-902.....	564	79846-87610.....	500-501	79911GP-110.....	605
763600-902.....	561, 575, 579	79846-87612.....	500-501	79911GP-500.....	605
763750-902.....	564	79846-87613.....	500-501	79911GP-501.....	605
763953-902.....	561, 575	79847-44901.....	502	79911GP-502.....	605
763954-302.....	561, 575, 577	79847-60005.....	502	79911GP-503.....	605
763973-902.....	564	79853-22500.....	486-488	79911GP-504.....	605
764953-302.....	561, 575, 577	79853-27200.....	486-488	79911GP-505.....	605
764953-902.....	561, 575	79853-29100.....	486-488	79911GP-510.....	605
765600-902.....	561, 575, 579	79853-68734.....	488	79911GP-MXA.....	605
765750-902.....	564	79853-68742.....	486-488	79911GP-MXB.....	605
765973-902.....	564	79853-68743.....	486, 488	79911GP-MXC.....	605-606
766953-902.....	561, 575	79880-22711.....	490	79911GP-MXD.....	605
770050-902.....	561, 588	79880-60002.....	502	79911GP-MXE.....	605
770100-902.....	561, 588	79880-67304.....	503	79915MO-174.....	593
770150-902.....	561, 588	79881-09103.....	502	79915MO-574.....	593
770450-302.....	561, 577	79881-27101.....	502	79915OD-174.....	593

Part Number Index

79915OD-574.....	593	79925SB-563.....	592	820675-115.....	546-549, 566, 585
79916AA-572.....	616	79925SB-564.....	592	820675-119.....	597
79916KT-110.....	616	79925SB-56K.....	592	820675-124.....	546-549, 552-553, 585
79919CM-754.....	613	79925SB-583.....	592	820700-902.....	546-549, 571
79919CM-784.....	613	79925SB-584.....	592	820700-905.....	546-549, 571
79919DE-754.....	613	79925SB-58K.....	592	820700-906.....	546-549, 571
79919DE-784.....	613	79925SI-504.....	598	820888-901.....	521, 523, 535, 540-542, 546-549, 552-553, 555, 558, 561, 564, 566, 574- 575, 585, 597, 610, 613- 614, 616
79919QA-754.....	613	79925SI-564.....	598	820950-901.....	597
79919QA-784.....	613	79925SI-584.....	598	820950-902.....	585
79919SP-754.....	613	7992718-504.....	593	820950-903.....	613
79919SP-784.....	613	7992718-564.....	593	820950-904.....	613
7992318-562.....	594	7992718-584.....	593	820950-905.....	585, 597
799230P-564.....	594, 618	7995108-344.....	542	820950-906.....	585
799230P-584.....	594	7995108-585.....	542	820950-908.....	597, 614
7992518-402.....	595	7995108-595.....	542	820950-911.....	610
7992518-484.....	595	7995118-344.....	542	820950-912.....	585
7992518-563.....	592	7995118-504.....	542, 548-549	820950-913.....	566, 575
7992518-583.....	592	7995118-585.....	542	820950-914.....	566, 575
79925AP-504.....	598	7995118-595.....	542	820950-915.....	546-549, 575
79925AP-564.....	598	7995208-344.....	548-549	820950-916.....	546-549, 575
79925AP-584.....	598	7995208-585.....	548-549	820950-917.....	546-549, 575
79925CB-584.....	600	7995208-595.....	548-549	820950-918.....	552-553
79925CN-504.....	592, 598	7995218-344.....	548-549	820950-919.....	597
79925CN-564.....	592, 598	7995218-585.....	548-549	820950-920.....	546-549, 575
79925CN-584.....	592, 598	7995218-595.....	548-549	820950-921.....	552-553
79925DI-564.....	598	7995230-344.....	542	820950-922.....	546-549, 575
79925DI-584.....	598	820212-911.....	610	820950-923.....	552-553
79925EC-462.....	595	820212-914.....	566, 588	820950-924.....	552-553, 585
79925EC-482.....	595	820212-915.....	546-549, 566, 587	820950-925.....	540-542, 574
79925MO-504.....	592	820212-918.....	552-553, 587	820950-926.....	540-542, 574
79925MO-564-3.....	592	820212-919.....	588, 597	820950-927.....	540-542, 574
79925MO-584.....	592	820212-920.....	546-549, 587	820950-928.....	558, 575
79925MO-58K.....	592	820212-921.....	552-553, 587	820950-930.....	561, 575
79925OD-464.....	595	820212-924.....	552-553, 587	820950-931.....	616
79925OD-504.....	592	820212-925.....	540-542, 588	820950-932.....	564
79925OD-564-3.....	592	820212-926.....	540-542, 588	820950-933.....	546-549, 575
79925OD-584.....	592	820212-928.....	558, 588	820950-935.....	540-542, 574, 597
79925OD-58K.....	592	820212-928.....	558, 588	820950-936.....	535, 574
79925ODE-564.....	592	820212-930.....	561, 588	820950-937.....	535, 574
79925ODE-584.....	592	820212-933.....	546-549, 587	821075-918.....	555
79925OE-58K.....	592	820311-001.....	524	821075-920.....	555
79925PA-582.....	618	820315-015.....	524	821075-924.....	555
79925PA-583.....	618	820320-050.....	524	821125-915.....	546-549, 566, 575
79925PA-584.....	618	820330-030.....	524	821125-918.....	552-553
79925PE-504.....	594	820340-001.....	523	821125-919.....	597
79925PE-564.....	594	820345-001.....	523	821125-924.....	546-549, 552-553, 575
79925PE-584.....	594	820370-901.....	523-524	821125-926.....	540-542, 574-575
79925PU-504.....	594	820385-901.....	526, 588	821125-928.....	558, 575
79925PU-564.....	594	820400-901.....	526, 540-542, 546-549, 552-553, 558, 561, 566, 585, 588, 591, 597, 610	821125-930.....	561, 575
79925PU-584.....	594	820444-901.....	521, 526, 540-542, 546-549, 552-553, 558, 561, 566, 588, 591, 597, 610	821125-932.....	564
79925SB-402.....	595	820555-901.....	521, 524, 542, 548-549, 572	821125-933.....	546-549, 575
79925SB-462.....	595	820675-111.....	597, 610	821125-935.....	540-542, 574, 597
79925SB-464.....	595				
79925SB-482.....	595				
79925SB-484.....	595				
79925SB-504.....	592				

Part Number Index

821125-936.....	535, 574	828975-306.....	546-549, 571	8500-6812.....	119
821125-937.....	535, 574	828975-902.....	546-549, 571	8500-6813.....	119
82167-60003.....	127	828975-906.....	546-549, 571	8500-6900.....	674
821700-902.....	548-549, 572	829975-302.....	546-549, 571	8500-6917.....	116, 495
821700-932.....	548-549, 572	829975-902.....	546-549, 571	8500-6936.....	708
821975-902.....	548-549, 572	830990-902.....	546-549, 575	8500-6940.....	708
821975-932.....	548-549, 572	830990-906.....	546-549, 575	8500-6941.....	708
822111631A.....	599	830990-914.....	546-549, 575	8500-6942.....	708
822111651.....	599	831975-902.....	548-549	8500-6943.....	708
822600-902.....	571, 579	831975-906.....	548-549	8500-6944.....	708
822600-905.....	571, 579	831975-932.....	548-549	8500-6945.....	708
822600-906.....	571, 579	831975-936.....	548-549	8500-6946.....	708
822700-902.....	548-549, 572	832111630.....	599	8500-6947.....	708
822700-932.....	548-549, 572	832975-902.....	575	8500-6948.....	708
822975-902.....	548-549, 571-572	832975-906.....	575	8500-6998.....	709
822975-906.....	548-549, 572	833975-902.....	548-549	8500-7000.....	708
822975-932.....	548-549, 572	833975-906.....	548-549	8500-7001.....	709
823700-902.....	548-549, 572	833975-932.....	548-549	8500-8130.....	220, 227
823700-932.....	548-549, 572	833975-936.....	548-549	860700-304.....	613
823975-902.....	548-549, 572	834975-902.....	575	860700-704.....	613
823975-932.....	548-549, 572	834975-906.....	575	860700-708.....	597
824700-902.....	546-549, 571	835975-902.....	546-549, 569, 575	860950-902.....	552-553
824700-905.....	546-549, 571	835975-905.....	546-549, 575	860950-905.....	552-553
824700-906.....	546-549, 571	835975-906.....	546-549, 575	860950-906.....	552-553
824975-302.....	546-549, 571	835975-912.....	546-549, 575	860950-909.....	552-553
824975-305.....	546-549, 571	835975-914.....	546-549, 575	860975-902.....	546-549
824975-306.....	546-549, 571	840140-901.....	521, 525, 546-549, 552-553, 566, 585, 597, 610	860975-905.....	546-549
824975-902.....	546-549, 571			860975-906.....	546-549
824975-905.....	546-549, 571			860975-909.....	546-549
824975-906.....	546-549, 571	840300-908.....	597, 614	860975-912.....	546-549
825700-902.....	548-549, 572	843300-908.....	597, 614	860975-914.....	546-549
825700-932.....	548-549, 572	846952-704.....	613	861600-902.....	546-549, 575, 579
825975-902.....	548-549, 572	846975-202.....	546-549	861600-906.....	546-549, 575, 579
825975-932.....	548-549, 572	846975-902.....	546-549	861608-901.....	558, 575, 579
826700-902.....	546-549, 571	846975-906.....	546-549	861630-902.....	552-553, 579
826700-906.....	546-549, 571	846975-914.....	546-549	861700-901.....	558, 573, 575
826975-302.....	546-549, 571	8500-0656.....	216, 220-221, 227	861753-902.....	546-549, 575
826975-306.....	546-549, 571	8500-1233.....	216	861753-905.....	546-549, 575
826975-902.....	546-549, 571	8500-1867.....	498	861753-906.....	546-549, 566, 575
826975-906.....	546-549, 571	8500-2236.....	498	861753-912.....	546-549, 575
827700-902.....	546-549, 570-571	8500-4328.....	120	861753-914.....	546-549, 575
827700-905.....	546-549, 571	8500-4410.....	685	861767-902.....	566, 575
827700-906.....	546-549, 571	8500-4789.....	120, 204	861768-901.....	558, 575
827975-302.....	546-549, 571	8500-5067.....	120	861775-902.....	552-553
827975-305.....	546-549, 571	8500-5440.....	227	861775-906.....	552-553
827975-306.....	546-549, 571	8500-5808.....	227	861953-902.....	546-549, 575
827975-902.....	546-549, 571	8500-5851.....	227	861953-905.....	546-549, 575
827975-905.....	546-549, 571	8500-5901.....	185	861953-906.....	546-549, 566, 575
827975-906.....	546-549, 571	8500-5995.....	227	861953-912.....	546-549, 575
828600-902.....	546-549, 571	8500-6035.....	618	861953-914.....	546-549, 575
828600-905.....	546-549, 571	8500-6762.....	116, 495	861954-302.....	546-549, 575, 577
828600-906.....	546-549, 571	8500-6782.....	686	861954-305.....	546-549, 575, 577
828700-902.....	546-549, 571	8500-6785.....	674	861954-306.....	546-549, 566, 575, 577
828700-905.....	546-549, 571	8500-6786.....	686	861954-309.....	546-549, 575, 577
828700-906.....	546-549, 571	8500-6787.....	686	861954-312.....	546-549, 575, 577
828975-302.....	546-549, 571	8500-6797.....	674	861954-314.....	546-549, 575, 577

Part Number Index

861967-302.....	566, 575, 577	866953-905.....	544, 546-549, 575	8720-0010.....	109
861967-902.....	566, 575	866953-906.....	539, 546-549, 566, 575	8720-0025.....	109
861971-901.....	558	866953-912.....	546-549, 575	872700-902.....	575
861973-306.....	552-553, 577	866953-914.....	546-549, 575	872700-906.....	575
861973-902.....	552-553	866967-902.....	566, 575	873700-902.....	548-549
861973-906.....	552-553	868050-901.....	558, 588	873700-906.....	548-549
863600-902.....	546-549, 575, 579, 581	868100-901.....	558, 588	873700-932.....	548-549
863600-905.....	546-549	868150-901.....	558, 588	873700-936.....	548-549
863600-906.....	546-549, 575, 579	870050-902.....	546-549, 587	874700-902.....	575
863608-901.....	558, 575, 579	870050-906.....	546-549, 566, 587	874700-906.....	575
863630-902.....	552-553, 578-579	870050-914.....	546-549, 587	875700-902.....	548-549
863630-906.....	552-553, 579	870100-902.....	546-549, 587	875700-906.....	548-549
863668-301.....	558, 575, 577	870100-906.....	546-549, 566, 587	875700-932.....	548-549
863668-901.....	558, 575	870100-914.....	546-549, 587	875700-936.....	548-549
863700-901.....	558, 575	870150-902.....	546-549, 587	877150-102.....	546-549, 587
863750-906.....	552-553	870150-906.....	546-549, 566, 587	877150-106.....	546-549, 566, 587
863953-902.....	546-549, 575-576	870150-914.....	546-549, 587	877150-114.....	546-549, 587
863953-905.....	546-549, 575	8710-0004.....	110, 498	877250-101.....	588, 597
863953-906.....	546-549, 566, 575	8710-0007.....	110	877250-102.....	546-549, 587
863953-912.....	546-549, 575	8710-0018.....	110	877250-105.....	546-549, 587
863953-914.....	546-549, 575	8710-0510.....	94, 109, 174, 204-205, 216-217, 494, 498	877250-106.....	546-549, 566, 587
863954-302.....	546-549, 575-577	8710-0641.....	110, 494	877250-112.....	546-549, 587
863954-305.....	546-549, 575, 577	8710-0803.....	94, 109	877250-114.....	546-549, 587
863954-306.....	546-549, 566, 575, 577	8710-0806.....	94, 109, 498	877952-101.....	588, 597
863954-309.....	577	8710-0899.....	110, 216-217	877952-102.....	585, 588
863954-312.....	546-549, 575, 577	8710-0900.....	110, 216-217	877952-105.....	585, 588, 597
863954-314.....	546-549, 575, 577	8710-0972.....	94, 109	877952-106.....	585, 588
863967-302.....	566, 575, 577	8710-0979.....	54	877952-108.....	588, 597
863967-902.....	566, 575	8710-1217.....	94	877967-102.....	566, 588
863973-902.....	552-553	8710-1220.....	216-217	877974-901.....	610
863973-905.....	552-553	8710-1346.....	196-197, 207	877974-910.....	610
863973-906.....	552-553	8710-1534.....	109, 492	878150-101.....	558, 588
863974-302.....	552-553, 577	8710-1561.....	196-197, 207	878250-101.....	558, 588
863974-306.....	552-553, 577	8710-1615.....	216-217, 498	880668-301.....	558, 577
863974-309.....	552-553, 577	8710-1622.....	216-217, 498	880668-901.....	558
864668-301.....	558, 575, 577	8710-1643.....	54	880949-903.....	604
864668-901.....	558, 575	8710-1707.....	110	880949-904.....	604
8650-0029.....	216	8710-1708.....	110	880952-201.....	597
8650-0030.....	216	8710-1709.....	94-95, 110	880952-202.....	585
865600-902.....	546-549, 575, 579	8710-1710.....	110	880952-203.....	613
865600-906.....	546-549, 575, 579	8710-1712.....	109	880952-204.....	613
865608-901.....	558, 575, 579	8710-1841.....	109	880952-205.....	597
865630-902.....	552-553, 579	8710-1924.....	109	880952-206.....	585
865630-906.....	552-553, 579	8710-1930.....	110, 448, 464	880952-208.....	597
865750-902.....	552-553	8710-1931.....	110, 448	880952-302.....	585
865750-906.....	552-553	8710-2391.....	456	880952-701.....	597
865973-902.....	513, 552-553	8710-2392.....	110	880952-702.....	585
865973-905.....	552-553	8710-2393.....	110	880952-703.....	612-613
865973-906.....	552-553	8710-2394.....	110, 456	880952-704.....	612-613
865973-909.....	552-553	8710-2411.....	110	880952-705.....	596-597
8660-0791.....	216	8710-2412.....	110	880952-706.....	585
8660-0827.....	498	8710-2699.....	498	880952-708.....	597
866668-901.....	558, 573, 575	871700-902.....	546-549, 575	880952-710.....	585
866735-902.....	546-549, 575	871700-906.....	546-549, 575	880952-712.....	585
866953-902.....	544, 546-549, 573, 575	871700-914.....	546-549, 575	880957-801.....	604
				880957-802.....	604

Part Number Index

880957-805	604	883952-703	613	921700-902	542, 572
880957-806	604	883952-704	613	921700-932	542, 572
880957-807	604	883952-705	597	921975-902	542, 572
880957-808	604	883952-706	585	921975-932	542, 572
880957-809	604	883952-708	597	922600-902	571
880957-814	604	883952-710	585	922600-906	571
880967-201	546-549, 566	883952-712	585	922700-902	542, 572
880967-202	566	883967-302	566, 577	922700-932	542, 572
880967-302	565-566, 577	883967-901	566	922975-902	542, 571-572
880967-901	566	883967-902	544, 563, 566	922975-906	542, 572
880967-902	566	883975-202	546-549	922975-932	542, 572
880975-201	597	883975-302	546-549, 576-577	923700-902	542, 572
880975-202	546-549	883975-305	546-549, 577	923700-932	542, 572
880975-205	546-549	883975-306	546-549, 566, 577	923975-902	542, 572
880975-209	546-549	883975-309	546-549, 577	923975-932	542, 572
880975-212	546-549	883975-312	546-549, 577	924700-902	540-542, 571
880975-302	546-549, 577	883975-314	546-549, 577	924700-906	540-542, 571
880975-305	546-549, 577	883975-901	597	924975-302	540-542, 571
880975-306	546-549, 566, 577	883975-902	544-549, 563, 569, 576, 581	924975-306	540-542, 571
880975-309	546-549, 577	883975-905	544-549	924975-902	540-542, 571
880975-312	546-549, 577	883975-906	537, 545-549	924975-906	540-542, 571
880975-314	546-549, 577	883975-909	545-549	925700-902	542, 572
880975-901	597	883975-912	545-549	925700-932	542, 572
880975-902	546-549	883975-914	546-549	925975-902	542, 569, 572
880975-905	546-549	883995-902	513, 550, 552-553	925975-932	542, 572
880975-906	546-549	883995-905	550, 552-553	926700-902	540-542, 571
880975-909	546-549	883995-906	550, 552-553	926700-906	540-542, 571
880975-912	546-549	883995-909	550, 552-553	926975-302	540-542, 571
880975-914	546-549	884950-507	585	926975-306	540-542, 571
880995-202	552-553	884950-526	585	926975-902	540-542, 571
880995-205	552-553	884950-543	585	926975-906	540-542, 571
880995-206	552-553	884950-567	546-549	9270-0658	123
880995-209	552-553	884973-701	609-610	927700-902	540-542, 571
880995-902	552-553	884973-901	608, 610	927700-906	540-542, 571
880995-905	552-553	884973-902	609-610	927975-302	540-542, 571
880995-906	552-553	884975-202	546-549	927975-306	540-542, 571
880995-909	552-553	89075-23800	118, 717	927975-902	540-542, 571
881750-902	552-553	89075-60002	717	927975-906	540-542, 571
883668-301	558, 577	89076C	717	928600-902	571, 579
883668-901	556-558, 573	895050-902	552-553, 587	928600-906	571, 579
883700-704	613	895050-906	552-553, 587	928700-902	540-542, 571
883700-901	597	895050-909	552-553, 587	928700-906	540-542, 570-571
883700-902	566	895100-902	552-553, 587	928975-302	540-542, 571
883700-905	546-549	895100-906	552-553, 587	928975-902	540-542, 571
883700-906	546-549, 566	895100-909	552-553, 587	9300-0311	94, 102, 113
883700-909	546-549	895150-902	552-553, 587	9300-0761	716
883700-912	546-549	895150-906	552-553, 587	9300-1747	687
883700-922	546-549	895150-909	552-553, 587	9300-1748	687
883725-901	558	897150-102	552-553, 587	9301-0407	494
883750-902	552-554	897150-106	552-553, 587	9301-0633	500-502
883750-905	552-553	897150-109	552-553, 587	9301-0656	469, 500-501
883750-906	552-553	897250-102	552-553, 587	9301-0658	61, 193, 205
883750-909	552-553	897250-105	552-553, 587	9301-0675	500-502
883952-302	585	897250-106	552-553, 587	9301-0677	500-501
883952-701	597	897250-109	552-553, 587	9301-0678	500-501
883952-702	585	907-0056	99	9301-0713	57, 160

Part Number Index

9301-0714.....	57	959731-902.....	535, 571	961600-906.....	540-542, 574, 579
9301-0718.....	50	959731-906.....	535, 571	961753-902.....	540-542, 570, 574
9301-0719.....	51	959733-902.....	535, 574	961753-905.....	540-542, 574
9301-0720.....	54	959733-906.....	535, 574	961753-906.....	540-542, 574
9301-0721.....	50	959741-902.....	535, 571	961967-302.....	540-542, 574, 577
9301-0722.....	54, 688	959741-906.....	535, 571	961967-306.....	540-542, 574, 577
9301-0723.....	48, 188	959743-902.....	535, 574	961967-312.....	540-542, 574, 577
9301-0725.....	57	959743-906.....	535, 574	961967-902.....	540-542, 574
9301-0891.....	57	959746-902.....	535	961967-905.....	540-542, 574
9301-0892.....	57, 160	959746-906.....	535	961967-906.....	540-542, 574
9301-0895.....	454	959763-902.....	535, 574	963400-902.....	616, 618
9301-0976.....	51	959763-906.....	535	963600-902.....	540-542, 574, 579
9301-0977.....	39	959764-902.....	535, 571	963600-906.....	540-542, 574, 579
9301-0978.....	41, 687	959764-906.....	535, 571	963954-302.....	540-542, 574, 577
9301-0985.....	114, 197, 207	959793-902.....	535, 574	963954-305.....	540-542, 574, 577
9301-1031.....	48, 188	959793-906.....	535, 574	963954-306.....	540-542, 574, 577
9301-1104.....	221-223	959931-902.....	535, 571	963954-312.....	540-542, 574, 577
9301-1130.....	45	959931-906.....	535, 571	963967-902.....	538, 540-542, 569, 574
9301-1161.....	716-717	959933-902.....	535, 574	963967-905.....	540-542, 574
9301-1291.....	496-497	959933-906.....	535, 574	963967-906.....	538, 540-542, 574
9301-1337.....	464	959936-902.....	535, 574	963967-912.....	538, 540-542, 574
9301-1377.....	47	959936-906.....	535, 574	965600-902.....	540-542, 574, 579
9301-1378.....	47	959941-302.....	535, 571	965600-906.....	540-542, 574, 579
9301-1379.....	47	959941-306.....	535, 571	966400-902.....	616
9301-1387.....	43	959941-902.....	513, 534-535, 571	966735-902.....	540-542, 574
9301-1388.....	38, 502	959941-906.....	535, 571	966954-302.....	540-542, 574, 577
9301-1419.....	47	959943-902.....	535, 574	966967-902.....	540-542, 569, 574
9301-1420.....	469	959943-906.....	535, 574	966967-905.....	540-542, 574
9301-1421.....	469	959946-902.....	535	966967-906.....	539-542, 574
9301-1425.....	47	959946-906.....	535	966967-912.....	540-542, 574
9301-1446.....	494	959961-302.....	535, 574	970050-902.....	540-542, 588
9301-1450.....	469	959961-306.....	535, 574	970050-906.....	540-542, 588
9301-6341.....	471	959961-902.....	535, 574	970100-902.....	540-542, 588
9301-6342.....	471	959961-906.....	535, 574	970100-906.....	540-542, 588
930990-902.....	540-542, 574	959963-302.....	535, 574	970150-902.....	540-542, 588
930990-906.....	540-542, 574	959963-306.....	535, 574	970150-906.....	540-542, 588
9310-4828.....	216	959963-902.....	535, 574	971700-902.....	540-542, 574
931975-902.....	542	959963-906.....	535, 574	971700-906.....	540-542, 574
931975-906.....	542	959964-302.....	535, 571	972700-902.....	574
931975-932.....	542	959964-306.....	535, 571	972700-906.....	574
931975-936.....	542	959964-902.....	535, 571	973700-902.....	542
932967-902.....	574	959964-906.....	535, 571	973700-906.....	542
932967-906.....	574	959990-902.....	535	973700-932.....	542
933975-902.....	542	959990-906.....	535	973700-936.....	542
933975-906.....	542	959993-302.....	535	974700-902.....	574
933975-932.....	542	959993-306.....	535	974700-906.....	574
933975-936.....	542	959993-902.....	513, 534-535	975700-902.....	542
934967-902.....	574	959993-906.....	535	975700-906.....	542
934967-906.....	574	959996-902.....	534-535	975700-932.....	542
935967-902.....	540-542, 574	959996-906.....	535	975700-936.....	542
935967-906.....	540-542, 574	960967-902.....	540-542	977150-102.....	540-542, 588
935967-912.....	540-542, 574	960967-905.....	540-542	977150-106.....	540-542, 588
946975-902.....	540-542	960967-906.....	540-542	977250-102.....	540-542, 588
946975-906.....	540-542	960967-912.....	540-542	977250-106.....	540-542, 588
959701-902.....	535	961400-302.....	616	990967-202.....	540-542
959701-906.....	535	961600-902.....	540-542, 574, 579	990967-206.....	540-542

Part Number Index

990967-302.....	540-542, 577	G1162A.....	460	G1313-87203.....	473-474, 483
990967-305.....	540-542, 577	G1163A.....	460	G1313-87300.....	474
990967-306.....	540-542, 577	G1310-68730.....	469	G1313-87301.....	473
990967-312.....	540-542, 577	G1310-68731.....	469	G1313-87302.....	474, 483
990967-902.....	540-542, 569	G1311-60002.....	467	G1313-87303.....	473
990967-905.....	540-542, 597	G1311-60003.....	469	G1313-87304.....	446, 482
990967-906.....	540-542	G1311-60006.....	453	G1313-87305.....	446, 482
990967-912.....	540-542	G1311-60009.....	466	G1313-87306.....	474, 483
993400-902.....	616	G1311-60012.....	467	G1313-87307.....	473
993700-902.....	540-542	G1311-67304.....	484	G1313-87308.....	473
993700-905.....	540-542, 597	G1311-68705.....	469	G1313-87309.....	474, 483
993700-906.....	540-542	G1311-68710.....	466, 469	G1314-60081.....	488
993700-912.....	540-542	G1311-68711.....	466	G1314-60082.....	488
993967-302.....	540-542, 577	G1312-60012.....	467	G1314-60083.....	487
993967-305.....	540-542	G1312-60020.....	467, 469	G1314-60086.....	487
993967-306.....	540-542, 577	G1312-60022.....	469	G1314-60100.....	486
993967-312.....	540-542, 577	G1312-60023.....	469	G1314-65050.....	486
993967-902.....	539-542	G1312-60025.....	467, 469	G1314-65051.....	486
993967-905.....	539-542, 577, 597	G1312-67300.....	484	G1314-65052.....	488
993967-906.....	537-542, 557	G1312-67301.....	469	G1314-65053.....	488
993967-912.....	540-542	G1312-67302.....	484	G1314-65054.....	488
998-0000053-EHS.....	187-188	G1312-67304.....	484	G1314-65056.....	487
ACR.....	78-79	G1312-67305.....	446	G1314-65061.....	487
BACR.....	78	G1312-67500.....	469	G1314-65062.....	487
BHT-2.....	78	G1312-68706.....	469	G1314-65063.....	487
BHT-4.....	78, 498	G1312-68711.....	466	G1314-65064.....	487
BMSR-1.....	75	G1312-68716.....	469	G1314-65065.....	487
BMT-2.....	75	G1312-68730.....	469	G1314-65066.....	487
BMT-4.....	75	G1312-87300.....	469	G1314-68705.....	486
BOT-2.....	77, 94	G1312-87301.....	469	G1315-27705.....	493
BOT-4.....	77	G1312-87303.....	469, 483	G1315-45001.....	490
G1072-20008.....	218	G1312-87304.....	469, 483	G1315-45003.....	463, 470, 492
G1099-20030.....	216-217	G1312-87305.....	469, 483	G1315-60011.....	491
G1099-20130.....	218	G1312-87306.....	469, 483	G1315-60012.....	490
G1099-20132.....	218	G1312-87330.....	469	G1315-60015.....	491
G1099-20133.....	218	G1313-27302.....	474	G1315-60016.....	493
G1099-20136.....	218	G1313-43206.....	474	G1315-60017.....	493
G1099-60104.....	218	G1313-43216.....	474	G1315-60018.....	493
G1099-60106.....	218	G1313-44500.....	474	G1315-60022.....	490
G1099-60170.....	218	G1313-44502.....	474	G1315-60024.....	491
G1099-80001.....	222-224	G1313-44503.....	474	G1315-60025.....	491
G1099-80053.....	219-220	G1313-44512.....	474	G1315-67301.....	493
G1103-60001.....	490	G1313-44513.....	474	G1315-67302.....	493
G1103-61611.....	127	G1313-60004.....	474	G1315-68703.....	484, 492
G1120-60006.....	717	G1313-68705.....	472	G1315-68708.....	484, 492
G1120-62301.....	717	G1313-68709.....	472	G1315-68710.....	490-491
G1120-68707.....	717	G1313-68711.....	473	G1315-68711.....	490
G1120-68708.....	717	G1313-68712.....	474	G1315-68712.....	490
G1156-68711.....	460	G1313-68713.....	474	G1315-68713.....	491
G1156-68712.....	460	G1313-68730.....	472	G1315-68715.....	493
G1156-68713.....	460	G1313-87101.....	473	G1315-68716.....	492
G1156-68714.....	460	G1313-87102.....	473-474	G1315-68724.....	492
G1157A.....	460	G1313-87103.....	473	G1315-68725.....	493
G1158A.....	460	G1313-87104.....	474, 483	G1315-80003.....	493
G1158B.....	460	G1313-87201.....	473	G1315-80004.....	493
G1160-68706.....	460	G1313-87202.....	473	G1315-84901.....	490-491

Part Number Index

G1315-87302.....	490-491	G1361-22402.....	471	G1367-87200.....	473, 475, 480
G1315-87305.....	493	G1361-23204.....	468, 471	G1367-87201.....	473, 475
G1315-87306.....	491	G1361-23205.....	471	G1367-87300.....	475
G1315-87307.....	483	G1361-60008.....	471	G1367-87302.....	475
G1315-87311.....	446, 490-491, 494	G1361-60012.....	471	G1367-87303.....	475
G1315-87312.....	446, 490-491	G1361-60022.....	471	G1375-87300.....	473, 476
G1315-87313.....	493	G1361-67300.....	471	G1375-87301.....	484
G1315-87318.....	493	G1361-67301.....	471	G1375-87302.....	484
G1315-87319.....	483	G1361-67302.....	471	G1375-87303.....	484
G1315-87321.....	490	G1361-67303.....	471	G1375-87304.....	484
G1315-87323.....	493	G1361-67304.....	471	G1375-87305.....	484
G1315-87325.....	491	G1361-67305.....	471	G1375-87306.....	484
G1315-87328.....	493	G1361-67306.....	471	G1375-87307.....	484
G1315-87333.....	493	G1361-68707.....	471	G1375-87308.....	484
G1315-87338.....	493	G1361-68708.....	471	G1375-87309.....	484
G1315-87339.....	483	G1361-68710.....	471	G1375-87310.....	484
G1316-27301.....	483	G1362-68706.....	495	G1375-87311.....	484
G1316-68710.....	460	G1362-68709.....	495	G1375-87312.....	484
G1316-68711.....	460	G1362-87300.....	495	G1375-87315.....	476
G1316-80002.....	482	G1362-87301.....	495	G1375-87316.....	473, 476
G1316-80003.....	482	G1364-27107.....	481	G1375-87317.....	473, 476
G1316-80004.....	482	G1364-60021.....	481	G1375-87320.....	485
G1316-83200.....	482	G1364-68706.....	481	G1375-87321.....	485
G1316-87300.....	446, 482	G1364-68711.....	480	G1375-87322.....	485
G1316-87303.....	446, 482	G1364-68712.....	480	G1375-87323.....	485
G1316-87304.....	483	G1364-68723.....	480	G1375-87324.....	485
G1316-87305.....	483	G1364-81701.....	481	G1375-87325.....	485
G1316-87306.....	483	G1364-83205.....	481	G1375-87326.....	475
G1316-87309.....	483	G1364-84501.....	479	G1375-87327.....	485
G1316-87312.....	483	G1364-84502.....	479	G1375-87400.....	484
G1316-87313.....	483	G1364-84503.....	479	G1376-60003.....	470
G1316-87314.....	483	G1364-84504.....	479	G1376-68705.....	470
G1316-87315.....	483	G1364-84505.....	479	G1376-68707.....	470
G1316-87316.....	483	G1364-84506.....	479	G1376-68710.....	470
G1316-87317.....	483	G1364-84511.....	481	G1377-44900.....	463, 476
G1316-87318.....	483	G1364-84512.....	479	G1377-60002.....	475
G1316-87319.....	483	G1364-84516.....	479	G1377-68705.....	476
G1316-87321.....	483	G1364-84521.....	479	G1377-87101.....	473
G1316-87323.....	483	G1364-84522.....	479	G1377-87201.....	473, 476
G1316-87326.....	483	G1364-84523.....	479	G1377-87300.....	476
G1316-87327.....	483	G1364-84524.....	479	G1377-87301.....	476
G1321-60005.....	494	G1364-84525.....	479	G1379-60010.....	464
G1321-60007.....	494	G1364-84531.....	479	G1379-67310.....	464
G1322-67300.....	464, 469	G1364-84532.....	479	G1512-60530.....	127
G1322-68705.....	464	G1364-86711.....	481	G1530-60560.....	127
G1328-87600.....	446	G1364-87201.....	480	G1530-60570.....	125-126
G1329-60001.....	474	G1364-87202.....	480	G1530-60590.....	127
G1329-60011.....	474	G1364-87304.....	480-481	G1530-60600.....	127
G1329-68715.....	475	G1364-87305.....	480-481	G1530-60610.....	127
G1329-68718.....	472	G1364-87306.....	480-481	G1530-60630.....	127
G1329-68727.....	472	G1367-60001.....	479	G1530-60930.....	127
G1329-80001.....	473, 475	G1367-68705.....	475	G1530-61580.....	111
G1329-87101.....	473, 475, 484	G1367-68730.....	475	G1530-80650.....	211
G1329-87103.....	473, 475	G1367-87101.....	473, 475	G1531-20690.....	196-197
G1329-87300.....	446, 470, 475	G1367-87102.....	473, 475	G1531-20700.....	196-197
G1329-87302.....	474	G1367-87104.....	475	G1531-20740.....	196-197

Part Number Index

G1531-21090.....	196-197	G1600-60400.....	685, 689	G1820-60393.....	701
G1531-40020.....	199	G1600-60411.....	677	G1820-60399.....	701-702
G1531-60680.....	196-197	G1600-60419.....	679	G1820-60453.....	695-696
G1531-60690.....	196-197	G1600-61132.....	678	G1820-65003.....	692
G1531-80560.....	198-199	G1600-61211.....	677	G1820-65004.....	692
G1531-80620.....	198	G1600-61219.....	679	G1820-65007.....	697
G1532-20710.....	200	G1600-61232.....	675, 678	G1820-65008.....	692
G1532-60675.....	200	G1600-61239.....	679	G1820-65013.....	698-699
G1532-60685.....	200	G1600-61311.....	677	G1820-65015.....	698-699
G1532-80540.....	200	G1600-61332.....	678	G1820-65016.....	694
G1533-80565.....	202	G1600-61411.....	677	G1820-65017.....	707
G1534-20530.....	199	G1600-61419.....	679	G1820-65018.....	707
G1534-20590.....	199	G1600-62132.....	678	G1820-65019.....	707
G1534-40020.....	199	G1600-62211.....	674, 677	G1820-65023.....	692
G1534-40030.....	199	G1600-62232.....	678	G1820-65025.....	701
G1534-60570.....	199	G1600-62311.....	674, 677	G1820-65026.....	698-699
G1534-60610.....	199	G1600-62318.....	680	G1820-65027.....	693
G1534-80500.....	199	G1600-62332.....	678	G1820-65028.....	698-699
G1534-80510.....	199	G1600-62402.....	687	G1820-65030.....	695-696
G1534-80540.....	199	G1600-62411.....	677	G1820-65031.....	707
G1535-00010.....	203	G1600-62700.....	688-689	G1820-65032.....	707
G1535-00030.....	203	G1600-63200.....	684	G1820-65033.....	695-696
G1535-60600.....	202	G1600-63211.....	677	G1820-65035.....	698-699
G1535-60610.....	203	G1600-63311.....	677	G1820-65044.....	701-702
G1535-80520.....	203	G1600-63411.....	677	G1820-65050.....	700
G1544-20590.....	190-191	G1600-64211.....	675, 677	G1820-65052.....	693, 706
G1544-60575.....	190-191	G1600-64232.....	678	G1820-65057.....	701-702
G1544-60585.....	190-191	G1600-64311.....	677	G1820-65060.....	698-699
G1544-60610.....	190-191	G1600-64332.....	678	G1820-65061.....	698-699
G1544-80530.....	190-191	G1600-64411.....	677	G1820-65062.....	701-702
G1544-80550.....	190-191	G1600-67201.....	687	G1820-65073.....	707
G1544-80580.....	190-191	G1600-67219.....	679, 685	G1820-65074.....	707
G1544-80700.....	168	G1600-67311.....	685	G1820-65075.....	695-696
G1544-80730.....	168	G1600-67319.....	679, 685	G1820-65105.....	694, 705
G1544-80731.....	168	G1600-68319.....	679, 684	G1820-65110.....	701-702
G1545-80520.....	193-194	G1600-68701.....	688	G1820-65119.....	693
G1553A.....	125	G1600-68706.....	683	G1820-65121.....	695-696
G1580-60575.....	190-191	G1600-68714.....	684	G1820-65138.....	695-696
G1580-60585.....	190-191	G1600-68715.....	684	G1820-65141.....	695-696
G1600-23223.....	687	G1600-68716.....	684	G1820-65144.....	693
G1600-60002.....	689	G1600-68723.....	684	G1820-65163.....	697
G1600-60007.....	687	G1603A.....	685	G1820-65164.....	697
G1600-60013.....	685	G1607-20030.....	685	G1820-65185.....	698-699
G1600-60027.....	684	G1607-60000.....	685	G1820-65198.....	695-696
G1600-60033.....	687	G1607-60001.....	685	G1820-65199.....	695-696
G1600-60132.....	678	G1607-60041.....	685	G1820-65201.....	707
G1600-60150.....	689	G1607A.....	685	G1820-65214.....	693
G1600-60210.....	689	G160U-60419.....	679	G1820-65216.....	694
G1600-60211.....	677	G160U-61219.....	679	G1820-65221.....	694
G1600-60230.....	689	G160U-61239.....	679	G1820-65237.....	700
G1600-60232.....	678	G160U-61419.....	679	G1820-65238.....	700
G1600-60233.....	678	G1680-63715.....	127	G1820-65239.....	700
G1600-60310.....	689	G1811-23200.....	718	G1820-65276.....	695-696
G1600-60311.....	677	G1820-60104.....	700	G1820-65336.....	697
G1600-60330.....	689	G1820-60160.....	695-696, 706	G1820-65337.....	697
G1600-60332.....	678	G1820-60376.....	700	G1820-65338.....	697

Part Number Index

G1820-65339.....	697	G1833-65332.....	703	G1833-65593.....	701-702
G1820-65342.....	697	G1833-65404.....	701-702	G1833-65594.....	701-702
G1820-65343.....	697	G1833-65405.....	701	G1833-65595.....	701-702
G1820-65345.....	695-696	G1833-65407.....	700	G1833-65596.....	701-702
G1820-65356.....	695-696	G1833-65408.....	700	G1833-65597.....	701-702
G1820-65357.....	698-699	G1833-65409.....	698-699	G1833-65598.....	701-702
G1820-65358.....	701-702	G1833-65411.....	694	G1833-65599.....	701-702
G1820-65360.....	700	G1833-65412.....	707	G1833-66000.....	701-702
G1820-65361.....	698-699	G1833-65413.....	701-702	G1833-66001.....	701-702
G1820-65435.....	701	G1833-65414.....	692	G1833-66024.....	707
G1820-65478.....	694, 705	G1833-65415.....	698-699	G1833-66035.....	701-702
G1820-65479.....	694	G1833-65416.....	698-699	G1833-66042.....	707
G1820-65480.....	700	G1833-65417.....	701-702	G1888-60701.....	187-188
G1820-65481.....	700	G1833-65418.....	701-702	G1946-20056.....	496-497
G1820-65482.....	697	G1833-65419.....	698-699	G1946-20087.....	496-497
G1820-65491.....	695-696	G1833-65421.....	698-699	G1946-20089.....	496-497
G1820-65494.....	701-702	G1833-65422.....	698-699	G1946-20156.....	496-497
G1820-65497.....	698-699	G1833-65423.....	698-699	G1946-20157.....	496-497
G1820-65498.....	698-699	G1833-65424.....	698-699	G1946-20163.....	496-497
G1820-65501.....	698-699	G1833-65425.....	698-699	G1946-20215.....	498
G1820-65502.....	698-699	G1833-65426.....	697	G1946-20301.....	496-497
G1820-65503.....	697	G1833-65427.....	697	G1946-20302.....	496-497
G1820-65504.....	697	G1833-65428.....	692	G1946-60037.....	496-497
G1820-65505.....	694	G1833-65429.....	707	G1946-60098.....	496-497
G1820-65515.....	694	G1833-65430.....	697	G1946-60157.....	498
G1820-65518.....	695-696	G1833-65432.....	698-699	G1946-60180.....	498
G1820-65520.....	695-696	G1833-65444.....	701-702	G1946-80006.....	496-497
G1820-65526.....	694	G1833-65462.....	695-696	G1946-80009.....	496-497
G1820-65527.....	694	G1833-65463.....	697	G1946-80019.....	496-497
G1820-65528.....	698-699	G1833-65464.....	697	G1946-80041.....	496-497
G1820-65529.....	698-699	G1833-65475.....	695-696	G1946-80049.....	498
G1820-65531.....	694	G1833-65476.....	695-696	G1946-80054.....	498
G1820-65533.....	695-696	G1833-65477.....	693	G1946-85020.....	496-498
G1820-80235.....	697	G1833-65480.....	697	G1946-85021.....	498
G1820-80237.....	697	G1833-65494.....	701-702	G1947-20029.....	496-497
G1820-80341.....	707	G1833-65497.....	700	G1947-60103.....	496-497
G1820-80386.....	702	G1833-65498.....	700	G1956-20302.....	496-497
G1820-80430.....	707	G1833-65499.....	701-702	G1956-80000.....	496-497
G1820-80512.....	697	G1833-65500.....	701-702	G1969-20302.....	496-497
G1820-81012.....	703	G1833-65501.....	701-702	G1969-60086.....	498
G1820-81013.....	703	G1833-65502.....	701-702	G1969-80208.....	496-497
G1833-65024.....	701-702	G1833-65503.....	701-702	G1969-80230.....	496-497
G1833-65025.....	701-702	G1833-65505.....	700	G1969-85000.....	498
G1833-65036.....	707	G1833-65513.....	701-702	G1969-85001.....	498
G1833-65071.....	694	G1833-65562.....	701-702	G1969-85003.....	116, 498
G1833-65079.....	701	G1833-65569.....	694	G1969-85010.....	498
G1833-65088.....	701-702	G1833-65570.....	694	G1969-85020.....	498
G1833-65089.....	701-702	G1833-65571.....	694	G1969-85026.....	498
G1833-65092.....	700	G1833-65572.....	694	G1972-60025.....	481
G1833-65094.....	701-702	G1833-65573.....	694	G1978-85000.....	116
G1833-65125.....	701-702	G1833-65575.....	702	G1999-20021.....	218
G1833-65132.....	700	G1833-65578.....	701-702	G1999-20022.....	218
G1833-65133.....	701-702	G1833-65583.....	695-696	G1999-80410.....	82
G1833-65134.....	701-702	G1833-65590.....	700	G2100A.....	124
G1833-65138.....	701-702	G1833-65591.....	700	G2101A.....	124
G1833-65200.....	707	G1833-65592.....	701-702	G2105A.....	124

Part Number Index

G2108A.....	125	G2589-60102.....	218	G3158-65007.....	707
G2228-68700.....	485	G2590-60053.....	219-220	G3160-60015.....	704
G2250-04500.....	477	G2617-20510.....	192	G3160-65300.....	704
G2250-04501.....	477	G2617-60506.....	192	G3160-65301.....	704
G2250-04502.....	477	G2617-60507.....	192	G3160-65302.....	704
G2250-04503.....	477	G2617-60508.....	192	G3160-65303.....	704
G2250-04504.....	477	G2617-60510.....	192	G3160-65304.....	704
G2250-23200.....	477	G2617-80540.....	192	G3160-65305.....	704
G2250-24500.....	477	G2618-80500.....	192	G3160-65306.....	704
G2250-24501.....	477	G2619-60501.....	192	G3160-65307.....	704
G2250-47100.....	477	G2630-60710.....	211	G3160-65308.....	704
G2250-87300.....	477	G2630-61230.....	200	G3160-65309.....	704
G2255-68700.....	476, 478, 480	G2630-80800.....	111	G3160-65310.....	704
G2255-68709.....	477	G2855-20530.....	175, 179	G3160-65311.....	704
G2255-68710.....	477	G2855-20555.....	175, 179	G3160-65312.....	704
G2255-68720.....	477	G2855-20590.....	179	G3160-65313.....	704
G2255-68730.....	477	G2860A.....	223-225	G3160-65314.....	704
G2258-23101.....	478	G3138-65000.....	705	G3160-65315.....	704
G2258-23201.....	468, 478	G3138-65003.....	705	G3160-65317.....	704
G2258-60001.....	475, 478	G3138-65006.....	705	G3160-65320.....	704
G2258-60003.....	478	G3138-65023.....	705	G3160-65321.....	704
G2258-60011.....	475, 478	G3138-65024.....	705	G3160-65324.....	704
G2258-68710.....	473, 478	G3138-65025.....	705	G3160-65325.....	704
G2258-87102.....	473, 478	G3138-65102.....	705	G3160-65326.....	704
G2258-87300.....	478	G3138-65103.....	705	G3160-65327.....	704
G2258-87301.....	478	G3138-65104.....	705	G3160-65328.....	704
G2258-87307.....	478	G3138-65117.....	705	G3160-80041.....	704
G2258-87310.....	478	G3138-65118.....	705	G3160-80044.....	704
G2258-87311.....	478	G3138-65119.....	705	G3163-20530.....	218
G2258-87312.....	478	G3138-65121.....	705-706	G3169-60177.....	218
G2258-87313.....	478	G3138-65122.....	705	G3170-20126.....	218
G2258-87314.....	478	G3138-65125.....	705	G3170-65710.....	218
G2258-87315.....	478	G3138-65128.....	706	G3182-61580.....	175
G2258-87316.....	478	G3138-65129.....	706	G3182-61581.....	175
G2260-68705.....	478	G3138-65130.....	706	G3185-60300.....	179
G2260-68711.....	478	G3138-65131.....	706	G3185-60361.....	179
G2260-87101.....	473, 478	G3138-65132.....	706	G3185-60362.....	179
G2260-87201.....	473, 478	G3138-65133.....	706	G3185-60363.....	179
G2260-87300.....	478	G3138-65134.....	706	G3185-60364.....	179
G2260-87301.....	478	G3138-65135.....	706	G3199A.....	499
G2397-20540.....	202	G3138-65136.....	706	G3266-80010.....	695-696
G2397-80520.....	202	G3138-65137.....	706	G3266-80011.....	695-696
G2421A.....	496-498	G3138-65138.....	706	G3266-80015.....	695-696
G2423A.....	498	G3138-65139.....	706	G3270-60639.....	701-702
G2424A.....	498	G3138-65140.....	706	G3270-65021.....	692
G2427A.....	496-497	G3138-65141.....	706	G3270-65023.....	701-702
G2428A.....	496-497	G3138-65143.....	706	G3270-65024.....	700
G2431A.....	498	G3138-65144.....	706	G3270-65028.....	701-702
G2432A.....	498	G3138-65158.....	705	G3270-65029.....	701-702
G2441-80010.....	496-497	G3139-65002.....	707	G3270-65030.....	701-702
G2453-85050.....	498	G3139-65003.....	707	G3270-65031.....	701-702
G2453-85060.....	498	G3139-65004.....	707	G3285-80020.....	697
G2589-20043.....	218	G3139-65005.....	707	G3285-80021.....	697
G2589-20044.....	218	G3139-65006.....	707	G3285-80022.....	697
G2589-20045.....	218	G3158-65001.....	707	G3285-80023.....	697
G2589-20100.....	218	G3158-65003.....	707	G3285-80030.....	697

Part Number Index

G3285-80031.....	697	G6500-80117.....	64	MT200-4-S.....	73
G3285-80032.....	697	G6500-80118.....	64	MT400-2.....	72
G3285-80033.....	697	G6500-80119.....	64	MT400-2-D.....	73
G3285-80050.....	697	G6500-80120.....	64	MT400-2-S.....	73
G3286-80100.....	704	G6500-80121.....	68	MT400-4.....	72
G3286-80101.....	704	G6500-80122.....	68	MT400-4-D.....	73
G3286-80102.....	704	GC-1.....	90	MT400-4-S.....	73
G3286-80117.....	704	GC-2.....	90	OT1-2.....	76
G3286-80118.....	704	GC-2-I.....	90	OT1-4.....	76
G3397A.....	221-222	GC-3.....	90	OT3-2.....	82
G3431-60680.....	196-197	GC-4.....	90	OT3-4.....	82
G3432-67685.....	200	GMSR.....	74	R2D2-I-P.....	90
G3433-67565.....	202	GMT-2-HP.....	74, 94	R2D2-ORINGS.....	90
G3434-67500.....	199	GMT-2GC-HP.....	74	RBC-D-P.....	90
G3434-67540.....	199	GMT-4-HP.....	74	RBCDP-GC2/1.....	90
G3504-20504.....	174	GMT-4GC-HP.....	74	RDT-1020.....	93-94
G4200-80101.....	64, 66	HCRMS.....	82	RDT-1023.....	93
G4200-80102.....	64, 66	HFM-420.....	102	RFT-2500.....	112
G4200-80103.....	66	HFM-420-B.....	102	RFT-5300.....	112
G4200-80104.....	64, 66	HFM-570.....	102	RMP-5005.....	113
G4200-80105.....	64, 66	HFM-570-B.....	102	RMSH-2.....	84
G4200-80106.....	64, 66	HFM-570-FC.....	102	RMSH-4.....	84
G4200-80107.....	64, 66	HFM-570FC-B.....	102	RMSHY-2.....	84
G4200-80108.....	64, 66	HFM-650.....	102	RMSHY-4.....	84
G4200-80111.....	66	HFM-650-B.....	102	RMSN-2.....	84
G4200-80112.....	66	HFM-650-FC.....	102	RMSN-4.....	84
G4200-80113.....	66	HFM-650-FT.....	102	RQC-P.....	90
G4200-80114.....	66	HFM-650FC-B.....	102	RSF-1200.....	114
G4200-80115.....	66	HFM-BULB.....	102	RTC-I-P.....	90
G4200-80116.....	66	HMT200-2.....	82	RTC-P.....	90
G4200-80117.....	66	HMT200-4.....	82	SGR.....	73
G4200-80118.....	66	HT200-2.....	78	SL-4.....	104
G4200-80119.....	66	HT200-4.....	78	SL-8.....	104
G4208-68700.....	463	HT3-2.....	79	UMC-2.....	76, 93
G4240-23705.....	482	HT3-4.....	79	UMC-3.....	74, 76, 93
G4240-25206.....	482	HVF-500.....	100	UMC-4.....	72-74, 93
G4240-43200.....	482	IOT-2-HP.....	76, 94	UMC-5.....	93
G4240-87300.....	482	IOT-4-HP.....	76	UMC-5-2.....	75, 77-78, 84, 93
G4240-87301.....	482	LGMT-2-HP.....	74		
G4240-87302.....	482	LGMT-4-HP.....	74		
G4240-87303.....	482	LIOT-2.....	76		
G4240-87304.....	482	LIOT-4.....	76		
G6500-80100.....	68	MC-1.....	72-73, 76, 78-79, 82, 93		
G6500-80101.....	68	MSR-1.....	72		
G6500-80102.....	66	MSR-2.....	73		
G6500-80103.....	66	MT120-2.....	72		
G6500-80104.....	66	MT120-2-D.....	73		
G6500-80105.....	66	MT120-2-S.....	73		
G6500-80106.....	66	MT120-4.....	72		
G6500-80107.....	64	MT120-4-D.....	73		
G6500-80109.....	64	MT120-4-S.....	73		
G6500-80111.....	64	MT200-2.....	72		
G6500-80113.....	64	MT200-2-D.....	73		
G6500-80114.....	64	MT200-2-S.....	73		
G6500-80115.....	64	MT200-4.....	72		
G6500-80116.....	64	MT200-4-D.....	73		

Compound Index

Compound Index

A

ACA 624
Acenaphthene 646
Acenaphthylene 646
Acetal (acetaldehyde diethyl acetal) ... 267, 293, 410
Acetaldehyde 235, 248, 267, 271, 274, 277, 283, 293, 387, 389, 395, 402, 406, 427, 428
Acetaldehyde - DNPH 642
2-Acetamidophenol 624 659
Acetaminophen
(4-acetamidophenol) 244, 426, 624, 626-628, 659
Acetanilide 624, 659
Acetic acid 273-274, 276-277, 395, 397, 403, 405, 641
Acetic acid, ethyl ester 302, 439
Acetic acid, methyl ester 302, 439
Acetone 235, 239, 248, 267, 271, 273, 276-277, 283, 293, 300, 387, 389, 395, 397, 402, 406, 414-415, 419, 427-429
Acetone - DNPH 642
Acetone-d₆ 248, 387
Acetonitrile 235, 267, 283, 293, 414, 416, 428-429
Acetylacetone 638
Acetylcedrene 274, 392
6-Acetylcodeine 244, 248, 425
Acetylene 298-300, 302-303, 431-432, 435-436
6-Acetylmorphine 665
Acetylsalicylic acid (aspirin) 244, 426, 664
Acifluorfen 253, 256, 365
Acrolein 235, 267, 271, 293, 402, 406, 416
Acrolein - DNPH 642
Acrylamide 248, 405
Acrylonitrile 235, 267, 274, 293, 416-417
Adenine 670
Adenosine 628
Air 302, 430, 435
Alachlor 248, 250, 253, 256, 358-360, 363-364, 366
Alanine 618, 624
Aldrin 244, 248, 250, 253, 256, 268, 286, 357-363
Alfentanyl 268, 424
Allobarbitol 256, 423
Allyl acrylate 277, 417

Allyl ether 267, 293, 410
Allyl ethyl ether 267, 293, 410
Allyldisulfide 253, 393
Allylmethylsulfide 253, 393
Allylmethyltrisulfide 253, 393
Allylpropenyldisulfide 253, 393
Allylsulfide 253, 393
Allyltrisulfide 253, 393
Allylmethylsulfide 253, 393
Alpha-1-Antichymotrypsin 627
Alphenal 256, 423
Alprazolam 256, 424
Ametryn 250, 253, 257, 268, 364, 366-367, 648
4-Amino-2,6-dinitrotoluene 644
4-Amino-2-nitrotoluene 644
2-Amino-4,6-dinitrotoluene 644
4-Amino-4,6-dinitrotoluene 644
2-Amino-4-nitrotoluene 644
2-Amino-6-nitrotoluene 644
2-Aminoazotoluene 256, 417
3-Amino-benzonitrile 643
n-(2-Aminoethyl) piperazine 307, 405
Aminoethylethanolamine 307, 405
2-Aminonaphthalene 256, 417
Amitriptyline 252, 422, 538, 625-626, 668
cis-10-OH - Amitriptyline 668
trans-10-OH - Amitriptyline 668
Amobarbital 256, 423
Amphetamine 244, 252, 422
Amyl acetate 235, 267, 274, 293, 396, 409-410
n-Amyl alcohol 277, 395
Amyl butyrate 274, 396
n-Amyl mercaptan 239, 437
tert-Amyl mercaptan 239, 437
tert-Amyl methyl ether 267, 293, 410
tert-Amyl methyl ether (TAME) 295, 355
n-Amyl salicylate 274, 392
 β -Amylase (Sweet Potato) 609
Amyl alcohol 283, 428
5 α -Androstan-17 α -ol-3-one (Stanolone) 235, 426
Androsterone 257, 426
5- β -Androsterone 257, 426
Anethole 651
Angiotensin I 563
Angiotensin II 554, 563, 580, 630-632
Angiotensin III 563
Aniline 248, 405
p-Anisidine 643
Anisyl alcohol 389

Antazoline 423
Anthracene 646
Anthranilic acid 643
Antithrombin-III Precursor 627
Aprobarbital 256, 423
Arabinitol 265, 396
Arabinose 268, 397
Arachidic acid
(eicosanoic acid) 276, 397
Arachidic acid methyl ester (C20:0) 265, 271, 399-400
Arachidonic acid methyl ester (C20:4n6) 265, 271, 399-400
Arginine 618, 624
Argon 301, 430
Arsine 239, 420
Asparagine 618
Aspartame 628
Aspartic acid 618, 624, 628
Aspirin (acetylsalicylic acid) ... 276, 426, 624, 659
Aspon 248, 256, 364-365
Atraton 250, 253, 257, 268, 364, 366-367
Atrazine 248, 250, 253, 256-257, 268, 359-360, 364-367, 644-648
Azide 609
Azinphos ethyl 248, 256, 364-365
Azinphos methyl 248, 256, 364-365

B

Barberine 662
Barbital 256, 423, 538-539
Behenic acid methyl ester (C22:0) 265, 271, 399-400
Bensulfuron-methyl 648
Bentazon 644-645
Bentazone 253, 256, 365
Benylamine 255, 307, 404
Benz[a]anthracene 646
Benzaldehyde 235, 252, 267, 271, 293, 392, 402, 406, 439
Benzaldehyde - DNPH 642
Benzene 235, 239, 263, 267, 273-274, 283, 289, 293, 295, 355, 385, 392, 407-409, 413-415, 428-429, 438, 440-441
Benzene-d₆ 235, 441
Benzidine 256, 417
Benzo[a]pyrene 646
Benzo[b]fluoranthene 646
Benzo[g,h,i]perylene 646
Benzo[k]fluoranthene 646
Benzocaine 284, 422
Benzoic acid 651, 664

Benzonitrile	235, 248, 267, 293, 405, 416	Bromomethane	235, 385	sec-Butyl alcohol	273, 283, 414, 428
Benzophenone	658	Bromopheniramine	423	tert-Butyl alcohol	283, 428
Benzothioephene	288, 437	3-Bromopyridine	248, 405	sec-Butyl benzene	235, 263, 274, 289, 407-408, 415, 438, 440
Benzoyllecgonine	663	Buclizine	423	Butyl benzyl phthalate	248, 376
Benzphetamine	244, 422	Bufotenine	259, 425	Butyl caproate	274, 410
Benzthiazuron	645	Butabarbital	256, 423	Butyl cellosolve	414
Benzyl acetate	235, 253, 267, 274, 293, 392, 394, 409-410	Butacaine	284, 422, 545, 659	Butyl cellosolve acetate	414
n-6-Benzyl adenine	648	Butachlor	250, 253, 364, 366	Butyl ether	267, 293, 410
Benzyl alcohol	273, 389, 402	1,3-Butadiene	298-300, 303, 431-432, 436	Butyl ethyl ether	267, 293, 410
Benzyl benzoate	248, 253, 274, 376, 392, 394, 396	Butalbitol	256, 423	Butyl heptanoate	274, 410
Benzyl ether	267, 293, 410	Butanal	274, 405	Butyl mercaptan (1-Butanethiol)	239, 437
Benzyl salicylate	253, 274, 392, 394	Butane (C4)	239, 274, 288-289, 298-300, 302-303, 397, 430-432, 435-436, 440	1-Butyl mercaptan	300, 437
Benzylamine	248, 405	cis-Butane	302, 435	sec-Butyl mercaptan (1-methyl-1-propanethiol)	239, 437
n-Benzylmethylamine	248, 405	tert-Butane	302, 435	tert-Butyl mercaptan (2-methyl-2-propanethiol)	239, 437
Berberine	534	1,3-Butanediol	235, 239, 267, 271, 293, 411-412	sec-Butyl methacrylate	277, 417
trans-a-Bergamotene	244, 393	1,4-Butanediol	235, 267, 271, 293, 411	Butyl methyl ether	267, 293, 410
4,4 δ -BHC	244, 248, 250, 253, 256, 268, 286, 357-363	2,3-Butanediol	235, 267, 271, 293, 411	Butyl paraben	569, 654
α -BHC	244, 248, 250, 253, 256, 268, 286, 357-363	1-Butanethiol	235, 300, 435, 437	Butyl propionate	263, 268, 274, 410, 416
β -BHC	244, 248, 250, 253, 256, 268, 286, 357-363	Butanol	267, 263, 268, 277, 293, 395, 414, 416, 428	Butyl valerate	274, 410
γ -BHC	244, 248, 250, 253, 256, 268, 286, 357-363	1-Butanol	239, 273-274, 283, 389, 402-403, 428, 439	Butylate	250, 364
BHT	261, 279, 395, 398	2-Butanol	429	Butylbenzene	235, 263, 273-274, 289, 407-409, 415, 438, 440
Bifenox	647	sec-Butanol	239, 267, 273, 277, 293, 395, 402, 414-415, 428, 439	tert-Butylbenzene	235, 263, 274, 407-408, 415, 438
2,2'-Bipyridine	638	tert-Butanol	239, 267, 273, 293, 402, 414, 428, 439	Butylphenone	569-570
β -Bisabolene	244, 393	2-Butanone	248, 387, 429	4-tert-Butyltoluene	235, 407-408
Bolstar	248, 256, 364-365	2-Butanone (MEK)	235, 267, 271, 283, 293, 402, 406, 428-429, 642	Butyraldehyde	235, 267, 271, 293, 402, 406
(+)-Borneol	392	2-Buten-1-ol (crotyl alcohol)	273, 402	Butyric acid	273-274, 276, 397, 403, 405
(+/-)-Borneol	279, 395	3-Buten-1-ol	273, 402	iso-Butyric acid	274, 405
β -Bourbonene	271, 394	Butene	409	Butyric acid methyl ester (C4:0)	265, 271, 399-400
Bovine Serum Albumin (BSA)	555, 609, 634-635, 637	1-Butene	288, 298-299, 300, 303, 409, 425, 431-432, 435-436		
BPE (PB)	235, 372	cis-2-Butene	288, 298-300, 431-432, 435-436		
Bromacil	250, 253, 364, 366, 647	cis-2-Butene	303, 436		
Bromazepam	256, 424	n-Butene	302, 435		
1-Bromo-2-nitrobenzene	248, 256, 358	trans-2-Butene	288, 298-300, 303, 431-432, 435-436		
Bromoacetic acid	253, 256, 378	trans-2-Methyl-2-butenic acid	274, 403		
4-Bromoaniline	248, 405, 642	Butethal	256, 423		
Bromobenzene	235, 407-408	Butylpentylin	239, 246, 373		
2-Bromobiphenyl	248, 256, 358	2-Butoxyethanol (Butyl cellosolve)	273, 402		
Bromochloroacetic acid	253, 256, 378	Buturon	647		
Bromochloroacetonitrile	235, 248, 383-384	Butyl acetate	235, 263, 267-268, 293, 409-410, 414, 416		
Bromochloromethane	235, 248, 385, 387, 413	sec-Butyl acetate	235, 267, 293, 409-410		
Bromodichloroacetic acid	253, 256, 378	tert-Butyl acetate	235, 267, 293, 409-410		
Bromodichloromethane	235, 248, 267, 293, 383-384, 413	Butyl acrylate	263, 268, 274, 416-417		
Bromoethane (ethyl bromide)	235, 413	n-Butyl acrylate	277, 417		
4-Bromofluorobenzene	248, 235, 385, 387	n-Butyl alcohol	414		
p-Bromofluorobenzene	248, 384				
Bromoform	235, 248, 267, 293, 383-384, 413				

C

Cadinene	244, 393
Caffeic acid	581
Caffeine	242, 244, 421-422, 425-426, 538-539, 560, 573, 587, 612, 624, 657, 659
Cafoperazone	626
Calmodulin	630
Camphene	244, 279, 392, 393, 395
Camphor	271, 279, 391, 395
Canadine	662
Capric acid methyl ester (C10:0)	265, 271, 399-400
Caproic acid (hexanoic acid)	273, 276, 397, 403
Caproic acid methyl ester (C6:0)	265, 271, 399-400
Caprylic acid methyl ester (C8:0)	265, 271, 399-400
Captafol	248, 256, 358

Compound Index

Captan	248, 256, 358, 363	Chloramben	253, 256, 365	377, 418, 647	
Carbamazepine	235, 422	Chlorbromuron	647	4-Chlorophenol	248, 253, 271, 377
Carbazepine	242, 421	Chlorcyclizine	423	<i>o</i> -Chlorophenoxy acetic acid	648
Carbazole	643	α -Chlordane	244, 248, 250, 253, 256, 268, 286, 357-363	<i>p</i> -Chlorophenoxy acetic acid	648
Carbepoxide	252, 423	γ -Chlordane	244, 248, 250, 253, 256, 268, 286, 357-363	<i>o</i> -Chlorophenoxy propionic acid	648
Carbetamide	647	δ -Chlordane	250, 360	Chloropicrin	235, 248, 383-384
Carbinoxamine	423	Chlorfenvinphos	248, 256, 364-365	2-Chloropropene	302, 439
Carbon dioxide (CO ₂)	235, 300, 302, 385, 420, 430, 435	Chloridazon	647	3-Chloropropene (allyl chloride)	235, 267, 293, 412-413
Carbon disulfide (CS ₂)	235, 248, 300, 387, 435, 437	2-Chloro,2-methylaniline	642	Chloropropylate	248, 256, 358
Carbon monoxide (CO)	301, 302, 430, 435	3-Chloro,4-methoxyaniline	642	4-Chlorostyrene	235, 407-408
Carbon tetrachloride (CCl ₄)	235, 248, 267, 283, 291, 293, 300, 383-385, 412-413, 419, 428	3-Chloro,4-methylaniline	642	Chlorothalonil	248, 250, 253, 256, 358-360
Carbonic anhydrase	550, 554-555, 630-631	4-Chloro,2-methylaniline	256, 417	2-Chlorotoluene	235, 263, 407-408, 415
Carbonyl sulfide (COS)	235, 248, 300, 302, 387, 435, 437	4-Chloro,2-methylphenol	248, 253, 271, 377	3-Chlorotoluene	235, 263, 407-408, 415
Carbophenothion	248, 256, 363-365	4-Chloro,3-methylphenol	248, 250, 253, 271, 377, 418, 647	4-Chlorotoluene	235, 239, 263, 273, 407-408, 413, 415
Carboxin	250, 253, 364, 366	4-Chloro,3-nitrobenzotrifluoride	248, 256, 358	Chlorotoluron	647
Carbutilat	647	4-Chloro,3-nitrotrifluoride	248, 256, 364-365	Chloroxuron	647
Carfentanyl	268, 424	3-Chloro,4-fluoroaniline	642	Chlorpheniramine	244, 423, 556, 560, 573, 626-628, 658, 660
β -carotene	655	1-Chloro,4-nitrobenzene	235, 407-408	Chlorpothixene	252, 423
<i>cis</i> -Carveol	252, 271, 392, 394	2-Chloro,5-methylphenol	248, 253, 271, 377	Chlorpropham	250, 364
<i>trans</i> -Carveol	252, 271, 392, 394	Chloroacetic acid	253, 256, 378	Chlorpyrifos	248, 256, 363-365
Carvocrol	274, 392	2-Chloroaniline	248, 405, 642	Chlorpyrifos-methyl	248, 256, 364-365
Carvone	271, 394, 651	3-Chloroaniline	248, 405, 642	Chlorsulfuron-methyl	648
<i>cis</i> -Carvylacetate	271, 394	4-Chloroaniline	248, 256, 405, 417, 642	4-Chlortestosterone-17-acetate (Clostebal)	235, 426
β -Caryophyllene	244, 253, 271, 393-394	<i>o</i> -Chloroaniline	643	Chlortetracycline	667
Catechol	643, 651, 662	<i>o</i> -Chloroaniline	643	Chlortoluron	647
CDR	550	<i>p</i> -Chloroaniline	643	5- α -Cholestane	257, 426
Cefachlor	539, 626	Chlorobenzene	235, 239, 263, 273, 385, 407-408, 413, 415	Cholesterol	257, 426
Cefalexin	626	Chlorobenzene-d ₅	235, 248, 385, 387	Chrysene	646
Cefamandole nafate	626	Chlorobenzilate	248, 250, 253, 256, 358-360, 363	Chymotrypsinogen	636
Cefatoxime	626	2-Chlorobenzoic acid	661	Cimetidine	669
Cefazolin	626, 659	4-Chlorobenzonitrile acid	248, 405	δ -Cinchonine	545, 659
Cefotaxime	539, 659	1-Chlorobutane	235, 267, 283, 293, 412-413, 428	1,8-Cineol	271, 394
Cefoxitin	539, 626	2-Chlorobutane	283, 428	Cineole	392
Ceftazidime	659	Chlorodibromoacetic acid	253, 256, 378	Cinerin I	235, 372
Ceftazidone	539	Chloroethane	235, 385	Cinerin II	235, 372
Cellosolve acetate	414	2-Chloroethanol	271, 419	Cinnamaldehyde	389
Cephaclor	557	Chloroform	235, 248, 267, 273, 283, 291, 293, 383-385, 412-414, 428-429	<i>trans</i> -Cinnamaldehyde	392
Cephalexin	557	Chlorogenic acid	581	Cinnamylacetate	253, 394
Cephalothin	539, 626	1-Chlorohexane	235, 267, 293, 412-413	Cinnanzine	423
Cephoxitin	557	1-Chloroisooctane	274, 413, 443	Ciprofloxacin	659
Cephuroxime	557	3-Chloroisooctane	274, 413, 443	Citronellal	244, 393
Dichloromethane (CH ₂ Cl ₂)	300, 419	4-Chloroisooctane	274, 413, 443	Citral (geranial)	252, 389, 292
Iodomethane (CH ₃ I)	300, 419	Chloromethane	235, 385	Citric Acid	641
Dichlorobromomethane (CHCl ₂ Br)	300, 419	4-Chloromethyl 2,2'-dimethylpentane	274, 413, 443	Citronellal	244, 393
Chloroform (CHCl ₃)	300, 419	Chloroneb	248, 250, 253, 256, 358-360, 363	(+)-Citronellal	392
Dibromochloromethane (CHClBr ₂)	300, 419	4-Chloronitrobenzene	569	Citronellol	274, 389, 392, 396
Chicken Albumin	609	2-Chlorophenol	248, 250, 253, 271,	<i>cis</i> -Citronellyl tiglate	252, 392
Chloral hydrate	235, 248, 383-384			<i>trans</i> -Citronellyl tiglate	252, 392
				Citrulline (Cit)	618
				Clemizole	423

Clindamycin 660
 Clobazam 256, 424
 Clonazepam 256, 424
 Cloridazon 647
 Clotrimazole 660
 Cocaine 242, 244, 252, 421-422, 425, 663
 Codeine 244, 248, 252, 422, 425, 665
 Commamyl acetate 274, 392
 Complement Factor B Precursor 627
 Coprostan (5'-cholestane) 257, 426
 Cortisone acetate 577
 Coumaphos 248, 256, 364-365
p-Coumaric acid 581
 Coumarin 274, 392
 2-Cresol 419
 3-Cresol 419
 4-Cresol 419
m-Cresol 418, 647
o-Cresol 418, 647
p-Cresol 418
 Crimidin 647
 Crotonaldehyde 235, 267, 271, 293, 402, 406
 Crotonaldehyde - DNPH 642
 Crotoxyphos 248, 256, 364-365
 Cumene 239, 263, 273-274, 295, 355, 409, 413, 438
 Cyanazine 253, 256, 359, 647
 2-Cyanopyridine 248, 405
 3-Cyanopyridine 248, 405
 Cyclizine 423
 Cycloate 250, 364
 Cyclohexane 239, 263, 267, 273-274, 289, 293, 413-414, 428-429, 438, 440
 Cyclohexanol 273-274, 402-403
 Cyclohexanone 235, 239, 267, 271, 293, 402, 406, 415
 Cyclohexyl methacrylate 277, 417
 2-Cyclohexyl-4,6-dinitrophenol 248, 253, 271, 377
 Cyclopentane 289, 440
 Cyclopentanol 273, 402
 Cyclopentanone 235, 267, 271, 293, 402, 406
 1-Cyclopentene 289, 440
 Cyclopentylbarbital 256, 423
 Cyclopropane 298-299, 431-432
 Cyheptamide 252, 422
 Cymene 244, 271, 279, 393-395
 Cysteine (Cys) 618
 Cytidine 628
 Cytochrome C 550, 555, 631, 634-635
 Cytosine 670

D

Dacthal 248, 253, 256, 358, 366
 Daidzen 544
 Dalapon 253, 256, 268, 365-366, 378
 DCPA 250, 253, 256, 359-360, 363, 365
 4,4'-DDD 250, 253, 256, 357, 359-360
o,p-DDD 363
p,p-DDD 244, 248, 256, 268, 286, 358, 361-363
 4,4'-DDE 250, 253, 256, 357, 359-360
o,p-DDE 363
p,p-DDE 244, 248, 256, 268, 286, 358, 361-363
 4,4'-DDT 250, 253, 256, 357, 359-360
o,p-DDT 363
p,p-DDT 244, 248, 256, 268, 286, 358, 361-363
 DEA 647
 Decachlorobiphenyl 244, 253, 256, 268, 286, 357, 361-363, 371
 Decanal 244, 274, 393, 405
 Decane (C10) 235, 239, 248, 263, 273-274, 287, 289, 356, 397, 413, 438, 440-441
 1,10-Decanediol 235, 239, 267, 271, 293, 411-412
 Decanoic acid 274, 276, 397, 405
 Decanol 273, 279, 395, 402
n-Decylamine 248, 255, 307, 404-405
 Decylphenone (C10) 569-570
 1-Dehydro-17- α -methyltestosterone (Methandrostenolone) 235, 426
 Dehydroisoandrosterone (Prasterone) 235, 426
 1-Dehydrotestosterone (Boldenone) 235, 426
 1-Dehydrotestosterone acetate 235, 426
 1-Dehydrotestosterone benzoate 235, 426
 1-Dehydrotestosterone undecylenate 235, 426
 Delorazepam 256, 424
 Demeton-O 248, 256, 364-365
 Demeton-S 248, 256, 364-365
 Demoxepam 256, 424
 Dentyphenone (C5) 569-570
 Deoxycorticosterone 577
 2' Deoxycytidine 628
 2' Deoxyguanosine 628
 2' Deoxyinosine 628
 Desethylatrazine 645, 647
 Desethyl-desisopropylatrazine 645
 Desethylterbutylazine 647
 Desipramine 242, 421, 668

Desisopropylatrazine 647
n-Desmethyl methsuximide 235, 422
 Desmethyldiazepam 256, 424
 DETBA 647
 Dextran 607
 Dextromethorphan 248, 425, 626-628, 664
 Diacetone-alcohol 239, 414, 415
 Diacetyl 277, 395
 Diacetylmorphine (Heroin) 244, 425
 Di-allate A 248, 256, 358
 Di-allate B 248, 256, 358
 2,4-Diaminoanisole 256, 417
 2,4-Diaminotoluene 256, 417
 3,4-Diaminotoluene 248, 405
 Diamyl phthalate 248, 376
 Diazepam 252, 256, 422, 424, 565
 Diazinon 248, 250, 256, 364-365
 Dibenz[a,h]anthracene 646
 Dibenzyl phthalate 248, 376
 Diborane 239, 420
 1,2-Dibromo-3-chloropropane (DBCP) 235, 248, 256, 267, 293, 358, 383-384, 412-413
 Dibromoacetic acid 253, 256, 378
 Dibromoacetonitrile 235, 248, 383-384
 1,2-Dibromobenzene 235, 385
 4,4'-Dibromobiphenyl 253, 256, 359
 Dibromochloromethane 235, 248, 267, 293, 383-384
 1,2-Dibromoethane (EDB) 235, 248, 267, 293, 383-385, 412-413
 Dibromomethane (CH₂Br₂) 235, 300, 413, 419
 α,α -Dibromo-*m*-xylene 248, 256, 358
 2,4-Dibromophenol 248, 253, 271, 377
 1,2-Dibromopropane 235, 267, 293, 383
 2,3-Dibromopropionic acid 253, 256, 378
 Dibucaine 284, 422
tert-Dibutyl disulfide 239, 437
 Dibutyl ether 263, 268, 416
 Dibutylchlorendate 248, 256, 358
 Dibutylpentyltin 239, 246, 373
 Dicamba 253, 256, 268, 365-366, 647
 Dichlobenil 253, 366
 Dichlofenthion 248, 256, 364-365
trans-1,4-Dichloro-2-butene 235, 267, 293, 412-413
 1,1-Dichloro-2-propanone 235, 248, 383-384
 Dichloroacetic acid 253, 256, 378
 Dichloroacetonitrile 235, 248, 383-384
 2,4-Dichloroaniline 642
 2,5-Dichloroaniline 642
 2,6-Dichloroaniline 642
 3,4-Dichloroaniline 248, 405, 642

Compound Index

1,2-Dichlorobenzene	235, 239, 263, 273, 385, 407-408, 413, 415	1,3-Diethylbenzene	289, 440	Dimethylformamide (DMF)	235, 267, 293, 414, 416, 428-429
1,3-Dichlorobenzene	235, 239, 263, 273, 385, 407-408, 413, 415	1,4-Diethylbenzene	235, 441	2,2-Dimethylpentane	289, 440
1,4-Dichlorobenzene	235, 239, 263, 273, 385, 407-408, 413, 415	Diethylene glycol	235, 251, 267, 293, 411-412	2,4-Dimethylpentane	289, 440
3,3'-Dichlorobenzidine	256, 417	Diethylene glycol monobutyl ether	235, 267, 271, 293, 411	Dimethylpentyltin	239, 246, 373
3,5-Dichlorobenzoic acid	253, 256, 365	Diethylene glycol monoethyl ether	235, 267, 271, 293, 411	2,3-Dimethylphenol	248, 253, 271, 377
<i>p,p'</i> -Dichlorobiphenyl	363	Diethylene glycol monomethyl ether	235, 267, 271, 293, 411	2,4-Dimethylphenol	248, 250, 253, 271, 377, 418
1,1-Dichloroethane	235, 267, 291, 293, 384-385, 412-413	Diethylenetriamine	307, 405	2,5-Dimethylphenol	248, 253, 271, 377
1,2-Dichloroethane	235, 267, 291, 293, 384-385, 412-413	Diethylstilbestrol	544	2,6-Dimethylphenol	248, 253, 271, 377
<i>trans</i> -1,2-Dichloroethene (ClCH=CHC)	235, 300, 413, 419	Diethyltryptamine	259, 425	3,4-Dimethylphenol	248, 253, 271, 377
1,1-Dichloroethene	235, 267, 293, 385, 412-413	1,4-Difluorobenzene	235, 248, 385, 387	Dimethyltetrasulfide	253, 393
1,1-Dichloroethylene	291, 384	Difolotan	253, 366	2,5-Dimethylthiophene	235, 435
Dichloromethane	239, 302, 415, 439	Diglyme (diethylene glycol dimethyl ether)	267, 293, 410, 411	Dimethyltrisulfide	253, 393
2,3-Dichlorophenol	248, 253, 271, 377	Dihexyl phthalate	248, 376	Dimethyltryptamine	259, 425
2,4-Dichlorophenol	248, 250, 253, 271, 377, 418, 647	Dihydrocarvone	271, 394	1,3-dimethyluric acid	658
2,5-Dichlorophenol	248, 253, 271, 377	<i>trans</i> -Dihydrocarvyl	271, 394	Dimethylxanthine	560
2,6-Dichlorophenol	248, 253, 271, 377	Dihydrocodeine	248, 425	1,7-dimethylxanthine	658
3,4-Dichlorophenol	248, 253, 271, 377	Dihydropentaborane	239, 420	3,7-dimethylxanthine (theobromine)	658
3,5-Dichlorophenol	248, 253, 271, 377	Dihydroquinine	666	Di- <i>n</i> -butyl phthalate	248, 376
Dichloropropane	253, 256, 268, 365-366	Dihydroxybenzyl amine (DHBA)	661	1,3-Dinitrobenzene	644
1,1-Dichloropropane	235, 413	2,3-Dihydroxybiphenol diol	643	2,4-Dinitrophenol	248, 250, 253, 271, 377, 418, 647
1,2-Dichloropropane	235, 267, 293, 385, 412-413	Dihydroxyphenyl acetic acid (DOPAC)	661	2,5-Dinitrophenol	248, 253, 271, 377
1,3-Dichloropropane	235, 413	Dihydroxyphenylalanine (DOPA)	661	2,4-Dinitrotoluene	644
2,2-Dichloropropane	235, 413	Diisobutyl phthalate	248, 376	2,6-Dinitrotoluene	644
<i>cis</i> -1,2-Dichloropropene	267, 293, 412	Diisopropyl ether (DIPE)	295, 355	Di- <i>n</i> -octyl phthalate	248, 376
<i>cis</i> -1,3-Dichloropropene	235, 385, 413	Diisopropylamine	248, 405	Dinonyl phthalate	248, 376
<i>trans</i> -1,2-Dichloropropene	267, 293, 412	1,3-Diisopropylbenzene	235, 263, 407-408, 415	Dinoseb	248, 253, 256, 268, 271, 365-366, 377
<i>trans</i> -1,3-Dichloropropene	235, 385, 413	1,4-Diisopropylbenzene	235, 263, 407-408, 415	1,3-Dioxalane	267, 293, 410
Dichlorvos	248, 250, 256, 364-365	Diltiazem	573	1,4-Dioxane	239, 267, 274, 293, 410, 414-415, 428, 438
<i>cis</i> -1,2-Dichloroethene (ClCH=CHCl)	235, 300, 385, 419	Dimefuron	647	Dioxathion	248, 256, 364-365
Dicrotophos	248, 256, 364-365	Dimenhydrinate	423	Dioxins	290, 368
Dicyclohexyl phthalate	248, 376	Dimethoate	248, 256, 364-365	DIPA	647
Dicyclohexylamine	248, 255, 307, 404-405	3,3'-Dimethoxybenzidine	256, 417	DIPE	239, 439
Dieldrin	244, 248, 250, 253, 256, 268, 286, 357-363	1,2-Dimethoxyethane	239, 429, 439	Diphenamid	250, 253, 364, 366
Dienestrol	667	Dimethyl phthalate	248, 376	Diphenhydramine	423, 560, 658, 666
Diethyl ether	283, 300, 302, 419, 428-429, 439	Dimethyl sulfide	235, 239, 248, 300, 387, 435, 437	Diphenyl isophthalate	248, 376
Diethyl phthalate	248, 274, 376, 392	Dimethylsulfoxide (DMSO)	235, 267, 283, 293, 416, 428, 429	Diphenyl phthalate	248, 376
Diethyl sulfide	235, 435	Dimethyl thiophene	288, 437	Diphenylamine	644
1,2-Diethyl-4-ethylbenzene	289, 440	1,3-Dimethyl-2-imidazolidinone (DMI)	429	Diphenylaniline	248, 405
1,3-Diethyl-5-ethylbenzene	289, 440	<i>n,n</i> -Dimethylacetamide	429	Diphenylpyraline	423
Diethylamine	248, 405	Dimethylamine	235, 404	Dipropenyldisulfide	253, 393
2,6-Diethylaniline	248, 405, 642	Dimethylamphetamine	244, 422	Dipropyl Phthalate	569
<i>n,n</i> -Diethylaniline	248, 405	2,4-Diethylaniline	248, 405	Dipropyldisulfide	253, 393
Diethylbenzene	274, 438	2,6-Diethylaniline	248, 405, 642	Dipropylene glycol	235, 271, 411
1,2-Diethylbenzene	235, 441	1,2-Dimethylbenzene	392	Dipyridamide	573
		<i>n,n</i> -Dimethylbenzylamine	248, 405	Disopramole	666, 670
		2,2-Dimethylbutane	289, 440	Disulfoton	248, 250, 256, 364-365
		2,3-Dimethylbutane	289, 440	Diuron	253, 366, 539, 644-647
				<i>cis</i> -13,16-Docosadienoic acid methyl ester (C22:2)	265, 271, 399-400

cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester (C22:6n3)265, 271, 399-400
n-Docosane248, 356
 Dodecane (C12)239, 263, 273-274, 289, 397, 413, 438, 440
n-Dodecane235, 248, 287, 289, 356, 440-441
 Dodecanoic acid276, 397
 Dodecenal244, 393
 Dodecylphenone569-570
 Dopamine661
n-Dotriacontane287, 441
 Doxepin538, 625-626, 668
 Doxycycline667
 Doxylamine423, 556, 560, 573, 658
 Droperidol284, 425

E

Ecgonine methylester663
 Econazole660
cis-11,14-Eicosadienoic acid methyl ester (C20:2)265, 271, 399-400
n-Eicosane248, 287, 356, 441
cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester (C20:5n3)271, 399
cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester(C20:5n3)265, 400
cis-11,14,17-Eicosatrienoic acid methyl ester (C20:3n3)265, 271, 399-400
cis-8,11,14-Eicosatrienoic acid methyl ester (C20:3n6)265, 271, 399-400
cis-11-Eicosenoic acid methyl ester (C20:1)265, 271, 399-400
 Elaidic acid methyl ester (C18:1n9t)265, 271, 399-400
 Endo-MGK 264235, 372
 Endosulfan I244, 248, 250, 253, 256, 268, 286, 357-363
 Endosulfan II244, 248, 250, 253, 256, 268, 286, 357-363
 Endosulfan sulfate244, 248, 250, 253, 256, 268, 286, 357-363
 Endrin244, 248, 250, 253, 256, 268, 286, 357-363
 Endrin aldehyde244, 248, 250, 253, 256, 268, 286, 357-363
 Endrin ketone244, 248, 253, 256, 268, 286, 357-358, 361-363
 Enkephalin580
 Epagalocatechin651
 Ephedrine244, 422
 Epiandrosterone (*trans*-androsterone)257, 426
 Epicatechin651, 662
 Epicatechin gallate651, 662

Epichlorohydrin267, 293, 410
 Epigallocatechin662
 Epigallocatechin gallate651, 662
 Epinephrine (EP)661
 EPN248, 256, 364-365
 EPTC250, 253, 364, 366
 Erucic acid methyl ester (C22:1n9)265, 271, 399-400
 Estradiol667
 17- α Estradiol257, 426
 β -Estradiol257, 426
 Estriol257, 426, 544
 Estrone257, 426
 ETBE239, 439
 Ethane (C2)274, 289, 298-300, 302-303, 397, 430-432, 435-436, 440
 Ethanol239, 263, 267-268, 273-274, 277, 283, 289, 293, 302, 389, 392, 395, 402, 403, 413-416, 427-429, 439-440
 Ethchlorvynol284, 425
 Ethinamate284, 425
 Ethinylestradiol667
 Ethion248, 256, 364-365
 Ethoprop248, 250, 256, 364-365
 Ethosuximide235, 422
 Ethotoin252, 423
 2-Ethoxyethanol (Cellosolve)273, 277, 402, 403, 429
 2-Ethoxyethyl acetate235, 267, 277, 293, 403, 409-410
 Ethyl acetate235, 239, 263, 267-268, 273-274, 277, 283, 293, 389, 395-396, 409-410, 414-416, 428-429
 Ethyl acrylate235, 263, 267-268, 293, 409-410, 416
 Ethyl alcoholSee Ethanol
 Ethyl benzoate235, 267, 274, 293, 396, 409-410
 Ethyl butyrate274, 396, 410
 Ethyl caproate274, 410
 Ethyl cellosolve414
 Ethyl disulfide235, 435
 Ethyl ether267, 293, 410, 414, 428
 Ethyl formate235, 267, 273, 277, 283, 293, 395, 403, 409-410, 414, 428
 Ethyl mercaptan235, 239, 300, 435, 437
 Ethyl methacrylate277, 417
 Ethyl methyl sulfide235, 435
 Ethyl parathion248, 256, 364-365
 Ethyl propionate235, 263, 267-268, 274, 293, 409-410, 416
 Ethyl thiophene288, 437
 Ethyl valerate274, 410

Ethyl vinyl ether267, 293, 410
 2-Ethyl-1-butanol274, 403
 2-Ethyl-1-hexanol273, 279, 396, 402
 Ethyl-3-phenyl oxiran carboxylate274, 396
 2-Ethyl-6-methylaniline642
 Ethylbenzene235, 239, 263, 271, 273-274, 283, 289, 293, 295, 355, 385, 407-409, 413, 415, 428-429, 438-441
 Ethylbenzene-d10235, 441
 Ethylene298-300, 302-303, 431-432, 435-436
 Ethylene glycol235, 239, 267, 271, 273, 283, 293, 402, 411-412, 419, 428
 Ethylene glycol monobutyl ether235, 267, 271, 293, 411
 Ethylene glycol monoethyl ether235, 267, 271, 293, 411
 Ethylene glycol monomethyl ether235, 267, 271, 293, 411
 Ethylene glycol phenyl ether239, 412
 Ethylene glycol/monoacetate277, 403
 Ethylene glycol/monoformate277, 403
 Ethylene oxide271, 277, 300, 302, 403, 419-420, 439
 Ethylenediamine307, 405
 2-ethylhexyl salicylate657
 2-ethylhexyl *trans*-4-methoxycinnamate657
 Ethylhexylsalicylate538-539
 Ethylmorphine248, 425
 Ethylparaben565, 654
 α -Ethylphenethyl alcohol273, 402
 β -Ethylphenethyl alcohol273, 402
 2-Ethylphenol419
 4-Ethylphenol419
 Ethyl-tert-butyl ether (ETBE)295, 355
 2-Ethylthiophene235, 435
 Ethyltoluene271, 439
m-Ethyltoluene274, 438
p-Ethyltoluene274, 438
 Etridiazole250, 253, 256, 359-360, 363
 Eugenol252, 392
 Excipient656
 Exo-MGK 264235, 372

F

FAMES261-262, 265, 271, 274, 397-400, 410
 Famotidine669
 Famphur248, 256, 364-365
 Faneosolacetate253, 394
trans- β -Farnesene271, 394
 Farnesol252, 392
 Fatty Acids261-262, 265, 271, 274, 397-400, 410

Compound Index

Fenamiphos 250, 364
Fenarimol 250, 364
Fenchone 252, 392
Fenfluramine 624
Fenitrothion 248, 256, 364-365
Fensulfotthion 248, 256, 364-365
Fentanyl 242, 259, 268, 421, 424-425
Fenthion 248, 256, 364-365
Fenuron 539, 647
Ferulic acid 581
Flunarizine 573
Flunitrazepam 256, 424
Fluoranthene 646
Fluorene 646
Fluorobenzene 235, 407-408
2-Fluorobenzoic acid 661
3-Fluorobenzoic acid 661
Fluorocytosine 670
Flurazepam 252, 256, 422, 424
Fluridone 250, 253, 364, 366
Folic acid 656
Fonofos 248, 256, 364-365
Formaldehyde 248, 271, 387, 407
Formaldehyde-DNPH 235, 407, 642
Formaldehyde-PFBHA 235, 407
Formic acid 276-277, 397, 403
Freon 11 (CC13F) 300, 419
Freon 11 (Trichlorofluoromethane) 235, 385
Freon 113 (CF3CCl3) 300, 419
Freon 113
(1,1,2-Trichloro-1,2,2-trifluoroethane) ... 235, 385
Freon 113
(1,1,2-Trichlorotrifluoroethane) ... 235, 267, 293,
412-413
Freon 114
(1,2-Dichloro-1,1,2,2-tetrafluoroethane) ... 235,
385
Freon 114 (C1CF2 CF2 Cl) 300, 419
Freon 12 (CC12F2) 300, 419
Freon 12 (Dichlorodifluoromethane) ... 235, 385
Freon 12B2 (CF2Br2) 300, 419
Freon 21 (CHC12F) 300, 419
Freon 22 (CHC1F2) 300, 419
Fructose 652
 δ -Fructose 268, 397
Fucitol 265, 396
Fumaric Acid 641
Furan 267, 293, 410
Furans 290, 368
Furazolidone 576
Furfural 235, 267, 271, 293, 402, 406
Furfuryl alcohol 273, 402

G

Galactitol 265, 396
 α -D-Galactose 268, 397
Genistein 544
Geraiol 274, 392
Geranial 244, 393
Geraniol 253, 274, 389, 394, 396
trans-Geraniol 252, 392
Geranylacetate 244, 253, 393-394
Germacrene-D 253, 271, 394
Glucitol 265, 396
Glucose 652
 α -D-Glucose 268, 397
 β -D-Glucose 268, 397
Glutamic Acid (Glu) 618, 624
Glutamine (Gln) 618
Glutethimide 242, 284, 421, 425
Glyburide 669
Glyceryl Guaicolate 612
Glycidol 273, 402
Glycine (Gly) 618, 624
Glycine-tyrosinedipeptide (Gly-Tyr) 580
Glyme
(propylene glycol dimethyl ether) ... 267, 293,
410-411
GMP 612, 629
Guaifenesin 664
Guanine 670
Guanosine 628

H

Halazepam 256, 424
Haloperidol 284, 425
Halothane 300, 419
Heneicosanoic acid methyl ester
(C21:0) 265, 271, 399-400
1,7-Hepatanediol 239, 412
Heptachlor 244, 248, 250, 253, 256,
268, 286, 357-363
Heptachlor epoxide 244, 248, 250, 253, 256,
268, 286, 357-363
Heptadecane 235, 372
n-Heptadecane 287, 441
Heptadecanoic acid methyl ester
(C17:0) 265, 271, 399-400
cis-10-Heptadecenoic acid methyl ester
(C17:1) 265, 271, 399-400
Heptanal 235, 267, 271, 274,
293, 402, 405-406
Heptane (C7) 235, 239, 263, 267, 273-274,
283, 287, 289, 293, 302, 397,
408, 413-414, 428-430, 438,
440-441

1,7-Heptanediol 235, 267, 271, 293, 411
1-Heptanethiol 235, 435
Heptanoic acid 273-274, 276, 397, 403, 405
1-Heptanol 273-274, 402-403
2-Heptanol 273, 402
3-Heptanol 273, 402
2-Heptanone 235, 267, 271, 293, 402, 406
3-Heptanone 235, 267, 271, 293, 402, 406
4-Heptanone 235, 267, 271, 293, 402, 406
trans-2-Hepten-1-ol 273, 402
Heptylphenone 569-570
Herbicides 253, 256, 268, 365-366, 647
Heroin 242, 248, 421, 425
Hexabromobenzene (HBB) 363
Hexachloro-1,3-butadiene 235, 385
Hexachlorobenzene 248, 250, 253, 256,
358-360, 363
Hexachlorobutadiene 235, 267, 293, 412-413
Hexachlorocyclopentadiene 235, 250, 253,
256, 267, 293,
359-360, 412-
413
Hexachloroethane 235, 267, 293, 412-413
Hexachloropentadiene 248, 256, 358
n-Hexacosane 248, 356
Hexadecane (C16) 248, 274, 287,
356, 397, 441
Hexadecanoic acid 276, 397
Hexaldehyde - DNPH 642
Hexamethylphosphoramide ... 248, 256, 364-365
Hexanal 235, 267, 271, 274,
293, 402, 405-406
Hexane 235, 239, 263, 267, 273-274, 283,
287, 289, 293, 298-299, 302, 413-
414, 428-432, 439-441
1,6-Hexanediol 235, 267, 271, 293, 411
1-Hexanethiol 235, 435
Hexanoic acid 274, 405
Hexanol 389
1-Hexanol 274, 403
2-Hexanol 273, 402
3-Hexanol 273, 402
2-Hexanone 235, 267, 271, 293, 402, 406
3-Hexanone 235, 267, 271, 293, 402, 406
n-Hexatriacontane 287, 441
Hexazinone 645, 647
Hexazinone 250, 253, 364, 366
cis-2-Hexen-1-ol 273, 402
cis-3-Hexen-1-ol 273, 402
cis-4-Hepten-1-ol 273, 402
Hexobarbital 256, 423
Hexogen (RDX) 644
Hexyl 644
Hexyl 2-ethylhexyl phthalate 248, 376
1-Hexyl mercaptan 300, 437

n-Hexyl mercaptan 239, 437
 Hexyl methacrylate 277, 417
 Hexylphenone (C6) 569-570
 Histidine 618, 624
 HMX 644
 Homovanillic acid (AVA) 661
 α -Humulene 244, 393
 Hydrastine 662
 Hydrocarbon 274, 409
 Hydrocortisone 577, 590, 688, 670
 Hydrogen Sulfide (H₂S) 235, 239, 248, 300, 302, 387, 420, 430, 435, 437
 Hydroxy acetate 277, 403
 Hydroxy citronellal 389
 2-hydroxy-4-methoxybenzophenone 657
 Hydroxyindoleacetic acid (HIAA) 661
 4-Hydroxy-4-methyl-2-pentanone 273, 402
 Hydroxyprogesterone 577
 Hydroxypropyl acrylate 277, 417
 5-Hydroxytryptamine 661
 Hydroxyzine 423
 Hypoglycin (Hyp) 618

I

Ibogaine 242, 259, 421, 425
 Ibuprofen 244, 276, 426, 658
 IgG Dimer and Aggregate 609
 IgG2a, I HOPC-1 625
 IgM, MOPC-104E 625
 Imipramine 252, 422, 625, 688
 Indane 235, 289, 440-441
 Indeno{1,2,3-cd}pyrene 646
 Indole 671
 3-Indole acetic acid 648
 3-Indole butyric acid 648
 3-Indole propionic acid 648
 Inosine 628
 Inositol 265, 396
 Insulin 550, 554-555, 632
 Insulin (BOV) 630-631
 Iodobenzene 235, 407-408
 Iodoethane (CH₃CH₂I) 300, 419
 Iodoform 235, 267, 293, 412-413
 Iodomethane 235, 267, 293, 412-413
 Iodonoalfluorobutane (C₄F₉I) 300, 419
 Iodopropane (CH₃CH₂CH₂I) 300, 419
 Isoamyl acetate 235, 267, 274, 293, 396, 409-410
 Isoamyl alcohol 277, 395
 Isoamyl butyrate 274, 396
 Isoamyl mercaptan 239, 437
 Isoamyl salicylate 274, 392
 (+/-)-Isoborneol 279, 392, 395

Isobutane 274, 288, 298-300, 302, 303, 403, 430-432, 435-436
 Isobutanol 239, 263, 268, 273-274, 277, 389, 395, 402, 415-416, 439
 Isobutyl acetate 235, 263, 267-268, 273, 293, 409-410, 414, 416
 Isobutyl acrylate 263, 268, 416
 Isobutyl mercaptan 239, 437
 Isobutyl propionate 263, 268, 416
 Isobutylbenzene 235, 263, 289, 407-408, 415, 440
 Isobutylene 298-299, 431-432
 Isobutyraldehyde 235, 267, 271, 293, 402, 406
 Isobutyric acid 273-274, 276, 397, 403
 Isocaproic acid 273, 276, 397, 403
 Isodrin 248, 256, 358, 363
trans-Isoeugenol 252, 392
 Isoleucine (Ile) 618
 Isomaltose 652
 δ -Isomethone 271, 394
 Isooctane 235, 239, 263, 273, 289, 293, 355, 413-414, 429, 440-441
 Isopentane 239, 288-289, 298-300, 302-303, 430-432, 435-436, 440, 625
 Isopropanol 239, 267, 273, 283, 293, 402, 414-415, 427-428
 Isopropyl acetate 235, 239, 267, 273, 293, 409-410, 414-415, 429
 Isopropyl acrylate 263, 268, 416
 Isopropyl alcohol 273, 283, 414, 428
 Isopropyl amine 283, 428
 Isopropyl ether 267, 293, 410
 Isopropyl mercaptan 239, 437
 4-Isopropylaniline 642
 Isopropylbenzene 263, 271, 273-274, 289, 408, 415, 438-440
 Isopropylbenzene (cumene) 235, 407-408
 2-Isopropylphenol 419
 Isoproturon 645, 647
 Isopteropodin 666
 Isorrhynchophyllin 666
 Isovaleric acid 273-274, 276, 397, 403, 405

J

Jasmolin I 235, 372
 Jasmolin II 235, 372
cis-Jasmone 271, 394

K

Karbutyl 647
 Kelthane 248, 256, 358
 Ketamine 244, 425
 Ketimine 259, 425
 Kinetin 648
 Krypton 301, 430

L

Lactic Acid 641
 Lauric acid methyl ester (C12:0) 265, 271, 399-400
 Leptophos 248, 256, 364-365
 Leucine (Leu) 618, 624
 Leucine enkephalin 630, 631
 IgG2a 625
 IgM 625
 Lidocaine 242, 244, 284, 421-422, 425, 545, 659, 670
 Lidoflazine 573
 Lignoceric acid methyl ester (C24:0) 265, 271, 399-400
 Limonene 244, 274, 389, 392, 393
 δ -Limonene 244, 393
 (-)-Limonene 279, 395
 (+)-Limonene 279, 395
 (+/-)-Limonene 271, 279, 394-395
 Linalool 244, 253, 271, 274, 279, 389, 391-395
 (+/-)-Linalool 279, 395
 Linalyl acetate 271, 274, 391-392
 Lincomycin 660
 Lindane 250, 360
 Linoleic acid methyl ester (C18:2n6c) 265, 271, 399-400
 Linolelaidic acid methyl ester (C18:2n6t) 265, 271, 399-400
 Linolenic acid methyl ester (C18:3n3) 265, 271, 399-400
 γ -Linolenic acid methyl ester (C18:3n6) 265, 271, 399-400
 Linuron 539, 645, 647
 Lofentanyl 268, 424
 Lorazepam 256, 424
 LSD 242, 259, 421, 425
 Lysine (lys) 618, 624
 Lysozyme 550, 554-555, 630-632, 634-636

M

Malathion 248, 256, 364-365
 Maleate 560
 Maleic acid 626-628
 Mannitol 265, 396
 δ -Mannose 268, 397
 MCPA 253, 256, 268, 365-366, 647
 MCPB 647
 MCPP 253, 256, 268, 365-366, 647
 Mct - Trp 612
 Meclizine 423
 Medazepam 256, 424
 Mefanamic Acid 569

Compound Index

1R,2S,5R-(-)-Menthol	392	2-Methyl butanal	274, 405	2-Methyl-5-nitroaniline	256, 417
1S,2R,5S-(+)-Menthol	392	2-Methyl butyric acid	274, 403	Methylamine	235, 404
(-)-Menthol	279, 392	Methyl decanoate (C10:0)	274, 410	4-Methylaminorex	259, 425
(+)-Menthol	279, 392	Methyl disulfide	235, 393, 435	Methylansiole	253, 394
(+/-)-Menthol	271, 394	Methyl dodecanoate	274, 410	2-methyl-butanol (active amyl alcohol)	389
Menthyl acetate	271, 394	Methyl eicosenoate	274, 410	3-methyl-butanol (isoamyl alcohol)	389
Meperidine	252, 422	Methyl ephedrine	244, 422	2-Methyl-2-butanol	
Mephobarbital	256, 423	Methyl ethyl ketone (MEK)	239, 267, 273, 293, 414-415, 428	(tert-amyl alcohol)	273, 402
Mepivacaine	284, 422	Methyl formate	235, 239, 267, 293, 409-410, 415	2-Methyl-2-butene	289, 298, 431, 440
Meprobamate	284, 425	Methyl heptin carbonate	389	2-Methylbutyl acetate	235, 267, 293, 409-410
Merphos	248, 250, 256, 364-365	Methyl hexadecanoate	274, 410	Methylcyclohexane	429
Mert	624	α -Methyl Ionone	274, 392	Methylcyclopentane	289, 440
Mescaline	259, 425	Methyl isobutyl ketone	273, 414	1-Methyl-1-cyclopentene	289, 440
Mesityl oxide	239, 415	Methyl mercaptan	235, 239, 248, 300, 387, 435, 437	<i>trans</i> -1-(Methyldithio)-1-propene	253, 393
Mesitylene	239, 263, 273, 413	Methyl methacrylate	263, 268, 277, 416-417	Methylene chloride	235, 267, 273, 283, 293, 385, 412-414, 428-429
Mesterolone	235, 426	Methyl octadecanoate	274, 410	4,4'-Methylenedianiline	256, 417
Metabromuron	647	Methyl parathion	248, 256, 364-365	3,4-Methylenedioxyamphetamine (MDA)	244, 422
Metalacher	647	Methyl propionate	235, 263, 267-268, 293, 409-410, 416	3,4-Methylenedioxyethylamphetamine (MDE; Eve)	244, 422
Metamitron	647	Methyl salicylate	651	3,4-Methylenedioxymethylamphetamine	244, 422
Metazachlor	645, 647	Methyl tetradecanoate	274, 410	2-Methylheptane	289, 440
Met-enkephalin	580, 630	Methyl thiophenes	288, 437	3-Methylheptane	289, 440
Methabenzthiazuron	645, 647	2-Methyl-1-butanol		4-Methylheptane	289, 440
Methacrolein	235, 267, 271, 293, 402, 406, 416	(active amyl alcohol)	273, 402	1-Methylnaphthalene	235, 441
Methacrolein-DNPH	642	3-Methyl-1-butanol		2-Methylnaphthalene	235, 289, 440-441
Methacrylonitrile	235, 267, 293, 416	(isoamyl alcohol)	273, 402	Methylparaben	654
Methadone	242, 252, 421-422	2-Methyl-1-butanol / (3-Methyl-1-butanol)	274, 395	2-Methylpentane	289, 295, 355, 440
Methamphetamine	244, 252, 422	2-Methyl-1-butene	289, 440	3-Methylpentane	239, 263, 273, 289, 293, 295, 355, 413, 440
Methane	288-289, 298-301-303, 419, 430-432, 435-436, 440	2-Methyl-1-pentene	289, 440	3-Methyl-3-pentanol	274, 403
Methanol	239, 263, 267-268, 271, 273-274, 277, 283, 293, 302, 389, 395, 402, 407, 413-416, 427-429, 435, 439-440	2-Methyl-1-propanethiol	235, 300, 435, 437	2-Methylphenol	248, 253, 271, 377
Methapyrilene	423	2-Methyl-1-propyl mercaptan	300, 437	3-Methylphenol	248, 253, 271, 377
Methaqualone	242, 284, 421, 425	Methyl-2,4-dichlorophenylacetate	253, 256, 365	4-Methylphenol	248, 253, 271, 377
Methoxytyrosine	661	4-Methyl-2,5-dimethoxyamphetamine (STP)	244, 422	5-Methyl-5-phenylhydantoin	235, 422
Methionine (Met)	618	3-Methyl-2-butanone	235, 267, 271, 293, 402, 406	2-Methyl-2-propanethiol	235, 300, 435, 437
Methofuran	271, 394	3-Methyl-2-buten-1-ol	273, 402	2-Methyl-2-propanol (<i>tert</i> -butanol)	429
Methohexital	256, 423	1-Methyl-2-ethylbenzene	235, 441	1-Methyl-1-propanethiol	300, 437
(+/-)-Methone	271, 394	4-Methyl-2-pentanol	273-274, 402-403	1-Methyl-1-propyl mercaptan	300, 437
Methoprene	235, 372	4-Methyl-2-pentanone (MIBK)	235, 267, 271, 293, 402, 406	2-Methyl-2-propyl mercaptan	300, 437
1-Methoxy-2-propanol	429	1-Methyl-2-pyrrolidine	248, 405	Methylpropyldisulfide	253, 393
2-Methoxy-5-methylaniline	256, 417	1-Methyl-2-pyrrolidinone	235, 267, 293, 416	Methylpropyltrisulfide	253, 393
Methoxychlor	244, 248, 250, 253, 256, 268, 286, 357-363	2-Methyl-3-buten-2-ol	273, 402	<i>n</i> -Methylpyrrolidone	429
2-Methoxyethanol		1-Methyl-3-ethylbenzene	235, 441	4-Methylstyrene	235, 407-408
(methyl Cellosolve)	273, 402	2-Methyl-3-pentanone	235, 267, 271, 293, 402, 406	α -Methylstyrene	235, 273-274, 407-408, 438, 439
Methsuximide	235, 422	1-Methyl-3-propylbenzene	289, 440	β -Methylstyrene	271, 439
Methyltripentyltin	239, 246, 373	2-Methyl-4,6-dinitrophenol	248, 250, 253, 271, 377, 418, 647	Methyl- <i>tert</i> -butyl ether (MTBE)	235, 239, 263, 267, 273, 293, 295, 355, 410, 413, 441
Methyl acetate	235, 263, 267-268, 293, 409-410, 416	1-Methyl-4-ethylbenzene	235, 441	17 α -Methyltestosterone	235, 426
Methyl acetylene	300, 303, 436			2-Methylthiophene	235, 435
Methyl acrylate	263, 268, 274, 416-417			3-Methylthiophene	235, 435
Methyl benzoate	235, 253, 267, 293, 394, 409-410				

1-methylxanthine 658
 Metobromuron 645, 647
 Metolachlor 250, 253, 256, 359,
 364, 366, 644-645
 Metoxuron 645, 647
 Metprolol 625
 Metribuzin 250, 253, 256, 359, 364, 366, 647
 Metsulfuron-methyl 648
 Mevinphos 248, 250, 256, 364-365
 MGK-264 250, 364
 Miconazole 660
 Minocycline 667
 Mirex 248, 256, 358, 363
 Mitraphyllin 666
 Molinate 250, 253, 364, 366
 Monlinuron 645
 6-Monoacetylmorphine 248, 425
 Monocrotophos 248, 256, 364-365
 Monolinuron 539, 647
 Monuron 253, 366, 539
 Morphine 244, 248, 425, 665
 Morphine-3-glucuronide 665
 Morphine-6-glucuronide 665
 Mouse IgG 609
 Mouse IgM 609
 MTBE 239, 283, 428-429, 439
 Musk ketone 274, 392
 Musk xylene 274, 392
 Myoglobin 550, 554-555, 630-632
 Myrcene 244, 271, 392-394
 Myristic acid methyl ester
 (C14:0) 265, 271, 399-400
 Myristoleic acid methyl ester
 (C14:1) 265, 271, 399-400

N

Nadolol 670
 Naled 248, 256, 364-365
 Nalidixic Acid 576
 Naphthalene 235, 239, 263, 273, 289, 293,
 295, 355, 413, 440-441,
 569,646
 Naphthalene-d8 235, 441
 1-Naphthol 418
 1-Naphthyl acetamide 648
 1-Naphthyl acetic acid 648
 Napropamide 250, 253, 364, 366
 Naproxen 569
 Nefopam 284, 422
 Neomenthol 271, 394
 (-)- Neomenthol 279, 392
 (+)-Neomenthol 279, 392
 Neon (Ne) 301, 430, 624
 Neral 244, 389, 393

Nervonic acid methyl ester
 (C24:1) 265, 271, 399-400
 Nerylacetate 244, 393
 Neurentensin 630
 Neurotensin 554, 632
 Niacinamide 657
 Nicotinamine 244, 422
 Nicotine 242, 244, 421, 426
 Nicotinic Acid 657
 Nifedipine 573, 586, 670
 2,4-Nimethylphenol 647
 Nimodine 586
 Nimodipine 670
 Nisoldipine 586, 670
 2-Nitroaniline 248, 405
 3-Nitroaniline 248, 405
 4-Nitroaniline 248, 405
 Nitrobenzene 235, 407-408
 2-Nitrobenzoic acid 661
 3-Nitrobenzoic acid 661
 Nitrogen 300-301, 419-420, 430
 2-Nitrophenol 248, 250, 253, 271,
 377, 418, 647
 3-Nitrophenol 248, 253, 271, 377
 4-Nitrophenol 248, 250, 253, 256, 271,
 365, 377, 418, 647
 Nitropropane 239, 415
 2-Nitrotoluene 235, 263, 407-408, 415, 644
 3-Nitrotoluene 235, 263, 407-408, 415, 644
 4-Nitrotoluene 235, 263, 407-408, 415, 644
 2-Nitroxylyene 257, 268, 367
cis-Nonachlor 250, 360
trans-Nonachlor 248, 250, 256, 358, 360
 Nonanal 244, 393
 Nonane 239, 263, 273-274, 287,
 289, 413, 438, 440-441
 1,9-Nonanediol 235, 239, 267, 271,
 293, 411-412
 Nonanol 273, 279, 395, 402
 Nonyl aldehyde 235, 267, 271, 293, 402, 406
n-Nonylamine 248, 255, 307, 404-405
 Nonylphenone 569-570
 Nootkatone 244, 393
 Norcodeine 248, 425
 Norepinephrine 661
 Norethandrolone 235, 426
 Norethindrone 667
 Norflurazon 250, 253, 364, 366
 Normorphine 248, 425
 19-Nortestosterone (Nandrolone) 235, 426
 19-Nortestosterone-17-decanoate 235, 426
 19-Nortestosterone-17-propionate 235, 426
 Nortriptyline 538, 625-626, 668
cis-10-OH - Nortriptyline 668

trans-10-OH - Nortriptyline 668
 Norvaline (Nva) 618, 624

O

OcCDD 290, 368
 OcCDF 290, 368
cis-Ocimene 271, 394
n-Octacosane 248, 287, 356, 442
 Octadecane (C18) 235, 248, 274, 287,
 356, 372, 397, 441
 Octadecanoic acid 276, 397
 Octanal 244, 274, 393, 405
 Octane (C8) 235, 239, 263, 273-274, 287,
 289, 397, 413, 438, 440-441
 1,8-Octanediol 235, 267, 271, 293, 411
 Octanoic acid 274, 276, 397, 405
 Octanol 244, 273, 279, 393, 395, 402
 3-Octanol 271, 394
 1-Octen-3-ol 271, 394
 Octogen (HMX) 644
 Octyl aldehyde 235, 267, 271, 293, 402, 406
n-Octyl mercaptan 239, 437
 3-Octylacetate 271, 394
n-Octylamine 248, 255, 307, 404-405
 Octylphenone 569-570
 Oleic acid methyl ester
 (C18:1n9c) 265, 271, 399-400
 Orotic Acid 612, 629
 Ovalbumin 554, 632, 634
 Oxazepam 256, 424
 Oxolinic Acid 576
 Oxybensone 538-539
 4,4'-Oxydianiline 256, 417
 Oxygen 301, 430
 Oxymetholone 235, 426
 Oxymorphone 665
 Oxypropenol 625

P

Padimate-O 538-539, 657
 Palatinose 652
 Palmatine 662
 Palmitic acid methyl ester
 (C16:0) 265, 271, 399-400
 Palmitoleic acid methyl ester
 (C16:1) 265, 271, 399-400
 Pantothenic acid 656
 Parvalbumin 550
 PCBs 253, 256, 371
 PCP 242, 259, 421, 425
 Pebulate 250, 253, 364, 366
 PEMA 252, 423
 Pencycuron 539, 647

Compound Index

Pendimethalin	647	Phenoxy acid Herbicides	253, 256, 268, 365-366, 647	Prometon	250, 253, 257, 268, 364, 366-367, 645, 648
Pentaborane	239, 420	2-Phenoxyethanol	273, 402	Prometron	644
Pentachlorobenzene	235, 407-408	Phensuximide	235, 422	Prometryn	250, 364, 645, 647-648
Pentachloroethane	235, 267, 293, 412-413	Phentermine	244, 422, 624	Prometryne	253, 257, 268, 366-367, 644-646
Pentachloronitrobenzene	248, 253, 256, 358, 359, 363	Phenyl acetaldehyde	389	Pronamide	250, 253, 364, 366
Pentachlorophenol	248, 250, 253, 256, 268, 271, 365-366, 377, 418, 647	2-Phenyl heptene	409	Propachlor	248, 250, 253, 256, 358-360, 363
<i>n</i> -Pentadecane	287, 441	Phenylacetone	244, 422	Propadiene	298-299, 431-432
Pentadecanoic acid methyl ester (C15:0)	265, 271, 399-400	Phenylacetylene	271, 274, 438-439	Propane (C3)	274, 288-289, 298-300, 302-303, 397, 409, 430-432, 435-436, 440
<i>cis</i> -10-Pentadecenoic acid methyl ester (C15:1)	265, 271, 399-400	Phenylalanine (Phe)	618, 624, 628	1,3-Propanediol	235, 267, 271, 293, 411
Pentamethylbenzene	235, 441	2-Phenylbutene - C ₂ H ₅ -C(Ph) = CH ₂	409	1,2-Propanediol (propylene glycol)	267, 271, 293, 411
Pentanal	274, 405	Phenylephedrine	244, 422	1-Propanethiol	235, 300, 411, 435, 437
Pentane (C5)	239, 267, 274, 287-289, 293, 298-300, 302-303, 397, 409, 412, 430-432, 435-436, 439-441	Phenylephrine	612	2-Propanethiol	235, 300, 435, 437
1,5-Pentanediol	235, 267, 271, 293, 411	Phenylethanol	389	Propanil	253, 366, 644-646
1-Pentanethiol	235, 435	Phenylethylamine	248, 405	Propanoic acid	274, 405
1-Pentanol	273-274, 402-403, 429	Phenylethylmalonamide	235, 422	Propanol	239, 248, 267, 273-274, 277, 283, 289, 293, 387, 395, 402-403, 414-415, 427-429, 439
2-Pentanol	273, 402	2-Phenylhexene - C ₄ H ₉ -C(Ph) = CH ₂	409	Propanolol	626, 668
3-Pentanol	273, 389, 402	Phenyltoin	235, 252, 422, 423	2-Propanone	302, 439
2-Pentanone	235, 267, 271, 273, 293, 402, 406, 414	Phenyltoloxamine	423	Propazine	250, 253, 257, 268, 364, 366-367, 644-648
3-Pentanone	235, 267, 271, 293, 402, 406	1-Phenyl hexane	409	2-Propen-1-ol (allyl alcohol)	273, 402
2-Pentanone (MIBK)	429	Phorate	248, 256, 364-365	<i>cis</i> -1-(Methyldithio)-1-propene	253, 393
2-Penten-1-ol	273, 402	Phosmet	248, 256, 364-365	Propiomazine	284, 425
1-Penten-3-ol	273, 402	Phosphamidon	248, 256, 364-365	Propionaldehyde	235, 267, 271, 293, 402, 406
1-Pentene	289, 298-299, 431-432, 440	Phosphine	239, 420	Propionaldehyde - DNPH	642
<i>cis</i> -2-Pentene	298, 431	<i>bis</i> -(2-ethoxyethyl) phthalate	248, 376	Propionic acid	273, 276-277, 395, 397, 403
<i>n</i> -Pentene	302, 435	<i>bis</i> -(2-ethylhexyl) phthalate	248, 376	Propionitrile	235, 248, 267, 293, 405, 416
<i>trans</i> -2-Pentene	298, 431	<i>bis</i> -(2- <i>n</i> -butoxyethyl) phthalate	248, 376	Proposyphene	252, 422
4-Pentenoic acid	274, 403	<i>bis</i> -(4-methoxyethyl) phthalate	248, 376	Propranolol	569, 625, 670
<i>trans</i> -2-Pentenoic acid	274, 403	<i>bis</i> -(4-methyl-2-pentyl) phthalate	248, 376	Propyl acetate	235, 267, 274, 293, 409-410
<i>trans</i> -3-Pentenoic acid	274, 403	Phthalic	661	Propyl benzoate	235, 267, 293, 409-410
Pentobarbital	256, 423	Picloram	253, 256, 268, 365-366	Propyl butyrate	274, 410
Pentyl ether	267, 293, 410	Picric acid	644	Propyl caproate	274, 410
1-Pentyl mercaptan	300, 437	Pindolol	625, 670-671	Propyl ether	267, 293, 410
<i>cis</i> -Permethrin	248, 250, 253, 256, 358-360, 363	1S(-)-b-Pinene	392	Propyl formate	235, 267, 293, 409-410
<i>trans</i> -Permethrin	248, 250, 253, 256, 358-360, 363	α -Pinene	244, 271, 279, 393-395	1-Propyl mercaptan	300, 437
Perthane	248, 256, 358	β -Pinene	244, 271, 279, 392-395	2-Propyl mercaptan	300, 437
α -Phellandrene	244, 393	Piperazine	307, 405	<i>n</i> -Propyl mercaptan	239, 437
Phenacetin (acetophenetidin)	244, 422, 624, 659	5-benzyl-3, 6-dioxo-2-piperazineacetic acid	628	Propyl propionate	235, 267, 274, 293, 409-410
Phenanthrene	646	Piperitone	271, 394	Propyl valerate	274, 410
Phencyclidine (PCP)	252, 422	Pirenzepine	669	Propylbenzene	235, 239, 263, 273-274, 289, 407-409, 413, 438, 440
Phenethylalcohol	279, 395	Poly brominated diphenylethers (PBDEs)	369	<i>n</i> -Propylbenzene	235, 263, 271, 273-274, 289, 408, 415, 438-441
Pheniramine	423	Polyethylene glycol 200	251, 412	Propylene	298-300, 302-303, 409, 431-432, 435-437
Phenobarbital	235, 242, 252, 256, 421-423	Polyethylene glycol 400	251, 412	Propylene glycol	273, 402
Phenol	248, 250, 253, 271, 377, 418-419, 534, 569, 647	Polyethylene glycol 600	251, 412	Propylparaben	654
		Polymethoxyflavones	244, 393	2-Propyn-1-ol (propargyl alcohol)	273, 402
		Prazepam	256, 424	Propyne	298-299, 431-432
		Primidone	235, 252, 422-423	Protocatechuic acid	581
		Procainamide	666, 670		
		Procaine	244, 284, 422, 425, 545, 659, 670		
		Progesterone	257, 426, 577, 669		
		Proline (Pro)	618, 624		
		Promazine	252, 423		
		Promethazine	252, 423		

Proylphenone (C3) 569-570
 Pseudoephedrine 244, 560, 626-658, 660
 Psilocin 259, 425
 PTBEs 369
 Pteropodin 666
 Pulegone 271, 394
 Pyrazole 248, 405
 Pyrene 646
 Pyrethrin I 235, 372
 Pyrethrin II 235, 372
 Pyridazine 248, 405
 Pyridine 235, 248, 267, 293, 405,
 414, 416, 428, 534
 Pyridoxine 657
 Ppyrilamine 244, 423, 612, 660
 Pyrimidine 248, 405
 Pyrithyldione 284, 425

Q

Quercetin 544, 576
 Quinine 244, 425, 666

R

RDX 644
 all-trans Retinol 655
 Retinol 656
 Retinol acetate 656
 Retinol palmitate 656
 Rhamnitol 265, 396
 Rhynchophyllin 666
 Ribitol 265, 396
 Ribonuclease A 634
 δ -Ribose (anomers) 268, 397
 Risulfuron-methyl 648
 RNA polymerase 636
 RNase 550, 554, 630, 632
 RNase (Bovine) 609
 RNase A 631
 Ronnel 248, 256, 364-365

S

S-100 β 550
 S-100a 550
trans-Sabinene hydrate 271, 394
 Sabinene 244, 271, 393-394
 Saccharose 652
 Salicylamide 284, 422, 638
 Salicylic acid 659
 Salts: Tris, Na₂HPO₄, NaCl 609
 Sarcosine (Sar) 618
 Scopolamine 244, 560, 658, 660
 Sebutylazine 645, 647

Secbumeton 253, 257, 268, 366-367
 Secobarbital 256, 423
 Selenide 239, 420
 Serine (Ser) 618, 624
 Simazine 248, 250, 253, 256-257, 268, 359-
 360, 364-367, 644-645, 647-648
 Simetryn 250, 253, 364, 366
 Simetryne 257, 268, 367
 α -Sinensal 244, 393
 β -Sinensal 244, 393
 Sodium Azide 634
 Spectiophyllin 666
 Stanazolol 235, 426
 Stearic acid methyl ester
 (C18:0) 265, 271, 399-400
 Stigmasterol 257, 426
 Stirophos 248, 250, 256, 364-365
 Strawberry aldehyde 274, 396
 Strychnine 244, 425
 Styrene 235, 239, 263, 271, 273-274, 385,
 407-409, 413, 415, 417, 438, 439
 Styrene dimer 409
 Styrene oxide 235, 407, 408
 Styrene trimer 409
 Succinic Acid 641
 Sufentanyl 268, 424
 Sulfadiazine 534, 671
 Sulfadimethoxine 576
 Sulfallate 253, 366
 Sulfamerazine 534, 576, 671
 Sulfamethazine 671
 Sulfamethoxazole 534, 538-539
 Sulfanilamide 534, 671
 Sulfaquinoxaline 576
 Sulfathiazole 534, 671
 Sulfmethazine 534
 Sulfotepp 248, 256, 364-365
 Sulfur Compounds 274, 396
 Sulfur dioxide 300, 420
 Sulfur hexafluoride 300, 420
 Sulpiride 284, 425
 Syringic acid 581

T

TAA 239, 439
 Talbutal 256, 284, 423, 425
 TAME 239, 439
 TCP (Tenocyclidine) 259, 425
 Tebutiuron 250, 364, 644-646
 Temazepam 256, 424
 TEPP 248, 256, 364-365
 Terbacil 250, 253, 364, 366
 Terbufos 248, 250, 256, 364-365
 Terbutylazine 253, 257, 268, 366-367, 647

Terbutryn 250, 253, 364, 366, 648
 Terbutryne 257, 268, 367
 Terbutylazine 645, 647
 Terbutyn 647
 Terpinen-4-ol 279, 395
 Terpinene 271, 394
 α -Terpinene 244, 271, 393-394
 γ -Terpinene 244, 271, 279, 393-395
 (+/-)-Terpinene-4-ol 279, 395
 α -Terpineol 244, 271, 279, 392-395
 (+/-)- α -Terpineol 279, 395
 Terpinolene 244, 271, 393-394
 γ -Terpinolene 271, 394
 Terrazole 248, 256, 358
 Testosterone 235, 426, 590
 Tetraborane 239, 420
 Tetrabutyltin 239, 246, 373
 Tetracaine 284, 422, 545, 659
 Tetrachloro *m*-xylene 248, 253, 256,
 357-358, 371
 1,2,4,5-Tetrachlorobenzene 235, 407-408
 1,1,1,2-Tetrachloroethane 235, 267, 293,
 412-413
 1,1,2,2-Tetrachloroethane 235, 267, 293,
 385, 412-413
 Tetrachloroethene 235, 248, 267, 293,
 383-385, 413
 Tetrachloroethylene 291, 384
 Tetrachloro-*m*-xylene 363
 2,4,5,6-Tetrachloro-*m*-xylene 244, 268, 286,
 361-362
 2,3,4,5-Tetrachlorophenol 248, 253, 271, 377
 2,3,4,6-Tetrachlorophenol 248, 253, 271,
 377, 647
 2,3,5,6-Tetrachlorophenol 248, 253, 271, 377
n-Tetracontane 287, 441
n-Tetracosane 248, 287, 356, 441
 Tetracycline 667
 Tetradecane 289, 440
n-Tetradecane 248, 287, 356, 441
 Tetradecane (C14) 274, 397
 Tetradecanoic acid 276, 397
 Tetracyclphenone 570
 Tetraethylenepentamine 307, 405
 Tetrahydrofuran (THF) 267, 273, 293, 410,
 414, 428, 429
 Tetrahydropyran 267, 293, 410
 Tetrahydrothiophene 235, 435
 1,2,3,5-Tetramethylbenzene 235, 289, 440-441
 Tetrapentyltin 239, 246, 373
 Tetryl 644
 THC 244, 427
 Theobromine 560, 587, 657
 Theophylline 560, 587, 612
 Thiamine 657

Compound Index

- Thiamylal 256, 423
Thifensulfuron-methyl 648
4,4'-Thiodianiline 256, 417
Thionazin 248, 256, 364-365
Thiopental 256, 423
Thiophene 235, 239, 288, 300, 435, 437
Thioridazine 252, 423
Thonzylamine 423
Threonine (Thr) 618, 624
Thujone 252, 392
 α -Thujone 244, 393
 β -Thujone 244, 393
Thymine 670
Thymol 651
Thyroglobulin (Bovine) 609
Tocainamide 666
 α -Tocopherol 259, 424, 652, 656-657
 β -Tocopherol 259, 424, 652, 656-657
 γ -Tocopherol 259, 424, 652, 656-657
 δ -Tocopherol 259, 424, 652, 656-657
(+)- δ -Tocopherol 655
Tocopherol acetate 656
(+)- α -Tocopherol Acetate 655
Tokuthion 248, 256, 364-365
o-Tolidine 256, 417
m-Tolualdehyde 235, 267, 271, 293, 402, 406
o-Tolualdehyde 235, 267, 271, 293, 402, 406
p-Tolualdehyde 235, 267, 271, 293, 402, 406
m-Tolualdehyde - DNPH 642
Toluene 235, 239, 263, 267, 273-274, 283, 289, 293, 295, 355, 385, 407-409, 413-415, 428-429, 438, 440-441, 569
Toluene-d8 235, 385
m-Toluic acid 661
m-Toluidine 643
o-Toluidine 256, 417
Tonalid 274, 392
Trehalulose 652
Trepinen-4-ol 244, 271, 393-394
Triademefon 250, 364
Triamcinolone 577, 670, 688
Triazolam 242, 256, 421, 424
Tribenuron-methyl 648
Tribromoacetic acid 253, 256, 378
Tributylpentyltin 239, 246, 373
1,1,1-Trichloro-2-propanone 248, 384
Trichloroacetic acid 253, 256, 378
Trichloroacetoneitrile 235, 248, 383-384
1,2,3-Trichlorobenzene 235, 407-408
1,2,4-Trichlorobenzene 235, 385, 407-408
1,3,5-Trichlorobenzene 235, 407-408
Trichloroethane 273, 414, 428
1,1,1-Trichloroethane 235, 283, 248, 267, 291, 293, 383-385, 412-413, 428
1,1,2-Trichloroethane 235, 248, 267, 293, 384-385, 412-413
Trichloroethene 235, 248, 267, 293, 383-385, 413
Trichloroethylene 267, 291, 293, 384, 414, 428
Trichloronate 248, 256, 364-365
2,3,4-Trichlorophenol 248, 253, 271, 377
2,3,5-Trichlorophenol 248, 253, 271, 377
2,3,6-Trichlorophenol 248, 253, 271, 377
2,4,5-Trichlorophenol 248, 253, 271, 377
2,4,6-Trichlorophenol 248, 253, 271, 377, 418, 647
3,4,5-Trichlorophenol 248, 253, 271, 377
3,4,5-Trichlorophenoxy acetic acid 648
3,4,5-Trichlorophenoxy propionic acid 648
1,2,3-Trichloropropane 235, 248, 267, 293, 384, 412-413
1,2,3-Trichloropropane 253, 256, 378
1,1,1-Trichloropropanone 235, 383
Tricosanoic acid methyl ester (C23:0) 265, 271, 399-400
Tricyclazole 250, 253, 364, 366
Tridecane 274, 289, 438, 440
Tridecanoic acid methyl ester (C13:0) 265, 271, 399-400
Triethylamine 235, 248, 267, 293, 405, 416
Triethylene glycol 235, 251, 412
Triethylenetetramine 307, 405
 α,α,α -Trifluorotoluene 295, 355
Triflupromazine 252, 423
Trifluralin 248, 250, 253, 256, 358-360, 363
Triglyme 267, 293, 411
Triglyme (triethylene glycol dimethyl ether) 267, 293, 410
4'5,7-Trihydroxyflavanone 576
Trimethylamine 235, 404
2,4,5-Trimethylaniline 256, 417
1,2,3-Trimethylbenzene 235, 289, 295, 355, 440-441
1,2,4-Trimethylbenzene 235, 239, 263, 273, 289, 293, 295, 355, 385, 413, 440-441
1,3,5-Trimethylbenzene 235, 289, 295, 355, 385, 440-441
1,2,3-Trimethylbenzene (hemimellitene) 235, 407-408
1,3,5-Trimethylbenzene (mesitylene) 235, 407-408
1,2,4-Trimethylbenzene (pseudocumene) 235, 407-408
2,3,3-Trimethylpentane 289, 440
2,3,5-Trimethylphenol 419
Trimipramine 242, 421, 538, 625-626, 668
1,3,5-Trinitrobenzene 644
2,4,6-Trinitrophenol 250, 418
2,4,6-Trinitrotoluene 644
Tri-*o*-cresyl phosphate 248, 256, 364-365
Tripeleminamine 423
Triprolidine 423, 556, 560, 573, 658
Tryptophan (Trp) 612, 618
Tyrosine (Tyr) 612, 618, 624
-
- ## U
- UMP 612, 629
Uncarin F 666
Undecane 239, 263, 273-274, 413, 438
n-Undecane 287, 289, 440-441
Undecanoic acid methyl ester (C11:0) 265, 271, 399-400
Uracil 538, 569-570, 638, 667, 670
-
- ## V
- Valencene 244, 393
Valeraldehyde - DNPH 642
Valeraldehyde (pentanal) 235, 267, 271, 293, 402, 406
Valeric acid (pentanoic acid) 273, 274, 276, 397, 403, 405
Valerolactone 274, 403
Valine (Val) 618, 624
Valine-tyrosine-valine-tripeptide (val-tyr-val) 580
Vanillin 252, 392
Vernolate 250, 253, 364, 366
Vinyl acetate 235, 267, 293, 409-410
Vinyl chloride 235, 385
3-Vinyl-1,2-dithiin 253, 393
2-Vinyl-1,3-dithiin 253, 393
Viridiflorol 271, 394
Vitamin A (Palmitate) 655
Vitamin B1 (Thiamine) 656
Vitamin B1 (Thiaminium dichloride) 650
Vitamin B12 (Cyanocobalamin) 650, 656
Vitamin B2 (Riboflavin) 656
Vitamin B3 (Niacin) 656
Vitamin B6 (Pyridoxine) 650, 656
Vitamin C (Ascorbic acid) 656
Vitamin D2 655
Vitamin D3 655-656
Vitamin E (Tocopherol) 655
Vitamin K1 655
-
- ## W
- Warfarin 670
Water (H2O) 239, 277, 302, 403, 430, 435, 439

X

Xenon	301, 430
XMP	612, 629
<i>m</i> -Xylene	235, 239, 263, 271, 273-274, 289, 295, 355, 385, 407-409, 413, 415, 438-441
<i>m,p</i> -Xylene	283, 293, 355, 428-429
<i>o</i> -Xylene	235, 239, 263, 271, 273-274, 283, 289, 293, 295, 355, 385, 407-409, 413-415, 428-429, 438-441
<i>p</i> -Xylene	235, 239, 263, 271, 273-274, 289, 295, 355, 385, 407-409, 413-415, 438-441
2,3-Xylenol	418-419
2,4-Xylenol	418-419
2,5-Xylenol	418-419
2,6-Xylenol	418-419
3,4-Xylenol	418-419
3,5-Xylenol	418-419

Z

δ -Zylose	268, 397
------------------------	----------

Alphabetical Index

Alphabetical Index

A

AccuBOND [®] , Empty Reservoirs and Frits.....	140
SPE Products, Bulk SPE Sorbents.....	139
Cartridge Starter Kits.....	139
Ion Exchange.....	135
Non-silica.....	137-138
Normal Phase (Non-polar).....	133
Normal Phase (Polar).....	133-134
Reversed Phase.....	133
Agilent Cartridge Column, LC, Starter Kits.....	615
Amino Acid Separations, Amino Acid Standards.....	616-617
Application Kit.....	616-617
Columns.....	616-617
Reagents.....	616-617
Applications, GC Applications Environmental - Hydrocarbons.....	355-356
Environmental - Pesticides and Herbicides.....	357-367
Environmental - Semivolatiles.....	368-378
Environmental - Volatiles.....	379-384
Environmental - Air Analysis.....	385-388
Foods, Flavors and Fragrances.....	389-401
Industrial Chemicals.....	402-420
Life Sciences.....	421-429
Petroleum.....	430-443
LC Applications BioPharmaceutical.....	624-637
Chemical/Industrial.....	638-641
Environmental.....	642-648
Food & Consumer Products.....	649-657
Pharmaceutical.....	658-671
Asahipak LC Columns.....	594
Autosampler Supplies, ALS Supplies, CTC GC and Combi PAL.....	63-64
CTC HTC PAL.....	65
Miscellaneous.....	186-188
Quadrant Trays.....	186-188
Wash Vials.....	48, 186-188
ICP-MS, Integrated AutoSampler Supplies.....	704
UV-Vis.....	718
Autosampler Supplies, GC, 7673.....	186-188
Diffusion Cap Inserts.....	48, 186-188
Purge and Trap.....	182
Septum Tool.....	113-114
Syringes.....	56

Wash Vials.....	48, 186-188
Autosampler Supplies, LC, 1090, Injector/Sampler.....	502
Vials, Caps.....	502
1100/1200 Micro.....	475-477
1100/1200 Micro Well Plate Sampler.....	475-477
1100/1200 Well Plate.....	475-477
1100/1200, Metering Device.....	473
Needle/Seat.....	473
Trays.....	474
Valve Supplies.....	472
Vials, Caps.....	474
220 Micro Plate Sampler.....	476-477
Pistons.....	473

B

Bar Code Reader Labels.....	186-188
Bleed and Temperature Optimized Septa.....	157-158
Buffers, CE, Buffers for μ PAGE.....	676-677
For CZE of Charged Analytes.....	686-687
For CZE of Proteins.....	686-687
MEKC, for Neutral and Charged Analytes.....	686-687

C

Cables, Instrument Interface.....	125
Integrator.....	125
Network.....	125
Capillary Cassette, CE.....	689
Capillary Column Ferrules.....	171-174
Caps, Diffusion.....	48, 186-188
Fittings.....	105-106
Caps, Crimp, Headspace Vial.....	50
Wide Opening, 2mL.....	39
Caps, Screw, 4 mL Vial.....	48
Wide Opening, 2mL.....	34
Caps, Snap.....	42
Cartridge Column Fittings.....	520
Cell Accessories, UV-Vis.....	716
Cell Cleaning Fluid, UV-Vis.....	716
Cell Tray, UV-Vis.....	716
Cells and Cell Supplies, UV-Vis, Cylindrical.....	714
Flow-through.....	715
Macro.....	712
Semi-micro.....	713
Ultra-micro.....	714
Ceramic Wafer, GC Column Cutter.....	111

CE (Capillary Electrophoresis), μ PAGE Kits.....	676-677
Accessory Kit.....	687-688
Alignment Interfaces.....	689
Buffers for μ PAGE.....	676-677
Buffers for CZE of Proteins.....	686-687
CE-Grade Water.....	00686-687
CE-MS Supplies.....	685
Capillary Cassette.....	689
Capillary Conditioning Solutions.....	686-687
Cation Solutions Kit.....	674-675
Forensic Anions Kit.....	674-675
High Sensitivity Detection Cell.....	684
Inorganic Anion Solutions Kit.....	674-675
Instrument Supplies.....	687-688
Microvials and Caps.....	687
OQ/PV and IQ Kits.....	683
Optical Filter.....	687-689
Organic Acids Solutions Kit.....	674-675
Reagents, Buffers for CZE of Proteins.....	686-687
CE-Grade Water.....	686-687
CZE Buffers for Charged Analytes.....	686-687
Conditioning Solutions.....	686-687
MEKC Buffer for Neutral/ Charged Analytes.....	686-687
Start-up Kits.....	683
Vials.....	687
Window Etching Tool.....	687-688
CE Capillaries, μ PAGE Kits.....	676-677
μ SIL-DB Coated.....	681
μ SIL-WAX Coated.....	681
CE-MS.....	685
CEP Coated.....	680
Extended Light Path (Bubble Cell).....	678
Fused-Silica, Bulk.....	678
PVA Coated.....	679
Packed CEC.....	682
Packed CEC (HSDC).....	682
Standard.....	677
Universal.....	678
CE-MS, Alignment Interface.....	685, 689
CE-MS Adapter Kit.....	685
Capillaries.....	685
Nebulizer Kit.....	685
ChiraDex LC Columns.....	600
Chiral LC Columns, ChiraDex.....	600
Ultron.....	599
ChromTrac Tubing Labels.....	449-450
Cleaning and Maintenance Supplies, MS Engine.....	225
Column Compartment Supplies, LC, 1090 Switching Valve.....	502

Alphabetical Index

1100/1200, Capillary Column Switching Valve.....	482
Column Clamp.....	482
Column ID Module.....	482
Column Switching Valve.....	482
Connecting Capillaries.....	446-451
Column Connectors, GC, Glass.....	176
Graphpak.....	176-177
Metal.....	176-177
Quartz.....	176
Column Cutting Tool with Rotating Diamond.....	111
Column Installation Tool.....	112-113, 204-205
Column Nuts, GC, Finger-tight.....	173-174
GC/MS (Long).....	173-174
Standard (Short).....	173-174
Connectors (Swagelok-style To NPT)107	
Connectors, ICP-MS.....	693
Cool On-Column Inlet Supplies, 5890.....	205
6890/6850.....	193-194
Columns, See GC Columns See LC Columns	
Crimp Caps, Headspace Vial (20 mm).....	50
Wide Opening, 2mL.....	39
Crimp Top Vials, Kits and Convenience Packs.....	39
Wide Opening, Extreme Recovery.....	38
Glass.....	37
Glass, Deactivated.....	37
Glass-lined Plastic.....	39
High Recovery.....	38
Polypropylene.....	41
Crimper, Electronic.....	53
Manual.....	54
Crosses (Fittings).....	106
CTC Autosampler, GC and Combi PAL, Headspace supplies.....	64
Syringes.....	64
Vials and caps.....	63
HTC PAL, Sampling valve supplies.....	67
Syringes.....	66
Vials and caps.....	65
Sample Trays.....	68
Cuvettes.....	712
Cylinder Bracket.....	104
CZE Buffers, For Charged Analytes.....	686-687
For Proteins.....	686-687

D	
Decapper, Electronic.....	53
Manual.....	54
Detector Supplies, GC, ECD, 5890.....	209
6890/6850.....	202
FID, 5890.....	207
6890/6850.....	196-198
FPD, 5890.....	210
6890/6850.....	202
NPD, 5890.....	207
6890/6850.....	199
TCD, 5890.....	209
6890/6850.....	200-201
Test Samples.....	120
Tools.....	112-114
Detector Supplies, LC, 1037/47 Refractive Index.....	503
1040 DAD Series I/II.....	503
1046 Fluorescence.....	503
1049 Electrochemical.....	504
1090, DAD Series I/II.....	503
Filter Photometric (FPD).....	502
1100/1200, DAD 500 nL Flow Cell.....	492-493
DAD Flow Cells.....	489
DAD Micro/HP Flow Cell.....	491
DAD Semi-Micro Flow Cell.....	491
DAD Standard Flow Cell.....	490
DAD Supplies.....	490
DAD/MWD Prep Cells.....	492-493
Fluorescence.....	494
Refractive Index.....	495
VWD Flow Cells.....	486
VWD High Press Flow Cell.....	487-488
VWD Micro Flow Cell.....	487-488
VWD Semi-Micro Flow Cell.....	487-488
VWD Standard Flow Cells.....	486-487
VWD Supplies.....	486
Flow Cells.....	486-493
Lamps.....	486, 490, 502-503
Detector Supplies, MS.....	218-219
Diamond-tipped Column Cutting Pencil.....	111
Diffusion Caps.....	48
Diffusion Pump Supplies, Ion Gauge Supplies.....	220-221
Pump Oil.....	220-221
Dissolution Testing Supplies.....	719

E	
ECD Supplies, 5890.....	209
6890/6850.....	202
Test Samples.....	120
Elbows (Fittings).....	106
Electron Multipliers, ICP-MS, 4500/7500.....	702
MS, MSD.....	222
Electronic Crimpers & Decappers.....	53
EPA 8270 Application Kit.....	223
Evidex® SPE Products.....	141
F	
Ferrule Tools, GC Column.....	111
Ferrules, Capillary Column.....	173-174
Metal (1/16, 1/8, 1/4 in.).....	105-106
Reducing.....	174
Straight.....	174
TCD.....	200-201
FID Supplies, 5890.....	207
6890/6850.....	196-198
Cleaning Kits.....	113-114
Igniter Cable (6890/6850).....	196-197
Jets (6890/6850).....	198
Test Samples.....	120, 196-197
Filaments, 5989 MS Engine.....	225
MSD.....	219
File Set, 12-Piece.....	113-114
Filters, Chemical, 5890 Internal.....	93
ICP-MS Cooling Water.....	707
Syringe.....	149
Fittings, Caps.....	105-106
Connectors (Swagelok-style To NPT.....	107
Crosses.....	106
Elbows.....	106
Ferrules.....	105-106
General Purpose Kit.....	108
Miscellaneous Parts.....	105-106
Nuts.....	105-106
Plugs.....	105-106
Tees.....	106
Unions.....	107
Unions, Reducing.....	108
Fittings, LC, Capillary LC Fittings.....	484-485
PEEK.....	449-450
Stainless Steel.....	449-450
Flexible Tubing, LC.....	446-448, 451

Alphabetical Index

Flip-Top Inlet Sealing System.....	189
Flow Cells, LC	486-493
Flow Tracker Flowmeter	98
Flowmeter/Leak Detector	98
Flowmeters, Gas,	
A Selection Guide.....	97
ADM	99
Digital Bubble	101
FlowTracker	98
Glass Bubble.....	102
Optiflow.....	101
Veri-Flow 500	100
Flowmeters, Liquid	102
Forceps	110
FPD Supplies,	
5890.....	210
6890/6850	202
Fraction Collector Supplies, LC.....	479-481
Frits, LC Column.....	527
Fused Silica Tubing,	
Deactivated.....	318-319
Deactivated, High Temp	318-319
ProSteel Stainless Steel.....	318-319
Undeactivated.....	318-319

G

Gas Analyzer Accessories & Standards	122
Gas Line Supplies, ICP-MS	692
Gas Management,	
Cylinder Bracket	104
Flowmeters	96-102
GC Installation Kits.....	94-95
Gas Regulators,	
Brass, CGA.....	103-104
Outlet Adapters	103-104, 107
Leak Detector.....	98
Tubing.....	104
Gas Regulators,	
5890/6890 Instruments	211
Brass, CGA	103-104
Outlet Adapters	103-104, 107
Gas Sampling Valves.....	180
Gas Traps,	
A Selection Guide.....	70
Combination Traps,	
Big Universal (RMSH Series).....	83-84
Gas Specific for MS	82
Hydrocarbon/Moisture Removal.....	82
Oxygen/Moisture Removal.....	81-82
GC Applications	
Environmental - Hydrocarbons.....	355-356
Environmental -	
Pesticides and Herbicides.....	357-367
Environmental - Semivolatiles.....	368-378
Environmental - Volatiles	379-384
Environmental - Air Analysis.....	385-388

Foods, Flavors and Fragrances.....	389-401
Industrial Chemicals	402-420
Life Sciences	421-429
Petroleum.....	430-443
GC Buddy Multi-purpose Tool.....	113-114
GC Column Cutting Tools111, 113-114	
GC Column Rinse Kit.....	111
GC Columns,	
6850 on 5 in. Cage,	
CAM.....	310-313
DB-1.....	310-313
DB-1301.....	310-313
DB-17.....	310-313
DB-1701.....	310-313
DB-5.....	310-313
DB-5ms.....	310-313
DB-624.....	310-313
DB-FFAP.....	310-313
DB-MTBE.....	310-313
DB-Petro.....	310-313
DB-VRX.....	310-313
DB-WAX.....	310-313
GS-Q.....	310-313
HP Blood Alcohol.....	310-313
HP Fast GC Residual Solvents310-313	
HP-1.....	310-313
HP-1ms.....	310-313
HP-5.....	310-313
HP-50+.....	310-313
HP-5ms.....	310-313
HP-FFAP.....	310-313
HP-INNOWax.....	310-313
HP-PLOT Al2O3 "KCl".....	310-313
HP-PLOT Al2O3 "S".....	310-313
HP-PLOT Molesieve.....	310-313
HP-PLOT Q.....	310-313
HP-PLOT U.....	310-313
HP-PONA.....	310-313
Ultra 1.....	310-313
Ultra 2.....	310-313
Cage only, 5 in. (For 6850).....	111
Columns on 8 in. Cage,	
CAM.....	307
Carbowax 20M.....	306
Column Installation Kit.....	111
Column Rinse Kit.....	111
CycloSil-B.....	279
Cyclodex-B.....	279
DB-1.....	235-238
DB-1301.....	268-269
DB-17.....	257-258
DB-1701.....	268-269
DB-1701P.....	286
DB-17ht.....	282
DB-17ms.....	259
DB-1ht.....	281

DB-1ms	242
DB-200.....	263
DB-210.....	264
DB-225.....	265
DB-225ms.....	266
DB-23.....	261
DB-2887.....	287
DB-35.....	254
DB-35ms.....	256
DB-5.....	244-245
DB-5.625.....	244-245
DB-502.2.....	294
DB-5ht.....	281
DB-5ms.....	248-249
DB-5ms-EVDX.....	141, 284
DB-608.....	286
DB-624.....	267, 293-294
DB-ALC1.....	283
DB-ALC2.....	283
DB-Dioxin.....	290
DB-EVDX.....	141, 284
DB-FFAP.....	276
DB-HT SimDis.....	288
DB-MTBE.....	295
DB-PS1.....	304
DB-PS2887.....	304
DB-PS5.....	304
DB-PS624.....	304
DB-PSWAX.....	304
DB-Petro.....	289
DB-ProSteel.....	304
DB-TPH.....	295
DB-VRX.....	292-293
DB-WAX.....	271-272
DB-WAXetr.....	273
DB-WaxFF.....	271-272
DB-XLB.....	253-254
DX-1, DX-4.....	307
Drugs of Abuse.....	141, 284
GS-Alumina.....	299
GS-Alumina KCl.....	298
GS-CarbonPLOT.....	300
GS-GasPro.....	299
GS-Q.....	303
HP Blood Alcohol Analysis.....	284
HP Fast Residual Solvents.....	284
HP PAS 5.....	285
HP PLOT Al2O3 "KCl".....	297
HP PLOT Al2O3 "M".....	299
HP PLOT Al2O3 "S".....	298
HP-1.....	239-241
HP-101.....	305
HP-17.....	305
HP-1ms.....	243
HP-20M.....	306
HP-35.....	255

Alphabetical Index

HP-5	246-247
HP-50+	260
HP-5ms	250
HP-88	262
HP-Chiral-10b	280
HP-Chiral-20b	280
HP-FFAP	276
HP-INNOWax	0274-275
HP-PLOT MoleSieve	301
HP-PLOT Q	302
HP-PLOT U	303
HP-PONA	288
HP-Ultra 1	251
HP-Ultra 2	252
HP-VOC	294-295
SE-30, SE-54	308
Fused Silica Tubing,	
Deactivated	318-319
Deactivated, High Temp	318-319
Undeactivated	318-319
Installation Tools	111
Particle Traps	302
Quality Control Specs,	
DB-1	314-317
DB-17	314-317
DB-17ms	314-317
DB-1ms	314-317
DB-200	314-317
DB-225ms	314-317
DB-35ms	314-317
DB-5	314-317
DB-5ms	314-317
DB-WAX	314-317
DB-XLB	314-317
Retention Gaps	318-319
Stainless Steel Tubing (ProSteel),	
Deactivated	318-319
Undeactivated	318-319
Test Standards	119
Tools,	
Ceramic Wafer Cutter	111
Column Rinse Kit	111
Installation Tools	111
Tubing Cutters	111
GC Installation Kits	94-95
GC Instrument,	
Detector, 5890	93
Internal Split Vent, 5890	93
Split Vent Trap	93
Gas Purification Systems,	
High Capacity	86
Point of Operation Panels	90
Super Clean	90-92
Hydrocarbon Removal	78-79
Moisture Removal	72-75
Oxygen Removal	76-77

Trap Mounting Clips	93
Gel Filtration LC Columns,	
PL aquagel-OH	607
PLgel	605
ZORBAX GF-250	610
ZORBAX GF-450	610
ZORBAX PSM	604
GFC Calibration Standards	602-603
Gloves, Lint Free	216, 225
GPC, GFC Calibration Standards	602-603
GPC-SEC,	
Calibration Standards	602-603
PLgel	605
Start-up Kits	601
ZORBAX GF-250	610
ZORBAX GF-450	610
ZORBAX PSM	604
Graphpak Capillary Column Connectors	177
Guard Cartridge Holders,	
LC Column	521

H

Headspace Sampler Supplies	187-188
Headspace Sampler Supplies,	
CTC Combi PAL	64
Headspace Vials, Caps, Septa	49-51
Hex Keys	110
High Sensitivity Detection Cell, CE	684

I

ICP-MS Supplies,	
Autosampler Supplies	704
Connectors	693
Electron Multiplier	702
Gas Line Supplies	692
ISIS Supplies	705
Ion Lens System Components	701-702
Nebulizers & Supplies	695-696
Peristaltic Pump Tubing	694
Sampling Cones	701
Skimmer Cones	701
Spray Chambers	697
Standards	708-709
Torches & Components	698-699
Vacuum System, Misc	707
Vials	704
Igniter Cable, FID,	
5890	207
6890/ 6850	196-197
Injector Valve Syringes	62
Inlet Liners,	
Direct	167
Direct Connect	168
Focus	168
Liner O-Rings	169

Split/Splitless	167
Inlet Supplies,	
Cleaning Wires	113-114
Column Nuts	173-174
Cool on-Column,	
5890	205
6890/6850	193-194
Evaluation Sample	120
Flip Top Inlet Sealing System	189
PTV, 6890/6850	192
Packed Column Inlet,	
5890	206
6890/6850	195
Split/Splitless,	
5890	204-205
6890/6850	190-191
Inlet Tools, GC	112-114
Inserts for Vials,	
For Standard Opening (8-425) Vials	46
For Wide Opening Vials, 2mL	43
Integrator Supplies,	
Accessories	124
Cables	125-127
Cartridges and Printheads	123
Paper and Supplies	123
Integrators	124
Ion Lens System Components,	
ICP-MS	701-702
Ion Lens System Components, ICP-MS,	
7500c	701-702
Ion Source Parts and Supplies,	
5972/5971/GCD MSD	218
5973/5975	218
MS Engine	225
ISIS Supplies, ICP-MS	705

J

Jets, FID,	
5890	208
6890/6850	198
Jets, NPD,	
5890	208
6890/6850	199

L

Labels, Bar Code Reader	186-188
Lamps,	
LC Detectors	486, 490, 494
UV-Vis	718
LC Applications	
BioPharmaceutical	624-637
Chemical/Industrial	638-641
Environmental	642-648
Food & Consumer Products	649-657
Pharmaceutical	658-671

Alphabetical Index

LC Columns,	
1.8 µm.....	571-572
600 bar.....	571-572
Agilent Cartridge System.....	520-522
Agilent Prep.....	589
Amino Acid Separations.....	616-617
Asahipak LC Columns.....	594, 618
Capillary.....	580
Cartridge Hardware.....	520-526
ChiraDex.....	600
Chiral,	
ChiraDex.....	600
Ultron.....	599
Column ID Module.....	482
GFC-SEC,	
EasyCal Vial Calibration Standards...602-603	
PLgel.....	601
Start-up Kits.....	601
ZORBAX PSM.....	604
GPC-SEC,	
EasyCal Vial Calibration Standards...602-603	
PLgel.....	601
Start-up Kits.....	601
ZORBAX PSM.....	604
LiChrospher,	
CN.....	592
Normal Phase.....	598
RP-18.....	592
RP-18 Endcapped.....	592
RP-8.....	592
RP-Select B.....	592
Nucleosil.....	593
PAH.....	618
PL aquagel-OH.....	607
PLgel GPC-SEC.....	605
Purospher.....	594
SEC	
PL aquagel-OH.....	607
PLgel.....	605
Start-up Kits.....	601
ZORBAX PSM.....	604
Special Applications,	
Amino Acid Separations.....	616-617
Anion Chromatography.....	618
Superspher.....	595
SynChropak,	
Ion Exchange.....	613
Ultron Chiral.....	599
ZORBAX,	
1.8 µm.....	571-572
600 bar.....	571-572
Bonus-RP.....	558
Capillary.....	584
Carbohydrate Analysis.....	614
Eclipse AAA.....	616-617
Eclipse Plus.....	535

Eclipse XDB.....	540-542
Extend-C18 300Å.....	564
Extend-C18 80Å.....	561
GF-250.....	610
GF-450.....	610
LC/MS.....	567
Method Development Kits.....	615
Microbore 1.0mm ID.....	579
NH2.....	597
Nano.....	584
Normal Phase.....	597
Original RP C18.....	585
Original RP C8.....	585
Original RP CN.....	585
Original RP Phenyl.....	585
Original RP TMS.....	585
PSM.....	604
Poroshell.....	555
PrepHT.....	587-588
RRHT.....	571-572
Rapid Resolution.....	574-575
Rapid Resolution HT.....	571-572
Rx.....	566
Rx-SIL.....	597
SAX.....	613
SCX.....	613
SIL.....	597
Stablebond 300Å.....	552-553
Stablebond 80Å.....	546-549
Stablebond Wide Pore.....	552-553
LC Standards,	
GPC-SEC Calibration Standards...115, 602-603	
LC/MS.....	116
Qualitative.....	116
LC/MS Standards,	
Calibration, Performance.....	116, 498
Qualitative.....	116, 498
LC/MSD Supplies	
LC MSD Chemical Supplies.....	498
LC MSD Common Supplies.....	498
LC MSD Quad.....	496-497
LC MSD TOF.....	496-497
LC MSD Trap.....	496-497
Lens Cleaning Paper.....	716
LiChrospher Columns,	
CN.....	592, 598
Normal Phase.....	598
RP-18.....	592
RP-18 Endcapped.....	592
RP-8.....	592
RP-Select B.....	592
Liners,	
Direct.....	167
Direct Connect.....	168
Focus.....	168
Liner O-Rings.....	169

Split/Splitless.....	167
Liquid Sampling Valves, GC.....	180

M

Magnifier.....	112-113
Mass Flow Controllers, 5890/6890.....	211
MEKC Buffer for Neutral/ Charged Analytes.....	686-687
Merlin Microseal.....	160
Microfluidic Supplies,	
Fittings and Ferrules.....	179
Restrictors.....	179
Microprobe Set.....	112-113
Microvolume Inserts,	
For Standard Opening (8-425) Vials.....	46
For Wide Opening Vials.....	43
Mirror, Inspection.....	112-113
Mounting Panels & Clips for Gas Traps.....	93
MS Engine,	
Cleaning and Maintenance Supplies.....	225
Electron Multiplier.....	226
Ion Source Parts and Supplies.....	225
Pump Lubricants and Oils.....	226
MS Interface Column Nut.....	173-174, 216
MS Test and Performance Samples.....	227
MSD,	
Calibration/Tuning Standards.....	227
Electron Multipliers, Replacement Horn.....	222
Filaments.....	219
Ion Source Parts (EI),	
5972/5971/GCD.....	218
5973/5975.....	218
Maintenance Kit (For Diffusion Pump).....	216
QuickSwap Restrictors.....	179
MSD, 1100/1200 LC,	
Cleaning and Maintenance Supplies.....	498
MSD Interface,	
Column installation tool.....	112-113, 216
Column nut.....	173-174, 216
MSD QuickSwap Restrictors.....	179
Multicell Transport Supplies, UV-Vis.....	717

N

NPD Beads,	
5890.....	208
6890/6850.....	199
NPD Supplies,	
5890.....	208
6890/6850.....	199
Nebulizer, CE/MS.....	685
Non-Stick,	
Inlet Septa.....	157-158
O-Rings, GC inlet.....	169
Nucleosil LC Columns.....	593
Nuts (Fittings).....	105-106
Nuts and Ferrules Set.....	105-106

Alphabetical Index

O

O-rings, GC Inlet Liner.....	169
Oil, Vacuum Pump.....	220-221, 226, 703
Optical Filter, CE.....	687-688

P

Packed Inlet Supplies,	
5890.....	206
6890/6850.....	195
Peltier Supplies, UV-Vis.....	718
Peristaltic Pump Tubing, ICP-MS.....	694
Petrochemical Standards.....	121-122
PFDTD Sample.....	227
PFTBA Sample.....	227
PL aquagel-OH LC Columns.....	607
Piston Seals, LC.....	467, 473, 500-501
Pliers and Tweezers.....	110
Polyimide Sealing Resin.....	176
Press-Fit Connectors.....	176
PTV Inlet Supplies, 6890/6850.....	192
Pump Oil, Vacuum.....	220-221
Pump Pistons, LC.....	467, 500-501
Pump Seals, LC.....	467, 500-501
Pump Supplies, LC,	
1090 Solvent Delivery.....	500-501
1090 Solvent Mixer.....	500-501
1100/1200,	
Active Inlet Valve & Supplies.....	467
Capillary Pump.....	469-471
Isocratic, Binary, Quat.....	469-471
Outlet Ball Valve & Supplies.....	467
Prep Pump.....	469-471
Purge Valve & Supplies.....	466
Seal Wash & Supplies.....	466
Pistons.....	467
Solvent Bottles & Supplies.....	469-471
Solvent Inlet Filters.....	468
Solvent Mixer, Static.....	500-501
Purge & Trap Supplies.....	182-185
Purospher LC Columns.....	594

Q

QuickSwap,	
Fittings and Ferrules.....	179
Restrictors.....	179
Quiet Cover for LC/MS Rough Pump.....	499

R

Racks, Vial.....	54
Reducing Ferrules.....	174
Regulators, 5890/6890.....	211
Retention Gaps.....	318-319
Rheodyne Valves.....	455

Rinse Kit, GC Columns.....	111
Rotor Seals, LC.....	456, 460, 472
Rotors, GC Valve.....	181

S

Sample Filtration,	
Disposable Syringes.....	149
Syringe Filters.....	149
Sample Loops, GC.....	181
Sample Loops, LC,	
PEEK.....	458
Stainless Steel.....	457
Sample and Storage Vials.....	52
Sampling Cones, ICP-MS.....	701
SantoVac Ultra 5P.....	220-221
Screw Caps,	
4 mL Vial.....	48
Septa,	
For Standard Opening (8-425).....	45
For Wide Opening.....	35
Standard Opening (8-425).....	45
Wide Opening.....	34
Wide Opening with Integrated Septa.....	34
Screw Top Vials,	
4 mL.....	48
Standard Opening (8-425).....	44
Wide Opening,	
Glass.....	32-33
High Recovery.....	33
Kits and Convenience Packs.....	35-36
Screwdrivers.....	110
Semi-Volatiles (EPA 8270) Application Kit.....	223
Septa, GC Inlet,	
Advanced Green.....	157-158
Bleed and Temperature Optimized.....	157-158
General Purpose.....	159
Gray, Low-bleed.....	159
Long-Life.....	157-158
Merlin Microseal.....	160
Red, Low-bleed.....	159
Septa, Vial,	
GC Autosampler Wash Vial.....	186-188
Headspace.....	51
Standard Opening (8-425) Screw Top.....	45
Wide Opening Screw Top.....	35
SimDis Standards.....	121
Sipper Supplies, UV-Vis.....	718
Skimmer Cones, ICP-MS.....	700
Snap Caps, Wide Opening.....	42
Snap Top Vials,	
Kits and Convenience Packs.....	42
Wide Opening,	
Glass.....	40
High Recovery.....	41
Polypropylene.....	41
Snoop.....	113-114

Solvent Filters,	
Filter/Degasser.....	454
In-line.....	453
Solvent Reservoir,	
1090.....	500-501
1100/1200.....	469-471
SPE Products,	
AccuBOND ^{II} ,	
Bulk SPE Sorbents.....	139
Cartridge Starter Kits.....	139
Empty Reservoirs & Frits.....	140
Ion Exchange.....	135
Non-silica.....	137-138
Normal Phase (Non-polar).....	133
Normal Phase (Polar).....	133-134
Reversed Phase.....	131-132
Evidex ^{II}	141
Parts and Disposables,	
Cartridge Manifold.....	142
Vacuum Manifolds,	
10- and 20-Port.....	142
Special Applications LC Columns.....	614-618
Split Vent Trap, 5890 Internal & External ⁹³	
Split/Splitless Inlet Supplies,	
5890.....	204
6890/6850.....	189-191
Splitter, GC Column,	
Fixed & Variable.....	176, 178
Glass, Press-fit.....	176
Spray Chambers, ICP-MS.....	697
Stainless Steel Tubing, GC,	
Deactivated.....	318-319
Undeactivated.....	318-319
Standards,	
Boiling Point Calibration, Qualitative.....	121
CE OQ/PV and IQ.....	117, 683
GC,	
Column Test.....	119
GC/MS Evaluation.....	120
Nickel Catalyst.....	120
GFC Calibration.....	115
GPC Calibration.....	115, 602-603
GPC-SEC Calibration.....	115, 602-603
Gas Analyzer.....	122
ICP-MS,	
Calibration.....	708-709
Checkout Solutions.....	708-709
Environmental.....	708-709
Interference Check Mixes.....	708-709
Tuning Solutions.....	708-709
LC,	
LC/MS.....	116
Qualitative.....	116
MIDI Calibration.....	120
Petrochemical, Qualitative.....	121
UV-Vis OQ/PV and IQ.....	117, 720

Alphabetical Index

Stirring Bar, UV-Vis	716
Straight Ferrules	174
Superspher LC Columns	595
Swabs	113-114
SynChropak Columns, Ion Exchange	613
Syringe Needles, Fused Silica	61
Syringes,	
Disposable, 20 mL	149
GC Autosampler,	
23 and 26s gauge, Straight Needle	57
23-26s gauge, Tapered Needle	56
7670/71/72	58
CTC GC and Combi PAL	64
General Info	55
On-column	58
LC Autosampler,	
1090	500-501
CTC HTC Sampler	66
Manual,	
For LC Injector Valves	62
Gas-Tight Luer Lock	61
Gas-Tight Plunger	60-61
Gas-Tight with Luer Lock Valve61	
Low Volume (0.5-5.0mL)	59
On-column	61
Regular Plunger	59
SuperfleX Plunger	60
Teflon Tipped Plunger	60

T

TCD Supplies,	
5890	209
6890/6850	200-201
Test Samples	120
Tees (Fittings)	106
Test Solutions, LC,	
1100/1200 MSD	498
1100/1200 MSD OQ/PV	116
1100/1200 OQ/PV	116
1100/1200 Qualitative	116
LC/MS	498
Qualitative	116
Tool Kit, General Laboratory	109
Tools,	
1100/1200 Series LC	463
Column Installation Kit, GC	111
Crimping & Decapping	53-54
FID Cleaning Kit	113-114
Ferrule Installation Tool	112-113
Ferrule Tools, GC column	112-113
File Set, 12-Piece	113-114
Forceps	110
GC Buddy Multi-purpose Tool	113-114
GC Column Cutting Tools	111
GC Column Ferrule Tools	112-113
GC Column Rinse Kit	111

GC Inspection Tools	112-113
General Laboratory Tool Kit	109
Hex Keys	110
Injection Port Cleaning Kit	113-114
Inlet Cleaning Wires	113-114
Magnifier	112-113
Pliers & Tweezers	110
Screwdrivers	110
Tubing Cutters	110
Wrenches	109
Torches & Components, ICP-MS	698-699
Traps,	
A Selection Guide	70
Combination Traps,	
Big Universal (RMS Series)	83-84
Gas Specific for MS	82
Hydrocarbon/Moisture Removal	82
Oxygen/Moisture Removal	81-82
GC Instrument,	
Detector, 5890	93
Internal Split Vent, 5890	93
Split Vent Trap	93
Gas Purification Systems,	
High Capacity	85-86
Point of Operation Panels	90
Super Clean	90-92
Hydrocarbon Removal	78-79, 82
Moisture Removal	72-75
Oxygen Removal	76-77, 81-82
Trap Mounting Panel/Clips	93
Traps, Particle	302
Tubing Cutters	110
Tubing,	
Fused Silica,	
Deactivated	318-319
High-temperature	318-319
Undeactivated	318-319
Gas Supply,	
Copper	104
Stainless Steel (Spectra-Link)	104
ICP-MS,	
Gas Line	692
Peri Pump	694
LC,	
1100/1200	
Module Connectors	446-447, 483
Capillary LC, Fused Silica/PEEK	484-485
Color Code Labels	449-450
Fast LC Conversion Kit	568
Kits	451
PEEK	448
PEEK Tubing Cutter	448
Stainless Steel, Flexible	446-447, 483
Stainless Steel, Rigid	447
UV-Vis	716

Tubing, GC	
Stainless Steel (ProSteel),	
Deactivated	318-319
Undeactivated	318-319
Tubing, LC,	
1100/1200	
Module Connectors	446-447, 483
Capillary LC, Fused Silica/PEEK	484-485
Color Code Labels	449-450
Fast LC Conversion Kit	568
Kits	451
PEEK	448
PEEK Tubing Cutter	448
Stainless Steel, Flexible	446-447, 483
Stainless Steel, Rigid	447
Tuning Samples, GC/MS	227

U

Ultimate Union	175
Ultimate Union, Fittings and Ferrules	175
Ultron Chiral LC Columns	599
Union, Fused Silica	176
Unions,	
Fittings	107
Reducing	108
UV-Vis,	
Autosampler Supplies	718
Cell Accessories	716
Cell Holder Supplies	717
Cells,	
Cylindrical	714
Flow-through	715
Macro (Standard)	712
Semi-micro	713
Ultra-micro	714
Dissolution Testing Supplies	719
Lamps	717
Multicell Transport Supplies	717
Peltier Supplies	718
Sipper Supplies	718
Standards,	
Checkout Samples	118, 720
Holmium Oxide	720
Hoya 056 Filter	118, 720
OQ/PV and IQ Kits	118, 720
Qualitative	118, 720
Tubing & Fittings	716

V

Vacuum Degasser Supplies	464
Vacuum Manifolds, SPE,	
10- and 20-Port	142
Parts and Disposables	143
Vacuum Pump Oil	220-221, 226, 703
Vacuum Pump Supplies, ICP-MS	703

Vacuum System & Pump Supplies, MS	220-221, 226
Valves, GC, Gas Sampling	180
Liquid Sampling	180
Supplies, Miscellaneous	180-181
Sample Loops	181
Valve Rotors	181
Valves, LC, Manual Injection	455
Sample Loops, PEEK	458
Stainless Steel	457
Supplies, 1090 Manual Injector	456
1100/1200 Manual Injector	456
CTC HTC PAL	67
Column Switching	460
Miscellaneous	456
Rotor Seals	456
Stator Face	456
Stators	456
Vial Inserts, For Standard Opening (8-425) Vials	46
For Wide Opening Vials	43
Vial Racks	54
Vials, GC Autosampler Wash Vial	48, 186-188
Headspace	49-50
ICP-MS	704
Sample and Storage	52
Wide Opening, 2 mL	32, 37, 40
Vials, Crimp Top, Kits and Convenience Packs	39
Wide Opening, 2 mL, Extreme Recovery	38
Glass	37
Glass, Deactivated	37
Glass-lined Plastic	39
High Recovery	38
Polypropylene	41
Vials, Headspace	49-51
Vials, Screw Top, 4 mL	48
Kits and Convenience Packs	35-36
Standard Opening (8-425)	44
Wide Opening, 2 mL, Glass	32
Glass, Deactivated	33
High Recovery	33
Vials, Snap Top, Kits and Convenience Packs	42
Wide Opening, 2 mL, Glass	40
Glass, Deactivated	40
High Recovery	41
Polypropylene	41

W

Wash Vials, GC Autosampler	48, 186-188
Water, CE-Grade	686-687
Window Etching Tool, CE	687-688
Wrenches	109

Z

ZORBAX, 1.8 µm	571-572
600 bar	571-572
Bonus-RP	558
CN	597
Carbohydrate Analysis	597
Eclipse AAA	616-617
Eclipse Plus	535
Eclipse XDB	540-542
Extend-C18 300Å	564
Extend-C18 80Å	561
GF-250	610
GF-450	610
HPLC Capillary	584
LC/MS	567
Method Development Kits	615
NH2	597
Normal Phase	597
Original ZORBAX, RP C18	585
RP C8	585
RP CN	585
RP Phenyl	585
RP TMS	585
PSM	604
Poroshell	555
PrepHT	587-588
RRHT	571-572
Rapid Resolution	574-575
Rapid Resolution HT	571-572
Rx	566
Rx-SIL	597
SAX	613
SCX	613
SIL	597
Stablebond 300Å	552-553
Stablebond 80Å	546-549
Stablebond Wide-Pore	552-553

Ordering Information

Easy Ordering Terms and Conditions

Easy Ordering Terms and Conditions

Pricing

Prices in this catalog are for reference only and are subject to change without notice. Prices are effective January 1, 2007. Please check with your Agilent Customer Service Representative, sales offices, local authorized distributor, or the Agilent website for current prices when placing your order.

Freight

A shipping and handling fee will be added to your order. Special shipping (e.g., overnight in the U.S.) is available in most regions at an additional cost. Shipping and handling fees are waived for purchases over \$2,000 US.

Discounts

Agilent Technologies offers volume discounts on a variety of individual products sold in bulk quantity. In the U.S. and Canada, ask your Telesales Representative about volume discounts when you call in your order. The entire quantity must be shipped at one time to one address to qualify for the discount. Order quantities may be limited on certain products. Outside the U.S. and Canada, contact your local Agilent sales office or authorized distributor. Don't forget to check our website for special offers, promotions, and discounts.

Return Policy: Satisfaction Guaranteed

If you are not satisfied with your Agilent product within the first 60 days, you may return your purchase in its original condition for a full refund or credit. All items returned due to customer error must be new, unused, and in resell condition. Software must be unopened. A return policy statement is included in every Agilent shipment and posted under Product Information on the website. In the U.S. and Canada please phone for a Return Authorization form and return instructions at 1-800-227-9770. If your Agilent product was purchased from a distributor, please contact the distributor.

Ordering Information

Easy Ordering Terms and Conditions

Shipping Damages

If items are damaged in transit, please follow the instructions below:

- If a shipment is visibly damaged on arrival, do not accept it until the person making the delivery has endorsed the bill of lading with statement for the extent of the damage.
- If any damage is found after unpacking, retain all cartons and inner packaging at the shipment location and immediately request that the carrier arrange for an inspection.
- Notify the Agilent Customer Contact Center at 1-800-227-9770 about the damaged shipment so we can make the appropriate sales adjustment and/or provide you with return instructions. Please provide us with the sales order number, product number, and quantity damaged.
- If instructed to return the damaged products to Agilent, please include copies of the bill of lading (with the carrier's statement of damage), return authorization number on packing material, and the inspection report.

Warranties

All Agilent Technologies products in this catalog are designed and manufactured to stringent standards under the Agilent quality system registered to ISO 9001. At Agilent, we back every product with a 90-day warranty and a money-back guarantee. If Agilent receives notice of defects during the warranty period, Agilent shall, at its option, either repair or replace products which prove to be defective. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, the buyer shall be entitled to a refund of the purchase price upon return of the product to Agilent. The warranty period for each product begins on the day of shipment.

This warranty shall not apply to any defect, failure, or damage caused by improper use or improper or inadequate maintenance or care. This warranty is exclusive and no other warranty, whether written or oral, is expressed or implied. Agilent specifically disclaims the implied warranties of merchantability and fitness for particular purposes. The remedies provided herein are the buyer's sole and exclusive remedies. In no event shall Agilent be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) whether based on contract, tort, or any other legal theory.

Ordering Information

Easy Ordering Terms and Conditions

Fast Delivery

Agilent Technologies specializes in fast delivery. Over 97% of all orders for the U.S., Asia Pacific, and Europe are shipped from stock, and we are working to achieve fast delivery for every order.

In the U.S., if you call before 2 PM EST, we will ship your order that day. You can also ask for overnight express delivery before 6 PM EST and you will have your order the next day.

Scheduled deliveries can be arranged upon request.

Taxes

Agilent is required to collect all state and local sales taxes on an order unless the buyer's tax exempt certificate is on file with Agilent Technologies. If your certificate is not on file, please be prepared to provide a copy of your exemption certificate when phoning your order.

Ordering Information

Easy Ordering Terms and Conditions

Easy Ways to Order

Phone us

In the U.S. and Canada, call 1-800-227-9770 (option 1, 1) or call your local authorized Agilent Technologies sales office or distributor. Our customer service representatives are waiting for your call Monday through Friday, from 8 AM to 8 PM EST.

Fax us

In the U.S. fax your order to 302-633-8901.

Email us

In the U.S. and Canada email your order to us at cag_sales-na@agilent.com.

Order online

Order online at www.agilent.com/chem. Full ecommerce capabilities are available in the U.S. and Canada.

Credit Cards and Purchase Orders

Order using a credit card or purchase order. Credit cards currently accepted in the U.S. include Visa, MasterCard, Discover, and American Express. Credit card orders are not applicable in all countries. Credit card acceptance may vary with distributors. A minimum order of \$20 is required for credit card orders.

Electronic Funds Transfer (EFT)

Agilent accepts electronic payments for your convenience. To take advantage of using ACH/EFT payments (Automated Clearing House/Electronic Funds Transfer) please email us at ePay@agilent.com.

Establish an Account

To open a charge account, give your company's billing and shipping address and a purchase order number to your Agilent Customer Service Representative or your local Agilent sales office. An account number will be assigned to you for charging your purchases. Payment terms are net 30 days from the invoice date. All orders are subject to credit approval.

Price Quotes

Just ask for a price and we will be happy to supply it over the phone, email, or via fax if you need a written quote.

Ordering Information

Easy Ordering Terms and Conditions

Custom GC Column Specification and Order Form

- For best results, please photocopy this page, fill in the required information, and mail, fax, or email to Agilent Technologies. For all your custom capillary columns ordered, reference part number 100-2000.
- If you require assistance, please contact 1-800-227-9770, press option 4, column technical support, then press option 1, GC phase application.

Mail: Agilent Technologies
2850 Centerville Road
Wilmington, DE 19808
Attn: Customer Service

Fax: 302-633-8901

Email: custom_columns@agilent.com
(for U.S., Canada, and Puerto Rico) All other countries, please contact your local Agilent sales office or distributor.

Type I

Type of Phase	Length (m)	
<input type="text"/>	<input type="text"/>	
Internal Diameter (mm)	Film Thickness (μm)	5" Cage or Standard Cage
<input type="text"/>	<input type="text"/>	<input type="text"/>

Type II – Duraguard

Column Part Number	OR	Fill in Parameters as Type I
<input type="text"/>		
Guard – Front End Length (m)	OR	Transfer Line – Back End Length (m)
<input type="text"/>		<input type="text"/>

Type III – Guard Column or Transfer Line

Leak Free U

Column Part Number	OR	Fill in Parameters as Type I
<input type="text"/>		
Guard – Front End	OR	Transfer Line – Back End
<input type="text"/>		<input type="text"/>
Internal Diameter (mm)	Length (m)	Internal Diameter (mm) Length (m)
<input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>

Note: Choose Guard Column or Transfer Line

Type IV – Dual Column

Column #1	OR	Fill in Parameters as Type I	
Column Part Number			
<input type="text"/>			
Column #2	OR	Fill in Parameters as Type I	
Column Part Number			
<input type="text"/>			
Leak Free Y	Guard Column	Length (m)	Internal Diameter (mm)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Ordering Information

Easy Ordering Terms and Conditions

Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
Name:		If No, please provide Certificate #		
Title:				
Phone:		Fax:		
Company:		Email:		
Shipping Address		Billing Address		
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
<p>For Assistance: Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada)</p> <p>Email Node: cag_sales-na@agilent.com</p> <p>Fax Number: 302-633-8901 U.S. and Canada</p> <p>Note: 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2,000 U.S.</p>				

Ordering Information

Ordering Information

Easy Ordering Terms and Conditions

Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
Name:		If No, please provide Certificate #		
Title:				
Phone:		Fax:		
Company:		Email:		
	Shipping Address	Billing Address		
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
For Assistance: Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada) Email Node: cag_sales-na@agilent.com Fax Number: 302-633-8901 U.S. and Canada Note: 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2,000 U.S.				

Ordering Information

Ordering Information

Easy Ordering Terms and Conditions

Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
		If No, please provide Certificate #		
Name:		Fax:		
Title:		Email:		
Phone:				
Company:				
Shipping Address		Billing Address		
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
For Assistance: Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada) Email Node: cag_sales-na@agilent.com Fax Number: 302-633-8901 U.S. and Canada Note: 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2,000 U.S.				

Ordering Information

Ordering Information

Easy Ordering Terms and Conditions

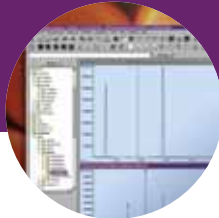
Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
Name:		If No, please provide Certificate #		
Title:				
Phone:		Fax:		
Company:		Email:		
		Shipping Address		Billing Address
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
<p>For Assistance: Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada)</p> <p>Email Node: cag_sales-na@agilent.com</p> <p>Fax Number: 302-633-8901 U.S. and Canada</p> <p>Note: 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2,000 U.S.</p>				

Ordering Information



A full year of exciting offers – right at your fingertips:

www.agilent.com/chem/specialoffers

Now you don't have to look far to find valuable offers that feature high-performance columns and supplies, accessories, software, and more.

Just go to www.agilent.com/chem/specialoffers to find out about our latest offers. And be sure to check back often, because we'll be updating this page throughout the year!

It's just one more way that Agilent helps your lab save time and work more efficiently.

For more details about these limited time offers, contact your local Agilent office or Authorized Agilent Distributor.



www.agilent.com/chem/supplies

**More than essential products.
Reproducible results.**

See the inside back cover for the
latest special offers from Agilent.

This information is subject to change without notice.
© Agilent Technologies, Inc. 2007
Printed in Germany January 15, 2007
5989-5021ENE



Agilent Technologies