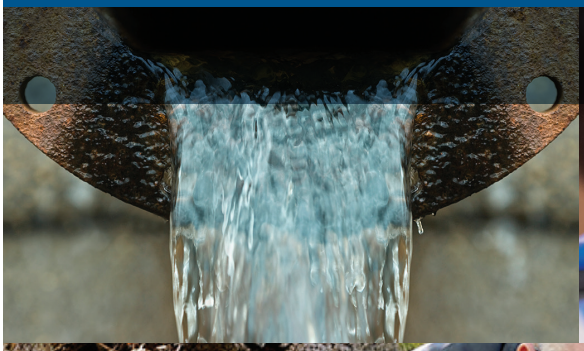
Agilent CrossLab
From Insight to Outcome

Volatile Organic Compounds in Water

Using GC/MSD with helium or hydrogen carrier gases

Consumable workflow ordering guide



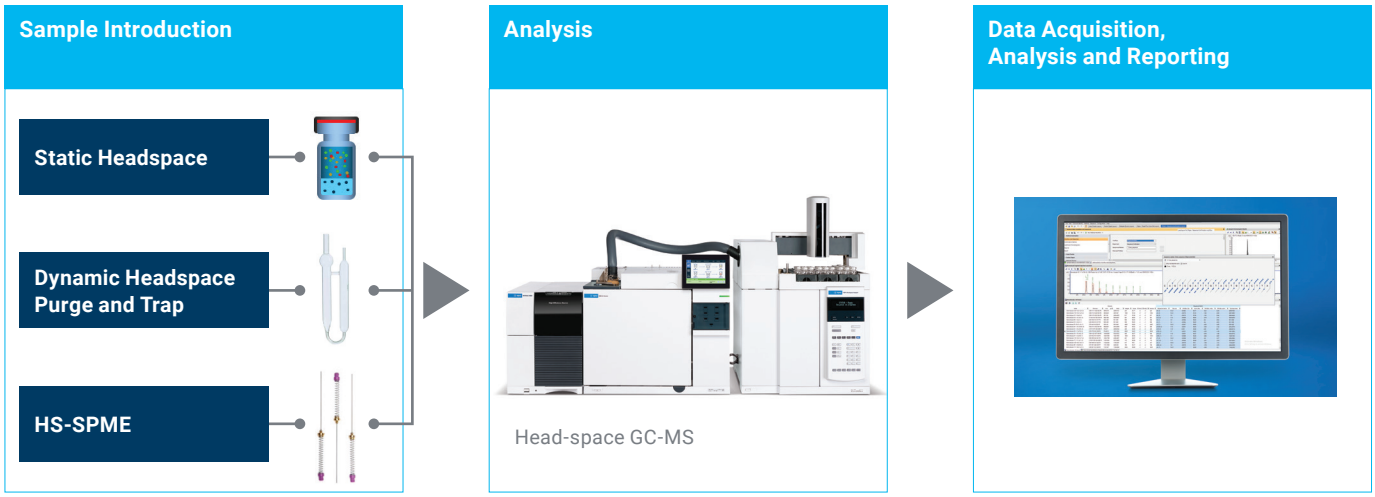
Agilent

Your Complete Solution for Analyzing Volatile Organic Compounds (VOC) in Water

Volatiles are monitored in drinking water supplies by environmental regulators as build-ups of toxic organics, nitrosamines and other disinfection by-products (DBPs) can cause widespread damage.

Regulatory agencies set threshold limits for volatile organic compounds based on threat, toxicity, and target matrix. The allowable concentration of VOCs in drinking water varies by country and region but are typically in the low mg/L (ppb) range. Due to the large number of potential contaminants, and the need to measure them at such low levels, GC/MS systems are commonly used, as they provide both the sensitivity and selectivity required to identify and quantify VOCs.

Agilent provides a complete range of products, spanning sample introduction to analysis and reporting, to labs using regulated methods for the analysis of VOCs in water.



Automated sampling technique extract the VOC analytes from water samples and inject them into the GC/MS

Agilent 7697A, 8697 and 8697-XL Headspace Sampler – static headspace (HS) extraction is a direct approach. As the instrument itself heats the vial to shift diffusion of VOCs into sample headspace.
Regulatory Methods: ISO 20595: 2018 and HJ 810-2016[2]

Teledyne/Tekmar Purge & Trap – widely used with GC/MS for extracting trace levels of VOCs
Regulatory Methods: EPA Method 524.2, 624.1 and 8260C; ISO 15680: 2003; HJ 639-2012

HS-SPME – solid phase microextraction facilitates the extraction of volatile aromatic compounds in the absence of solvent.
Regulatory Methods: ISO 17943:2016[3]

ULTRA EPA Certified Reference Materials (CRMs) – calibration standards for EPA 500, EPA 600 and EPA 8000 series methods includes CofA and SDS

Agilent 8890-5977B, 7890-5977B and 8890-5977C GC/MS – accurate temperature control, precise injection system and enhanced Electronic Pneumatic Control (EPC) modules for the best retention times.

Achieve trace-level analysis with **Agilent J&W Ultra Inert GC Columns** designed with exceptionally low bleed and consistently high inertness, even at high temperatures.

Ensure accurate and reproducible results with Agilent inert flow path solutions such as **Ultra Inert liners, Gold plated inlet seals and inert MS source.**

Protect your flow path from oxygen, moisture, hydrocarbons, to ensure high sensitivity with the **Gas Clean purifier.**

Save on the cost of carrier gas by using the **Hydroinert source** and H_2 carrier gas instead of He, with minimal loss in sensitivity and spectral anomalies.

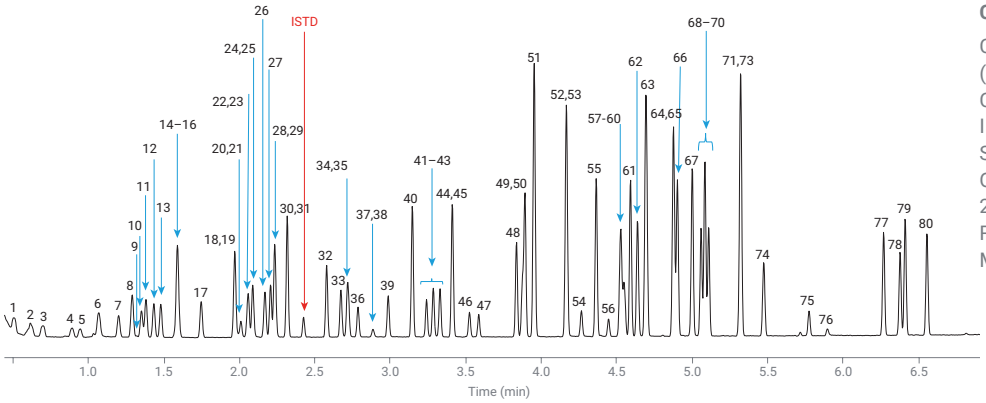
Achieve higher library match scores and greater confidence in peak identification through **Aglent MassHunter Unknowns Analysis software,** which uses spectral deconvolution to extract clean analyte spectra from those of overlapping peaks.

Capture, analyze and share water quality data using **Agilent OpenLab software.**

Recent concerns with the price and availability of helium have led laboratories to look for alternative carrier gases.

For GC/MS, hydrogen is the best alternative to helium, and offers potential advantages in terms of chromatographic speed and resolution. However, hydrogen is not an inert gas, and may cause chemical reactions that can change analysis results. The Agilent Hydroinert source is a newly designed extractor source for GC/MSD that addresses these issues and improves performance of H_2 carrier gas with GC/MS.[1] Agilent scientists have developed optimized chromatographic conditions to separate 80 VOCs in 7 minutes using H_2 carrier gas with the Hydroinert source.[2]

Rapid 7 Minute Analysis of 80 VOCs in Drinking Water with Headspace GC/MSD using Hydrogen Carrier Gas



Conditions

Column: DB-624UI, 20 m x 0.18 mm, 1 µm (p/n 121-1324UI)
Carrier: H_2, 0.95 mL/min, CF
Inlet: 200 °C
Split: 21:1
Oven: 35 °C (0.25 min), ramp 25 °C/min to 240 °C (0.2 min)
Run time: 8.65 min
MS Transferline: 250 °C

Total ion chromatogram (TIC) from scan analysis of the 25 µg/L standard. For study details see reference 5994-4963EN[4]

Fluorobenzene (ISTD)

1. Dichlorodifluoromethane
2. Chloromethane
3. Chloroethane
4. Bromomethane
5. Ethyl Chloride
6. Trichloromonofluoromethane
7. Diethyl Ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile,
15. trans-1,2-dichloroethene
16. Methyl tert-butyl ether (MTBE)
17. 1,1-Dichloroethane
18. cis-1,2-Dichloroethene
19. 2,2-Dichloropropane
20. Propionitrile
21. 2-Propenoic acid, methyl ester
22. Methacrylonitrile
23. Bromochloromethane
24. Trichloromethane
25. THF
26. 1,1,1-Trichloroethane
27. 1-Chlorobutane
28. 1,1-Dichloropropene
29. Carbon tetrachloride
30. Benzene
31. 1,2-Dichloroethane
32. Trichloroethylene
33. 1,2-Dichloropropane
34. Methyl methacrylate
35. Dibromomethane
36. Bromodichloromethane
37. 2-Nitropropane
38. Chloromethyl cyanide
39. cis-1,3-Dichloropropene
40. Toluene
41. trans-1,3-Dichloropropene
42. Ethyl methacrylate
43. 1,1,2-Trichloroethane
44. Tetrachloroethylene
45. 1,3-Dichloropropane
46. Dibromochloromethane
47. 1,2-Dibromoethane
48. Chlorobenzene
49. 1,1,1,2-Tetrachloroethane
50. Ethylbenzene
51. m-Xylene
52. o-Xylene
53. Styrene
54. Tribromomethane
55. Isopropylbenzene
56. p-Bromofluorobenzene [SURR]
57. 1,1,2,2-Tetrachloroethane
58. Bromobenzene
59. 1,2,3-Trichloropropane
60. trans-1,4-Dichloro-2-butene
61. Propylbenzene
62. 2-Chlorotoluene
63. Mesitylene
64. tert-Butylbenzene
65. Pentachloroethane
66. 1,2,4-Trimethylbenzene
67. 1-Methylpropylbenzene
68. 1,3-Dichlorobenzene
69. p-Cymene (4-Isoproyltoluene)
70. 1,4-Dichlorobenzene
71. 1,2-Dichlorobenzene-D4 [SURR]
72. n-Butylbenzene
73. 1,2-Dichlorobenzene
74. Hexachloroethane
75. 1,2-Dibromo-3-chloropropane (DBCP)
76. Nitrobenzene
77. 1,2,4-Trichlorobenzene
78. 1,1,2,3,4,4-Hexachlorobuta-1,3-diene
79. Naphthalene
80. 1,2,3-Trichlorobenzene

Selecting the right J&W GC column for VOC analysis

DB-624 Column

The J&W DB-624 is the global reference standard for VOC analysis. It is often the column of choice when relying on copying existing VOC methodology. Excellent peak shapes and high levels of inertness are the forté of the DB-624UI. It is the column of choice for all VOC methods and for upgrading applications for improved ease of quantification and lower detection limits. For higher productivity and throughput, the 0.18 mm version provides a fast and comprehensive VOC analysis in less than 15 minutes. (Ideally combined with 6 mm MS drawout plate). For optimized chromatographic conditions to separate 80 VOCs in 7 minutes using the 0.18 mm column with H_2 carrier gas, the Hydroinert source and 9 mm drawout plate see Reference 5994-4963EN.[2]

DB-VRX Column

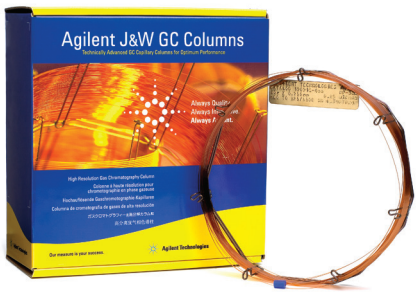
The J&W DB-VRX column is especially targeted for non-MS VOC methods. For VOC applications that contain the 6 early eluting "gases", the DB-VRX offers a unique separation that avoids sub-ambient initial oven temperatures.

Easy Selection and Ordering Information

To order items from the Agilent online store click on the part number hyperlinks in the table below, add-to-cart and proceed to check-out.

Alternatively, save the items in the table to your Favorite Products list by clicking the corresponding MyList header link. Enter the quantities for the products you need, Add-to-Cart and proceed to check-out. The list will remain under your Favorite Products for future use. If this is your first time ordering online, you will be asked to enter your email address for account verification. If you have an existing Agilent account, you will be able to log in. If you do not have a registered Agilent account, you will need to register for one. All items can also be ordered through your regular sales and distributor channels.

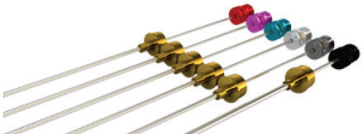
Description	Part Number
MyList of Agilent J&W GC columns	
DB-624 Column	
J&W DB-624 Ultra Inert GC Column, 20 m, 0.18 mm, 1.00 µm, 7 inch cage (recommended for H_2 carrier gas)	121-1324UI
J&W DB-624 Ultra Inert GC Column, 30 m, 0.25 mm, 1.40 µm, 7 inch cage	122-1334UI
J&W DB-624 Ultra Inert GC Column, 60 m, 0.25 mm, 1.40 µm, 7 inch cage	122-1364UI
DB-VRX Column	
J&W DB-VRX GC Column, 20 m, 0.18 mm, 1.00 µm, 7 inch cage	121-1524
J&W DB-VRX GC Column, 30 m, 0.25 mm, 1.40 µm, 7 inch cage	122-1534
J&W DB-VRX GC Column, 60 m, 0.25 mm, 1.40 µm, 7 inch cage	122-1564
MyList of Static Headspace supplies	
Vial, crimp top, headspace, clear, certified, flat bottom, 10 mL, 23 x 46 mm, 100/pk	5182-0838
Vial, headspace, certified, crimp, clear, flat bottom, 20 mL, 100/pk	5182-0837
Vial, crimp top, headspace, amber, graduation marks and write-on spot, flat bottom, certified, 10 mL, 23 x 46 mm, 100/pk	5190-2287
Vial, crimp top, headspace, amber, flat bottom, certified, 20 mL, 23 x 75 mm, 100/pk	5067-0226
Cap, crimp headspace, aluminum, PTFE/silicone speta, 20 mm, 100/pk	5183-4477
Vial, screw top, headspace, clear, 20 mL, 23 x 75 mm, 100/pk	5188-2753
Caps/septa, screw, head space, 18 mm, silver, magnetic, PTFE/silicone septa, 100/pk	8010-0139
MyList of Headspace syringes for CTC/CombiPAL	
Syringe for CTC headspace, HD-type, 1.0 mL, PTFE-tip plunger, 23/56/side hole	G6500-80107
Syringe for CTC headspace, HD-type, 2.5 mL, PTFE-tip plunger, 23/56/side hole	G6500-80109
Syringe for CTC headspace, HD-type, 5.0 mL, PTFE-tip plunger, 23/56/side hole	G6500-80111
MyList of HS-SPME supplies	
SPME Fibers	
SPME Fiber DVB/C-WR/PDMS 80/10-P1, dark gray, 3/pk	5191-5874
SPME Fiber Carbon WR-95/PDMS/10-P3, dark blue, 3/pk	5191-5875
SPME Arrows	
DVB/Carbon WR/PDMS Arrow, 1.10 mm, 120 µm, dark gray, 3/pk	5191-5861
DVB/Carbon WR/PDMS Arrow, 1.50 mm, 120 µm, dark gray, 3/pk	5191-5864
Carbon WR/PDMS Arrow, 1.10 mm, 120 µm, light blue, 3/pk	5191-5859
Carbon WR/PDMS Arrow, 1.50 mm, 120 µm, light blue, 3/pk	5191-5863
SPME Accessories	
Manual Injection Kit for SPME fiber and SPME Arrow	5191-5877
Merlin Microseal SPME replacement Microseal, 23 guage (only compatible with SPME fibers)	392609902



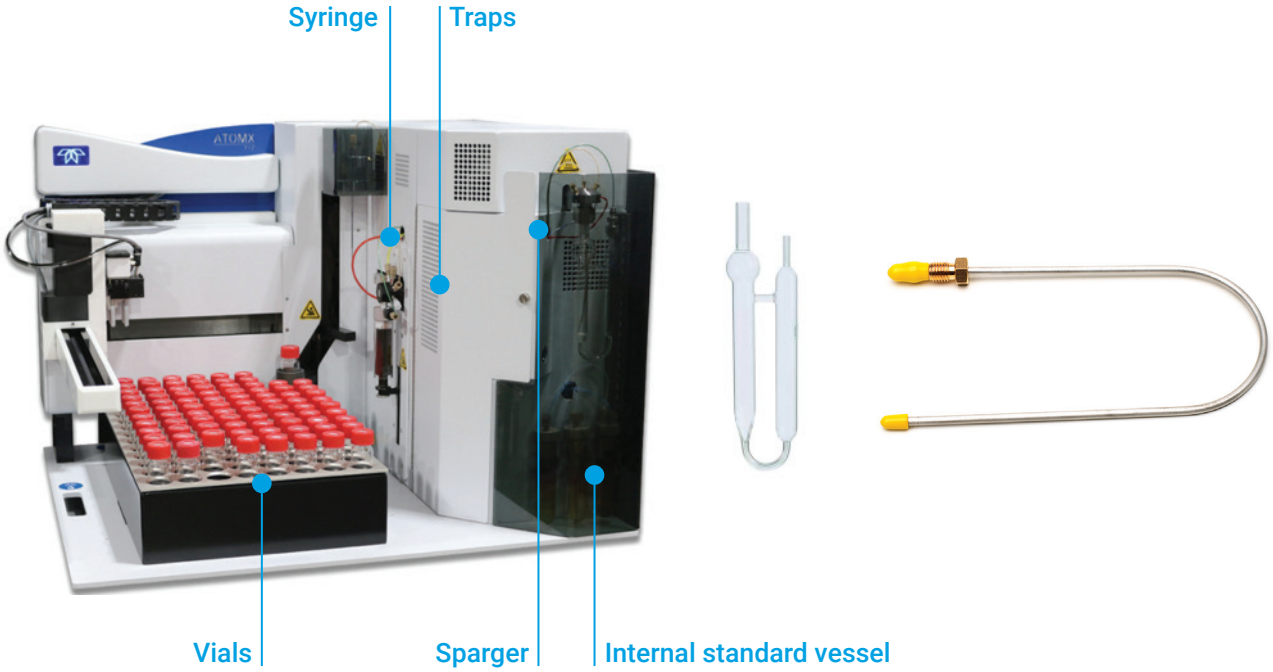
Agilent J&W GC Columns

Clear crimp flat bottom vials

Headspace Syringe



SPME Arrows



Dynamic Headspace Purge and Trap

For key instructions analyzing VOCs using P&T and method details for analysis of 71 compounds in 15 minutes see application note 5991-0029EN[5].

Description	Part Number
MyList of Purge and Trap supplies	
Headspace Syringe, 27 mL, with side port, for Atomx Automated VOC Sample Prep System	5190-2234
Vial kit, 40 mL, precleaned vials, caps, and septa, 72/pk	5183-4741
Traps	
Trap, Vocarb 3000, U-shape for Teledyne Tekmar purge and trap, 1/pk	5188-8820
Trap, proprietary (#9), 12 x 1/8 inch, U-shape	5188-8816
Trap, Tenax (#1A), U-shape	5188-1447
Spargers*	
Sparge vessel 15 mL, amber, for internal standards, for Atomx or Aquatek 100 ALS	5190-2233
Glass, frit sparger, 5 mL, 1/2-inch	5182-0852
Glass, frit sparger, 25 mL, 1/2-inch	5182-0851
Glass, fritless sparger, 5 mL, 1/2-inch	5182-0850
Glass, fritless sparger, 25 mL, 1/2-inch	5182-0849
Needle, sparger glass, 5 mL, 1/2-inch	5182-0848
Needle, sparger glass, 25 mL, 1/2-inch	5182-0847
Sparger Kits*	
Frit sparger kit with fittings, 5 mL, 1/2-inch. For use with Tekmar 3000 & 3100. (Lumin/Stratum)	5182-0846
Frit sparger kit with fittings, 25 mL, 1/2-inch (Lumin/Stratum)	5182-0845
Frit sparger glassware kit, 25 mL, for Atomx	5190-2232
Fritless sparger kit, with fittings, 25 mL, 1/2-inch (Lumin/Stratum)	5182-0796
Fritless sparger glassware kit, 25 mL, for Atomx	5190-2231
MyList of VOC standards	
Drinking water VOC standard, EPA 524.2 (73 compounds)	DWM-525-1
VOC gas standard (6 compounds)	DWM-544-1
Internal standard (3 compounds)	STM-320N-1

** Sparger glassware is interchangeable between all Tekmar P&T concentrators. Sparger kits come with drain line, nuts, and ferrules. Atomx and Atomx XYZ sparger kits are interchangeable. Stratum and Lumin sparger kits are interchangeable.*
Additional Supplies for Teledyne/ Tekmar Purge and Trap Concentrators

VOC-EPA 524.2 Standards

STS-210-1	STS-110N-1	DWM-560-1	DWM-550-1	DWM-570-1
DWM-527-1	DWM-526-1	DWM-528-1	DWM-525-1	DWM-524-1
DWM-540-1	DWM-520-1	DWM-510-1	DWM-530-1	STM-320N-1
STM-320N-1	DWM-529-1	SCA-112-1	STM-590-1	DWM-589N-1
DWM-592-1	DWM-588-1	DWM-583-1	EPA-2045N-1	DWM-580-1
DWM-710-1	DWM-584-1	DWM-596-1		

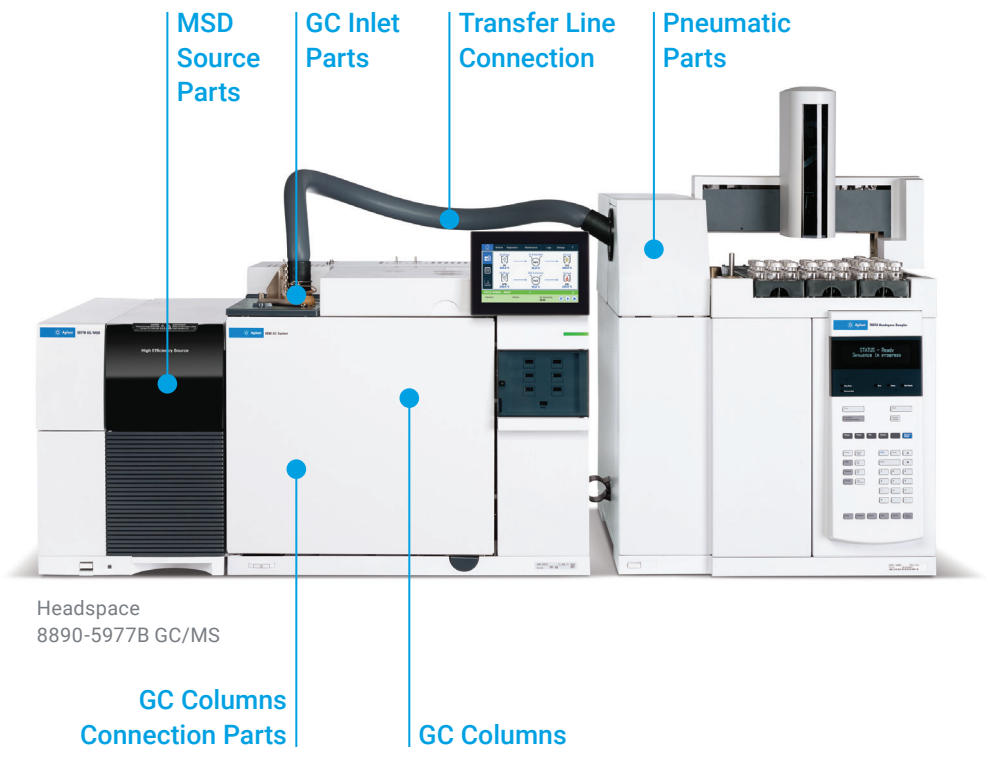
VOC-EPA 624.1 Standards

STS-200-1	STS-130-1	EPA-1016-1	STS-110N-1	STS-180-1
US-425-1	CHM-205-1	STS-164-1	STM-288-1	STS-170-1
XY-0116-1	HCM-601G-1	PMX-111-1	PMX-110-1	PMX-240-1
STM-395-1	STM-291-1	THM-511-1	DWM-584-1	EPA-2142N-1
STS-120-1	STS-201-1	STS-190-1	HC-070-1	US-430-1
STS-150-1	STS-160-1	STM-289-1	XY-0115-1	DWM-551-1
DWM-552-1	PMX-160-1	PMX-100-1	STM-390-1	STM-290N-1
PMX-220-1	PMX-190-1	DWM-544-1	EPA-2141N-1	

VOC-EPA 8260B/C Standards

HC-491-1	CLP-151-1	CLP-152-1	CLP-159-1	CLP-154-1
STM-540-1	STM-541-1	STM-520-1	STM-530-1	NV-240B-1
DWM-588-1	CLP-110-1	CLP-100N-1	CLP-102-1	PMX-144-1
PMX-145B-1	PMX-146-1	CLP-120-1		

More information at: www.agilent.com/chem/standards



Agilent GC/MS Supplies

Description	Part Number
MyList of GC/MSD supplies	
GC inlet parts	
Ferrule, 0.4 mm id, 15% graphite/85%Vespel, 0.1 to 0.25 mm column, 10/pk	5181-3323
Inlet liner, Ultra Inert, splitless, straight, 1 mm id **(recommended for both He and H2 carrier gas)**	5190-4047
Inlet liner, Ultra Inert, splitless, straight, 2 mm id, for use with HS Transferline (recommended with SPME arrows)	5190-6168
Inlet liner, Ultra Inert, splitless, straight, 0.75 mm id (recommended with SPME fibers)	5190-4048
Inlet septa, bleed and temperature optimized (BTO), non-stick, 11 mm, 50/pk,	5183-4757
GC inlet seal, gold plated, with washer, Ultra Inert	5190-6144
GC inlet seal, gold plated, with washer, Ultra Inert, 10/pk	5190-6145
GC columns connection parts	
Column nut, collared, self-tightening, inlet/detector	G3440-81011
Column nut, collared, self-tightening, MSD	G3440-81013
Pneumatic parts	
Sample loop, headspace, 1.00 mL, inert	G4556-80106
Sample probe, deactivated, for Agilent 7697A headspace sampler	G4556-63825
Transfer line connection supplies	
Fused silica tubing, deactivated, 5 m, 0.32 mm, 0.43 mm od	160-2325-5
Ferrule, polyamide, graphite 1/32 inch, 5/pk	0100-2595
Fitting, internal reducer, 1/16 to 1/32 inch	0100-2594
MSD source parts	
Filament, high temperature, EI ion source	G7005-60061
Drawout plate, 6 mm, inert	G2589-20045
Drawout plate, 9.0 mm, inert, Inconel	G3440-20022
9mm Hydroinert extraction lens* **(recommended for H2 carrier gas)**	G7078-20909
Extraction lens insulator **(recommended for H2 carrier gas)**	G3870-20445
Gas filters	
Gas Clean Carrier gas kit, 1-position, for 7890, 1/8 in. Includes one 1-position 1/8 in connecting unit; Purifiers: one carrier gas (p/n CP17973); one 7890 mounting bracket	CP17988
Gas Clean kit, for 8890 and 8860 GC. Includes mounting bracket, connecting unit, and carrier gas filter	CP179880
Gas Clean carrier gas purifier replacement cartridge	CP17973
Agilent big universal trap **(recommended for H_2 carrier gas)**	RMSH-2-SS
Agilent Gas Clean purifier kit for carrier gas	CP17976
MyList of Hydroinert source supplies for tranistion to H_2 carrier gas	
Hydroinert complete source assembly for 5977	G7078-67930
Hydroinert complete source assembly for 7000 TQ	G7006-67930
Hydroinert GC/MSD upgade	5505-0083
Hydroinert GC/TQ upgade	5505-0084
Stainless steel installation kit	19199S

** Default lens included with the Hydroinert source.*

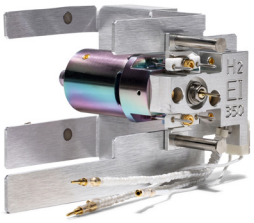
Ultra Inert Inlet Liners

BTO inlet septa

Gold seal

Column nut, collared, inlet

Gas Clean Filter System



Hydroinert complete source assembly

References

1. Agilent Inert Plus GC/MS System with HydroInert Source Applying H_2 carrier gas to real-world GC/MS analyses - 5994-4889EN.
2. Volatile Organic Compound Analysis in Water Following HJ810-2016 Using an Agilent 8697 Headspace Sampler -XL Tray with an Agilent 8860 GC System and 5977B MSD - 5994-6074EN.
3. Determination of VOCs in Water by GC/MS after Headspace-Solid-Phase Microextraction (HS-SPME - 5994-1045EN.
4. Volatile Organic Compounds Analysis in Drinking Water with Headspace GC/MSD Using Hydrogen Carrier Gas and HydroInert Source - 5994-4963EN.
5. Volatile Organic Compound Analysis Using Purge and Trap - 5991-0029EN.

Agilent CrossLab: Real insight, real outcomes

CrossLab goes beyond instrumentation to bring you services, consumables,and lab-wide resource management. So your lab can improve efficiency, optimize operations, increase instrument uptime, develop user skill, and more.

Learn more about Agilent CrossLab, and see examples of insight that leads to great outcomes at **www.agilent.com/crosslab**

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