

# **Agilent 5100 ICP-OES**

## **Site Preparation Guide**



**Agilent Technologies**

## Notices

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## Safety Notices

### 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.

**Request for Installation**

All preparations have been completed. Please arrange for the installation to be completed as soon as possible. I understand that if the installation site is not prepared in accordance with the enclosed instructions, additional installation charges may apply.

Company name: \_\_\_\_\_

Company address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_

Position: \_\_\_\_\_

Telephone: \_\_\_\_\_

Preferred installation date: \_\_\_\_\_

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## Site Preparation Checklist

### Site Preparation Checklist

Your site must meet all requirements before you request installation. Complete each requirement listed in the table. After completing each requirement, place a check in the appropriate check box. Ensure you compare the boxes with the shipping list supplied with the boxes.

<b>Requirements</b>	<input checked="" type="checkbox"/>
Principal installation area is in compliance with all relevant safety regulations.	<input type="checkbox"/>
Laboratory temperature is maintained between 15-30°C (59-86°F)	<input type="checkbox"/>
Laboratory is free of excessive particulate matter.	<input type="checkbox"/>
Cooling air system is set up (if required).	<input type="checkbox"/>
Workbench requirements are met.	<input type="checkbox"/>
Sufficient bench space is available for all components.	<input type="checkbox"/>
Bench can support system weight.	<input type="checkbox"/>
Personal computer with Microsoft Windows 7 Professional 64-bit SP1 installed and printer is set up, if purchased separately.	<input type="checkbox"/>
Entrance to the lab is at least 1050 mm (41.3 in) wide for packaged instrument, or 800mm (31.5 in) wide for unpackaged instrument.	<input type="checkbox"/>
Exhaust system is suitable.	<input type="checkbox"/>
Specified electrical supply and power outlets are installed.	<input type="checkbox"/>
Gas supply (at specified purity), regulator, and gas lines are installed for argon and any allowed optional gases.	<input type="checkbox"/>
Water cooling/circulation system and power connections are set up, if system is not purchased from Agilent.	<input type="checkbox"/>
Waste container appropriate for the chemical waste is prepared.	<input type="checkbox"/>
<b>Accessories</b>	
SPS 3 Sample Preparation System	<input type="checkbox"/>
SVS 2+ Productivity Package	<input type="checkbox"/>
VGA Vapor Generation Accessory	<input type="checkbox"/>
5 Channel Peristaltic Pump	<input type="checkbox"/>
Air Inlet Duct Filter	<input type="checkbox"/>
External Inlet Duct Adapter	<input type="checkbox"/>
Multimode Sample Introduction System (MSIS)	<input type="checkbox"/>
Argon Saturator Accessory (ASA)	<input type="checkbox"/>

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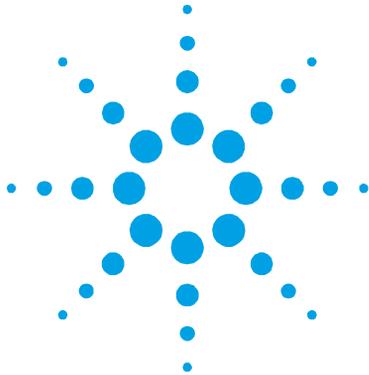
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## Safety Practices and Hazards

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## 1. Safety Practices and Hazards

### General

Operation of an Agilent 5100 Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES) involves the use of compressed gases, high voltage radio frequency energy and hazardous materials including corrosive fluids and flammable liquids. Careless, improper or unskilled use of this spectrometer or chemicals used with it can cause death or serious injury to personnel, and/or severe damage to equipment and property. Only trained personnel should use this instrument.

The spectrometer incorporates interlocks and covers that are designed to prevent inadvertent contact with any potential hazards. If the instrument is used in any manner not specified by Agilent, this protection provided by the equipment may be impaired. It is good practice to develop safe working habits that do not depend upon the correct operation of the interlocks for safe operation. It is essential that no interlock or cover is bypassed, damaged or removed.

The safety practices described below are provided to help the user operate the instrument safely. Read each safety topic thoroughly before attempting to operate the instrument and *always* operate the spectrometer in accordance with these safety practices.

### Plasma

The plasma is extremely hot (about 7,500 °C) and radiates dangerous levels of radio frequency (RF) and ultraviolet (UV) energy. The work coil operates at 1,500 V RMS and about 27 MHz. Exposure to the RF and UV energy can cause severe skin damage and cataracts of the eyes, while close contact with the operating plasma can result in severe heat burns to the skin, and an electrical discharge that can jump a considerable distance and may cause death, severe electric shock or sub-surface skin burns.

The plasma must *never* be operated unless:

- the plasma compartment door is closed, with the locking lever fully latched; and
- the space above the chimney and air intake is clear of objects.

The shielding around the torch compartment is designed to reduce UV, visible and RF radiation to safe levels while still permitting easy access to, as well as installation and viewing of, the torch. The spectrometer has an interlock system that is designed to extinguish the plasma if either the mains supply fails, the handle on the torch compartment door is opened, or the torch loading handle is open. *Do not* attempt to bypass the interlock system.

Before opening the torch compartment door, *always* extinguish the plasma by pressing SHIFT + F5 on the keyboard or by clicking the 'Plasma Off' icon on the ICP Expert software toolbar.

The torch and its surroundings remain hot for up to five minutes after the plasma is extinguished. Touching this area before it has cooled sufficiently may result in burns. Allow the torch and torch compartment to cool before carrying out any work in this area, or wear heat-resistant gloves.

The plasma system has been carefully designed to operate safely and effectively when using torches and related components that conform to Agilent's design criteria. Use of non-approved components in the plasma compartment may render the system inoperative and/or hazardous. It may also invalidate the warranty on the instrument. Use only torches and related components supplied or authorized by Agilent.

## Heat, Vapors and Fumes

Heat, ozone, vapors and fumes generated by the plasma can be hazardous, and must be extracted from the instrument by means of an exhaust system. Ensure that an exhaust system of the appropriate type is fitted (see Page 36). The system must be vented to the outside air in accordance with local regulations and never within the building. Regularly check the exhaust system by smoke test to ensure that the exhaust system is functioning correctly. The exhaust fan must always be switched on *before* igniting the plasma.

## Compressed Gas Hazards

All compressed gases (other than air) can create a hazard if they leak into the atmosphere. Even small leaks in gas supply systems can be dangerous. Any leak (except that of air or oxygen) can result in an oxygen-deficient atmosphere, which can cause asphyxiation. The area in which cylinders are stored and the area surrounding the instrument must be adequately ventilated to prevent such gas accumulations.

Gas cylinders must be stored and handled strictly in accordance with local safety codes and regulations. Cylinders must be used and stored only in a vertical position and secured to an immovable structure or a properly constructed cylinder stand. Move cylinders only by securing them to a properly constructed trolley.

Use only approved regulator and hose connectors (refer to the gas supplier's instructions). Keep gas cylinders cool and properly labeled. (All cylinders are fitted with a pressure relief device that will rupture and empty the cylinder if the internal pressure is raised above the safe limit by excessive temperatures.) Ensure that you have the correct cylinder before connecting it to the instrument.

The primary gas to be used with the spectrometer is argon, which is the conductive gas for the plasma. Argon or nitrogen can be used as the polychromator purge gas. Other gases may be required for future options and accessories. Use only 'instrument grade' gases with your spectrometer.

If using cryogenic gases (for example, liquid argon), prevent severe burns by wearing suitable protective clothing and gloves.

### Electrical Hazards

The spectrometer system and some accessories contain electrical circuits, devices and components operating at dangerous voltages. Contact with these circuits, devices and components can cause death, serious injury or painful electric shock. Panels or covers which are retained by screws on the spectrometer and accessories may be opened *only* by Agilent-trained, Agilent-qualified or Agilent-approved field service engineers (unless specified otherwise). Consult the manuals or product labels supplied with your personal computer (PC), monitor, printer and water-cooling system to determine which parts of those systems are operator-accessible.

Connecting the Agilent 5100 ICP-OES to a power source that is not equipped with a protective earth contact creates a shock hazard for the operator and can damage the instrument. Likewise, interrupting the protective conductor inside or outside the Agilent 5100 ICP-OES or defeating the power cord ground creates a shock hazard for the operator and can damage the instrument.

### Other Precautions

Use of the spectrometer system and accessories may involve materials, solvents and solutions which are flammable, corrosive, toxic or otherwise hazardous. Careless, improper or unskilled use of such materials, solvents and solutions can create explosion hazards, chemical burn hazards, fire hazards, toxicity and other hazards that can result in death, serious personal injury or damage to equipment. Apply all necessary precautions including use of lab coats, safety goggles and other appropriate forms of personal protection. All wastes should be disposed of in accordance with local regulatory requirements.

Operation of an ICP-OES involves analysis of solutions that have been prepared in or digested with acids, or in some cases, samples that have been prepared in organic solvents.

In case of uncertainty about a specific fluid, that fluid should not be used until confirmation by the manufacturer that it will not present a hazard.

The acid concentration in the sample that is measured is variable, depending upon the digestion steps and acid types used. Instrument users should be aware of the hazards associated with use of the acids used for sample preparation and apply all necessary precautions including use of lab coats, safety goggles and other appropriate forms of personal protection. The acid wastes should be disposed of in accordance with local regulatory requirements.

The type, volatility and concentration of the organic solvents used in the sample that is measured is variable, depending upon the selected solvent and the sample preparation involved. Instrument users should be aware of the hazards associated with use of the organic solvents used for sample preparation, and apply all necessary precautions including ensuring adequate ventilation during use, and use of lab coats, safety goggles and other appropriate forms of personal protection. The organic wastes should be disposed of in accordance with local regulatory requirements.

Air flow to the cooling fans of the spectrometer and accessories must be unobstructed. Do not block the ventilation grills on the spectrometer and accessories. Consult the manuals supplied with your PC, monitor, printer and water-cooling system for their specific ventilation requirements.

Great care should be taken when working with glass or quartz parts to prevent breakage and cuts. This is especially important when attaching plastic tubing to the nebulizer, inserting the nebulizer into the spraychamber, or removing and replacing pieces of broken torch.

The spectrometer weighs approximately 106 kg (234 lb). To avoid injury to personnel or damage to the instrument or property, always use a forklift or other suitable mechanical lifting device to move the instrument.

Use only Agilent-supplied spares with your instrument.

Only trained operators should use the instrument.

### Warning Symbols

The following is a list of symbols that appear in conjunction with warnings on the spectrometer. The hazard they describe is also shown. The beginning of the warning text is noted by a warning icon:

#### WARNING

A triangular symbol indicates a warning. The meanings of the symbols that may appear alongside warnings in the documentation or on the instrument itself are as follows:



*Broken glass*



*Chemical hazard*



*Electrical shock*



*Extreme cold hazard*



*Eye hazard*



*Fire hazard*



*Heavy weight  
(danger to hands)*



*Hot surface*



*Noxious gases*



*RF radiation*

The following symbol may be used on warning labels attached to the instrument. When you see this symbol, refer to the relevant operation or service manual for the correct procedure referred to by that warning label.



The following symbols appear on the instrument for your information.



Mains power on



Mains power off



Single phase alternating current



Protective ground terminal.



Socket for Agilent accessory serial cable



Socket for Ethernet LAN cable



Socket for Agilent accessory USB cable



Indication of correct orientation of gas filter flow direction

## CE Compliance

Your Agilent 5100 ICP-OES instrument has been designed to comply with the requirements of the Electromagnetic Compatibility (EMC) Directive and the Machinery Directive (MD) of the European Union. Agilent has confirmed that each product complies with the relevant Directives by testing a prototype against the prescribed EN (European Norm) standards.

## Safety Practices and Hazards

Proof that a product complies with these directives is indicated by:

- the CE Marking appearing on the rear of the product, and
- the documentation package that accompanies the product containing a copy of the Declaration of Conformity. The Declaration of Conformity is the legal declaration by Agilent that the product complies with the directives listed above, and shows the EN standards to which the product was tested to demonstrate compliance.

## Electromagnetic Compatibility

### EN55011/CISPR11

**Group 1 ISM equipment:** group 1 contains all Industrial, Scientific and Medical (ISM) equipment in which there is intentionally generated and/or used conductively coupled radio- frequency energy which is necessary for the internal functioning of the equipment itself.

**Class A equipment** is equipment suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

This device complies with the requirements of CISPR11, Group 1, Class A as radiation professional equipment. Therefore, there may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference.
- 2 This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- 1 Relocate the radio or antenna.
- 2 Move the device away from the radio or television.

- 3 Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
- 4 Make sure that all peripheral devices are also certified.
- 5 Make sure that appropriate cables are used to connect the device to peripheral equipment.
- 6 Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.

Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

### ICES/NMB-001

This ISM device complies with Canadian ICES- 001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.

### South Korean Class A EMC declaration

A 급 기기 ( 업무용 방송통신기자재 )

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

이 기기는 업무용 (A 급 ) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주

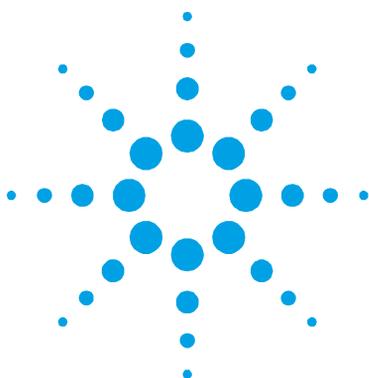
의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으로 합니다 .



After all safety regulations have been met, check the checklist box: *Principal installation area is in compliance with all relevant safety regulations.*

## Safety Practices and Hazards

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## 2. Introduction

This publication contains the information required to successfully prepare a site for an Agilent 5100 ICP-OES system installation.

On completion of the site preparation, fill in the checklist on Page 4, (striking out those entries not applicable), and send this checklist to your local Agilent agent or Agilent sales and service office. As soon as it is received, Agilent or its agent will contact you to arrange a convenient time for installation.

If you have difficulty in preparing for the installation, and for details of operator training courses, please contact your Agilent sales or field service representative.

### Installation Guidelines

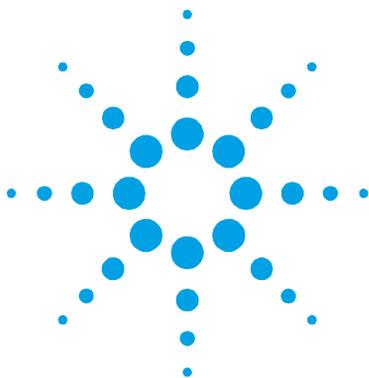
Allow a minimum of one day for the installation of the Agilent 5100 ICP-OES system by an Agilent field service engineer.

The installation will include the following:

- Spectrometer installation
- Water chiller connection
- Instrument software installation and registration
- Accessory installation
- Spectrometer installation performance tests
- Basic customer training
- Maintenance overview

## Introduction

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## 3. Laboratory Environment

### Environmental Conditions

The Agilent 5100 ICP-OES instrument is suitable for indoor use *only* and is classified suitable under Equipment class I category.

#### Installation category

The installation category is II, based on IEC61010-1. The installation category implies the regulation for impulse withstand voltage. It is also called the 'Over voltage category'. 'II' applies to electrical equipment with a nominal supply voltage up to 300 V.

#### Pollution level

The pollution level is 2, based on IEC61010-1. Pollution level describes the degree to which a solid, liquid or gas that deteriorates dielectric strength is adhering. '2' applies to a normal indoor atmosphere, where only non-conductive pollution occurs.

## Laboratory Environment

**Table 1.** Suitable environmental conditions for the 5100 ICP-OES instruments

Condition	Altitude	Temp. (°C)	Humidity (%RH) non-condensing
Non-operating (Storage)	0–3000 m (0–9840 ft)	5–60	15–85
Operating within specifications	0–3000 m (0–9840 ft)	15–30	20–80

### Temperature Control

Air-conditioning is strongly recommended for control of the environment.

#### NOTE

For *optimum analytical performance*, it is recommended that the ambient temperature of the laboratory be between 20 and 25 °C (68 and 77 F), and be held constant to within  $\pm 2$  °C ( $\pm 3.6$  °F) throughout the entire working day.

Most of the 2900 watts (joules per second) or 10,440 kilojoules per hour (9895 BTU per hour) generated by the system is vented outside the laboratory by the exhaust system.

The water chiller generates approximately 1000 watts (joules per second), or 3600 kilojoules per hour (3412 BTU per hour).



After the temperature requirements have been met, check the checklist box: *Lab temperature maintained between 15 and 30 °C.*

### Cleanliness

The area selected for the operation of an Agilent 5100 ICP-OES system *must be free from drafts, corrosive atmospheres and vibration* and should be a dust-free, low humidity environment.

Sample preparation areas and materials storage facilities should be located in a separate room.

Limit dust levels to less than 36,000,000 particles (0.5 microns or larger) per cubic meter of air. This is equivalent to a very clean office.



After the cleanliness requirements have been met, check the checklist box: *Laboratory is free of excessive particulate matter.*

## Instrument Cooling Air Supply

The Agilent 5100 ICP-OES instrument requires *clean, dry, non-corrosive air for cooling purposes*. This is supplied to the instrument through an air supply vent located at the top, front of the instrument. The vent is fitted with a dust filter, to filter out particulate matter from the surrounding environment.

The air supply is used to cool the RF generator and the electronics of the instrument. Several of these assemblies contain parts prone to corrosion. The introduction of cooling air contaminated with high levels of acid vapor or other corrosive substances may cause damage to the instrument.

Due to the corrosive nature of some analytical work, it is recommended that in applications demanding high usage of corrosive materials, an external cooling air supply system be provided. It is *strongly recommended* that the cooling air be supplied from an environmentally controlled area that is away from the instrument exhaust and any other area where corrosive materials are stored or used. Do not duct humid, warm air into an instrument in a cooled laboratory environment.

The external cooling air system with flue, fan, and ducting must provide a minimum positive flow of 4 m<sup>3</sup>/minute (141 ft<sup>3</sup>/min) to the instrument when using the External Inlet Duct Adaptor Kit (G8010-68002). The ducting should be corrosion resistant and fire-proof.

### NOTE

If an external cooling air supply system is required, an air inlet duct attachment must be ordered with the instrument.



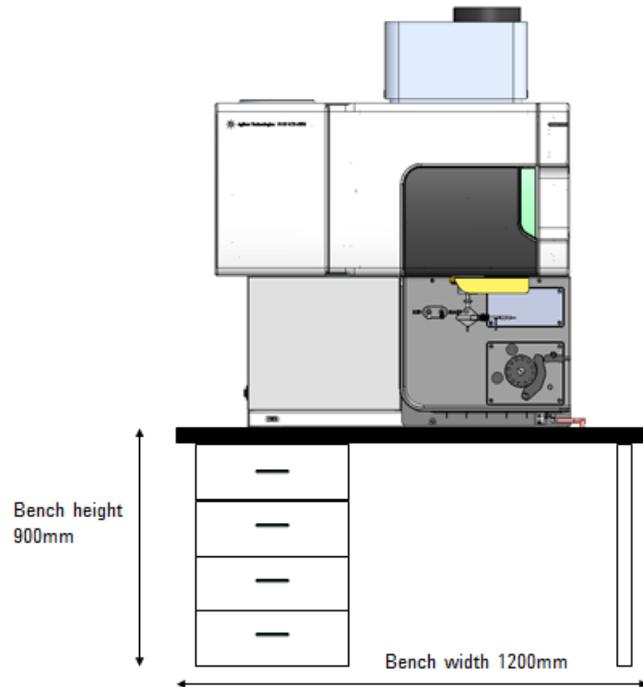
After the instrument cooling air supply requirements have been met, check the checklist box: *Cooling air system is set up*.

### Workbench

The Agilent 5100 ICP-OES is a precision optical instrument. The workbench must be free from vibration and must be stable and strong enough to support the total weight of the equipment to be placed on top of the workbench. The bench top should be large enough to permit free circulation of air through the main instrument and around each of the accessories.

The information provided in the weights and dimensions table will help make planning easier. Portable or semi-permanent trolleys can be used as workbenches for the spectrometer system, but you must *lock* the wheels. Accessories such as the Sample Preparation System (SPS) Autosampler, PC and printer can be positioned on a trolley. A specially designed SPS trolley is available from Agilent.

To avoid damage through spillage of samples being used, the instrument bench top should be covered with a material that is corrosion-resistant and impervious to liquid spillage. Generally, for comfortable working conditions and easy access to the instrument sample introduction system, Agilent recommends that the height of the workbench be approximately 900 mm (36 in) high. Refer to Figure 1.



**Figure 1.** Instrument workbench

### Location

The workbench location should permit service access from all sides.

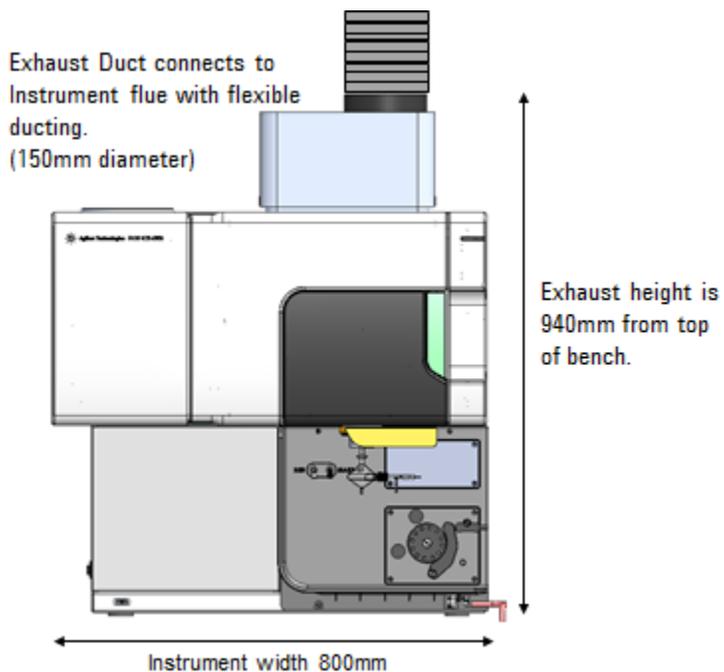
Position the equipment for easy access to the power switch and for disconnecting the power cable on the left side of the instrument. A minimum of 400 mm (16 in) free space at the sides of the spectrometer and approximately 30 mm (1.2 in) at the rear of the instrument is required for maintenance and service access. Leave enough space in front and to the left side of the instrument to provide easy access to the mains power on/off switch at all times.

The 5100 ICP-OES system should not be located close to an access door, window or any other area where drafts may cause fluctuating temperature conditions.

The following diagrams show the relative dimensions of the main instrument including the space needed for service access. These dimensions should be considered during the preparation for installation of your spectrometer.

## Laboratory Environment

The location of the workbench may be determined by the position of the exhaust flue required to remove fumes and vapors from the spectrometer sample compartment (see Section 4).



**Figure 2.** Front view of instrument

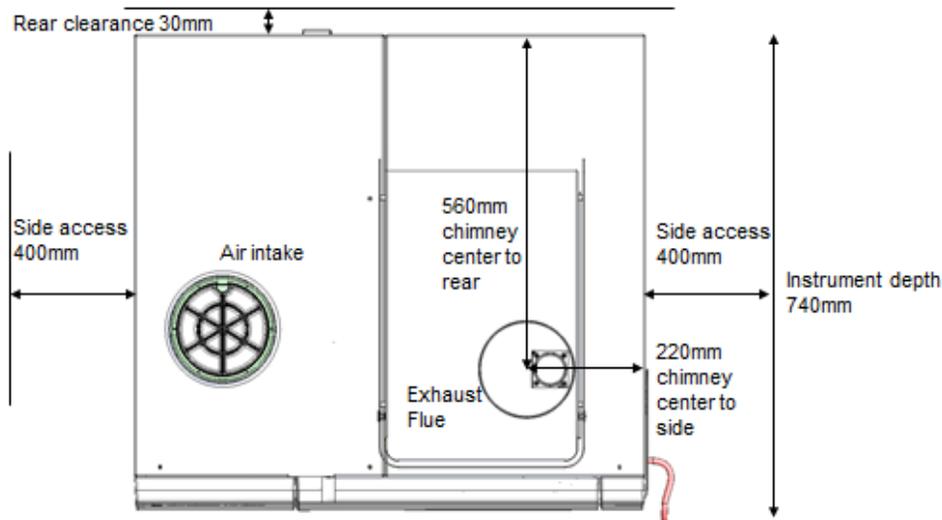


Figure 3. Top view of instrument

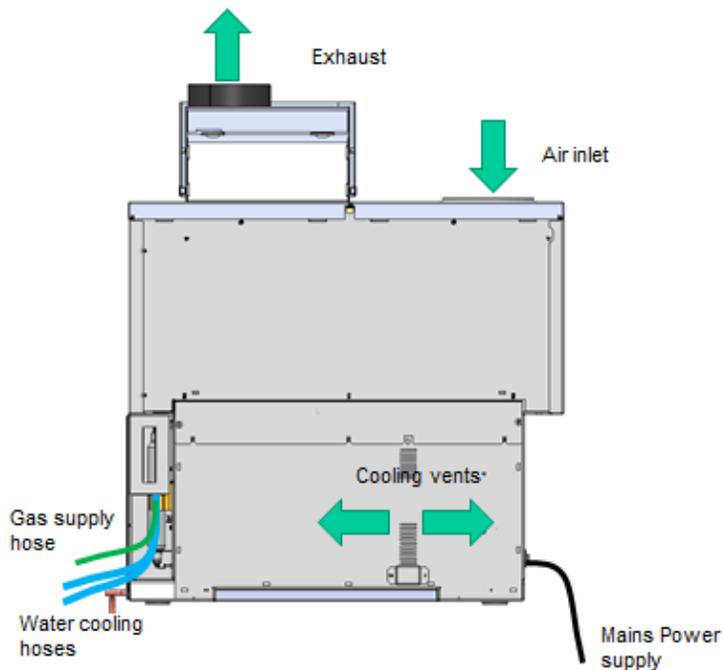


Figure 4. Rear view of instrument

## Laboratory Environment

- After the workbench vibration and location requirements have been met, check the checklist box: *Workbench requirements met.*
- After the bench space requirements have been met, check the checklist box: *Sufficient bench space is available for all components.*
- After the bench support requirements have been met, check the checklist box: *Bench can support system weight. See Page 31 for Weight and Dimension information.*

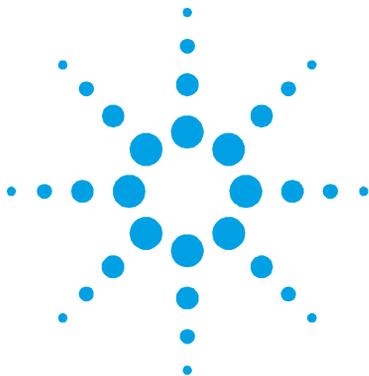
## PC Requirements

The minimum configuration represents the absolute minimum you can run the software on. This PC configuration may be out of manufacture, but you may want to use a PC you already have. The recommended configuration is that which you would buy new.

**Table 2.** PC requirements

Minimum	Recommended
2 GHz 64-bit (x86) quad core processor or higher	3.2 GHz 64-bit (x86) quad core processor or higher
4 GB of system memory	4 GB of system memory
120 GB hard drive with at least 15 GB of available space	500 GB hard drive
DVD-ROM Drive	DVD-ROM Drive
Screen resolution of 1280x768 running in 96 dpi	22 inch screen with minimum screen resolution of 1920x1080 running in 96 dpi
Ethernet port	Ethernet port
Two USB 2.0 ports	4 USB 3.0 ports 6 USB 2.0 ports
Windows 7 Professional 64-bit	Windows 7 Professional 64-bit

Higher rated PC components can be substituted for those listed above for example, processor type, amount of memory, screen size and resolution and operating system version.



## 4. Instrument Shipping Information

Generally, Agilent 5100 ICP-OES instruments are sold as ‘Free On Board’ to the shipping point, with the transportation from this point at the customer’s expense. Due to the size and nature of the spectrometer, it is advisable that a third party is engaged to assist with transportation from the point of unloading to the final placement of the instrument in the laboratory. The Agilent field Sales and Service Offices will be able to assist in the task of recommending a third party that specializes in the transportation of precision scientific instrumentation.

**NOTE**

The Agilent field service engineer cannot start the installation until the instrument is situated on the intended work bench.

### In-house Transit Routes

In-house transit routes must be carefully considered. Vertical, horizontal and turning clearances should be calculated from the shipping crate dimensions of the spectrometer, which is the largest unit in any system arrangement.

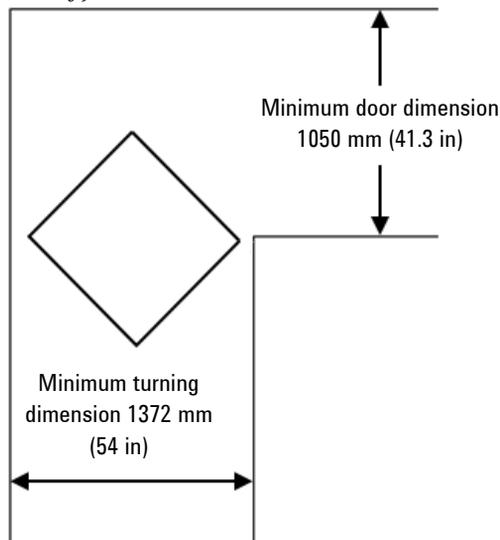
Figure 5 provides an indication of the minimum turning clearance and minimum door width required for the spectrometer in its shipping crate.

## Instrument Shipping Information



5100 instrument crate

Particular attention should be made to the clearance of any doors in the transit route to the laboratory. The required turning and door clearance may need to take into consideration any lifting device used for transporting the instrument (for example, fork lift, pallet truck or trolley).



**Figure 5.** Maximum clearance required for transportation in the shipping crate



After the in-house transit route requirements have been met, check the checklist box: *Entrance to the lab is at least 1050 mm (41.3 in) wide for packaged instrument, or 800 mm (31.5 in) wide for unpackaged instrument.*

## Insurance after Delivery

As the carrier's liability ceases when the equipment is delivered, Agilent recommends that the instrument owner arranges separate insurance that will cover transportation from the delivery point to the installation site. The delivery point will vary according to the carrier, the shipping method, and in some cases the terms of sale. Some carriers will only deliver to their own distribution center, while others may deliver to the actual installation site.

## Weights and Dimensions

**Table 2.** Weights and dimensions

System unit	Width	Depth	Height	Weight
<b>Agilent 5100 ICP-OES instrument</b>	800 mm 31 in	740 mm 29.5 in	940 mm 39 in	106 kg 234 lb
Shipping dimensions	998 mm 39.25 in	940 mm 37 in	1290 mm 50.8 in	180 kg 396 lb
<b>Personal computer (typical)</b>	450 mm 18 in	770 mm 30 in	520 mm 20 in	(N/A)
<b>Printer (typical)</b>	500 mm 18 in	650 mm 30 in	200 mm 20 in	(N/A)
<b>Water cooling system</b> G8481A Agilent water chiller	368 mm 14.5 in	702 mm 27.6 in	575 mm 22.6 in	82 kg 181 lb
<b>SPS 3</b>	490 mm 19.3 in	285 mm 11.2 in	510 mm 20.1 in	15 kg 33.1 lb
Shipping dimensions	760 mm 29.9 in	500 mm 19.7 in	840 mm 33.1 in	31 kg 68.4 lb
<b>SPS 3 trolley</b>	580 mm 23 in	412 mm 17 in	400 mm 16 in	
<b>SVS 2 Plus</b>	54 mm 2.1 in	110 mm 4.3 in	177 mm 7.0 in	620 g 1.37 lb
Shipping dimensions	400 mm 15.7 in	370 mm (14.6 in.)	250 mm (9.8 in.)	4.0 kg (8.8 lb)

## Instrument Shipping Information

Fast Uptake Pump for SVS 2+	122 mm 4.8 in	170 mm 6.7 in	97 mm 3.8 in	0.96 kg 2.1 lb
VGA (including mounting bracket)	385 mm 10 in	340 mm 8 in	195 mm 9 in	6 kg 13.2 lb
Shipping dimensions	490 mm 19.5 in	490 mm 19.5 in	320 mm 12.5 in	10 kg 22 lb

---

### WARNING



#### Heavy Weight

The Agilent 5100 ICP-OES weighs approximately 106 kg (234 lb). To avoid injury to personnel or damage to equipment, always use a fork lift or other suitable lifting device when moving the instrument.

---

## Transit Damage

Transit damage can be obvious or concealed, and in either case will only be admitted by the carrier if it is reported as agreed in the terms of their agreement. For any claims against damage in transit, the following general rules apply:

- Before accepting delivery, you should inspect the packages for signs of obvious damage. The nature of any obvious damage must be noted on the carrier's waybill, and then must be countersigned by a representative of the carrier.
- Within the time limits stated in the terms of conditions of carriage, a further inspection must be made for concealed damage. If any damage is found at this stage, the carrier must be notified in writing and all packaging material must be retained for subsequent inspection by a representative of the carrier.
- A copy of any damage report must be forwarded to the Agilent Sales Office dealing with the supply of the equipment.

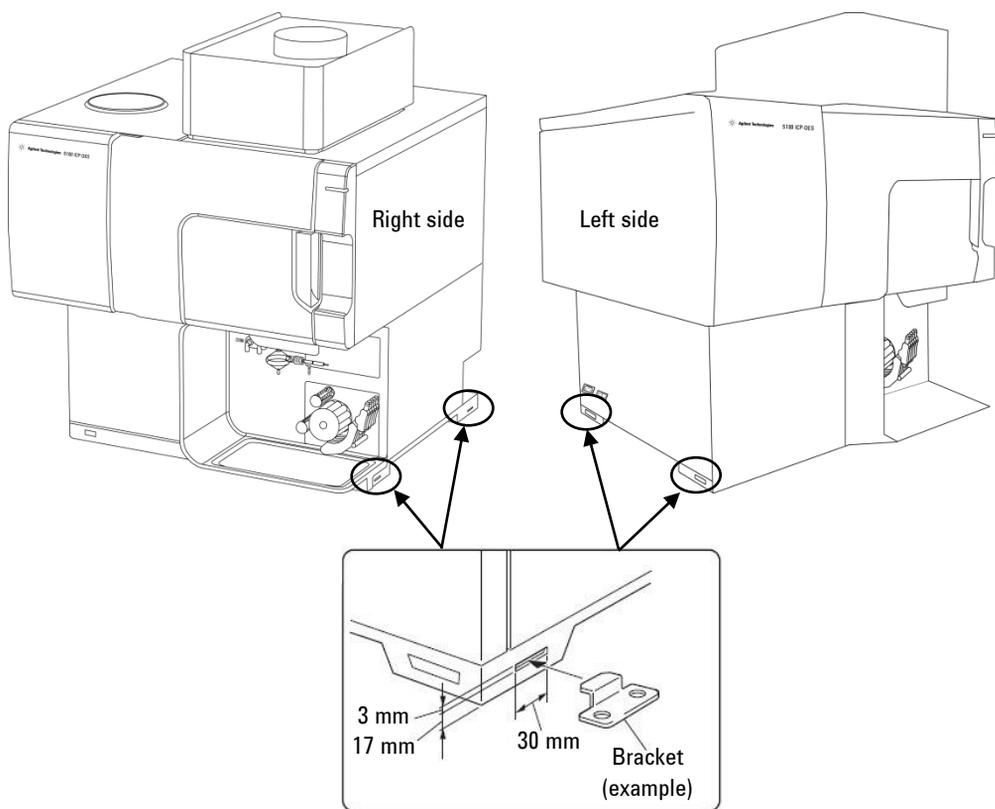
Agilent 5100 ICP-OES systems are inherently robust, and the packaging is designed to prevent damage. It must be remembered that the contents form part of a precision measuring system and all packages should be handled accordingly. In transit, sharp jolts and shocks must be avoided and the packages must not be inverted or tilted unnecessarily. Markings on the shipping cartons generally indicate the required orientation of the carton.

## Seismic Requirements

If necessary, insert tie down brackets into mounting slots, create corresponding holes in the table, and secure the brackets with bolts.

**NOTE**

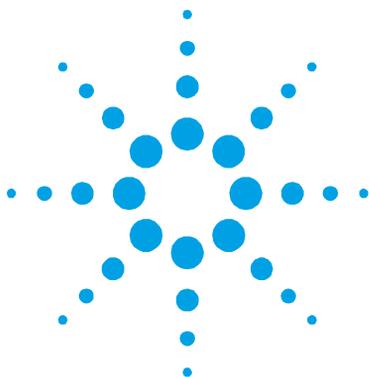
Seismic brackets are not supplied by Agilent. Prepare these items separately.



**Figure 6.** Slots for seismic tie down

## Instrument Shipping Information

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## 5. Laboratory Facilities

### Exhaust System

The plasma operates at a temperature of approximately 7,500 °C, (13,500 °F) with up to 1,500 watts of RF energy. Sample compartment exhaust fumes can be noxious or corrosive.

The Agilent 5100 ICP-OES must be located under a flue that is vented by an exhaust fan and ducted to an external vent. The exhaust system with flue, ducting and external vent must provide a minimum flow of 2.5 m<sup>3</sup>/min (88 ft<sup>3</sup>/min) at 2.4 m/s (7.7 ft/s) and a maximum flow of 6.0 m<sup>3</sup>/min (212 ft<sup>3</sup>/min) at 5.7 m/s (18.6 ft/s).

The exhaust system installation must comply with any rules and/or regulations that may be imposed by the local authorities responsible for control of facilities and fixtures in the work place.

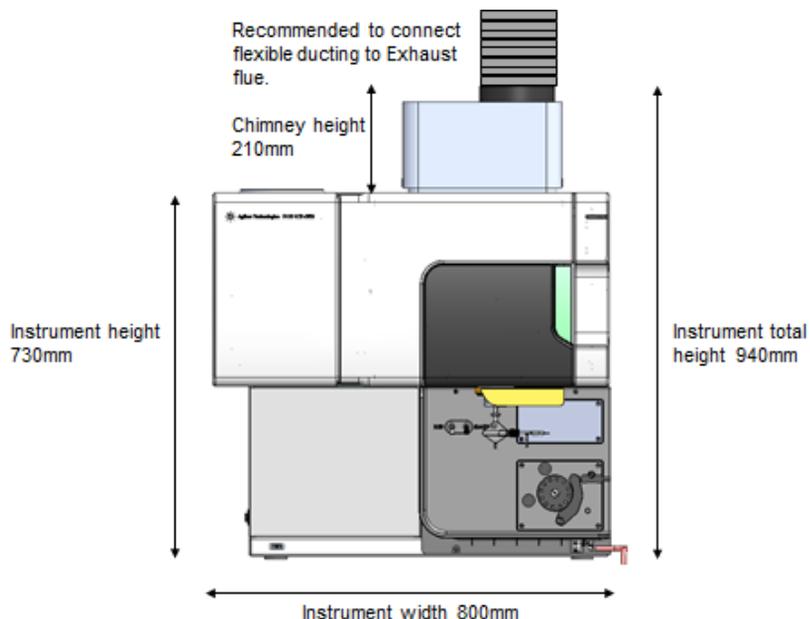
The exhaust fan should be located at least 2 meters (6 ft, 6 in) away from the top of the instrument chimney. The fan control switch and running indicator lamp should be located in a position where the instrument operator can view the indicator and access the control switch.

Ducting must be corrosion-resistant, fire-proof and should be kept clear of fire alarms, sprinkler heads and other heat sensitive devices.

The external vent must be fitted with a back draft damper and the outlet location must be clear of doors, windows and heater or air-conditioning units.

## Laboratory Facilities

It is recommended to directly connect the exhaust ducting directly via the 150 mm diameter exhaust vent. However if using an extraction hood it is important to closely couple this to the extraction port with a distance of no more than 1.5 cm (0.6 inches) above the exhaust outlet.



**Figure 7.** Spectrometer and flue position

### Agilent Exhaust System

The component parts required for an exhaust system may be purchased from Agilent. The parts may be ordered individually or in kit form. To allow for personal preferences, control gear switch and pilot light assemblies are not supplied by Agilent.

**Table 3.** Agilent exhaust kits

#### Exhaust kit

Exhaust kit for 240 V, 50 Hz supply

Exhaust kit for 115 V, 60 Hz supply

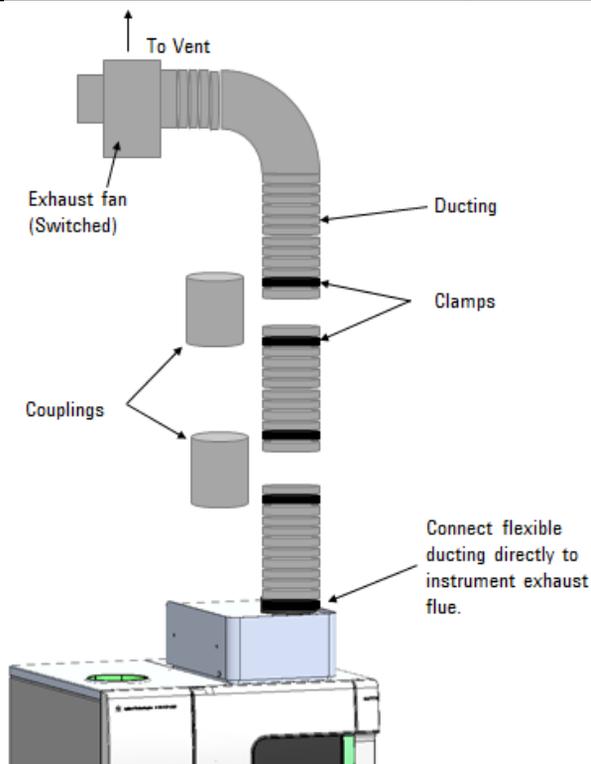
**NOTE**

Mounting hardware for the flue and fan is not included with the Agilent-supplied Exhaust Kit.

Each Agilent exhaust kit contains the following items, which *must* be installed by local fitters and not the Agilent service engineer.

**Table 4.** Exhaust kit components (refer to Figure 6)

Item	Remarks	Quantity
1	Exhaust fan (for 240 V, 50 Hz supply only)	1
	Exhaust fan (for 115 V, 60 Hz supply only)	1
2	Flexible ducting 1 meter length, aluminum	3
3	Coupling for joints in ducting	2
4	Ducting clamp two required per coupling	6



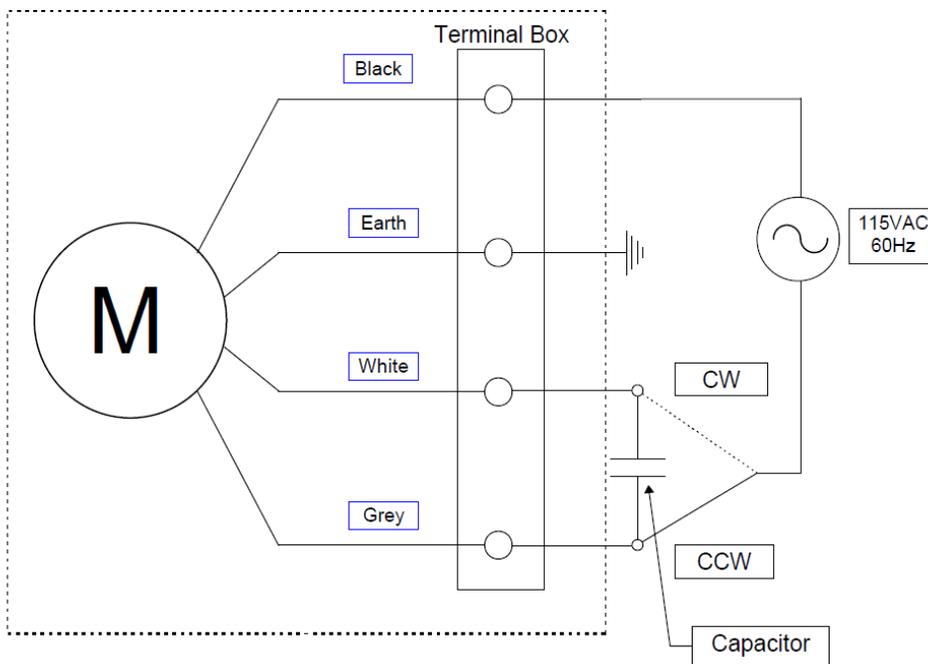
**Figure 8.** Agilent exhaust kit components

**Agilent Exhaust Fan Electrical Information**

**Table 5.** Exhaust fan motor specifications

<b>Voltage</b>	240 volts single phase	115 volts single phase
<b>Current</b>	0.45 A	0.7 A
<b>Frequency</b>	50 Hz	60 Hz
<b>Power input</b>	74 W	51 W
<b>Direction of rotation</b>	Anti-clockwise (shaft end)	
<b>Nominal RPM</b>	≈ 1600	

Installation instructions for the exhaust fan are included with the Agilent-supplied Exhaust Kit.. Figure 9 details exhaust fan wiring information for the 115 V 60 Hz fan *only*.



**Figure 9.** Electrical wiring information for 115 VAC 60 Hz fan only

**NOTE**

The direction of motor rotation (clockwise or counterclockwise) is as viewed from the shaft end of the motor. The exhaust fan rotation is counterclockwise (CCW) and the motor must be wired accordingly.

---



After the exhaust requirements have been met, check the checklist box: *Exhaust system is suitable.*

## Electrical Power Supplies

The installation of electrical power supplies must comply with the rules and/or regulations imposed by the local authorities responsible for the use of electrical energy in the workplace.

All power supplies for the Agilent 5100 ICP-OES, its accessories and water chiller should be single phase, AC, 3 wire systems (active, neutral, ground; or two active and ground). Each connection should be terminated at an appropriate receptacle within reach of each assembly's power cable. Use of power boards or extension cables is *not* recommended.

The outlet for the Agilent 5100 ICP-OES must have a dedicated ground.

It is recommended that separate mains circuits, (individually protected by fuses or circuit breakers) are used for each component in the system such as the water chiller, autosampler and printer.

Avoid using power supplies from a source that may be subject to electrical interference from other services (such as large electric motors, elevators, welders and air conditioning units).

## Laboratory Facilities

### Electrical Requirements

**Table 6.** System electrical specifications

<b>System unit</b>	<b>Required supply voltage</b>	<b>Nominal rating</b>
Spectrometer	200–240 VAC Single Phase 50Hz – 60Hz	2.9 kVA
Water chiller (typical)	220–240 VAC, 50 Hz 115 VAC, 60 Hz Voltage $\pm 10\%$ , Frequency $\pm 1$ Hz	1450 VA 1645 VA
SPS 3 Sample Preparation System	100–240 VAC $\pm 10\%$ , 50–60 $\pm 1$ Hz	~220 VA
VGA 77	100 VAC, $\pm 10\%$ 120 VAC, $\pm 10\%$  220 VAC, $\pm 10\%$ Equivalent to 230 VAC +6%, -14%  240 VAC, $\pm 10\%$ Equivalent to 230 VAC +14%, -6% Frequency 49–61 Hz	24 VA
SVS 2+	100–240 VAC, 50–60 Hz	1.8 A

### Single phase requirement

The Agilent 5100 ICP-OES requires a single phase mains input voltage of between 200-240VAC (50-60Hz) and draws a maximum of 15 amps RMS at 200 to 220 volts and 13 amps at 230-240 volts (2.9 kVA) with a power factor of approximately 0.99. (Can be a cross phase connection to achieve specified supply voltage).

### Power plugs and cords

The Agilent 5100 ICP-OES is supplied with a power cord set appropriate for the country from which the order originates. For example, if an order originates from an Agilent Technologies sales office in Germany, the power cord and plug supplied will be compatible with the standard voltage and outlet configuration in Germany. See Appendix A for illustrations of the power cords available.

#### CAUTION

If an instrument is being ordered from one location, but is to be installed in another location with different electrical power characteristics, this must be noted on the order. A special note must also be made if the electrical power at the site is different from the standard electrical power in that country.

#### WARNING



**Make sure the power cords supplied with the Agilent 5100 ICP-OES are appropriate for your country and site before using them.**

### Other Connections

IEEE 802.3, Ethernet LAN cable



After the electrical requirements have been met, check the checklist box: *Specified electrical supply and power outlets installed.*

### Circuit Breaker

**NOTE**

For safety reasons, any internal fuse or circuit breaker is not operator accessible, and should only be replaced by Agilent-authorized personnel.

---

The mains power switch contains a 20 A circuit breaker, which is reset when the power switch is cycled.

If necessary, replace the power cord only with a cord equivalent to the one specified (See Appendix A).

### Gas Supplies

The installation of compressed or liquid gas supplies must comply with the rules and/or regulations imposed by the local authorities responsible for such use in the workplace.

Liquid or gaseous argon and nitrogen may be used with Agilent 5100 ICP-OES spectrometer systems. Agilent recommends the use of liquid gases, which are purer, more convenient and cheaper per unit volume.

**NOTE**

Either argon or nitrogen gas may be used as an optics purge gas on the Agilent 5100 ICP-OES systems.

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The main gas supply requirement is argon for supply to the plasma, nebulizer and optics interface purge. Gas is also required to purge the polychromator assembly, and this may be either argon or nitrogen. A separate gas line to the polychromator connects internally to the argon supply unless the optional nitrogen purge kit is fitted. Gas supply regulator pressure setting may need to be adjusted to ensure the pressure is in the permissible pressure range when delivering the gas flow demanded during operation.

The user (or other authorized personnel) must carry out appropriate leak tests necessary to ensure safety on the gas and liquid connections that the operator is directed to assemble during installation, normal use or maintenance.

**Table 7.** Argon and nitrogen gas specifications

	<b>Argon</b>	<b>Nitrogen (if nitrogen is used to purge the polychromator)</b>
Purity	99.996%	99.996%
Oxygen	<5 ppm	<5 ppm
Nitrogen (argon only)	<20 ppm	-
Water vapor	<4 ppm	<4 ppm
Permissible pressure range*	500–600 kPa (73–88 psi)	
Recommended pressure*	550 kPa (80 psi) regulated	

\*When supplying required gas flows

**Table 8.** Typical flow rates for the Agilent 5100 ICP-OES instruments

	<b>Argon (with argon purge gas)</b>	<b>Nitrogen (as purge gas)</b>
Standby mode	0.70 L/min	Nitrogen flow 0.8 L/min
Operational range min-max (plasma on)	9.1-31.8 L/min	Argon flow 8.4-28.1 L/min Nitrogen flow 0.8-4.4 L/min
<b>Typical flows</b>		
Measuring wavelengths > 189 nm (poly boost off)	14.65-20.65 L/min	Argon flow 13.95-19.95 L/min Nitrogen flow 0.8 L/min
Measuring wavelengths < 189 nm (poly boost on)	19.25-25.25 L/min	Argon flow 15.55-21.55 L/min Nitrogen flow 4.4 L/min

The Agilent 5100 ICP-OES is supplied with three PVDF gas supply hose assemblies, each 3 m (9.8 ft) in length fitted with 1/4 inch Swagelok nut and ferrule set.

Fittings for the regulator end must be supplied by the customer. Alternatively, a fittings kit can be ordered from Agilent Technologies. See the Agilent website at [www.agilent.com](http://www.agilent.com) for ordering information.

## Laboratory Facilities

Customers will provide connection from the gas supply to a shutoff valve.

Customers must provide pressure regulators for the gas cylinders. When ordering, consider the size of the output tubing, 1/4 inch (6.4mm), and also the Compressed Gas Association (CGA) number.

If the Nitrogen Purge option is purchased, additional fittings will be supplied to connect the gas to the ICP-OES.

### Storage Cylinder Instructions

Cylinders containing gas under pressure should be firmly secured to a rigid structure, and the storage area must be adequately ventilated.

Never locate gas cylinders near a source of ignition, or in a position that is subject to direct heat. Gas storage cylinders often incorporate a pressure release device, which will discharge the gas at a predetermined temperature, usually around 52 °C (125 °F).

If gases are to be plumbed from a remote storage area to the instrument site, ensure that the local outlets are fitted with stop valves, pressure gauges and suitable regulators, which are easily accessible to the instrument operator. The gas outlets must be provided within 1.5 meters (5 feet) of the instrument.

### Cryogenic Liquids

Cryogenic liquid gases are stored under pressure at very low temperatures in Portable Liquid Cylinders (PLC).

---

**WARNING****Extreme Cold**

**Contact with the super-cold liquid, gas or pipe surfaces can cause severe skin damage. The Portable Liquid Cylinders should be located in a shielded position, and all piping should be routed or covered to prevent skin contact.**

---

For high gas flow rates and/or low ambient temperatures, it may be necessary to obtain sufficient gas pressure by passing the liquid through an external evaporator rather than use the internal pressure building facility of the PLCs.

Liquid argon and liquid nitrogen may *not* be stored for extended periods and often have special storage requirements. Contact your local authorities and cryogenic gas supplier for more detailed information on storage requirements and boil-off rates for local types of PLCs.



After the gas requirements have been met, check the checklist box: *Gas supply (at specified purity), regulator, and gas lines are installed for argon and optional nitrogen.*

## Water Chiller System

Agilent 5100 ICP-OES instruments require a source of cooling water. The water chiller system needs to remove up to 1400 W. The cooling water is required for the Solid State RF oscillator, load coil, camera Peltier assembly and Axial sample cone interface. The instrument incorporates an in-line particulate filter and water flow sensors on the water supply line.

An alternative is to install a recirculating water chiller system. The system should provide cover for the reservoir to prevent evaporation and stop contamination by dust or other impurities. Algaecide should be used to prevent algae growth that may restrict the flow of cooling water through the system.

A recirculating water chiller system has the advantage of reducing the volume of water that will be required over the life of the instrument's operation. Because of the limited size of the water chiller's reservoir, in the case of accidental damage the amount of water damage that can occur will also be limited.

The G8481A Agilent Water Chiller can be used and will ensure the continued delivery of temperature controlled coolant, at the correct pressure, with a minimum of long-term maintenance or operational expense.

**NOTE**

The operation manual and mounting and assembly hardware for the chiller system is included in the water chiller packaging. Locate all of these articles before the pack is discarded.

---

**Table 9.** Agilent 5100 ICP-OES chiller requirements

<b>Cooling capacity</b>	1400 W
<b>Flow rate</b>	2.0 L/min (0.53 gpm) minimum
<b>Recommended inlet temperature</b>	20 °C (68 °F)
<b>Temperature range</b>	15–28 °C (59–82 °F)
<b>Minimum inlet pressure</b>	230 kPa (33 psi)
<b>Maximum inlet pressure</b>	400 kPa (58 psi)

**NOTE**

Pressure regulation is recommended for water chiller systems that may exceed the maximum permissible pressure of 400 kPa (58 psi) or may be subject to pressure fluctuations.

---

The instrument is equipped with a water flow sensor, which will stop operation of the plasma if the cooling water flow through the instrument drops below 1.7 L/min (0.45 gpm). A second water flow sensor will stop the camera Peltier cooling assembly if the water flow through the instrument drops below 0.2 L/min (0.05 gpm).

**CAUTION**

*Always* ensure the water cooling system is on before igniting the plasma.

---

**Location**

Many water chillers are designed to be located and operated indoors. Consult the water chiller's literature for more information before installing.

The coolant supply and return hoses of the 5100 ICP-OES are 5.0 meters (10 feet) in length. The inner diameter of the return hose is 12 mm (1/2 inch). The inner diameter of the supply hose is 12 mm (1/2 inch). The 5100 ICP-OES is supplied with 1/2 inch NPT male fittings for connection to the G8481A Agilent Water Chiller. It is the customer's responsibility to supply appropriate fittings for other chilled water supplies.

Please see the Agilent website for part numbers for ordering additional hose by the meter and clamps: [www.agilent.com](http://www.agilent.com)



After the water cooling requirements have been met, check the checklist box: *Water cooling/circulation system and power connections are set up.*

## Waste Fluid Container

The Agilent ICP-OES system needs a drain vessel for disposal of excess fluids and vapors from the spraychamber or autosampler. Suitable tubing is supplied with the spectrometer for use with inorganic solvents. When using organic solvents, different drain tubing that is suitable for the solvent in use will be required.

A chemically inert container, not glass or of a narrow-necked style, to hold a minimum of 2 liters (4 pints) of waste must be provided by the user. It should be located underneath the sample compartment (or on the right side of the instrument), where it is protected by the bench and in full view of the operator.



After the waste fluid container requirements have been met, check the checklist box: *Waste container appropriate for the chemical waste is prepared.*

## Guidelines for Software Installation

Agilent recommends that you purchase a PC as part of the Agilent 5100 ICP-OES package. The PC included in the package will come with the appropriate operating system as loaded by the PC supplier.

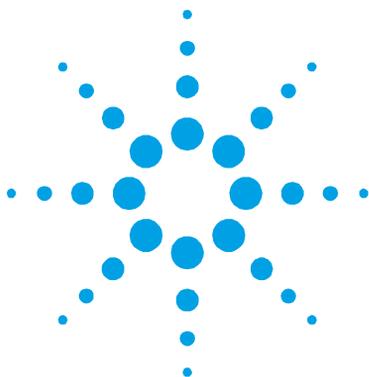
For instructions on installing the Microsoft Windows operating system, refer to the appropriate manuals supplied with the software. It is the responsibility of the customer to ensure that the operating system software has been installed and is functional if the customer is supplying the PC or the operating system.

**NOTE**

Agilent will not assume responsibility for loss of data.

---

The Agilent service engineer will connect the PC to the spectrometer and any factory-approved accessories purchased at installation. Initial instrument software installation is also included as part of the system installation. For information on installing the Agilent 5100 ICP-OES system software, consult the ICP Expert software installation instructions or the ICP Expert CFR software installation instructions supplied with the instrument software.



## 6. Accessories and Options

For detailed instructions and site requirements see the documentation supplied with the accessory.

### Sample Preparation System (SPS 3)

The SPS is compatible with a wide range of commercially available low-cost autoclavable sample racks.

Sample contamination from airborne particles is eliminated and corrosive or toxic fumes are removed during sampling with the optional environmental enclosure.

#### Environmental Conditions

The SPS accessory is suitable *only* for indoor use. The site should be selected to avoid dusty or corrosive atmospheres.

#### NOTE

Extra maintenance may be required on the SPS if it is operated in excessively dusty or corrosive conditions. Sample contamination from airborne particles is eliminated and corrosive or toxic fumes are removed during sampling with the optional environmental enclosure.

---

An Agilent-supplied trolley is available for the SPS. A drain vessel must also be accommodated.

### **SVS 2+ Productivity Package Accessory**

For safety information and to prepare the SVS 2+ for installation, please see the instructions that came with the accessory.

The SVS 2+ increases sample throughput and decreases turnaround time and operating costs. The SVS 2+ switching valve is positioned between the nebulizer and the peristaltic pump of the spectrometer. Samples are quickly loaded into the SVS 2+ sample loop, ready for immediate analysis by the ICP-OES, greatly reducing sample uptake delays. Pre-emptive rinsing of the sample line means analysis times are reduced. The SVS 2+ also features an internal T-piece within the valve, reducing dead volume and providing online addition of internal standard and ionization buffer solutions. A bubble injector automatically injects bubbles after the sample is loaded into the loop, isolating the sample from the rinse solution. This reduces the volume of sample required for measurement as tailing (or dilution) effects are minimized.

### **5-Channel Peristaltic Pump**

The five channel peristaltic pump can be used for for additional solution introduction and is required when using the MSIS accessory.

### **External Inlet Duct Adapter**

The External Inlet Duct Adapter provides greater filtration for use in labs with harsher environments.

### **Vapor Generation Accessory (VGA) Recommended Gases**

The VGA is fitted with 6 mm (1/4 inch) internal diameter flexible hose for connection to a standard barbed tail connector, which must be supplied by the customer.

**CAUTION**

The gas supply for the VGA must be a separate regulated line, to prevent exceeding the maximum inlet pressure to the VGA.

**NOTE**

The VGA allows a 45 mL/min flow of argon to pass through it even when it is switched off. It is recommended that the argon gas line is fitted with a stop valve to shut off the gas supply to the VGA.

---

**Table 10.** VGA gas supply requirements

Permissible pressure range	300–400 kPa (42–57 psi)
Recommended pressure	350 kPa (50 psi)
Required flow rates	Up to 100 mL/min

## Multimode Sample Introduction System (MSIS)

For safety information and to prepare the MSIS for installation, please see the instructions that came with this accessory and the ICP Expert Help.

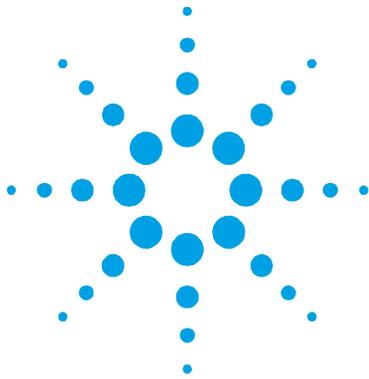
The MSIS is used with the ICP-OES instrument to provide simultaneous vapor generation of several hydride forming elements, enabling determination with low ppb detection limits.

The MSIS consists of the OneNeb nebulizer and modified glass cyclonic spray chamber that has two vertical conical tubes in the center of the chamber. This allows for reductant and sample to mix quickly and thoroughly in the chamber using thin film hydride technology to form the hydrides.

The MSIS can be operated in three modes: hydride only, simultaneous hydride and conventional nebulization or conventional nebulization only.

### **Argon Saturator Accessory (ASA)**

The Argon Saturator Accessory (ASA) is commonly used when running aqueous samples with high dissolved solids or high dissolved salt content. When using the ASA, the nebulizer gas flow is passed through the saturator to increase the water vapor in the gas. This has been found to be beneficial by reducing the build-up of salt and other dissolved solids in the sample introduction system. By reducing blockages, the ASA helps to ensure uninterrupted, maintenance-free operation.

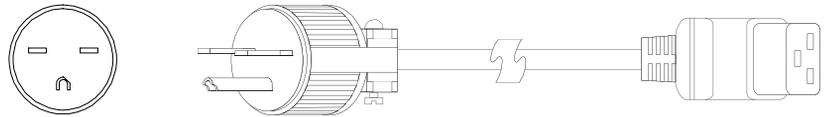


## Appendix A: Power Cords

This appendix shows the power cords available for the Agilent 5100 ICP-OES.

The diagrams are for illustration purposes only. The cable that arrives may differ in appearance.

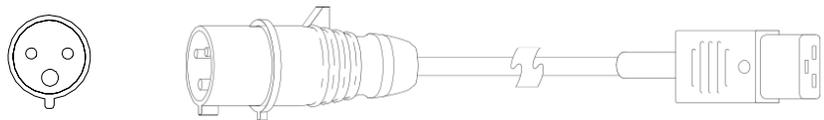
### US and Canada, NEMA 6-15P (Agilent Part Number 8120-8623)



### UK / Hong Kong / Singapore, BS 1363 (Agilent Part Number 8120-8620)



### Switzerland / Denmark, 1302 (Agilent Part Number 8120-8622)



### Australia, AS 3112 (Agilent Part Number 8120-8619) China, GB 1002 (Agilent Part Number 8121-0070) Argentina, IRAM 2073 (Agilent Part Number 8121-0675)

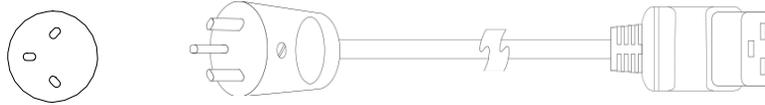


## Appendix A – Power Cords

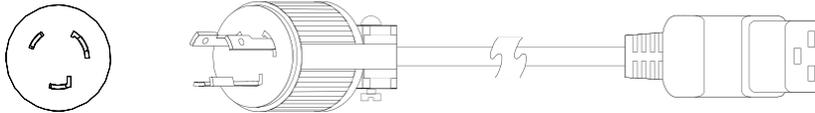
### India / South Africa, IS 1293 and IS 6538 (Agilent Part Number 8121-0710)



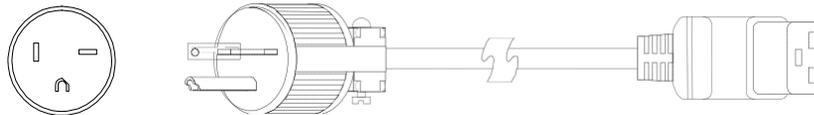
### Israel, SI 32 (Agilent Part Number 8121-0161)



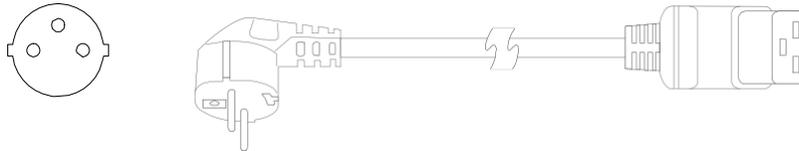
### Japan, NEMA L6-20P (Agilent Part Number 8120-6903)



### Taiwan/S America, NEMA 6-20P (Agilent Part Number 8120-6360)



### Europe/Korea, CEE7 VII (Agilent Part Number 8121-1222)



### Thailand, NEMA 5-15P (Agilent Part Number 8121-1301) (Not Shown)



## **In This Book**

The manual describes the following:

- Safety Practices and Hazards
- Introduction
- Laboratory Environment Requirements
- Instrument Shipping Information

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Issue 1



**Agilent Technologies**