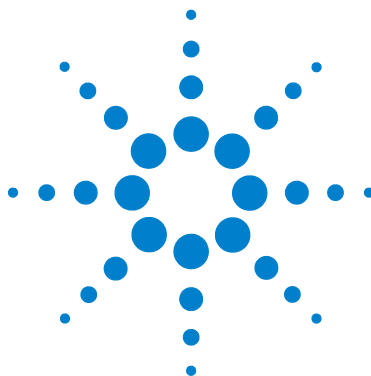




Agilent GC, GC/MS, and ALS

Site Preparation Guide



Agilent Technologies

Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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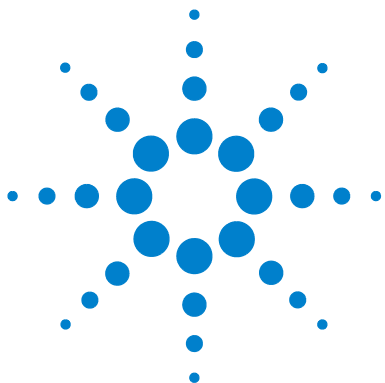
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This section outlines the space and resource requirements for GC, GC/MS, and automatic liquid sampler (ALS) installation. For a successful and timely installation of the instrument, the site must meet these requirements before beginning installation. Necessary supplies (gases, tubing, operating supplies, consumables, and other usage-dependent items such as columns, vials, syringes, and solvents) must also be available. Note that performance verification requires the use of helium carrier gas. For MS systems using chemical ionization, methane reagent gas or methanol (for internal ionization ion traps) is also required for performance verification. Refer to the Agilent Web site at www.agilent.com/chem for the most up-to-date listing of GC, GC/MS, and ALS supplies and consumables.



Customer Responsibilities

The specifications in this manual outline the necessary space, electrical outlets, gases, tubing, operating supplies, consumables, and other usage-dependent items such as columns, vials, syringes, and solvents required for the successful installation of instruments and systems.

If Agilent is delivering installation and familiarization services, users of the instrument should be present throughout these services; otherwise, they will miss important operational, maintenance, and safety information.

If Agilent is delivering installation and familiarization services, delays due to inadequate site preparation could cause loss of instrument use during the warranty period. In extreme cases, Agilent Technologies may ask to be reimbursed for the additional time required to complete the installation. Agilent Technologies provides service during the warranty period and under maintenance agreements only if the specified site requirements are met.

Dimensions and Weight

Select the laboratory bench space before the system arrives. Pay special attention to the total height requirements. Avoid bench space with overhanging shelves. See [Table 1](#).

The instrument needs space for proper convection of heat and ventilation. Allow at least 25 cm (10 in) clearance between back of the instrument and wall to dissipate hot air and allow for routine maintenance.

Table 1 Required height, width, depth, and weight

Product	Height	Width	Depth	Weight
7890A GCs	50 cm (19.2 in)	59 cm (23 in)	54 cm (21 in)	50 kg (112 lb)
With third detector	50 cm (19.2 in)	68 cm (27 in)	54 cm (21 in)	57 kg (125.4 lb)
7000 Triple Quad MS				
• Performance turbo pump	47 cm (18.5 in)	35 cm (14 in)	86 cm (34 in)	49 kg (180 lb)
• Performance CI/El turbo pump	47 cm (18.5 in)	35 cm (14 in)	86 cm (34 in)	63.5 kg (140 lb)
• Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
7200 Q-TOF MS				
• Performance turbo pump	133 cm (52.5 in)	88 cm (34.5 in)	100 cm (39.5 in)	138 kg (305 lbs)
• Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
5975 Series MSD				
• Diffusion pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Standard turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Performance turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	41 kg (90 lb)
• Performance CI/El turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	46 kg (100 lb)

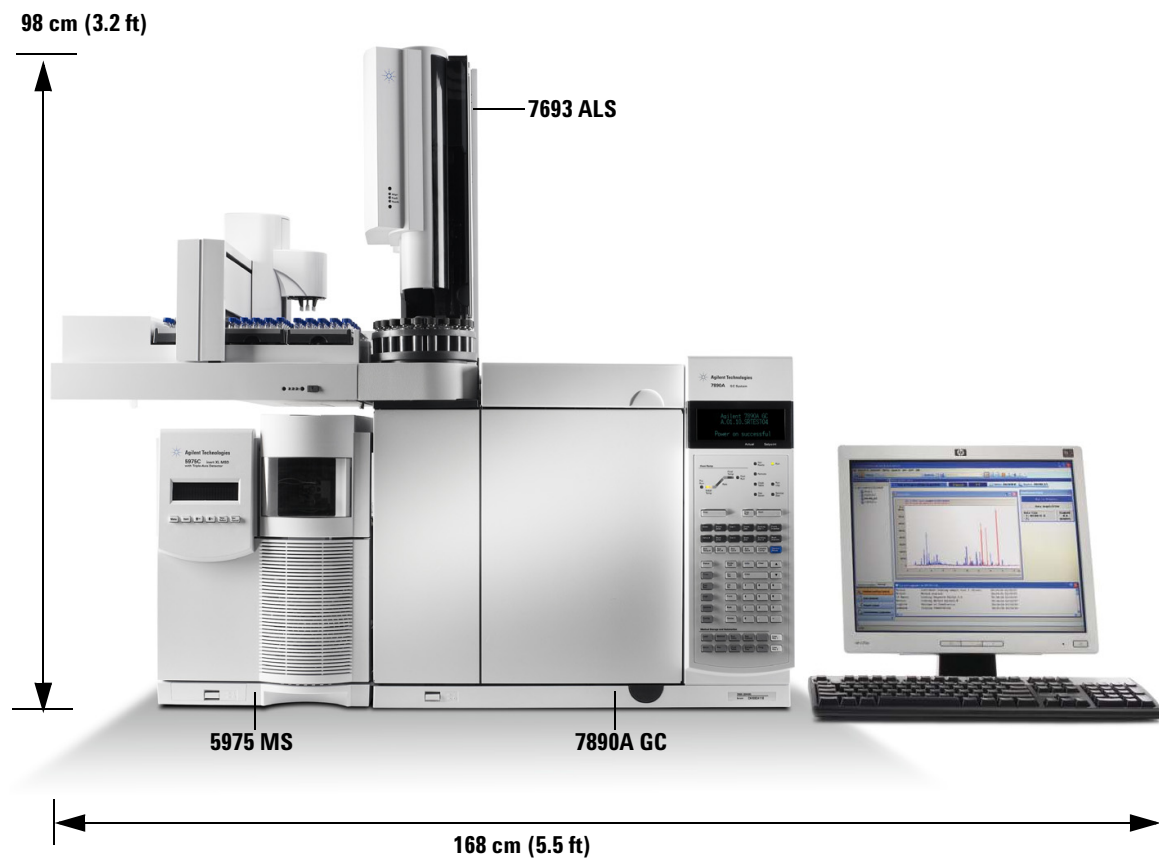
Table 1 Required height, width, depth, and weight (continued)

Product	Height	Width	Depth	Weight
• Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
220 Ion Trap MS	49 cm (19 in)	25 cm (10 in)	64 cm (25 in)	23 kg (51 lb)
• Foreline pump (with oil mist eliminator)	38 cm (15 in)	21 cm (8 in)	31 cm (12 in)	11 kg (24 lb)
240 Ion Trap MS	49 cm (19 in)	38 cm (15 in)	66 cm (26 in)	42 kg (93 lb)
• Foreline pump (with oil mist eliminator), standard	46 cm (18 in)	21 cm (8 in)	43 cm (17 in)	22 kg (49 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
7697A Headspace sampler				
111 vial model	80 cm (32 in)	69 cm (27 in)	70 cm (27.5 in)	46 kg (101 lb)
12 vial model	61 cm (24 in)	64 cm (25 in)	69 cm (27 in)	38.2 kg (84 lb)
G1888 Headspace sampler	56 cm (22 in)	46 cm (18.1 in)	64 cm (25 in)	46.3 kg (102 lb)
Additional space requirements				
• GC/MS operational and maintenance access	Requires 30 cm (1 ft) to its left			
• GC/Q-TOF operational and maintenance access	Requires 40 cm (16 in) on both sides, and 30 cm (12 in) in the back.			
• GC/Ion Trap MS operational and maintenance access	Requires 76 cm (30 in) above the instrument and 22 cm (9 in) to the right			
• Typical laser printer	Requires 41 cm (16 in)			
• GC operational oven access	Requires ≥ 30 cm (12 in) open space above GC			
• GC with 7693A ALS injector	Requires 50 cm (19.5 in) above the GC			3.9 kg (8.6 lb) each
• GC with 7693A ALS tray	Requires 45 cm (17.5 in) left of the GC Requires 2 cm (1 inch) in front of GC			6.8 kg (15 lb) each
• GC with 7683B ALS injector	Requires 42 cm (16.5 in) above the GC			3.1 kg (7 lb) each

Table 1 Required height, width, depth, and weight (continued)

Product	Height	Width	Depth	Weight
• GC with 7683B ALS tray		Requires 30 cm (12 in) left of the GC		3.0 kg (7 lb)
• GC with CTC PAL Autosampler		Requires 66 cm (26 in) above the GC and 4 to 20 cm (1.5 to 8 in) to the left or right, depending on configuration		
• GC with 7697A Headspace sampler		Requires 69 cm (27 in) to the right of the GC (G4557A), or 64 cm (25 in) to the right of the GC (G4556A).		

7890A GC Site Preparation



Depth: 92 cm (3 ft)

Figure 1 Front view of typical installation (7890A GC/5975 MS system with 7693A ALS)

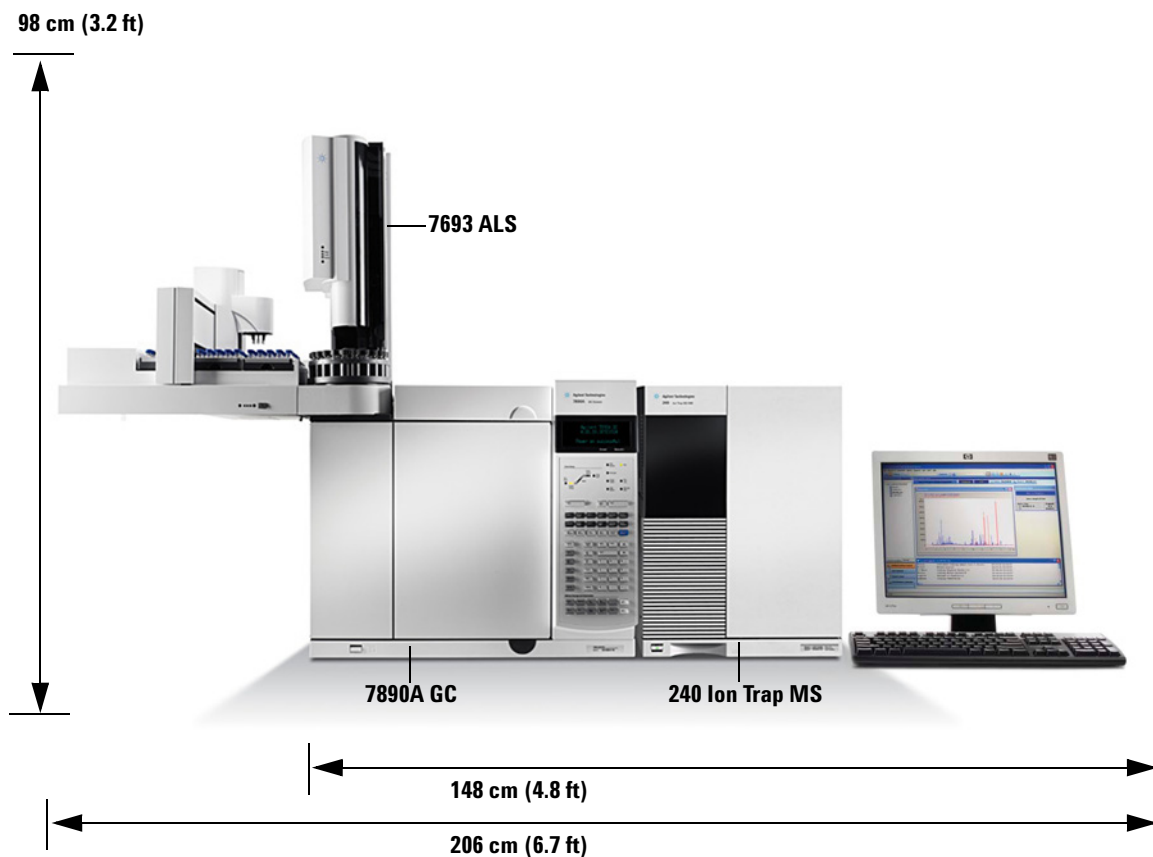


Figure 2 Front view of typical installation (7890A GC/240 Ion Trap MS system with 7693A ALS)

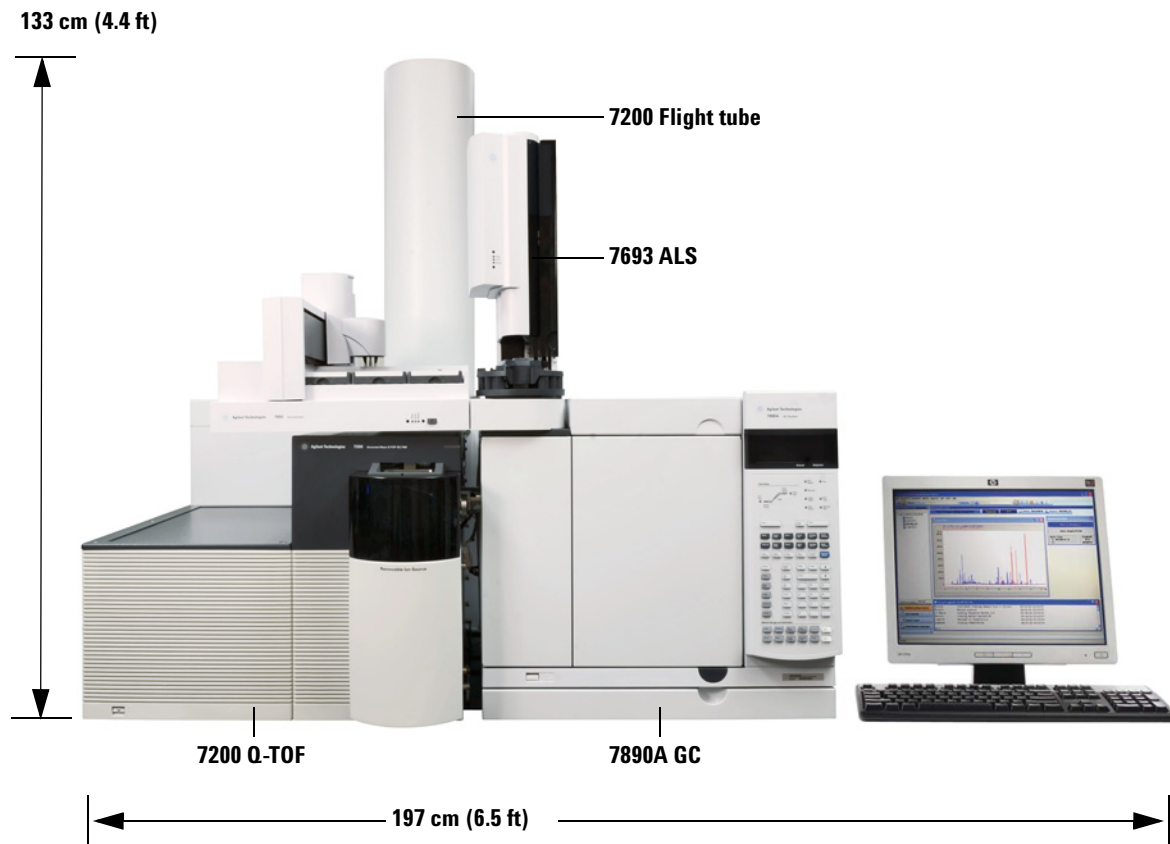


Figure 3 Front view of typical installation (7890A GC/7200 Q-TOF MS system with 7693 ALS)

A simple 7890A system that includes a GC, a 5975 or 7000 MS, an ALS, and a computer would require about 168 cm (5.5 ft) of bench space (see [Figure 1](#)). A simple 7890A system with a GC, Ion Trap MS, ALS, and computer would require about 206 cm (6.7 ft) of bench space (or 148 cm [4.8 ft] excluding the area under the tray.) See [Figure 2](#). Allowing for operational access and a printer, a total of 260 cm (8.5 ft) of bench space should be available for a quadrupole GC/MS system and 298 cm (9.7 ft)

should be available for an Ion Trap GC/MS system. Some repairs to the GC/MS or to the GC will also require access to the back of the instrument(s).

A simple 7890A system that includes a GC, a Q-TOF MS, an ALS, and a computer would require about 197 cm (6.5 ft) of bench space that is at least 92 cm (3 ft) deep. See [Figure 3](#). Allowing for operational access and a printer, a total of 277 cm (9.2 ft) of bench space should be available for a 7200 Q-TOF GC/MS system. In addition, the Q-TOF requires 30 cm (1 ft) of space behind the instrument for air circulation, the vacuum pump hose, and electrical connections; and 48 cm (1.6 ft) of space in front to allow for the RIS probe extraction tool handle when installed.

CAUTION

The supporting surface for the 7200 Q-TOF GC/MS system should be kept relatively vibration free. Do not put the rough pump on your laboratory bench with the 7200 Q-TOF GC/MS due to the vibration that the pump creates. Vibration can lead to a loss of mass accuracy and resolution.

Note that the length of the quadrupole (and Q-TOF GC/MS) vacuum hose is 130 cm (4 ft 3 in) from the high vacuum pump to the foreline pump, and the length of the foreline pump power cord is 2 m (6 ft 6 in).

The vacuum hose connecting the Ion Trap MS to the foreline pump is 200 cm (79 in) long. To accommodate the pump vacuum hose, the bench should be no higher than 91 cm (3 ft). If your bench is higher, place a bench that can support a 22 kg (48 lb) pump and isolate vibration under the bench. If your bench abuts a wall, drill a 3.8 cm (1.5 in) diameter hole through the rear of the bench for the vacuum hose.

CAUTION

Make sure the 7200 Q-TOF GC/MS foreline pump is located where it is not likely to be touched by operators.

Power Consumption

Table 2 lists site power requirements.

- The number and type of electrical outlets depend on the size and complexity of the system.
- Power consumption and requirements depend on the country the unit ships to.
- The voltage requirements for your instrument are printed near the power cord attachment.
- The electrical outlet for the unit should have a dedicated ground.
- All instruments should be on a dedicated circuit.
- Power line conditioners should not be used with Agilent instruments.

Table 2 Power requirements

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Maximum continuous power consumption (VA)	Current rating (amps)	Power outlet current rating
7890A GC	Standard	Americas: 120 single phase (–10% / +10%)	48–63	2250	18.8	20 Amp Dedicated
7890A GC	Standard	220/230/240 single/split phase (–10% / +10%)	48–63	2250	10.2/9.8/ 9.4	10 Amp Dedicated
7890A GC	Fast	Japan 200 split phase (–10% / +10%)	48–63	2950	14.8	15 Amp Dedicated
7890A GC	Fast	220/230/240 single/split phase (–10% / +10%)*	48–63	2950	13.4/12.8 / 12.3	15 Amp Dedicated
7000 Triple Quad MS		120 (–10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated
7000 Triple Quad MS		220–240 (–10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated

Table 2 Power requirements (continued)

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Maximum continuous power consumption (VA)	Current rating (amps)	Power outlet current rating
7000 Triple Quad MS		200 (–10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated
7200 Q-TOF MS		200–240 (–10% / +5%)	50/60 ± 5%	1800 (1200 for foreline pump)	15	15 Amp Dedicated
5975 Series MSD		120 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated
5975 Series MSD		220–240 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated
5975 Series MSD		200 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated
220/240 Ion Trap MS		100 (+/-10%)	50/60 ± 5%	1500	12	
220/240 Ion Trap MS		120 (+/-10%)	60 ± 5%	1500	12	
220/240 Ion Trap MS		200 (+/-10%)	50/60 ± 5%	1500	6	
220/240 Ion Trap MS		240 (+/-10%)	50/60 ± 5%	1500	6	
7697A Headspace		Americas: 120 single phase (–10% / +10%)	48–63	2250	18.8	20 Amp Dedicated
7697A Headspace		220/230/240 single/split phase (–10% / +10%)	48–63	2250	10.2/9.8/ 9.4	10 Amp Dedicated
Data system PC (monitor, CPU, printer)		100/120/200-240 (–10% / +5%)	50/60 ± 5%	1000	15	15 Amp Dedicated

* Option 003, 208 VAC fast oven, uses a 220 VAC unit with operating range of 198 to 242 VAC. Most labs have 4-wire service resulting in 208 VAC at the wall receptacle. It is important to measure the line voltage at the receptacle for the GC.

WARNING

Do not use extension cords with Agilent instruments. Extension cords normally are not rated to carry enough power and can be a safety hazard.

Although your GC should arrive ready for operation in your country, compare its voltage requirements with those listed in [Table 2](#). If the voltage option you ordered is not suitable for your installation, contact Agilent Technologies.

CAUTION

A proper earth ground is required for GC operations. Any interruption of the grounding conductor or disconnection of the power cord could cause a shock that could result in personal injury.

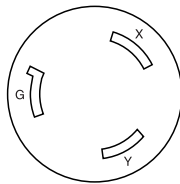
To protect users, the metal instrument panels and cabinet are grounded through the three-conductor power line cord in accordance with International Electrotechnical Commission (IEC) requirements.

The three-conductor power line cord, when plugged into a properly grounded receptacle, grounds the instrument and minimizes shock hazard. A properly grounded receptacle is one that is connected to a suitable earth ground. Be sure to verify proper receptacle grounding. The GC requires an isolated ground.

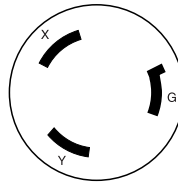
Connect the GC to a dedicated receptacle. Use of a dedicated receptacle reduces interference.

USA fast heating oven, 240 V

The 240 V fast heating oven requires 240 V/15A power. Do not use 208 V power. Lower voltage causes slow oven ramps and prevents proper temperature control. The power cord supplied with your GC is rated for 250 V/15A, and is a two-pole, three-wire cord with grounding (type L6-15R/L6-15P). See the figure below.



**Receptacle
L6-15R**



**Plug
L6-15P**

Canadian installation

When installing a GC in Canada, make sure your GC's power supply circuit meets the following additional requirements:

- The circuit breaker for the branch circuit, which is dedicated to the instrument, is rated for continuous operation.
- The service box branch circuit is marked as a “Dedicated Circuit.”

Heat Dissipation

Use [Table 3](#) to estimate the additional BTUs of heat dissipated from this equipment. Maximums represent the heat given off when heated zones are set for maximum temperatures.

Table 3 Heat dissipation

Oven type		
	Standard oven ramp	Fast oven ramp (option 002 or 003)
7890A GC	7681 BTU/hour maximum	10,071 BTU/hour maximum
Steady state, including MS interface		
5975 Series MSD	3000 BTU/hour	
7000 Triple Quad MS	3700 BTU/hour	
7200 Q-TOF MS	6200 BTU/hour	
220 Ion Trap MS	2100 BTU/hour	
240 Ion Trap MS	2800 BTU/hour	

1 BTU = 1055.05585262 J

Exhaust Venting

Hot air (up to 450 °C) from the oven exits through a vent in the rear. . Allow at least 25 cm (10 in) clearance behind the instrument, or 30 cm (12 in) behind a Q-TOF GC/MS, and 76 cm (30 in) above the Ion Trap to dissipate this air.

WARNING

Do not place temperature-sensitive items (for example, gas cylinders, chemicals, regulators, and plastic tubing) in the path of the heated exhaust. These items will be damaged and plastic tubing will melt. Be careful when working behind the instrument during cool-down cycles to avoid burns from the hot exhaust.

An optional oven exhaust deflector (G1530-80650) is available and may improve oven cooling by deflecting the exhaust air up and away from the instrument. For GCs with the exhaust deflector option installed, the exhaust is about 65 ft³/min (1.840 m³/min). Without the deflector, the exhaust rate is about 99 ft³/min (2.8 m³/min). The deflector outlet diameter is 10 cm (4 in).

During normal operation of the GC with many detectors and inlets, some of the carrier gas and sample vents outside the instrument through the split vent, septum purge vent, and detector exhaust. If any sample components are toxic or noxious, or if hydrogen is used as the carrier gas, the exhaust must be vented to a fume hood. Place the GC in the hood or attach a large diameter venting tube to the outlet for proper ventilation.

To further prevent contamination from noxious gases, attach a chemical trap to the vent(s).

Vent the GC/MS system externally to the building via an ambient-pressure vent system, within 460 cm (15 ft) of both the GC split vent and GC/MS foreline pump, or vent to a fume hood. Note that an exhaust vent system is not part of the building environmental control system, which recirculates air. Exhaust venting must comply with all local environmental and safety codes. Contact your Environmental Health & Safety (EHS) specialist.

Environmental Conditions

Operating the instrument within the recommended ranges optimizes instrument performance and lifetime. Performance can be affected by sources of heat and cold from heating, air conditioning systems, or drafts. See [Table 4](#). The conditions assume a noncondensing, noncorrosive atmosphere. The instrument meets the following International Electrotechnical Commission (IEC) classifications: Equipment Class I, Laboratory Equipment, Installation Category II, and Pollution Degree 2.

Table 4 Environmental conditions for operation and storage

Product	Conditions	Operating temp range	Operating humidity range	Maximum altitude
7890A GC	Standard oven ramp	0 to 55 °C	5 to 95%	4,615 m
	Fast oven ramp (options 002 and 003)	0 to 55 °C	5 to 95%	4,615 m
	Storage	–20 to 70 °C	5 to 95%	
7000 Triple Quad MS	Operation	15 to 35 °C * (59 to 95 °F)	0 to 85%	5,000 m †
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	
7200 Q-TOF MS	Operation	15 to 35 °C * (59 to 95 °F)	20 to 80%	5,000 m †
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	
5975 Series MSD	Operation	15 to 35 °C ‡ (59 to 95 °F)	20 to 80%	4,615 m
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	
220 Ion Trap	Operation	16 to 30 °C (61 to 86 °F)	20 to 80%	
240 Ion Trap	Operation	16 to 27 °C (61 to 81 °F)	20 to 80%	

* Operation requires constant temperature (variations < 2 °C/hour)

† An altitude of 3,700 meters (12,000 feet) is supported if the ambient temperature is less than 30 °C

‡ Operation requires constant temperature (variations < 2 °C/hour)

Gas and Reagent Selection

Table 5 lists gases usable with Agilent GCs and capillary columns. When used with capillary columns, GC detectors require a separate makeup gas for optimum sensitivity. The MS and MSD use GC carrier gas.

NOTE

Nitrogen and Argon/Methane are generally not suitable for GC/MS carrier gas.

Table 5 Gases usable with Agilent GCs and capillary columns

Detector type	Carrier	Preferred makeup	Alternate choice	Detector, anode purge, or reference
Electron capture (ECD)	Hydrogen	Argon/Methane (5%)	Nitrogen	Anode purge must be same as makeup
	Helium	Argon/Methane (5%)	Nitrogen	
	Nitrogen	Nitrogen	Argon/Methane (5%)	
	Argon/Methane (5%)	Argon/Methane (5%)	Nitrogen	
Flame ionization (FID)	Hydrogen	Nitrogen	Helium	Hydrogen and air for detector
	Helium	Nitrogen	Helium	
	Nitrogen	Nitrogen	Helium	
Flame photometric (FPD)	Hydrogen	Nitrogen		Hydrogen and air for detector
	Helium	Nitrogen		
	Nitrogen	Nitrogen		
	Argon	Nitrogen		
Nitrogen-Phosphorus (NPD)	Helium	Nitrogen	Helium*	Hydrogen and air for detector
	Nitrogen	Nitrogen	Helium	
Thermal conductivity (TCD)	Hydrogen	Must be same as carrier and reference	Must be same as carrier and reference	Reference must be same as carrier and makeup
	Helium			
	Nitrogen			

* Depending on bead type, higher makeup gas flow rates (> 5 mL/min) may introduce cooling effects or shorten bead life.

Table 6 lists gas recommendations for packed column use. In general, makeup gases are not required with packed columns.

Table 6 Gases usable with Agilent GCs and packed columns

Detector type	Carrier gas	Comments	Detector, anode purge, or reference
Electron capture (ECD)	Nitrogen	Maximum sensitivity	Nitrogen
	Argon/methane	Maximum dynamic range	Argon/Methane
Flame ionization (FID)	Nitrogen	Maximum sensitivity	Hydrogen and air for detector.
	Helium	Acceptable alternative	
Flame photometric (FPD)	Hydrogen Helium Nitrogen Argon		Hydrogen and air for detector.
Nitrogen-Phosphorus (NPD)	Helium	Optimum performance	Hydrogen and air for detector.
	Nitrogen	Acceptable alternative	
Thermal conductivity (TCD)	Helium	General use	Reference must be same as carrier and makeup.
	Hydrogen	Maximum sensitivity*	
	Nitrogen	Hydrogen detection†	
	Argon	Maximum hydrogen sensitivity	

* Slightly greater sensitivity than helium. Incompatible with some compounds.

† For analysis of hydrogen or helium. Greatly reduces sensitivity for other compounds.

For installation checkout, Agilent requires the gas types shown in [Table 7](#).

Table 7 Gases and reagents required for checkout

Detector	Gases required
FID	Carrier: helium Makeup: nitrogen Fuel: hydrogen Aux gas: Air
TCD	Carrier and reference: helium
NPD	Carrier: helium Makeup: nitrogen Fuel: hydrogen Aux gas: Air
uECD	Carrier: helium Anode purge and makeup: nitrogen
FPD	Carrier: helium Makeup: nitrogen Fuel: hydrogen Aux gas: Air
CI MS (external)	Reagent gas: methane
CI MS (internal)	Reagent: methanol

WARNING

When using hydrogen (H₂) as the carrier gas or fuel gas, be aware that hydrogen gas can flow into the GC oven and create an explosion hazard. Therefore, be sure that the supply is turned off until all connections are made and ensure the inlet and detector column fittings are either connected to a column or capped at all times when hydrogen gas is supplied to the instrument.

Hydrogen is flammable. Leaks, when confined in an enclosed space, may create a fire or explosion hazard. In any application using hydrogen, leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen supply at its source before working on the instrument.

Please refer to the Hydrogen Safety Guide shipped with your instrument.

Gas and Reagent Purity

Agilent recommends that carrier and detector gases be 99.9995% pure. See [Table 8](#). Air needs to be zero grade or better. Agilent also recommends using high quality traps to remove hydrocarbons, water, and oxygen.

Table 8 Carrier, collision, and reagent gas purity

Carrier, collision, and reagent gas requirements	Purity	Notes
Helium (carrier and collision)	99.9995%	Hydrocarbon free
Hydrogen (carrier)	99.9995%	SFC grade
Nitrogen (collision) [*]	99.999%	Research or SFC grade
Nitrogen (drying gas, nebulizer pressure) [†]	99.999%	Research or SFC grade
Methane reagent gas [‡]	99.999%	Research or SFC grade
Isobutane reagent gas ^{**}	99.99%	Instrument grade
Ammonia reagent gas ^{**}	99.9995%	Research or SFC grade
Carbon dioxide reagent gas ^{**}	99.995%	SFC grade
Methanol ^{††}	99.9%	Reagent grade. Purge and trap grade recommended.

* Nitrogen for the collision cell requires a separate supply from the nitrogen used for the drying gas. A separate pressure regulator is required. A high pressure bottle of nitrogen is recommended for the collision cell gas supply.

† Purity specification is the minimum acceptable purity. Major contaminants can be water, oxygen, or air. Drying gas and nebulizer pressure gas can be supplied by a nitrogen gas generator, house nitrogen system, or liquid nitrogen dewar.

‡ Required reagent gas for installation and performance verification, external CI MS only. The 5975, 7000 GC/MS, 7200 Q-TOF MS, and 240 Ion Trap operate in an external CI mode.

** Optional reagent gases, CI MS and MSD only.

†† Required reagent for performance verification in internal CI mode only. The 220 and 240 Ion Traps can operate in internal CI mode. Evaporation residue < .0001%.

Gas Supplies

Supply instrument gases using tanks, an internal distribution system, or gas generators. If used, tanks require two-stage pressure regulators with packless, stainless steel diaphragms. The instrument requires 1/8-inch Swagelok connections to its gas supplies.

NOTE

Plumb the gas supply tubing/regulators so that one 1/8-inch Swagelok female connector is available for each gas needed at the instrument.

[Table 9](#) lists available Agilent two-stage tank regulators. All Agilent regulators are supplied with the 1/8-inch Swagelok female connector.

Table 9 Tank regulators

Gas type	CGA number	Max pressure	Part number
Air	346	125 psig (8.6 Bar)	5183-4641
Hydrogen, Argon/Methane	350	125 psig (8.6 Bar)	5183-4642
Oxygen	540	125 psig (8.6 Bar)	5183-4643
Helium, Argon, Nitrogen	580	125 psig (8.6 Bar)	5183-4644
Air	590	125 psig (8.6 Bar)	5183-4645

[Table 10](#) and [Table 11](#) list minimum and maximum delivery pressures for inlets and detectors, measured at the bulkhead fittings on the back of the instrument.

Table 10 Delivery pressures for inlets required at the GC/MS, in kPa (psig)

Inlet type						
	Split/Splitless 150 psi	Split/Splitless 100 psi	Multimode 100 psi	On-column	Purged packed	PTV
Carrier (max)	1,172 (170) *	827 (120)	1,172 (170)	827 (120)	827 (120)	827 (120)
Carrier (min)	(20 psi) above pressure used in method					

* Japan only: 1013 (147)

Table 11 Delivery pressures for detectors required at the GC/MS, in kPa (psig)

Detector type					
	FID	NPD	TCD	ECD	FPD
Hydrogen	240–690 (35–100)	240–690 (35–100)			310–690 (45–100)
Air	380–690 (55–100)	380–690 (55–100)			690–827 (100–120)
Makeup	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)
Reference			380–690 (55–100)		

The minimum supply pressure for Auxiliary EPC and PCM modules is 138 kPa (20 psi) greater than the pressure used in your method. For example, if you need a pressure of 138 kPa (20 psi) for the method, the supply pressure must be at least 276 kPa (40 psi). [Table 12](#) lists the maximum carrier pressure for Auxiliary EPC and PCM modules.

Table 12 Delivery pressures for Auxiliary EPC and PCM modules, in kPa (psig)

	Aux EPC	PCM 1	PCM 2 or PCM Aux
Carrier (max)	827 (120)	827 (120)	827 (120) with Forward pressure control 345 (50) with Backpressure control

Conversions: 1 psi = 6.8947 kPa = 0.068947 Bar = 0.068 ATM

Notes:

- If you have not requested option 305 (pre-plumbed tubing), you must supply pre-cleaned, 1/8-inch copper tubing and a variety of 1/8-inch Swagelok fittings to connect the GC to inlet and detector gas supplies.
- Cryogenic cooling with Liquid N₂ requires 1/4-inch insulated copper tubing.
- Cryogenic cooling with Liquid CO₂ requires 1/8-inch heavy-walled, stainless steel tubing.
- If using a multimode inlet with compressed air cooling, the type of tubing needed depends on the type of inlet purchased, liquid CO₂ or liquid N₂. Use 1/4-inch copper or stainless steel tubing to supply the compressed air for the N₂ option, or 1/8-inch copper or stainless steel tubing for the CO₂ option.
- If you purchased automated valving, the valve actuation requires a **separate** pressurized, dry air supply at 380 kPa (55 psig). This air supply must end in a male fitting compatible with a 1/4-inch id plastic tube at the GC.
- Never use liquid thread sealer to connect fittings. Never use chlorinated solvents to clean tubing or fittings.

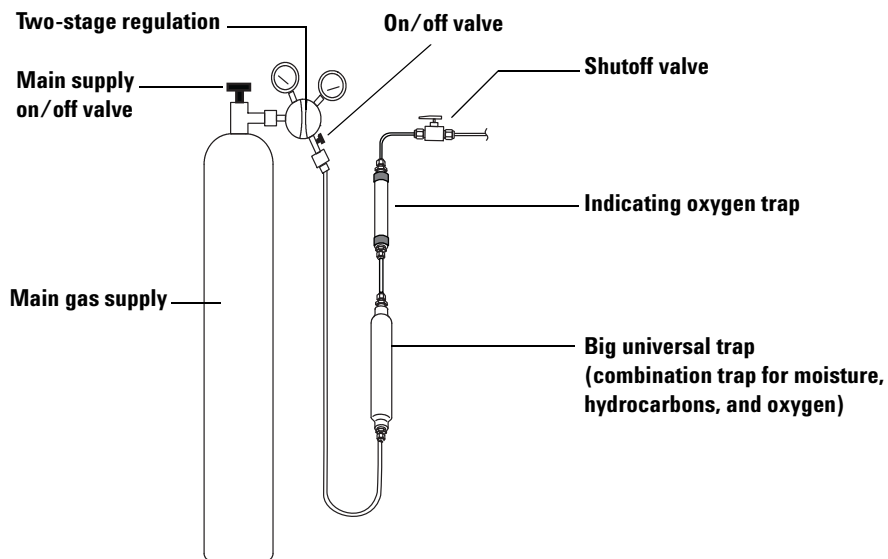
Gas Plumbing

WARNING

All compressed gas cylinders should be securely fastened to an immovable structure or permanent wall. Compressed gases should be stored and handled in accordance with the relevant safety codes.

Gas cylinders should not be located in the path of heated oven exhaust.

To avoid possible eye injury, wear eye protection when using compressed gas.



Trap size and shape will vary by manufacturer.

Figure 4 Recommended traps and plumbing configuration from a carrier gas cylinder

- Agilent strongly recommends two-stage regulators to eliminate pressure surges. High-quality, stainless-steel diaphragm-type regulators are especially recommended.
- On/off valves mounted on the outlet fitting of the two-stage regulator are not essential but are very useful. Be sure the valves have stainless-steel, packless diaphragms.
- FID, FPD, and NPD detectors require a dedicated air supply. Operation may be affected by pressure pulses in air lines shared with other devices.
- Flow- and pressure-controlling devices require at least 10 psi (138 kPa) pressure differential across them to operate properly. Set source pressures and capacities high enough to ensure this.
- Situate auxiliary pressure regulators close to the GC inlet fittings. This ensures that the supply pressure is measured at the instrument (rather than at the source); pressure at the source may be different if the gas supply lines are long or narrow.

Supply tubing for carrier and detector gases

Use only preconditioned copper tubing (part number 5180-4196) to supply gases to the instrument. Do not use ordinary copper tubing—it contains oils and contaminants.

CAUTION

Do not use methylene chloride or other halogenated solvent to clean tubing that will be used with an electron capture detector. They will cause elevated baselines and detector noise until they are completely flushed out of the system.

CAUTION

Do not use plastic tubing for supplying detector and inlet gases to the GC. It is permeable to oxygen and other contaminants that can damage columns and detectors. Plastic tubing can melt if near hot exhaust or components.

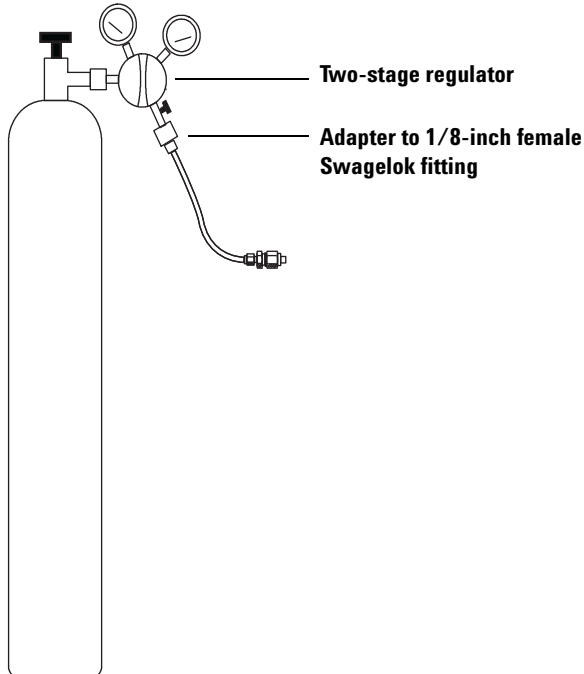
The tubing diameter depends on the distance between the supply gas and the GC and the total flow rate for the particular gas. Tubing of 1/8-in diameter is adequate when the supply line is less than 15 feet (4.6 m) long.

Use larger diameter tubing (1/4-in) for distances greater than 15 feet (4.6 m) or when multiple instruments are connected to the same source. Use larger diameter tubing if high demand is anticipated (for example, air for an FID).

Be generous when cutting tubing for local supply lines—a coil of flexible tubing between the supply and the instrument lets you move the GC without moving the gas supply. Take this extra length into account when choosing the tubing diameter.

Two-stage pressure regulators

To eliminate pressure surges, use a two-stage regulator with each gas tank. Stainless steel, diaphragm-type regulators are recommended.



The type of regulator you use depends on the gas type and supplier. The Agilent catalog for consumables and supplies contains information to help you identify the correct regulator, as determined by the Compressed Gas Association (CGA). Agilent Technologies offers pressure-regulator kits that contain all the materials needed to install regulators properly.

Pressure regulator-gas supply tubing connections

Use Teflon® tape to seal the pipe-thread connection between the pressure regulator outlet and the fitting to which you connect the gas tubing. Instrument grade Teflon tape (part number 0460-1266), from which volatiles have been removed, is recommended for all fittings. Do not use pipe dope to seal the threads; it contains volatile materials that will contaminate the tubing.

Traps

Using chromatographic-grade gases ensures that the gas in your system is pure. However, for optimum sensitivity, install high-quality traps to remove traces of water or other contaminants. After installing a trap, check the gas supply lines for leaks.

[Table 13](#) lists the recommended traps. See the Agilent online store for the complete listing of traps and trap accessories. As shown in [Figure 4](#), install the indicating trap last so that it warns when the combination begins to fail.

Table 13 Recommended traps

Description	Part number
Big universal trap. Removes oxygen, moisture, hydrocarbons, carbon dioxide and carbon monoxide from helium gas streams.	RMS
Indicating oxygen trap (for carrier and ECD gases).	IOT-2-HP

Moisture in carrier gas damages columns. Agilent recommends installing a moisture trap after the source regulator and before any other traps.

A hydrocarbon trap removes organics from gases. Place it after a molecular sieve trap and before an oxygen trap, if they are present.

An oxygen trap removes 99% of the oxygen from a gas plus traces of water. Place it last in a series of traps. Because trace amounts of oxygen can damage columns and degrade uECD performance, use an oxygen trap with carrier and uECD gases. Do not use it with FID, FPD, or NPD fuel gases.

GC/MS Gas and Reagent Requirements

Table 14 lists the limits on total gas flow into the 7000 Triple Quad MS.

Table 14 7000 Triple Quad MS total gas flow limitations

Feature	
High vacuum pump	Split-flow turbo
Optimal gas flow mL/min [*]	1.0 to 2.0
Maximum recommended gas flow, mL/min	4.0
Maximum gas flow, mL/min [†]	6.5
Maximum column id	0.53 mm (30 m long)

^{*} Total gas flow into the MS = column flow + reagent gas flow (if applicable) + Agilent QuickSwap flow (if applicable).

[†] Expect degradation of spectral performance and sensitivity.

Table 15 lists typical flows resulting from selected carrier and reagent gas source pressures.

Table 15 7000 Triple Quad MS carrier and reagent gases

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Helium (required) (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Hydrogen (optional) [*] (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Methane reagent gas (required for CI operation)	103 to 172 kPa (15 to 25 psi)	1 to 2

Table 15 7000 Triple Quad MS carrier and reagent gases (continued)

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Ammonia reagent gas (optional)	34 to 55 kPa (5 to 8 psi)	1 to 2
Isobutane reagent gas (optional) [†]	103 to 172 kPa (15 to 25 psi)	1 to 2
Carbon dioxide reagent gas (optional) [†]	103 to 138 kPa (15 to 20 psi)	1 to 2

* Hydrogen gas can be used for the carrier gas but specifications are based on helium as the carrier gas. Please observe all hydrogen gas safety cautions.

† Reagent available with manual tune only.

Table 16 lists the limits on total gas flow into the 7200 Q-TOF GC/MS.

Table 16 7200 Q-TOF GC/MS total gas flow limitations

Feature	
High vacuum pump 1	Split-flow turbo
High vacuum pump 2	Split-flow turbo
High vacuum pump 3	Turbo
Carrier gas optimal gas flow, mL/min [*]	1.0 to 1.5
Carrier gas maximum recommended gas flow, mL/min	2.0
Carrier gas maximum gas flow, mL/min [†]	2.4
Reagent gas flow (EI/CI – CI application)	1.0 to 2.0
Collision cell gas flow rate, mL/min	1.5
Maximum column id	0.32 mm (30 m long)

* Total gas flow into the MS = column flow + reagent gas flow (if applicable) + collision cell gas flow.

† Expect degradation of spectral performance and sensitivity.

Table 17 lists typical flows resulting from selected carrier and reagent gas source pressures.

Table 17 7200 Q-TOF GC/MS carrier and reagent gas flows

Carrier and reagent gas requirements	Typical pressure range	Typical flow
Helium (required for carrier and IRM)	173 to 207 kPa (25 to 30 psi)	1.0 to 2.0 (mL/min)
Nitrogen for RIS transfer line actuator	6.1 to 6.8 bar (612 to 690 kPa, or 90 to 100 psi)	Up to 30 L/min
Nitrogen for collision cell (Nitrogen source is supplied to EPC module in GC.)	0.7 to 2.0 bar (70 to 207 kPa, or 10 to 30 psi)	1 to 2 (mL/min)

WARNING

The use of hydrogen is specifically prohibited with the 7200 Q-TOF MS.

Table 18 lists the limits on total gas flow into the 5975 Series MSD.

Table 18 5975 Series MSD total gas flow limitations

Feature	G3170A	G3171A	G3172A	G3174A
High vacuum pump	Diffusion	Standard turbo	Performance turbo	Performance turbo, EI/PCI/NCI
Optimal gas flow mL/min*	1.0	1.0	1.0 to 2.0	1.0 to 2.0
Maximum recommended gas flow, mL/min	1.5	2.0	4.0	4.0
Maximum gas flow, mL/min†	2.0	2.4	6.5	4.0
Max column id	0.25 mm (30 m)	0.32 mm (30 m)	0.53 mm (30 m)	0.53 mm (30 m)

* Total gas flow into the MSD = column flow + reagent gas flow (if applicable) + Agilent QuickSwap flow (if applicable).

† Expect degradation of spectral performance and sensitivity.

Table 19 lists typical flows resulting from selected carrier and reagent gas source pressures.

Table 19 5975 Series MSD carrier and reagent gases

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Helium (required) (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Hydrogen (optional)* (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Methane reagent gas (required for CI operation)	103 to 172 kPa (15 to 25 psi)	1 to 2
Isobutane reagent gas (optional)	103 to 172 kPa (15 to 25 psi)	1 to 2
Ammonia reagent gas (optional)	34 to 55 kPa (5 to 8 psi)	1 to 2
Carbon dioxide reagent gas (optional)	103 to 138 kPa (15 to 20 psi)	1 to 2

* Hydrogen gas can be used for the carrier gas but specifications are based on helium as the carrier gas. Please observe all hydrogen gas safety cautions.

Table 20 lists typical flows resulting from selected reagents source pressures.

Table 20 220/240 Ion Trap reagents

Reagent requirements	Typical pressure range	Typical flow (mL/min)
Methane reagent gas	21 to 34 kPa (3 to 5 psi)	1 to 2
Isobutane reagent gas (optional)	21 to 34 kPa (3 to 5 psi)	1 to 2
Ammonia reagent gas (optional)	21 to 34 kPa (3 to 5 psi)	1 to 2

Cryogenic Cooling Requirements

Cryogenic cooling allows you to cool the oven or inlet, including cooling to setpoints below ambient temperature. A solenoid valve controls the flow of coolant to the inlet or oven. The oven can use either liquid carbon dioxide (CO₂) or liquid nitrogen (N₂) as a coolant. All inlets except the multimode inlet must use the same coolant type as the oven. The multimode inlet can use a different coolant than configured for the oven, and can also use compressed air as a coolant.

CO₂ and N₂ coolants require different hardware on the GC. (You can use air cooling on a multimode inlet, with either the CO₂ or N₂ solenoid valves and hardware.)

Using carbon dioxide

WARNING

Pressurized liquid CO₂ is a hazardous material. Take precautions to protect personnel from high pressures and low temperatures. CO₂ in high concentrations is toxic to humans; take precautions to prevent hazardous concentrations. Consult your local supplier for recommended safety precautions and delivery system design.

CAUTION

Liquid CO₂ should not be used as a coolant for oven temperatures below –40 °C because the expanding liquid may form solid CO₂—dry ice—in the GC oven. If dry ice builds up in the oven, it can seriously damage the GC.

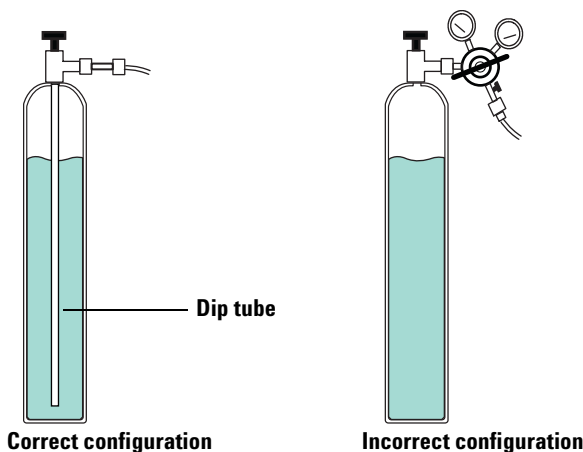
Liquid CO₂ is available in high-pressure tanks containing liquid. The CO₂ should be free of particulate material, oil, and other contaminants. These contaminants could clog the expansion orifice or affect the proper operation of the GC.

WARNING

Do not use copper tubing or thin-wall stainless steel tubing with liquid CO₂. Both harden at stress points and may explode.

Additional requirements for the liquid CO₂ system include:

- The tank must have an internal dip tube or eductor tube to deliver liquid CO₂ instead of gas (see the figure below).
- Typical liquid CO₂ tank pressure will be 4830 to 6900 kPa (700 to 1,000 psi) at a temperature of 25 °C.
- Use 1/8-inch diameter heavy-wall stainless steel tubing for supply tubing. The tubing should be between 1.5 and 15 m (5 and 50 feet) long.
- Coil and fasten the ends of the tubing to prevent it from “whipping” if it breaks.
- Do not install a pressure regulator on the CO₂ tank, as vaporization and cooling would occur in the regulator instead of the oven.
- Do not use a padded tank (one to which another gas is added to increase the pressure).



Using liquid nitrogen

WARNING

Liquid nitrogen is a hazard because of the extremely low temperatures and high pressures that may occur in improperly designed supply systems.

Liquid nitrogen can present an asphyxiant hazard if vaporizing nitrogen displaces oxygen in the air. Consult local suppliers for safety precautions and design information.

Liquid nitrogen is supplied in insulated Dewar tanks. The correct type for cooling purposes is a low-pressure Dewar equipped with a dip tube—to deliver liquid rather than gas—and a safety relief valve to prevent pressure build-up. The relief valve is set by the supplier at 138 to 172 kPa (20 to 25 psi).

WARNING

If liquid nitrogen is trapped between a closed tank valve and the cryo valve on the GC, tremendous pressure will develop and may cause an explosion. For this reason, keep the delivery valve on the tank open so that the entire system is protected by the pressure relief valve.

To move or replace a tank, close the delivery valve and carefully disconnect the line at either end to let residual nitrogen escape.

Additional requirements for the liquid N₂ system include:

- If needed, set the liquid N₂ pressure to the GC at 138 to 207 kPa (20 to 30 psi). Follow the manufacturer's directions.
- Make sure the supply tubing for liquid N₂ is insulated. Foam tubing used for refrigeration and air-conditioning lines is suitable for insulation. Since pressures are low, insulated copper tubing is adequate.
- Situate the liquid nitrogen tank close (within 1.5 to 3 m, or 5 to 10 feet) to the GC to ensure that liquid, not gas, is supplied to the inlet.

Using compressed air

The multimode inlet can also use compressed air cooling with either the liquid CO₂ or liquid N₂ inlet cooling option. Requirements for compressed air cooling:

- The compressed air should be free of particulate material, oil, and other contaminants. These contaminants could clog the inlet's cryo valve and expansion orifice or impact the proper operation of the GC.
- The required air supply pressure depends on the installed solenoid valve type. For a multimode inlet with CO₂ cooling, set the air supply pressure to 276 to 552 kPa (40 and 80 psig). For a multimode inlet with N₂ cooling, set the air supply pressure to 138 to 276 kPa (20 and 40 psig).

While air supplied from tanks can meet these criteria, the consumption rate of air can be 80 L/min, varying based on supply pressure.

Installation of a compressed air line to the inlet cryo coolant valve requires the hardware (and appropriate fittings) noted below:

- Use 1/8-inch diameter copper or stainless steel tubing for supply tubing to the CO₂ valve
- Use 1/4-inch copper or stainless steel tubing for supply tubing to the N₂ valve

Maximum Length of Cables and Hoses

The distance between system modules may be limited by some of the cabling and the vent or vacuum hoses.

- A quadrupole GC/MS system foreline pump can be located on the laboratory bench or on the floor. It must be close to the MS because it is connected by a hose. The hose is stiff and cannot be bent sharply. The length of the vacuum hose is 130 cm (4.24 feet) from the high vacuum pump to the foreline pump, while the length of the foreline pump power cord is 2 meters (6.6 feet).

CAUTION

The supporting surface for the 7200 Q-TOF GC/MS system should be kept relatively vibration free. Do not put the rough pump on your laboratory bench with the 7200 Q-TOF GC/MS due to the vibration that the pump creates. Vibration can lead to a loss of mass accuracy and resolution.

- A Q-TOF MS system foreline pump should be located on the floor. It must be close to the MS because it is connected by a hose. The hose is stiff and cannot be bent sharply. The length of the vacuum hose is 130 cm (4.24 feet) from the high vacuum pump to the foreline pump, while the length of the foreline pump power cord is 2 meters (6.6 feet).
- The vacuum hose connecting the Ion Trap MS to the foreline pump is 200 cm (79 in) long.
- The length of the Agilent-supplied remote cable is 2 meters (6.6 feet).
- The length of the Agilent-supplied LAN cable is 10 meters (32.8 feet).
- The lengths of the power cords are 2 meters (6.6 feet).
- The length of a 7697A Headspace Sampler transfer line is about 99 cm (39 inches).
- The length of a G1888 Headspace Sampler transfer line is about 80 cm (31.5 inches).

Site LAN Network

If you intend to connect your system to your site's LAN network, you must have an additional shielded twisted pair network cable.

NOTE

Agilent Technologies is not responsible for connecting to or establishing communication with your site LAN network. The representative will test the system's ability to communicate on a mini-hub or LAN switch only.

NOTE

The IP addresses assigned to the instrument(s) must be fixed (permanently assigned) addresses. If you intend to connect your system to your site's network, each piece of equipment must have a unique, fixed (static) IP address assigned to it.

Basic Tools

The GC/MS comes with a few basic tools and consumables depending on the specific inlet and detector that you ordered. Below is a general list of what comes with the instrument.

Table 21 Basic tools

Tool or consumable	Used for
7890A GC	
T10 and T20 Torx wrenches	Removing tray. Removing covers to access gas control modules, traps, and pneumatic connections.
1/4-inch nut driver	FID jet replacement.
FID flow measuring insert	FID troubleshooting.
Column cutter, ceramic or diamond	Column installation.
1/8-inch Tee, Swagelok, brass	Connect gas supplies.
1/8-inch nuts & ferrules, Swagelok, brass	Connect gas supplies.
Inlet septa appropriate for type	Inlet seal.
Inlet insert or liner	Contains sample during vaporization in inlet.
GC/MS	
1.5-mm and 2.0-mm hex driver	Source maintenance (disassembly).
Tool bag	Holding GC and MS tools.
Q-Tips	Cleaning source parts.
Cloths	Keeping surfaces and parts clean.
Gloves	Reducing contamination on GC and MS parts.
Funnel	Changing oil.
Hex key, 5 mm	Removing oil plug and screws in safety shield handle.

Table 22 lists other useful tools not included with the GC.

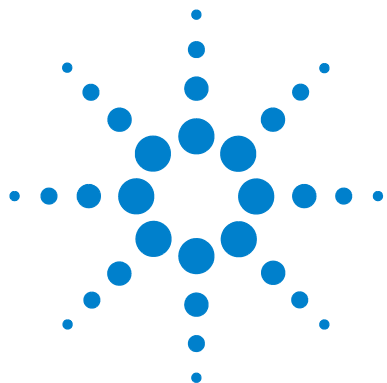
Table 22 Useful tools not included with GC

Tool	Used for
Custom Tee, G3430-60009	Connecting the same gas to front and back EPC module.
ECD/TCD Detector plug, 5060-9055	Inlet pressure decay test
1/8-inch Ball Valve, 0100-2144	Inlet pressure decay test (one per inlet)
Digital flow meter, Flow tracker 1000	Verifying flows, checking for leaks and plugs
Electronic gas leak detector	Locating gas leaks; safety checks when using Hydrogen
Column cutters	Cutting columns
T-10 and T-20 Torx drivers	Removing tray; removing covers to access EPC modules, traps, and possible leaks
1/8-inch tubing cutter (wire cutter type)	Cutting gas supply tubing
Assorted wrenches: 1/4-inch, 3/8-inch, 7/16-inch, 9/16-inch	Gas supply and plumbing fittings
Electronic vial crimper	Assuring consistently air-tight vial closure, regardless of who does the crimping

Table 23 lists consumables that you may wish to order. First time GC users should consider purchasing the following supplies in order to maintain their system and prevent interruptions in the use of their system. Please refer to the latest Agilent consumables and supplies catalog and to the Agilent web site at www.agilent.com/chem for part numbers and recommended maintenance periods.

Table 23 Additional consumables

Consumable category	Consumable
Inlet supplies	Septa, o-rings, liners, adapter, and seals
Inlet preventative maintenance (PM) kits	Kits with individual parts needed to maintain an inlet
Pneumatic supplies	Gases, traps, o-rings, seals, Swagelok fittings
Column supplies	Nuts, ferrules, adapters, guard columns, retention gaps
Detector supplies	Jets, beads, liners, adapters, cleaning kits
Application supplies	Standards, columns, syringes



2

6850 Series GC Site Preparation

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This section outlines the space and resource requirements for GC, GC/MS, and automatic liquid sampler (ALS) installation. For a successful and timely installation of the instrument, the site must meet these requirements before beginning installation. Necessary supplies (gases, tubing, operating supplies, consumables, and other usage-dependent items such as columns, vials, syringes, and solvents) must also be available. Note that performance verification requires the use of helium carrier gas. For MS systems using chemical ionization, methane reagent gas or methanol (for internal ionization ion traps) is also required for performance verification. Refer to the Agilent Web site at www.agilent.com/chem for the most up-to-date listing of GC, GC/MS, and ALS supplies and consumables.



Customer Responsibilities

The specifications in this manual outline the necessary space, electrical outlets, gases, tubing, operating supplies, consumables, and other usage-dependent items such as columns, vials, syringes, and solvents required for the successful installation of instruments and systems.

If Agilent is delivering installation and familiarization services, users of the instrument should be present throughout these services; otherwise, they will miss important operational, maintenance, and safety information.

If Agilent is delivering installation and familiarization services, delays due to inadequate site preparation could cause loss of instrument use during the warranty period. In extreme cases, Agilent Technologies may ask to be reimbursed for the additional time required to complete the installation. Agilent Technologies provides service during the warranty period and under maintenance agreements only if the specified site requirements are met.

Dimensions and Weight

Select the laboratory bench space before the system arrives. Pay special attention to the total height requirements. Avoid bench space with overhanging shelves. See [Table 24](#).

The instrument needs space for proper convection of heat and ventilation. Allow at least 25 cm (10 in) clearance between back of the instrument and wall to dissipate hot air and allow for routine maintenance.

Table 24 Required height, width, depth, and weight

Product	Height	Width	Depth	Weight
6850 Series GCs	51 cm (20 in)	29 cm (12 in) 34 cm (14 in) CO ₂ 37 cm (15 in) 6850 ALS	57 cm (23 in)	< 23 kg (51 lb)
5975 Series MSD				
• Diffusion pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Standard turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	39 kg (85 lb)
• Performance turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	41 kg (90 lb)
• Performance CI/EI turbo pump	41 cm (16 in)	30 cm (12 in)	54 cm (22 in)	46 kg (100 lb)
• Foreline pump				
Standard	21 cm (8 in)	13 cm (5 in)	31 cm (12 in)	11 kg (23.1 lb)
Oil-free	19 cm (7.5 in)	32 cm (13 in)	28 cm (11 in)	16 kg (35.2 lb)
7697A Headspace sampler				
111 vial model	80 cm (32 in)	69 cm (27 in)	70 cm (27.5 in)	46 kg (101 lb)
12 vial model	61 cm (24 in)	64 cm (25 in)	69 cm (27 in)	38.2 kg (84 lb)
G1888 Headspace sampler	56 cm (22 in)	46 cm (18.1 in)	64 cm (25 in)	46.3 kg (102 lb)
Additional space requirements				
• GC/MS operational and maintenance access	Requires 30 cm (1 ft) to its left			
• Typical laser printer	Requires 41 cm (16 in)			
• GC operational oven access	Requires ≥ 30 cm (12 in) open space above GC			

Table 24 Required height, width, depth, and weight (continued)

Product	Height	Width	Depth	Weight
• GC with 7693A ALS injector		Requires 50 cm (19.5 in) above the GC		3.9 kg (8.6 lb) each
• GC with 7683B ALS injector		Requires 42 cm (16.5 in) above the GC		3.1 kg (7 lb) each
• GC with CTC PAL Autosampler		Requires 66 cm (26 in) above the GC and 4 to 20 cm (1.5 to 8 in) to the left or right, depending on configuration		
• GC with 7697A Headspace sampler		Requires 69 cm (27 in) to the right of the GC (G4557A), or 64 cm (25 in) to the right of the GC (G4556A).		

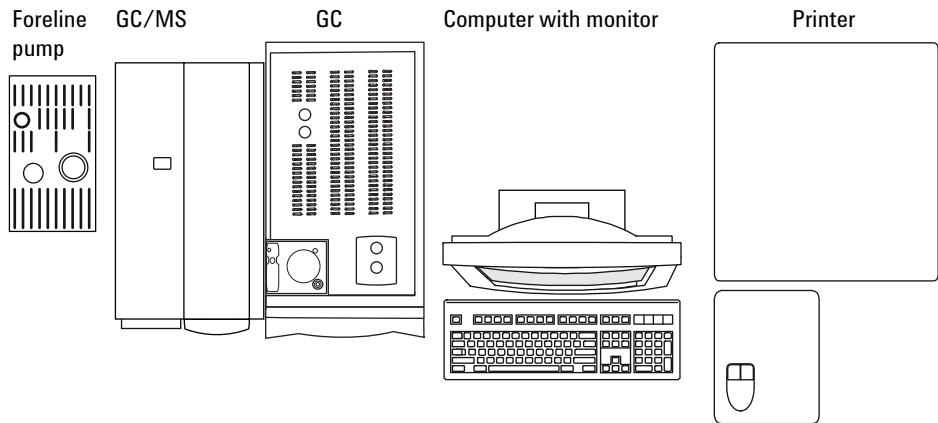


Figure 5 Top view of typical installation (6850 GC/MS system with ALS)

A simple 6850 system that includes a GC, an ALS injector, and a computer would require about 138 cm (4 ft 6 in) of bench space. Allowing for operational access and a printer, a total of 229 cm (7.5 ft) of bench space should be available for a full GC/MS system. Some repairs to the MSD or to the GC will also require access to the back of the instrument(s).

Note that the length of the quadrupole vacuum hose is 130 cm (4 ft 3 in) from the high vacuum pump to the foreline pump, and the length of the foreline pump power cord is 2 m (6 ft 6 in).

Power Consumption

Table 25 lists site power requirements.

- The number and type of electrical outlets depend on the size and complexity of the system.
- Power consumption and requirements depend on the country the unit ships to.
- The voltage requirements for your instrument are printed near the power cord attachment.
- The electrical outlet for the unit should have a dedicated ground.
- All instruments should be on a dedicated circuit.

Power line conditioners should not be used with Agilent instruments.

Table 25 Power requirements

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Maximum continuous power consumption (VA)	Current rating (amps)	Power outlet current rating
6850 Series GC	Standard	Japan: 100 single phase (–10% / +10%)	48–63	1440	15	15 Amp Dedicated
6850 Series GC	Standard	Americas: 120 single phase (–10% / +10%)	48–63	1440	12	15 Amp Dedicated
6850 Series GC	Standard	230 single/split phase (–10% / +10%)	48–63	2000	9	10 Amp Dedicated
6850 Series GC	Fast	120 single phase (–10% / +10%)	48–63	2400	20	20 Amp Dedicated
6850 Series GC	Fast	220/230/240 single/split phase (–10% / +10%)	48–63	2400	11	15 Amp Dedicated
6850 Series GC	Fast	200/208 single/split phase (–10% / +10%)	48–63	2400	12	15 Amp Dedicated
5975 Series MSD		120 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated

Table 25 Power requirements (continued)

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Maximum continuous power consumption (VA)	Current rating (amps)	Power outlet current rating
5975 Series MSD		220–240 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated
5975 Series MSD		200 (–10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp Dedicated
7697A Headspace		Americas: 120 single phase (–10% / +10%)	48–63	2250	18.8	20 Amp Dedicated
7697A Headspace		220/230/240 single/split phase (–10% / +10%)	48–63	2250	10.2/9.8/9.4	10 Amp Dedicated
Data system PC (monitor, CPU, printer)		100/120/200-240 (–10% / +5%)	50/60 ± 5%	1000	15	15 Amp Dedicated

WARNING

Do not use extension cords with Agilent instruments. Extension cords normally are not rated to carry enough power and can be a safety hazard.

Although your GC should arrive ready for operation in your country, compare its voltage requirements with those listed in [Table 25](#). If the voltage option you ordered is not suitable for your installation, contact Agilent Technologies.

CAUTION

A proper earth ground is required for GC operations. Any interruption of the grounding conductor or disconnection of the power cord could cause a shock that could result in personal injury.

To protect users, the metal instrument panels and cabinet are grounded through the three-conductor power line cord in accordance with International Electrotechnical Commission (IEC) requirements.

The three-conductor power line cord, when plugged into a properly grounded receptacle, grounds the instrument and minimizes shock hazard. A properly grounded receptacle is one that is connected to a suitable earth ground. Be sure to verify proper receptacle grounding. The GC requires an isolated ground.

Connect the GC to a dedicated receptacle. Use of a dedicated receptacle reduces interference.

Canadian installation

When installing a GC in Canada, make sure your GC's power supply circuit meets the following additional requirements:

- The circuit breaker for the branch circuit, which is dedicated to the instrument, is rated for continuous operation.
- The service box branch circuit is marked as a "Dedicated Circuit."

Heat Dissipation

Use [Table 26](#) to estimate the additional BTUs of heat dissipated from this equipment. Maximums represent the heat given off when heated zones are set for maximum temperatures.

Table 26 Heat dissipation

Oven type		
	Standard oven ramp	Fast oven ramp (option 002 or 003)
6850 Series GC	< 4800 BTU/hour maximum	< 4800 BTU/hour maximum
Steady state, including MS interface		
5975 Series MSD	3000 BTU/hour	

1 BTU = 1055.05585262 J

Exhaust Venting

Hot air (up to 350 °C) from the oven exits through a vent in the rear. Allow at least 25 cm (10 in) clearance behind the instrument to dissipate this air.

WARNING

Do not place temperature-sensitive items (for example, gas cylinders, chemicals, regulators, and plastic tubing) in the path of the heated exhaust. These items will be damaged and plastic tubing will melt. Be careful when working behind the instrument during cool-down cycles to avoid burns from the hot exhaust.

An optional oven exhaust deflector (vertical (G2630-60710) or horizontal (G2628-60800)) is available and may improve oven cooling by deflecting the exhaust air away from the instrument.

During normal operation of the GC with many detectors and inlets, some of the carrier gas and sample vents outside the instrument through the split vent, septum purge vent, and detector exhaust. If any sample components are toxic or noxious, or if hydrogen is used as the carrier gas, the exhaust must be vented to a fume hood. Place the GC in the hood or attach a large diameter venting tube to the outlet for proper ventilation.

To further prevent contamination from noxious gases, attach a chemical trap to the vent(s).

Vent the GC/MS system externally to the building via an ambient-pressure vent system, within 460 cm (15 ft) of both the GC split vent and GC/MS foreline pump, or vent to a fume hood. Note that an exhaust vent system is not part of the building environmental control system, which recirculates air. Exhaust venting must comply with all local environmental and safety codes. Contact your Environmental Health & Safety (EHS) specialist.

Environmental Conditions

Operating the instrument within the recommended ranges optimizes instrument performance and lifetime. Performance can be affected by sources of heat and cold from heating, air conditioning systems, or drafts. See [Table 27](#). The conditions assume a noncondensing, noncorrosive atmosphere. The instrument meets the following International Electrotechnical Commission (IEC) classifications: Equipment Class I, Laboratory Equipment, Installation Category II, and Pollution Degree 2.

Table 27 Environmental conditions for operation and storage

Product	Conditions	Operating temp range	Operating humidity range	Maximum altitude
6850 Series GC	Standard oven ramp	15 to 35 °C	5 to 95%	4,615 m
	Fast oven ramp (options 002 and 003)	15 to 35 °C	5 to 95%	4,615 m
	Storage	–5 to 40 °C	5 to 95%	
5975 Series MSD	Operation	15 to 35 °C * (59 to 95 °F)	20 to 80%	4,615 m
	Storage	–20 to 70 °C (–4 to 158 °F)	0 to 95%	

* Operation requires constant temperature (variations < 2 °C/hour)

Gas Selection

Table 28 lists gases usable with Agilent GCs and capillary columns. When used with capillary columns, GC detectors require a separate makeup gas for optimum sensitivity. The MS and MSD use GC carrier gas.

NOTE

Nitrogen and Argon/Methane are generally not suitable for GC/MS carrier gas.

Table 28 Gases usable with Agilent GCs and capillary columns

Detector type	Carrier	Preferred makeup	Alternate choice	Detector, anode purge, or reference
Electron capture (ECD)	Hydrogen	Argon/Methane (5%)	Nitrogen	Anode purge must be same as makeup
	Helium	Argon/Methane (5%)	Nitrogen	
	Nitrogen	Nitrogen	Argon/Methane (5%)	
	Argon/Methane (5%)	Argon/Methane (5%)	Nitrogen	
Flame ionization (FID)	Hydrogen	Nitrogen	Helium	Hydrogen and air for detector
	Helium	Nitrogen	Helium	
	Nitrogen	Nitrogen	Helium	
Flame photometric (FPD)	Hydrogen	Nitrogen		Hydrogen and air for detector
	Helium	Nitrogen		
	Nitrogen	Nitrogen		
	Argon	Nitrogen		
Thermal conductivity (TCD)	Hydrogen	Must be same as carrier and reference	Must be same as carrier and reference	Reference must be same as carrier and makeup
	Helium			
	Nitrogen			

Table 29 lists gas recommendations for packed column use. In general, makeup gases are not required with packed columns.

Table 29 Gases usable with Agilent GCs and packed columns

Detector type	Carrier gas	Comments	Detector, anode purge, or reference
Electron capture (ECD)	Nitrogen	Maximum sensitivity	Nitrogen
	Argon/methane	Maximum dynamic range	Argon/Methane
Flame ionization (FID)	Nitrogen	Maximum sensitivity	Hydrogen and air for detector.
	Helium	Acceptable alternative	
Flame photometric (FPD)	Hydrogen Helium Nitrogen Argon		Hydrogen and air for detector.
Thermal conductivity (TCD)	Helium	General use	Reference must be same as carrier and makeup.
	Hydrogen	Maximum sensitivity [*]	
	Nitrogen	Hydrogen detection [†]	
	Argon	Maximum hydrogen sensitivity [*]	

* Slightly greater sensitivity than helium. Incompatible with some compounds.

† For analysis of hydrogen or helium. Greatly reduces sensitivity for other compounds.

For installation checkout, Agilent requires the gas types shown in [Table 30](#).

Table 30 Gases required for checkout

Detector	Gases required
FID	Carrier: helium Makeup: nitrogen Fuel: hydrogen Aux gas: Air
TCD	Carrier and reference: helium
uECD	Carrier: helium Anode purge and makeup: nitrogen
FPD	Carrier: helium Makeup: nitrogen Fuel: hydrogen Aux gas: Air
CI MS (external)	Reagent gas: methane

WARNING

When using hydrogen (H₂) as the carrier gas or fuel gas, be aware that hydrogen gas can flow into the GC oven and create an explosion hazard. Therefore, be sure that the supply is turned off until all connections are made and ensure the inlet and detector column fittings are either connected to a column or capped at all times when hydrogen gas is supplied to the instrument.

Hydrogen is flammable. Leaks, when confined in an enclosed space, may create a fire or explosion hazard. In any application using hydrogen, leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen supply at its source before working on the instrument.

Please refer to the Hydrogen Safety Guide shipped with your instrument.

Gas Purity

Agilent recommends that carrier and detector gases be 99.9995% pure. See [Table 31](#). Air needs to be zero grade or better. Agilent also recommends using high quality traps to remove hydrocarbons, water, and oxygen.

Table 31 Carrier, collision, and reagent gas purity

Carrier, collision, and reagent gas requirements	Purity	Notes
Helium (carrier and collision)	99.9995%	Hydrocarbon free
Hydrogen (carrier)	99.9995%	SFC grade
Methane reagent gas [*]	99.999%	Research or SFC grade
Isobutane reagent gas [†]	99.99%	Instrument grade
Ammonia reagent gas [†]	99.9995%	Research or SFC grade
Carbon dioxide reagent gas [†]	99.995%	SFC grade

* Required reagent gas for installation and performance verification, external CI MS only. The 5975 operates in an external CI mode.

† Optional reagent gases, CI MS and MSD only.

Gas Supplies

Supply instrument gases using tanks, an internal distribution system, or gas generators. If used, tanks require two-stage pressure regulators with packless, stainless steel diaphragms. The instrument requires 1/8-inch Swagelok connections to its gas supplies.

NOTE

Plumb the gas supply tubing/regulators so that one 1/8-inch Swagelok female connector is available for each gas needed at the instrument.

[Table 32](#) lists available Agilent two-stage tank regulators. All Agilent regulators are supplied with the 1/8-inch Swagelok female connector.

Table 32 Tank regulators

Gas type	CGA number	Max pressure	Part number
Air	346	125 psig (8.6 Bar)	5183-4641
Hydrogen, Argon/Methane	350	125 psig (8.6 Bar)	5183-4642
Oxygen	540	125 psig (8.6 Bar)	5183-4643
Helium, Argon, Nitrogen	580	125 psig (8.6 Bar)	5183-4644
Air	590	125 psig (8.6 Bar)	5183-4645

[Table 33](#) and [Table 34](#) list minimum and maximum delivery pressures for inlets and detectors, measured at the bulkhead fittings on the back of the instrument.

Table 33 Delivery pressures for inlets required at the GC/MS, in kPa (psig)

	Inlet type				
	Split/Splitless 150 psi	Split/Splitless 100 psi	On-column	Purged packed	PTV
Carrier (max)	1,172 (170)	827 (120)	827 (120)	827 (120)	827 (120)
Carrier (min)	(20 psi) above pressure used in method				

Table 34 Delivery pressures for detectors required at the GC/MS, in kPa (psig)

	Detector type			
	FID	TCD	ECD	FPD
Hydrogen	240–690 (35–100)			310–690 (45–100)
Air	380–690 (55–100)			690–827 (100–120)
Makeup	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)	380–690 (55–100)
Reference	380–690 (55–100)			

Conversions: 1 psi = 6.8947 kPa = 0.068947 Bar = 0.068 ATM

Notes:

- If you have not requested option 305 (pre-plumbed tubing), you must supply pre-cleaned, 1/8-inch copper tubing and a variety of 1/8-inch Swagelok fittings to connect the GC to inlet and detector gas supplies.
- Cryogenic cooling with Liquid CO₂ requires 1/8-inch heavy-walled, stainless steel tubing.
- If you purchased automated valving, the valve actuation requires a **separate** pressurized, dry air supply at 380 kPa (55 psig). This air supply must end in a male fitting compatible with a 1/4-inch id plastic tube at the GC.
- Never use liquid thread sealer to connect fittings. Never use chlorinated solvents to clean tubing or fittings.

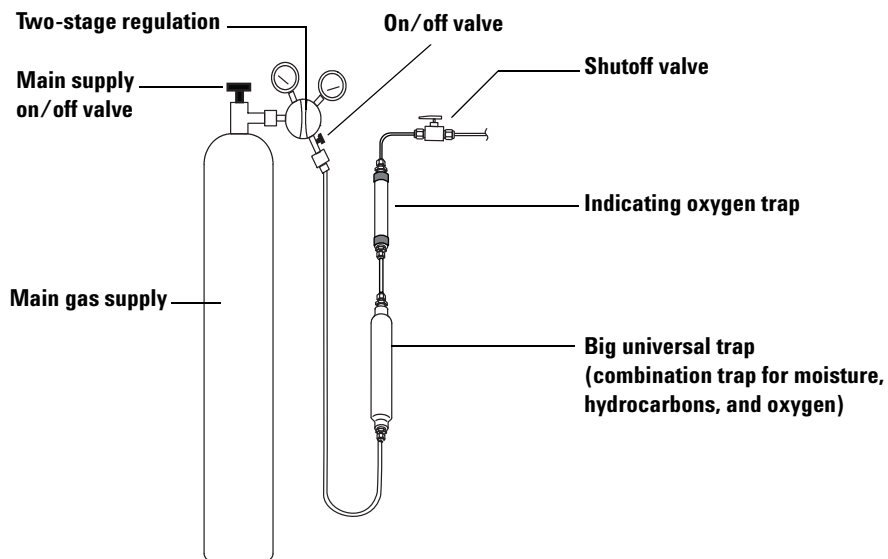
Gas Plumbing

WARNING

All compressed gas cylinders should be securely fastened to an immovable structure or permanent wall. Compressed gases should be stored and handled in accordance with the relevant safety codes.

Gas cylinders should not be located in the path of heated oven exhaust.

To avoid possible eye injury, wear eye protection when using compressed gas.



Trap size and shape will vary by manufacturer.

Figure 6 Recommended traps and plumbing configuration from a carrier gas cylinder

- Agilent strongly recommends two-stage regulators to eliminate pressure surges. High-quality, stainless-steel diaphragm-type regulators are especially recommended.
- On/off valves mounted on the outlet fitting of the two-stage regulator are not essential but are very useful. Be sure the valves have stainless-steel, packless diaphragms.
- FID and FPD detectors require a dedicated air supply. Operation may be affected by pressure pulses in air lines shared with other devices.
- Flow- and pressure-controlling devices require at least 10 psi (138 kPa) pressure differential across them to operate properly. Set source pressures and capacities high enough to ensure this.
- Situate auxiliary pressure regulators close to the GC inlet fittings. This ensures that the supply pressure is measured at the instrument (rather than at the source); pressure at the source may be different if the gas supply lines are long or narrow.

Supply tubing for carrier and detector gases

Use only preconditioned copper tubing (part number 5180-4196) to supply gases to the instrument. Do not use ordinary copper tubing—it contains oils and contaminants.

CAUTION

Do not use methylene chloride or other halogenated solvent to clean tubing that will be used with an electron capture detector. They will cause elevated baselines and detector noise until they are completely flushed out of the system.

CAUTION

Do not use plastic tubing for supplying detector and inlet gases to the GC. It is permeable to oxygen and other contaminants that can damage columns and detectors. Plastic tubing can melt if near hot exhaust or components.

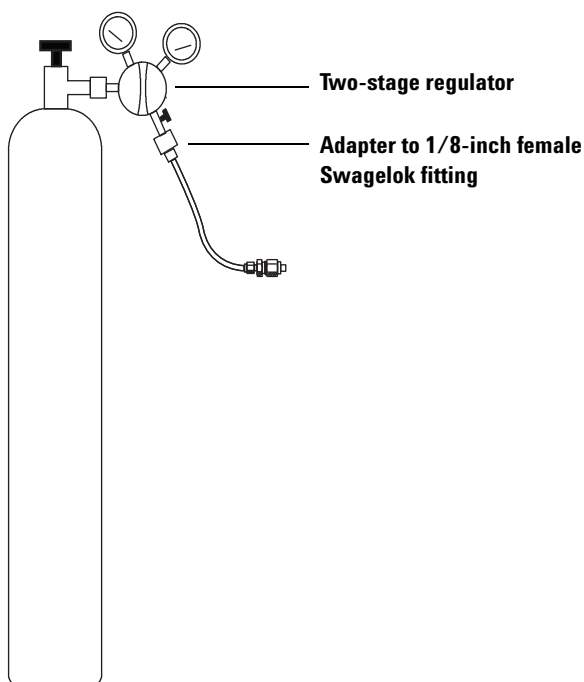
The tubing diameter depends on the distance between the supply gas and the GC and the total flow rate for the particular gas. Tubing of 1/8-in diameter is adequate when the supply line is less than 15 feet (4.6 m) long.

Use larger diameter tubing (1/4-in) for distances greater than 15 feet (4.6 m) or when multiple instruments are connected to the same source. Use larger diameter tubing if high demand is anticipated (for example, air for an FID).

Be generous when cutting tubing for local supply lines—a coil of flexible tubing between the supply and the instrument lets you move the GC without moving the gas supply. Take this extra length into account when choosing the tubing diameter.

Two-stage pressure regulators

To eliminate pressure surges, use a two-stage regulator with each gas tank. Stainless steel, diaphragm-type regulators are recommended.



The type of regulator you use depends on the gas type and supplier. The Agilent catalog for consumables and supplies contains information to help you identify the correct regulator, as determined by the Compressed Gas Association (CGA). Agilent Technologies offers pressure-regulator kits that contain all the materials needed to install regulators properly.

Pressure regulator-gas supply tubing connections

Use Teflon® tape to seal the pipe-thread connection between the pressure regulator outlet and the fitting to which you connect the gas tubing. Instrument grade Teflon tape (part number 0460-1266), from which volatiles have been removed, is recommended for all fittings. Do not use pipe dope to seal the threads; it contains volatile materials that will contaminate the tubing.

Traps

Using chromatographic-grade gases ensures that the gas in your system is pure. However, for optimum sensitivity, install high-quality traps to remove traces of water or other contaminants. After installing a trap, check the gas supply lines for leaks.

[Table 35](#) lists the recommended traps. See the Agilent online store for the complete listing of traps and trap accessories. As shown in [Figure 6](#), install the indicating trap last so that it warns when the combination begins to fail.

Table 35 Recommended traps

Description	Part number
Big universal trap. Removes oxygen, moisture, hydrocarbons, carbon dioxide and carbon monoxide from helium gas streams.	RMS
Indicating oxygen trap (for carrier and ECD gases).	IOT-2-HP

Moisture in carrier gas damages columns. Agilent recommends installing a moisture trap after the source regulator and before any other traps.

A hydrocarbon trap removes organics from gases. Place it after a molecular sieve trap and before an oxygen trap, if they are present.

An oxygen trap removes 99% of the oxygen from a gas plus traces of water. Place it last in a series of traps. Because trace amounts of oxygen can damage columns and degrade uECD performance, use an oxygen trap with carrier and uECD gases. Do not use it with FID or FPD fuel gases.

GC/MS Gas Requirements

Table 36 lists the limits on total gas flow into the 5975 Series MSD.

Table 36 5975 Series MSD total gas flow limitations

Feature	G3170A	G3171A	G3172A	G3174A
High vacuum pump	Diffusion	Standard turbo	Performance turbo	Performance turbo, EI/PCI/NCI
Optimal gas flow mL/min*	1.0	1.0	1.0 to 2.0	1.0 to 2.0
Maximum recommended gas flow, mL/min	1.5	2.0	4.0	4.0
Maximum gas flow, mL/min†	2.0	2.4	6.5	4.0
Max column id	0.25 mm (30 m)	0.32 mm (30 m)	0.53 mm (30 m)	0.53 mm (30 m)

* Total gas flow into the MSD = column flow + reagent gas flow (if applicable) + Agilent QuickSwap flow (if applicable).

† Expect degradation of spectral performance and sensitivity.

Table 37 lists typical flows resulting from selected carrier and reagent gas source pressures.

Table 37 5975 Series MSD carrier and reagent gases

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Helium (required) (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Hydrogen (optional)* (column and split flow)	345 to 552 kPa (50 to 80 psi)	20 to 50
Methane reagent gas (required for CI operation)	103 to 172 kPa (15 to 25 psi)	1 to 2

Table 37 5975 Series MSD carrier and reagent gases (continued)

Carrier and reagent gas requirements	Typical pressure range	Typical flow (mL/min)
Isobutane reagent gas (optional)	103 to 172 kPa (15 to 25 psi)	1 to 2
Ammonia reagent gas (optional)	34 to 55 kPa (5 to 8 psi)	1 to 2
Carbon dioxide reagent gas (optional)	103 to 138 kPa (15 to 20 psi)	1 to 2

* Hydrogen gas can be used for the carrier gas but specifications are based on helium as the carrier gas. Please observe all hydrogen gas safety cautions.

Cryogenic Cooling Requirements

Cryogenic cooling allows you to cool the oven or inlet, including cooling to setpoints below ambient temperature. A solenoid valve controls the flow of coolant to the inlet or oven. The oven and inlet can use liquid carbon dioxide (CO₂) as a coolant.

Using carbon dioxide

WARNING

Pressurized liquid CO₂ is a hazardous material. Take precautions to protect personnel from high pressures and low temperatures. CO₂ in high concentrations is toxic to humans; take precautions to prevent hazardous concentrations. Consult your local supplier for recommended safety precautions and delivery system design.

CAUTION

Liquid CO₂ should not be used as a coolant for oven temperatures below –40 °C because the expanding liquid may form solid CO₂—dry ice—in the GC oven. If dry ice builds up in the oven, it can seriously damage the GC.

Liquid CO₂ is available in high-pressure tanks containing liquid. The CO₂ should be free of particulate material, oil, and other contaminants. These contaminants could clog the expansion orifice or affect the proper operation of the GC.

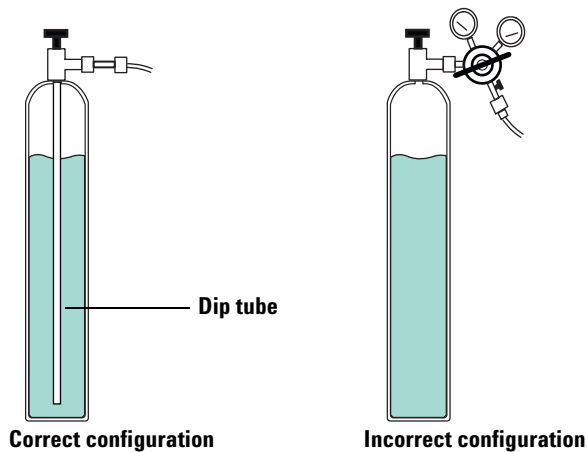
WARNING

Do not use copper tubing or thin-wall stainless steel tubing with liquid CO₂. Both harden at stress points and may explode.

Additional requirements for the liquid CO₂ system include:

- The tank must have an internal dip tube or eductor tube to deliver liquid CO₂ instead of gas (see the figure below).
- Typical liquid CO₂ tank pressure will be 4830 to 6900 kPa (700 to 1,000 psi) at a temperature of 25 °C.

- Use 1/8-inch diameter heavy-wall stainless steel tubing for supply tubing. The tubing should be between 1.5 and 15 m (5 and 50 feet) long.
- Coil and fasten the ends of the tubing to prevent it from “whipping” if it breaks.
- Do not install a pressure regulator on the CO₂ tank, as vaporization and cooling would occur in the regulator instead of the oven.
- Do not use a padded tank (one to which another gas is added to increase the pressure).



Maximum Length of Cables

The distance between system modules may be limited by some of the cabling and the vent or vacuum hoses.

- A quadrupole GC/MS system foreline pump can be located on the laboratory bench or on the floor. It must be close to the MS because it is connected by a hose. The hose is stiff and cannot be bent sharply. The length of the vacuum hose is 130 cm (4.24 feet) from the high vacuum pump to the foreline pump, while the length of the foreline pump power cord is 2 meters (6.6 feet).
- The length of the Agilent-supplied remote cable is 2 meters (6.6 feet).
- The length of the Agilent-supplied LAN cable is 10 meters (32.8 feet).
- The lengths of the power cords are 2 meters (6.6 feet).
- The length of a 7697A Headspace Sampler transfer line is about 99 cm (39 inches).
- The length of a G1888 Headspace Sampler transfer line is about 80 cm (31.5 inches).

Site LAN Network

If you intend to connect your system to your site's LAN network, you must have an additional shielded twisted pair network cable.

NOTE

Agilent Technologies is not responsible for connecting to or establishing communication with your site LAN network. The representative will test the system's ability to communicate on a mini-hub or LAN switch only.

NOTE

The IP addresses assigned to the instrument(s) must be fixed (permanently assigned) addresses. If you intend to connect your system to your site's network, each piece of equipment must have a unique, fixed (static) IP address assigned to it.

Basic Tools

The GC/MS comes with a few basic tools and consumables depending on the specific inlet and detector that you ordered. Below is a general list of what comes with the instrument.

Table 38 Basic tools

Tool or consumable	Used for
6850 Series GC	
T10 and T20 Torx wrenches	Removing tray. Removing covers to access gas control modules, traps, and pneumatic connections.
1/4-inch nut driver	FID jet replacement.
FID flow measuring insert	FID troubleshooting.
Column cutter, ceramic or diamond	Column installation.
1/8-inch Tee, Swagelok, brass	Connect gas supplies.
1/8-inch nuts & ferrules, Swagelok, brass	Connect gas supplies.
Inlet septa appropriate for type	Inlet seal.
Inlet insert or liner	Contains sample during vaporization in inlet.
GC/MS	
1.5-mm and 2.0-mm hex driver	Source maintenance (disassembly).
Tool bag	Holding GC and MS tools.
Q-Tips	Cleaning source parts.
Cloths	Keeping surfaces and parts clean.
Gloves	Reducing contamination on GC and MSD parts.
Funnel	Changing oil.
Hex key, 5 mm	Removing oil plug and screws in safety shield handle.

Table 39 lists other useful tools not included with the GC.

Table 39 Useful tools not included with GC

Tool	Used for
Custom Tee, G3430-60009	Connecting the same gas to front and back EPC module.
ECD/TCD Detector plug, 5060-9055	Inlet pressure decay test
1/8-inch Ball Valve, 0100-2144	Inlet pressure decay test (one per inlet)
Digital flow meter, Flow tracker 1000	Verifying flows, checking for leaks and plugs
Electronic gas leak detector	Locating gas leaks; safety checks when using Hydrogen
Column cutters	Cutting columns
T-10 and T-20 Torx drivers	Removing tray; removing covers to access EPC modules, traps, and possible leaks
1/8-inch tubing cutter (wire cutter type)	Cutting gas supply tubing
Assorted wrenches: 1/4-inch, 3/8-inch, 7/16-inch, 9/16-inch	Gas supply and plumbing fittings
Electronic vial crimper	Assuring consistently air-tight vial closure, regardless of who does the crimping

Table 40 lists consumables that you may wish to order. First time GC users should consider purchasing the following supplies in order to maintain their system and prevent interruptions in the use of their system. Please refer to the latest Agilent consumables and supplies catalog and to the Agilent web site at www.agilent.com/chem for part numbers and recommended maintenance periods.

Table 40 Additional consumables

Consumable category	Consumable
Inlet supplies	Septa, o-rings, liners, adapter, and seals
Inlet preventative maintenance (PM) kits	Kits with individual parts needed to maintain an inlet
Pneumatic supplies	Gases, traps, o-rings, seals, Swagelok fittings
Column supplies	Nuts, ferrules, adapters, guard columns, retention gaps
Detector supplies	Jets, beads, liners, adapters, cleaning kits
Application supplies	Standards, columns, syringes



3

7693A Automatic Liquid Sampler Site Preparation

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This section outlines the space and resource requirements for a 7693A automatic liquid sampler (ALS). For a successful and timely installation of the ALS, the site must meet these requirements before beginning installation. Necessary supplies (operating supplies, consumables, and other usage-dependent items such as vials, syringes, and solvents) must also be available. Refer to the Agilent Web site at www.agilent.com/chem for the most up-to-date listing of GC, GC/MS, and ALS supplies and consumables.



Customer Responsibilities

The specifications in this manual outline the necessary space, electrical outlets, tubing, operating supplies, consumables, and other usage-dependent items such as vials, syringes, and solvents required for the successful installation of instruments and systems.

If Agilent is delivering installation and familiarization services, users of the instrument should be present throughout these services; otherwise, they will miss important operational, maintenance, and safety information.

If Agilent is delivering installation and familiarization services, delays due to inadequate site preparation could cause loss of instrument use during the warranty period. In extreme cases, Agilent Technologies may ask to be reimbursed for the additional time required to complete the installation. Agilent Technologies provides service during the warranty period and under maintenance agreements only if the specified site requirements are met.

Dimensions and Weight

Select the laboratory bench space before the system arrives. Pay special attention to the total height requirements. Avoid bench space with overhanging shelves. See [Table 41](#).

Table 41 Required height, width, depth, and weight

Product	Height (cm)	Width (cm)	Depth (cm)	Weight (kg)
G4513A Injector	51	16.5	16.5	3.9
G4514A Tray	29	44	43	6.8
G4515A Bar Code Reader	not applicable	not applicable	not applicable	0.3
G4522A Cooling Accessory	not applicable	not applicable	not applicable	2.2 (plus water weight)
Additional space requirements				
• GC with 7693A ALS injector		Requires 50 cm (19.5 in) above the GC		
• GC with 7693A ALS tray		Requires 45 cm (17.5 in) left of the GC		

Power Consumption

The 7693A injectors, tray, and bar code reader/heater/mixer draw power from the GC. No other power source is required.

Environmental Conditions

Operating the instrument within the recommended ranges optimizes instrument performance and lifetime. The sampler system operates in the same environment as its parent GC. See:

The conditions assume a noncondensing, noncorrosive atmosphere.

Table 42 Environmental conditions for operation and storage

Product	Conditions	Operating temp range	Operating humidity range	Maximum altitude
G4513A Injector G4514A Tray G4515A Bar Code Reader	Operation	–5 to 45 °C	5–95%	4,300 m

Chiller Supplies

If using the optional G4522A Cooling Accessory, you will need to supply:

- A water chiller
- Tubing and 1/8-inch Swagelok fittings to connect the chilled water and return water to the chiller
- A container or drain to dispose of condensate from the tray



Basic Tools

The 7693A ALS comes with a few basic tools and consumables depending on the hardware that you ordered. Below is a general list of what comes with the instrument.

Table 43 Basic tools and consumables

Tool or consumable	Used for
T10 Torx wrench	Replacing turret. Replacing syringe carriage.
T35 Torx wrench	Removing tray.
Sample vial starter pack	
Syringe, 10 μ L	