

# Agilent Atomic Spectroscopy

## Safety Information

5800 ICP-OES	5900 ICP-OES	4210 MP-AES	7850 ICP-MS
7900 ICP-MS	8900 ICP-MS Triple Quad	Advanced Dilution System ADS 2 (ADS 2)	

For your safety, the following general safety precautions must be observed during all phases of operation of Agilent spectroscopy instruments installation. This document should be used in conjunction with installation requirements listed in your instrument Site Preparation Guide. The documentation supplied with your instrument provides detailed safety requirements for your instrument.

Documentation is provided with your software installation media or in printed form. Documentation may also be available on the Web. Visit [www.agilent.com](http://www.agilent.com) and type your product number in the Search field at the top of the page.

### Installing the instrument

Some instruments can be awkward to lift or carry. Refer to the instrument's documentation for lifting instructions.

Before connecting to power, check the following:

- Line voltage matches equipment ratings
- Instrument line voltage switch matches line voltage (if applicable)
- Instrument line fuse is correct for the line voltage (if applicable)
- Power cord matches the power receptacle (use the power cord included with the instrument)

Verify all other safety precautions described in the documentation have been taken.

### Ground the instrument

If your instrument is provided with a grounding-type power plug, the power plug must be connected to a properly-grounded electrical receptacle to minimize shock hazard.

## Fuses and batteries

See the documentation or rear of the instrument for information about line-fuse or battery replacement. Do not use a different fuse or battery than is specified for the instrument.

## Instrument operation

### **Do not operate in explosive atmosphere**

Do not operate the instrument in hazardous (potentially explosive) atmospheres.

### **Do not operate in wet environment**

Unless otherwise specified in the documentation, this instrument is intended for use in dry, indoor locations only.

### **In case of damage**

Instruments that appear damaged or defective should be secured against unintended operation until they can be repaired by qualified service personnel.

## Instrument modification

### **Do not remove the instrument cover**

Unless otherwise specified in the documentation, there are no user-serviceable parts inside this instrument. Refer all servicing to qualified service personnel.

### **Do not modify the instrument**


























Do not install substitute parts or perform any unauthorized modification to the product. Contact your Agilent Sales and Service office to arrange for service and repair to ensure that safety features are maintained. Failure to do so may void the safety certification and create a safety hazard.

## Information hazards

If you are relying on a reading from this instrument to determine whether a safe condition exists (for example, whether a conductor is at a low enough voltage to be touched safely), refer to the documentation for a procedure to assure that this instrument is working properly so that it provides trustworthy readings.

## Safety symbols

These symbols, which have these meanings, may be marked on this instrument. Other symbols may also be marked on this instrument. Refer to the documentation for more information.

	Direct current
	Alternating current
	Either direct or alternating current
	Earth ground terminal
	Protective earth ground terminal
	Frame or chassis ground terminal
	On (mains supply)
	Off (mains supply)
	Standby (mains supply). The instrument is not completely disconnected from the mains supply when the power switch is in the standby position.
	Caution, refer to accompanying documentation
	Risk of electric shock
	Hot surface
	Explosion hazard
	Broken glass
	Corrosive liquid
	Ejecting parts
	Eye hazard
	Fire hazard
	Heavy weight (danger to feet)
	Heavy weight (danger to hands)
	Moving parts
	Noxious gas
	Extreme cold
	Laser hazard
	RF radiation, Non-ionizing radiation

**NOTE**

Not all of the following information may apply to your instrument. Consult the Site Preparation Guide and the User's Guide for your instrument for details.

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## Ozone

Ozone can be generated by radiation from the light source lamps. Exposure to ozone can result in severe irritation to the skin, eyes, and upper respiratory system. The maximum permissible exposure level is 0.1 parts per million (0.2 milligrams per cubic meter).

Always ventilate the area surrounding the instrument such that the concentration of ozone does not exceed the maximum permissible level. All venting must be to outside air, never within the building.

## Heat, Vapors and Fumes

### ICP-OES, MP-AES

Heat, ozone, vapors and fumes generated by a 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 (as specified in the Site Preparation Guide). 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.

### ICP-MS

Due to potential health hazards, the exhaust gases from the plasma and vacuum systems must be removed through the laboratory ventilation system via the instrument exhaust vent. If inadequate ventilation occurs, vaporized pump fluid, ozone, and other toxic combustion products will accumulate in the laboratory.

Hydrofluoric acid (HF) fumes, if inhaled, cause extensive burning of lung tissue.

Ensure the ventilation system is always in operation.

- There is continuous oil mist from the foreline pump, even when the instrument is not in Analysis mode.
- Harmful hydrogen may remain even when not analyzing so the ventilation system should always be on, even in Standby mode.
- Condensation might occur due to reverse flow through the exhaust duct.

Ensure that the exhaust system established during installation continues to operate effectively. Connect a low-flow warning light to the extraction system or use an air-flow measurement device to give an alarm in the event of a malfunction.

Check the laboratory's ventilation duct and the hood over the sample preparation table before operating the instrument.

Do not cover the holes for air intake on the ICP-MS and the peripherals.

## Foreline pump

Foreline pump oil is flammable. Keep away from fire. If foreline pump oil contacts skin, mouth, or eyes, wash immediately and thoroughly and seek expert medical attention.

The surface of the foreline pump may be HOT, do not touch the pump until it has cooled. The oil may be hot. Avoid contact with the oil.

Make sure to connect the inlet and outlet of the foreline pump correctly.

Connect the exhaust hose from the foreline pump tightly with a hose clamp.

Do not disconnect the exhaust hose from the foreline pump.

## Plasma

### ICP-OES and MP-AES torch

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.

### ICP-OES

The plasma is extremely hot (about 6,000 K) and radiates dangerous levels of radio frequency (RF) energy. The plasma emits high intensity ultraviolet to infrared light. The work coil operates at 1,500 V RMS and about 40 MHz. Exposure to the RF energy and high intensity light 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 torch compartment door is closed, with the locking lever fully latched; and
- the space above the chimney is clear of objects.

The shielding around the torch compartment is designed to reduce high intensity light 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 or the handle on the torch compartment door is opened. Do not attempt to bypass the interlock system.

### MP-AES

The plasma is extremely hot (about 6,000 K) and operates using high levels of microwave energy. The plasma emits high intensity ultraviolet to infrared light. Always wear appropriate eye protection if viewing the plasma. Close contact with the operating plasma can result in severe heat burns to the skin, and exposure to microwave radiation can cause sub-surface skin burns.

Do not operate the plasma if:

- the microwave excitation assembly appears to be damaged
- foreign material is present in the viewing port (left end of the microwave excitation assembly) or the torch aperture (vertical space for the torch)
- the space above the chimney is not clear of objects

- the MP-AES exhaust system is not connected or turned on

The microwave excitation assembly is designed to reduce microwave radiation to safe levels while still permitting easy installation of the torch and viewing of the plasma.

### ICP-MS

The plasma is extremely hot (about 6,000 K) and radiates dangerous levels of radio frequency (RF) energy. The plasma emits high intensity ultraviolet to infrared light. Always wear appropriate eye protection if viewing the plasma. Close contact with the operating plasma can result in severe heat burns to the skin, and exposure to microwave radiation can cause sub-surface skin burns. The torch is exposed to very high temperatures. Wait at least 10 minutes for cooling before you start any torch maintenance.

The plasma must never be operated unless:

- either of the top covers are closed and
- the space above the chimney is clear of objects and
- the exhaust system operates correctly

The ICP-MS has an interlock system that is designed to extinguish the plasma if either the mains supply fails or either of the top covers is opened.

## Gas hazards

### General

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) 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.

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 that are easily accessible to the instrument operator.

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

Use only 'instrument grade' gases with your spectrometer.

Use only connector tubing that is chromatographically clean and has a pressure rating significantly greater than the highest outlet pressure from the regulator.

Check the condition of the pipes. Replace as needed during operation or maintenance.

## ICP-MS cell gas

Hydrogen, ammonia and oxygen cylinders must always be placed in separate safety cabinets. Fully and strictly adhere to all local and national regulations and guidelines for the proper storage, handling and transport of all gases. Consult the cylinder, regulator and/or gas supplier for additional safety measures and ensure all staff are fully familiarized with all safety precautions.

Helium content of the 3<sup>rd</sup> cell gas mix must be 90% or more. For example: NH<sub>3</sub>/He mix; He content must be equal to or greater than 90%. Even if introducing a non-corrosive non-flammable gas to the 3<sup>rd</sup> cell, it still must be diluted with 90% or more Helium.

When using an Agilent 8900 ICP-MS Triple Quad #210, 100% NH<sub>3</sub> can be used.

## Oxygen

Oxygen has the following properties. Handle with care.

- Oxygen supports combustion of other materials. Materials which are non-combustible in air may become combustible in oxygen.
- When compared to being in air, the flammability range of materials increases in oxygen, and materials burn at lower temperatures.
- Open the oxygen cylinder valve slowly. Opening the valve too quickly can generate heat by adiabatic compression (a momentary high-temperature state caused by rapid compression of oxygen) and friction, increasing the risk of ignition.
- In high-density oxygen, there is a potential risk that materials such as metals (and metal powders), dust, and hydrocarbons (petroleum, greases, oils and fats, skin oils, and so on) can easily burn.

Smoking, open flames and other sources of ignition are prohibited in or near a facility which uses oxygen. Additionally, do not place inflammable and pyrophoric materials in the area. Make sure to observe all applicable local and national regulations and guidelines for the use and handling of oxygen.

## Health hazards of oxygen

The primary health hazard at atmospheric pressure is respiratory system irritation after exposure to high oxygen concentrations. Oxygen levels in air should be maintained above 19.5% and below 23.5%. Up to 50% oxygen can be breathed for more than 24 hours without adverse effects.

Prolonged exposure to high oxygen levels (>75%) can cause central nervous system depression: signs/symptoms can include headache, dizziness, drowsiness, poor coordination, slowed reaction time, slurred speech, giddiness and unconsciousness. In addition, note the following inhalation effects from acute exposure: may cause breathing difficulty; may cause coughing and chest pain; may cause lung damage; may cause soreness of the throat.

## Solvents

### General

Always follow safe handling procedures and wear the appropriate safety equipment when handling solvents. Use only solvents recommended in the instrument User's Guide.

Read the Safety Data Sheet (SDS) for each solvent used.

## ICP-MS

### Dealing with liquid spills

**Tuning solution, foreline pump oil and other solution spills:** please clean with a dry cloth. In the case of large spills, use of a spill kit is recommended. Please refer to and follow the safety instructions on the SDS (Safety Data Sheet) when available.

**Solvent spillage into instrument:** disconnect the power cable and call the customer contact center.

Make sure the spray chamber has a good seal with the drain O-rings, especially when using organic solvents. Organic solvent leaks can be a fire hazard.

### Autosamplers

Do not use organic solvents and other combustible or flammables in the rinse port fluid. Combustibles or flammables can ignite during use. Also, some organic solvents can damage the internal elements of the instrument.

If an overflow of the rinse receptacle caused by blockage of the peristaltic pump or a liquid spillage is noted, switch off the sampler and unplug the main cords. The sampler then should be cleaned and wiped dry.

In the case of leakage (liquid under the I-AS), disconnect the power cable and contact your local Agilent office.

## Drain vessel/lines

### ICP-OES, MP-AES and ICP-MS

The drain vessel contains the spray chamber effluent, which can be toxic. Improper handling of the vessel can result in a serious explosion or fire if incompatible substances accumulate. Corrosion of the vessel and connecting tube can result in leaks that may damage the instrument or cause bodily harm. If the effluent collected in the drain vessel contains toxic materials or solvents, follow approved laboratory procedures to safely dispose of this hazardous waste.

### ICP-MS

Ensure that the drain bottle is adequately ventilated (by the lab ventilation system, the same as for the ICP-MS mainframe) to deal with vapors from the bottle.

Clean the drain vessel every time you empty it by thoroughly flushing it with water. If it contained organic solvents, wash the drain vessel in acetone and allow it to dry.

## Maintaining parts in the ICP-MS vacuum chamber

Before opening the vacuum chamber to clean the ORS cell or for other purposes, always switch OFF the power to the ICP-MS. Otherwise, you could expose yourself to the extreme danger of contact with high voltage electricity.



## Toxic materials

There is a toxic hazard associated with components that contain beryllium or polyvinyl chloride (PVC.) Use caution to dispose of components that contain these materials.

## Cleaning

Clean the outside of the instrument with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

## Glassware

Handle fragile glass parts carefully.

## Moving the instrument

Make sure the Power switch is turned OFF. Make sure all cables between other units are unplugged and the utility tubing is disconnected before moving equipment.

If you need to lift a heavy instrument, it should be lifted with a load not exceeding 23 kg (51 lbs.), or with a mechanical lifter. Refer to the instrument User's Guide for instrument weights.

## PC placement and set up

Refer to the documentation that came with your PC for ergonomic considerations when setting up the PC.

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This information is subject to change without notice.



5971-6636  
DE83272415

Part Number: 5971-6636

Edition 6/24  
Issue 6  
Printed in Malaysia

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Mulgrave, VIC 3170, Australia

EU Importer: Agilent Technologies Deutschland GmbH, Hewlett-Packard-Strasse 8, 76337 Waldbronn, Germany

